Fishery Data Series No. 98-27

Survey of the Rainbow Trout Sport Fishery on the Upper Alagnak River, Alaska, during June 1997

by

Michael J. Jaenicke

November 1998

Alaska Department of Fish and Game **Division of Sport Fish**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

FISHERY DATA SERIES NO. 98-27

SURVEY OF THE RAINBOW TROUT SPORT FISHERY ON THE UPPER ALAGNAK RIVER, ALASKA, DURING JUNE 1997

by

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ABSTRACT

The Alaska Department of Fish and Game-Division of Sport Fish and the National Park Service-Katmai National Park and Preserve conducted a cooperative project to monitor the rainbow trout fishery in the upper Alagnak River. A creel census during 8-30 June 1997 documented that 159 angler-days (792.5 hours) of effort occurred at the upper Alagnak River, and that 935 rainbow trout *Oncorhynchus mykiss* were caught and released. Overall CPUE was 1.18 fish per hour. No sport fishing effort via trolling for lake trout *Salvelinus namaycush* at the outlet of Kukaklek Lake occurred during the June 1997 creel census period. The typical angler on the upper Alagnak River was guided, non-resident, and fished from shore. Continued monitoring of the fishery and changes to the sampling design are recommended to ensure that the rainbow trout population remains healthy in the Alagnak River.

Key words: Rainbow trout, *Oncorhynchus mykiss*, lake trout, *Salvelinus namaycush*, creel census, angler demographics, biological composition, Alagnak River, Kukaklek Lake, Southwest Alaska.

INTRODUCTION

Since statehood, the Alaska Department of Fish and Game (ADF&G) has conducted studies of rainbow trout *Oncorhynchus mykiss* to document stock status and improve management. Sport fishing effort on the Alagnak River has increased dramatically since 1981(Mills 1982-1994, Howe et al. 1995, 1996), from 1,947 angler-days in 1981 to 13,232 angler-days in 1995 (Table 1). While much of the effort on the Alagnak River targets chinook *O. tshawytscha* and coho *O. kisutch* salmon, increased effort on resident rainbow trout stocks has also been observed. The estimated annual rainbow trout harvest in the Alagnak River has remained relatively low (below 500 fish since 1988); however, the estimated number of rainbow trout caught during 1991-1995 has ranged from 11,062 in 1994 to 30,665 in 1993 (Table 1).

Increased effort and reports from concerned anglers about poor fishing and small fish size have raised questions concerning status of rainbow trout stocks in the Alagnak River drainage. The rainbow trout fisheries throughout Southwest Alaska are managed to maintain historic age and size composition and a diversity of angling opportunity (ADF&G 1990). Periodic monitoring of these fisheries provides vital information to address management issues of these stocks.

The Alagnak River, known locally as the Branch River, is located in the Kvichak River drainage approximately 60 km (40 miles) north of King Salmon, Alaska (Figure 1). The river's source is the outlet of Kukaklek Lake, and the river flows in a westerly direction for approximately 100 km (60 miles) before it empties into the Kvichak River. The upper half of the Alagnak River drainage is within the National Park Service-Katmai National Park and Preserve (NPS-KNPP).

Little is known about rainbow trout or the trout fishery in the upper Alagnak River. Age and length data have been collected periodically from rainbow trout in the Nonvianuk River and throughout the Alagnak River. Creel surveys were conducted (Brookover 1989; Dunaway 1990, 1994) in the lower Alagnak River (approximately 5 km above the confluence with the Kvichak River and extending upstream 19 km), but the emphasis of these surveys was chinook and coho salmon rather than rainbow trout. A creel census was conducted at the outlet of Nonvianuk Lake during June 1996, and rainbow trout were sampled for age and length in 1996 from both the Nonvianuk River and upper 75 km (45 miles) of the Alagnak River (Jaenicke 1998). No creel survey has been conducted at the outlet of Kukaklek Lake or within the headwaters of the Alagnak River.

Table 1.-Estimated sport fishing effort (angler-days), and harvest and catch of rainbow trout and lake trout on the Alagnak River during 1981-1996.

	Fishing Effort	Rainbow trout		Lake trout	
Year	(Angler-days)	Harvest	Catch[a]	Harvest	Catch[a]
1981	1,947	76		0	
1982	2,252	157		0	
1983	2,348	178		0	
1984	5,119	187		0	
1985	2,473	518		0	
1986	7,628	340		1,257	
1987	4,786	824		0	
1988	1,182 [b]	18 [b]		73 [b]	
1989	2,717	343		20	
1990	6,571	423	6,057	74	370
1991	6,079	243	23,244	14	495
1992	12,323	111	18,452	8	147
1993	12,440	312	30,665	83	460
1994	10,949	74	11,062	15	119
1995	13,232	107	19,499	0	404
Average during:					
1991-1995	11,005	169	20,584	24	325
1986-1995	7,791	280		154	
1996	12,784	24	24,395	9	216

From: Mills 1982-1994, Howe et al. 1995-1997.

[a] Estimates of catch of rainbow trout and lake trout not available until 1990.

[b] Estimates based on less than 12 responses, and thus should be considered having less accuracy.

Discussions with guides and anglers familiar with the rainbow trout fishery in the upper Alagnak River indicated that two distinct fisheries occur in this area: a lake trout *Salvelinus namaycush* fishery at the outlet of Kukaklek Lake and a rainbow trout fishery in the upper Alagnak River. Both fisheries occur primarily in June. Estimates of historical catch and harvest of lake trout in the Alagnak River indicate that during 1990 to 1996, annual catches have ranged from 100 to 500 fish, and annual harvests have ranged from 0 to 83 fish (Table 1). The lake trout fishery is characterized by anglers in boats trolling in the offshore waters of the lake outlet area, where both lake trout and rainbow trout may be caught. The rainbow trout fishery extends from the outlet of Kukaklek Lake downstream approximately 17 km (10 miles) to the rapids area of the river, and is characterized by anglers fishing from shore. Rainbow trout are the main resident species caught within the upper Alagnak River, although Arctic grayling *Thymallus arcticus*, lake trout, and Dolly Varden *Salvelinus malma* are also present.

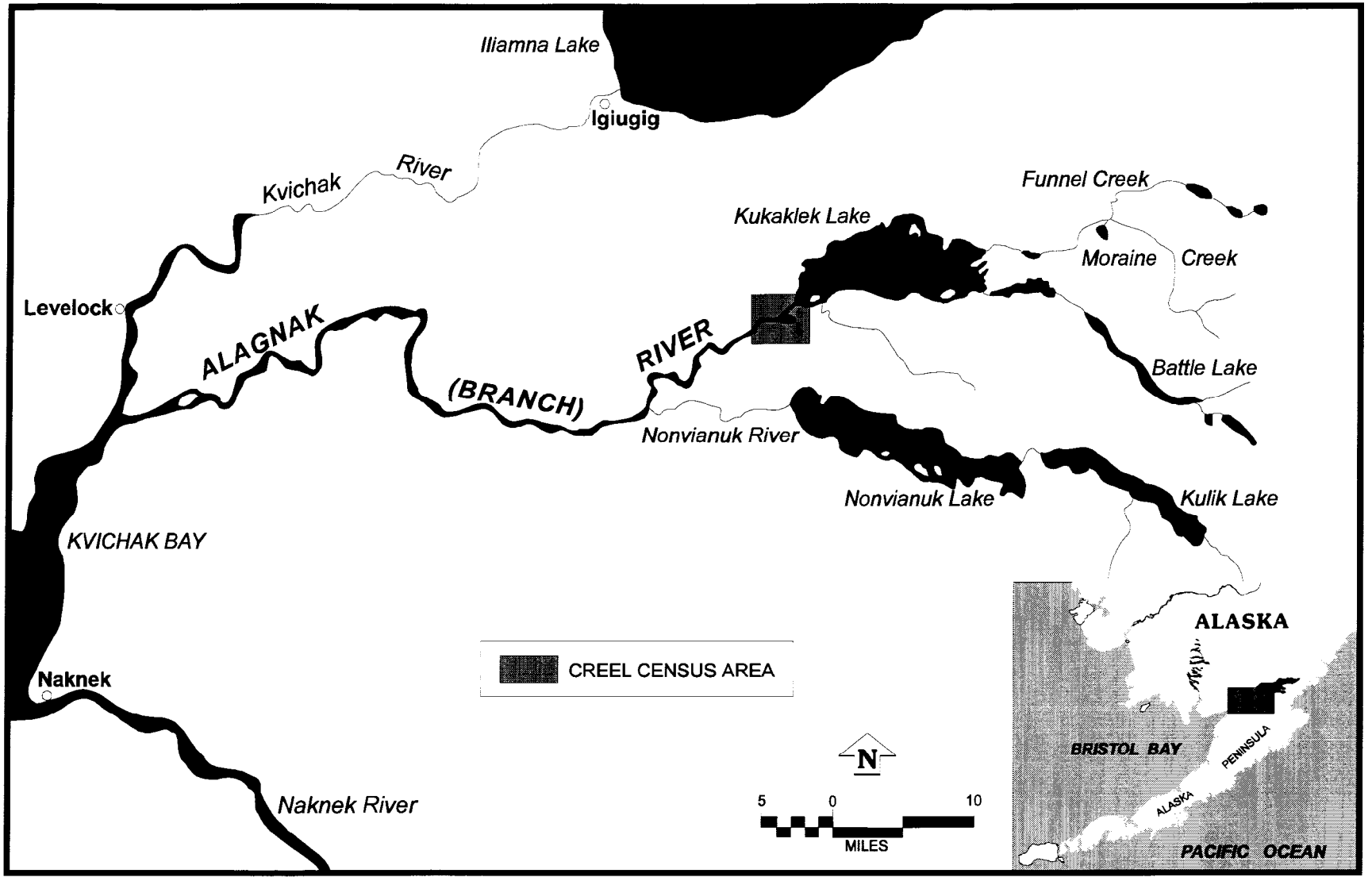

Figure 1.-Map of Alagnak River drainage and location of creel census area.

The objectives of this study were to document recreational fishing effort in the upper Alagnak River, the number of rainbow trout caught and released in the fishery, the distribution of catch success of rainbow trout among anglers (angler-days), and to estimate the proportion of angler-days by angler type (shore/boat, guided/unguided, local/Alaska/U.S./not U.S. residency, and adult/youth). In addition we sampled sport-caught rainbow trout for age and length.

METHODS

STUDY DESIGN

This was the second year in which ADF&G-Division of Sport Fish and the NPS-Katmai National Park and Preserve participated in a cooperative field study of the rainbow trout resources in the Alagnak River drainage. The NPS-KNPP provided logistic support and a field crew to conduct the creel census and biological sampling, while ADF&G-Division of Sport Fish provided sampling equipment, data forms, and training for creel censusing and collecting biological data, aged the scales, analyzed the data, and wrote the report.

Creel Census

An NPS field crew conducted a creel census from 8 June through 30 June 1997. The crew was housed onsite in tents at the outlet of Kukaklek Lake. Completed-trip angler interviews and sampling of rainbow trout occurred along the upper 4.2 km (2.5 mile) section of the river (Figures 1 and 2), where the majority of the fishing effort occurs and where the majority of the anglers enter and exit the fishery. Anglers who completed fishing for the day were interviewed. Biological data were collected throughout the fishing day from rainbow trout and lake trout caught by anglers in the upper Alagnak River.

The number of rainbow trout and lake trout caught and released, and time fished (to the nearest half hour) were recorded. The rainbow trout fishery around the outlet of Kukaklek Lake and the upper Alagnak River is catch-and-release by regulation (ADF&G 1997). Anglers provided information on their residency, whether they fished from a boat or from shore, and whether they employed the services of a guide. The number of anglers not interviewed each day was also recorded.

Biological Composition

Biological data were collected throughout the fishing day from rainbow trout and lake trout caught by anglers in the upper Alagnak River. Rainbow trout were measured for fork length to the nearest millimeter and examined for the presence of tags, fin clips, and tag scars. In addition, a scale smear of six to 12 scales was taken from the preferred area (Alvord 1954, Maher and Larkin 1955) for aging purposes. The smear technique minimized errors of estimating age caused by regenerated scales. Scales were placed inside coin envelopes upon which the corresponding length, tag number (if a tag was present), and other data were recorded. Upon completion of the sampling procedures, all rainbow trout were released unharmed.

Rainbow trout caught during the June fishery that were robust and healthy (e.g., not lethargic, no gaping wounds or scars, no bleeding gills) were also marked with a dark green Floy tag, each with a unique six digit number. The adipose fin was clipped to provide a secondary mark. Only fish at least 250 mm in fork length were marked. The Floy tag number was recorded on the coin envelope containing the scale samples. Floy tagging provided two benefits: (1) it prevented

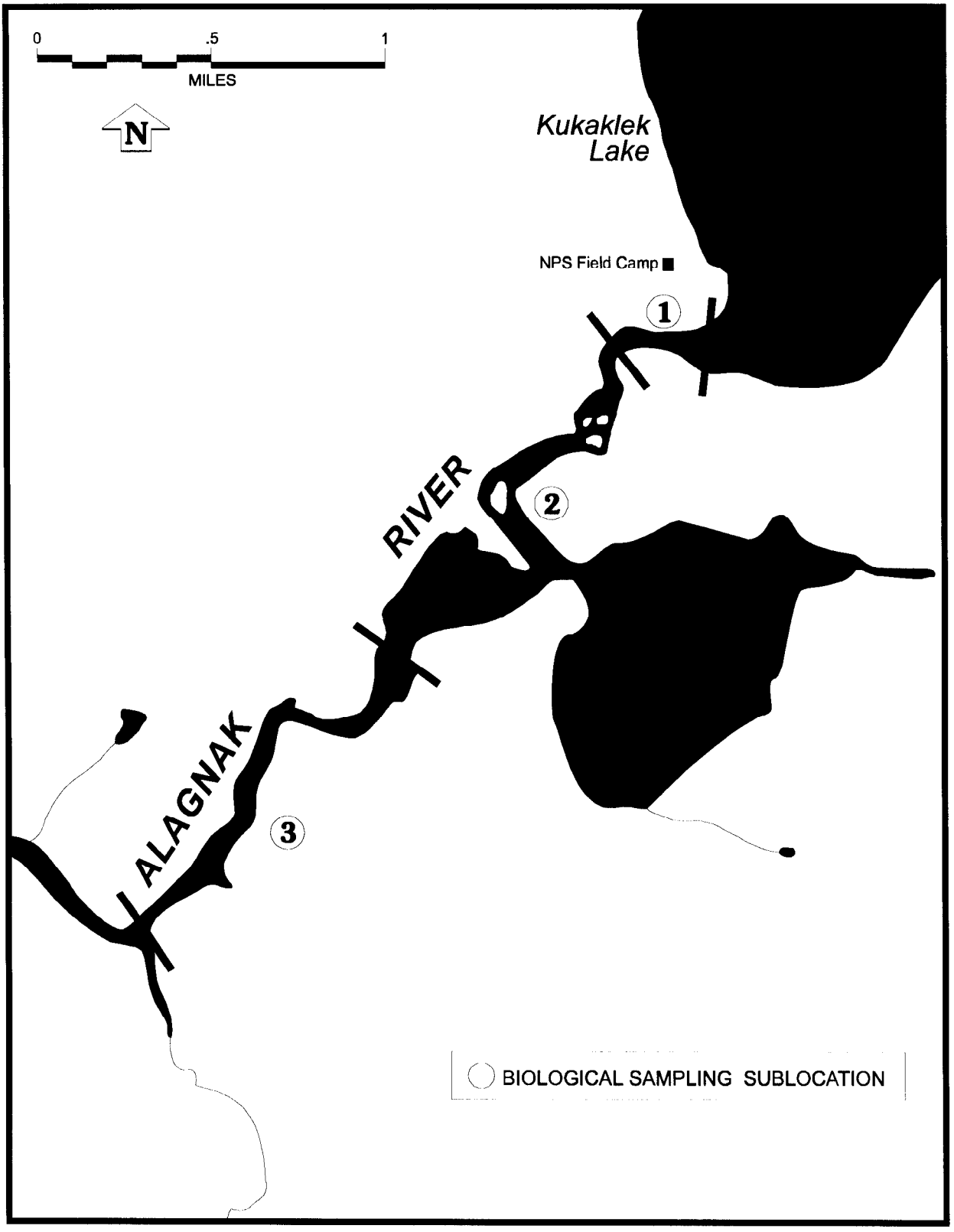

Figure 2.-Location of study area and biological sampling sublocations in the headwaters area of the Alagnak River.

double sampling of fish for biological data, and (2) possible future tag recovery of these tagged fish may provide indications of fish distribution and movement.

To collect biological information from sport anglers, field technicians stayed with a group of anglers for several hours at a time, with the anglers' permission, and sampled all the fish they caught and subsequently released. Due to the deep water and lack of room in lodge fishing boats, it was impractical to either wade out to sport anglers fishing from boats or to sit in their boat while the clients fished. Therefore, only rainbow caught by shore anglers wading in the stream were sampled. In addition, especially when sampling from sport anglers was not feasible or when sport anglers were not present, the field technicians conducted test fisheries with hook-and-line gear to capture and sample rainbow trout. The majority of the test fishing occurred after approximately 1700 hours, as by this time of day the sport anglers had completed their fishing trip and departed the area via floatplanes.

When rainbow trout were sampled for biological data, the location of capture was recorded. These locations were: (1) a 0.25 mile section of river from the outlet to the large bend in the river; (2) an approximate 1.5 mile section of the river from the large bend in the river to the lower end of the lagoon, and (3) an approximate 1.0 mile section from the lower end of the lagoon to the area in the river where rapid sections become prevalent (Figure 2).

Scale smears were sorted under a microscope and the three or four best scales were mounted on adhesive-coated cards. Mounted scales were pressed against acetate cards in a heated hydraulic press and the resulting scale impressions displayed on a microfiche projector for age determination (Jerald 1983). Scale impressions were read three separate times, and only those readings which had at least two out of the three age determinations matching were considered as a known age (Coggins 1994; Minard and Dye 1998). The occurrence of aging error (no modal ages, regenerated scales, inverted scales, missing scales) was recorded.

DATA ANALYSIS

Creel Census

Sampling at the upper Alagnak River was a census of all anglers using the area. Analysis of the data amounted to summing the reported hours of effort and number of fish caught or harvested by species, and summing the number of angler-days by gear type, demographic information, and other interview data. The distribution of catch success of rainbow trout was calculated as a binomial proportion by (Cochran 1977):

$$\hat{p}_i = \frac{n_i}{n}, \qquad (1)$$

where:

n_i = number of completed-trip anglers who caught zero rainbow trout for i = 0, 1 or more rainbow trout for i = 1, etc., and

n = total number of completed-trip anglers sampled.

The proportion of angler-days by angler type was calculated in a similar manner.

Biological Composition

Mean length and the associated variance were calculated using normal procedures. The proportion of rainbow trout of each length or age class (p_i) was estimated as shown in Equation 1. The numerator in this case was the number of rainbow trout sampled of length or age class i; and the denominator was the total number of fish sampled.

The variance of this proportion was estimated by (Cochran 1977):

$$\hat{V}(\hat{p}_i) = \frac{\hat{p}_i(1-\hat{p}_i)}{n-1}. \quad (2)$$

A Kolmogorov-Smirnov test (test statistic = D, Sokal and Rohlf 1981), at a significance level of $\alpha = 0.05$, was used to test the null hypothesis that the length distribution of sampled rainbow trout did not differ over time. To detect change over time, the data were divided into two groups of equal, or nearly equal, numbers of rainbow trout sampled. If no difference was detected then the sample would likely provide unbiased estimates of the length and probably the age distribution of the catchable population. If the length distribution was different between the groups, then the data were poststratified. Visual inspection of plots of the cumulative length frequency was also conducted to evaluate differences in length distributions.

Catch by age was estimated as:

$$\hat{C}_i = C\hat{p}_i, \quad (3)$$

and its variance by:

$$\hat{V}(\hat{C}_{i)} = C^2\hat{V}(\hat{p}_i). \quad (4)$$

Computer files and software used to produce this report are listed in Appendix B1.

RESULTS

CREEL CENSUS

During the creel census, 159 anglers were interviewed. Only six anglers were not interviewed, so we considered this a census. A total of 159 angler-days of effort, accounting for 792.5 angler-hours, resulted in a catch of 935 rainbow trout at the upper Alagnak River (Appendix A1). The overall CPUE was 1.2 fish per hour. In addition, 14 lake trout and 15 Arctic grayling were caught and released at the upper Alagnak River. Note that during the 3-week census period, no fish species was harvested in the area.

Most anglers in the upper Alagnak River were guided (69%), non-Alaskan U.S. residents (78%), fished from shore (67%), and used fly fishing gear (94%, Table 2). Approximately 89% of anglers at the upper Alagnak River caught one or more rainbow trout, and 50% of the anglers caught five or more fish by the end of the angling day (Figure 3).

BIOLOGICAL COMPOSITION

Length and scales were collected from a total of 139 rainbow trout (90 fish from the test fishery, 49 fish from the sport fishery) in the upper Alagnak River (Appendix A1). The biological data were stratified into the three locations designated in the creel census area (Figure 2): there were 32 sport fish samples and 24 test fish samples from location 1; 10 sport fish samples and 6 test

Table 2.-Number and percent of angler-trips by angler type during the upper Alagnak River rainbow trout sport fishery, 8 June through 30 June 1997.

Characteristic	Angler-trips	Percent
Guide Services		
Guided	110	69
Unguided	49	31
Residency		
Alaska Residents	24	15
Local Alaskan Residents	2	1
Nonlocal Alaskan Residents	22	14
Non-Alaskan Residents	135	85
U.S. Residents	124	78
Non-U.S. Residents	11	7
Access to Nonvianuk River		
Used air charter service	146	92
Used private plane	13	8
Outfitted		
Outfitted[a]	134	84
Not outfitted[b]	25	16
Sex		
Male	149	94
Female	10	6
Youth/Adult		
Adult	155	97
Youth	4	3
Boat/Shore		
Fished from boat	48	30
Fished from shore	107	67
Fished from shore and boat	4	3
Tackle Type		
Spin	10	6
Fly	149	94
Total Angler Trips	159	

[a] Outfitted implies that angler was provided with gear, rental boat, or camp equipment.

[b] Not outfitted implies that angler used personal gear.

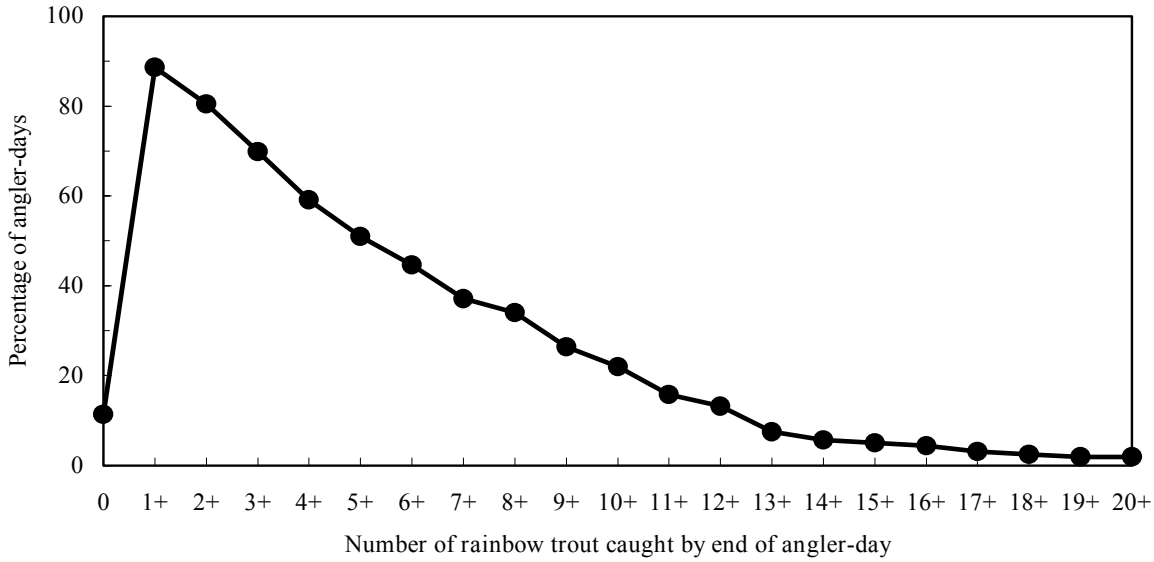

Figure 3.-Catch success rate of rainbow trout at the upper Alagnak River during 8 June through 30 June 1997.

fish samples from location 2, and 7 sport fish samples and 60 test fish samples from location 3. Note that the majority of test fish samples were collected in location 3, approximately 1.5 mi below the main sport fishing area.

Rainbow trout sampled from the sport fishery tended to be larger than those sampled in the test fishery (Figures 4 and 5). A Kolmogorov-Smirnov test detected a significant difference in the cumulative length distribution between the two sample types in location 1 ($n_1 = 32$, $n_2 = 24$, $D = 0.35$, $P = 0.04$; Figure 4), the only location with sufficient fish sampled to test between sample types, and when all locations were combined ($n_1 = 49$, $n_2 = 90$, $D = 0.33$, $P = 0.001$; Figure 5). These results indicate biological data collected in the test fishery cannot be used to estimate the age or length composition of the sport catch.

The length distribution of rainbow trout also changed during the month. Test fishery length data from location 3 was divided approximately in half (period 1: 6/8-6/18, n=29 and period 2: 6/19-6/28, n=31). Rainbow trout sampled later in June were significantly ($n_1=29$, $n_2=31$, $D=0.39$, $z=1.49$, $p=0.015$) smaller than those sampled early in June (Figure 6). This result suggests a potential temporal change may be present in the length distribution of the sport catch as well, although the lack of adequate data precludes addressing this issue.

The scale samples from the rainbow trout sampled in the test and sport fisheries were assigned ages (Table 3). Due to the small sample sizes, no further analysis of the age data was justified.

The age and length composition of the entire sport catch of rainbow trout cannot be estimated because the biological data were not representative of the catch. In the upper Alagnak River, anglers fishing from boats accounted for 30% (n = 48) of the completed angler interviews, 34% (n = 267 hours) of the angling effort, and 36% (n = 339 fish) of the rainbow trout catch. Unfortunately, all test and sport fish samples were from anglers fishing from the shore. This

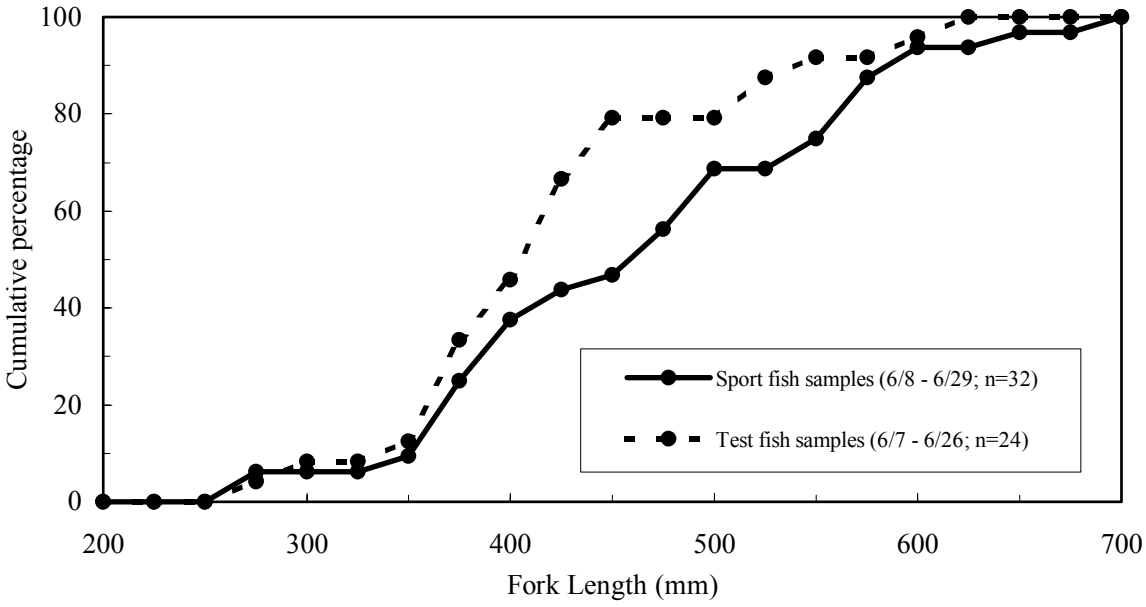

Figure 4.-Comparison of cumulative length distribution of rainbow trout sampled in sublocation 1 of the upper Alagnak River during June 1997.

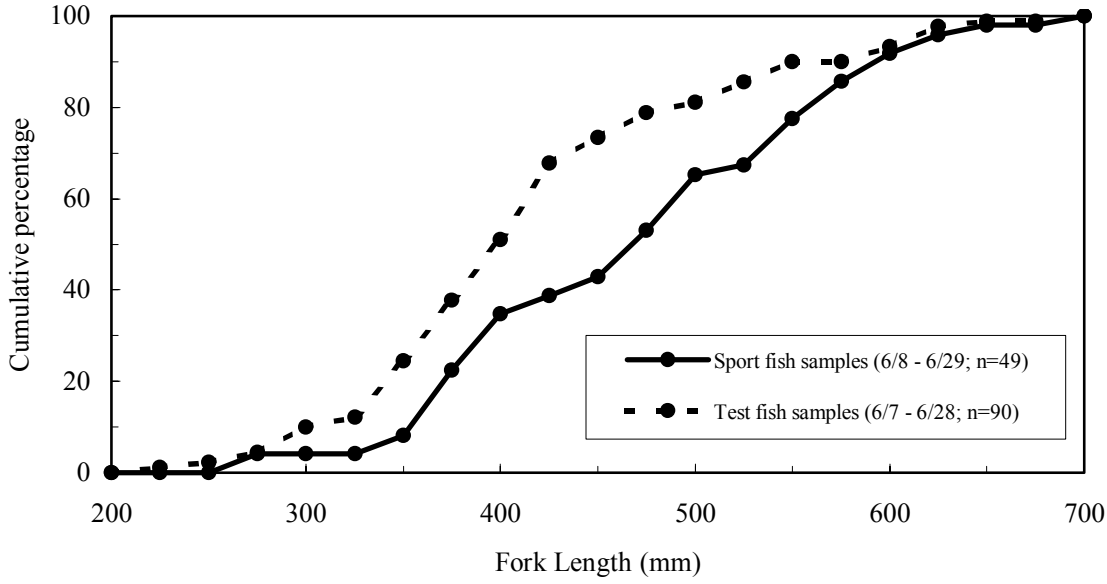

Figure 5.-Comparison of cumulative length distribution of rainbow trout sampled in the creel census area of the upper Alagnak River during June 1997.

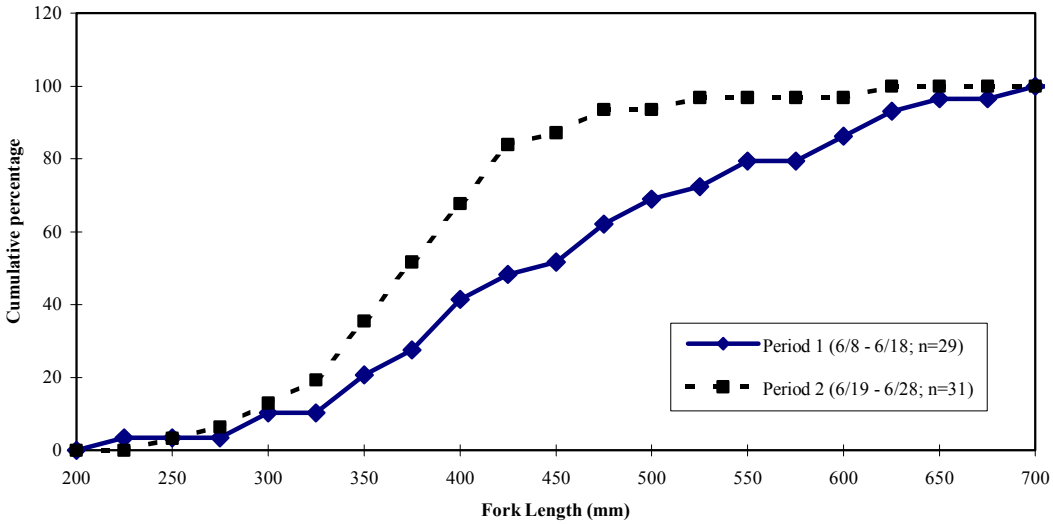

Figure 6.-Comparison of cumulative length distribution of rainbow trout sampled in test fishery in sublocation 3 of the upper Alagnak River during June 1997.

Table 3.-Mean length (millimeters) of rainbow trout, by age group, from the sport and test fish samples collected from 9 June through 29 June 1997 from the upper Alagnak River creel census area.

	Age										
	Unknown	4	5	6	7	8	9	10	11	12	Total
Test fish samples											
n (Known Age)		2	11	12	22	11	6	3	2		69
Percent		2.90	15.90	17.40	31.90	15.90	8.70	4.30	2.90		100.00
SE		2.03	4.44	4.6	5.65	4.44	3.42	2.47	2.03		
Mean Length	493	251	315	369	382	422	457	535	569		414
SE	26.13	3.00	11.13	9.68	9.11	10.77	15.81	40.78	44.50		10.17
Sample Size	21	2	11	12	22	11	6	3	2		90
Sport fish samples											
n (Known Age)			2	4	8	4	9	3	1	2	33
Percent			6.1	12.1	24.2	12.1	27.3	9.1	3	6.1	100
SE			4.22	5.77	7.58	5.77	7.87	5.08	3.03	4.22	
Mean Length	533		260	361	378	401	467	585	528	623	466
SE	17.4		2	8.32	7.95	18.47	9.61	7.84		56.5	14.14
Sample Size	16		2	4	8	4	9	3	1	2	49

occurred because sampling the sport catch of anglers in boats was impractical. The boats generally were full of anglers and had no room for a technician to remain within the boat and sample their sport catch. The generally deep (1 - 3 m) and fast current of the main channel of the upper Alagnak River made it difficult and unsafe for technicians to wade out to the boats to sample fish. Additionally, using the Zodiac raft and jet outboard to remain with anglers fishing from an anchored or drifting boat was not acceptable to anglers seeking a quality fishing experience.

Only a small number of lake trout were caught in either the sport fishery (n = 14) or test fishery (n = 3). Three of the 14 lake trout caught in the sport fishery were sampled and measured for length (479, 537, and 550 mm). The three lake trout caught in the test fishery had lengths of 419, 503, and 539 mm.

DISCUSSION

Comparisons of the creel census information at the upper Nonvianuk River in June 1996 (Jaenicke 1998) with the creel census information from the upper Alagnak River in June 1997 provide some indications of similarities and differences. Both areas received relatively moderate effort: 159 angler-days with a total of 792.5 angler-hours at the upper Alagnak River and 155 angler-days with 755 angler-hours at the upper Nonvianuk River. The number of fish caught and CPUE did differ slightly between the two sites: the upper Nonvianuk River had a total catch of 1,529 rainbow trout and CPUE of 2.03 fish per hour, while the upper Alagnak River had a total catch of 935 rainbow trout and CPUE of 1.18 fish per hour.

The lack of effort for lake trout in the outlet area of Kukaklek Lake was surprising, as prior to the season discussions with lodges and guides had indicated a major effort of anglers trolling for lake trout in this area. Based on the perception that two distinct fisheries occurred during June and the need to separate biological samples from Kukaklek Lake and the Alagnak River, it was necessary to establish an imaginary boundary between the outlet of Kukaklek Lake and the start of the Alagnak River. Within the lake outlet and river headwaters area, there is no obvious demarcation where the lake ends and the river begins, nor are there obvious landmarks to set boundary lines. The boundary was selected at an area where the lake outlet narrowed and the current increased and noticeable riffles existed. Throughout the creel census period the field technicians recorded catch, effort, and biological data on two series of data forms; i.e., one for the outlet of Kukaklek Lake and one for the upper Alagnak River. Discussion with the field technicians at the end of the project indicated that this separation of lake versus river areas was flawed, as angling activity above the imaginary line only took place within 100 yards of the line. It was determined postseason to merge the data sets into just one series, representing the upper Alagnak River.

A new lease agreement between a nearby fishing lodge and the land owners of the area at the outlet of Kukaklek Lake and first 2 miles of the upper Alagnak River corridor probably influenced the angler effort and demographics during the June sport fishery. It is possible that the exclusive-use and access land lease given to the lodge reduced fishing effort, especially with nonguided anglers. However, there are no historic data available to determine if effort was reduced in 1997.

The objective of the biological sampling was to estimate the length composition of the sport catch. Too few rainbow trout were sampled from the sport catch to provide estimates with much accuracy or precision. Although nearly 90 fish were sampled in the test fishery to supplement the sport catch samples, the differences in length distribution indicate that the test fishery data cannot be pooled with the sport fishery data. Possible causes of the observed difference in length distribution include the following: (1) inadequate sample sizes to provide representative data; (2) large fish may have been present in location 1, where the majority of the sport catch samples (32 out of 49 fish) occurred, while smaller fish may have been present in location 3, where the majority of the test fish (60 out of 90 fish) were sampled; or (3) perhaps by the evening, when the test fishery usually took place, larger fish had been caught and released earlier in the day and were not as likely to be caught as the smaller fish, or some form of diurnal migration of larger fish in the headwaters area was occurring.

Discussions with the field crew postseason indicated that every effort was made to sample adequately from the sport catch. The majority of the sport catch was sampled from location 1 because this area received the greatest amount of sport fishing effort. Additionally, the relatively shallow waters in this location made it possible to approach and sample the sport catch from anglers who waded into the river. The main problem encountered in sampling the sport catch in location 1 was that shore anglers spread out over an area approximately 0.25 mile in length, and in most cases had waded out 20 to 30 yards into the river channel. The field technicians would wait on the river bank approximately mid-way between the group of anglers and made efforts to sample the sport catch whenever possible. Even though anglers were informed about the need to sample the sport catch, such requests were occasionally forgotten by anglers intent on quickly releasing their fish.

Sampling the sport catch of anglers in boats proved to be the greatest hindrance to acquiring adequate numbers of sport fish samples. This also precluded getting a representative sample, since boat anglers fished a different habitat than shore anglers.

Discussions with the field crew after the season indicated that test fishing was conducted in all three locations. While test fishing did occur in the evenings in locations 1 and 2, generally after a group of sport anglers had fished these waters for 6 to 8 hours, catch success was usually extremely poor. The test fishing in location 3 in the evenings proved more successful as indicated by the test fish samples from this area, perhaps due to less sport fishing effort occurring here earlier in the day.

Proper planning and sampling are necessary to obtain accurate, precise estimates of the age and length composition of rainbow trout populations. Recommendations for future biological sampling of the rainbow trout populations in areas such as the upper Alagnak River are:

1. Obtain adequate sample sizes to improve accuracy and precision of the estimates of the age and length composition.
2. Spatial and temporal changes in the size structure of a rainbow trout population, as is indicated in this 3-week study on a small stretch of the upper Alagnak River, should be considered.
3. Sampling of the sport catch from shore and boat anglers should be at least roughly proportional to the catch occurring in these two modes of fishing. Although it proved

unfeasible to sample sport anglers in boats for this project, future sampling efforts at this site will require that a sampling method be developed to sample the sport catch from anglers in boats.

4. The biological data from the test fishery provides valuable supplementary information. However, test fishing effort should be representative of the sport fishing effort and the proportion of samples from a given location should be similar for both sport and test fisheries. Although attempts were made in this project, the catch success rate for test fishing was poor in areas that received significant sport fish effort earlier in the day.

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APPENDIX A

Appendix A1.-Daily sampling at the upper Alagnak River during the June 1997 creel census.

						Number of Rainbow Trout Sampled for Length and Age Data			Number of Lake Trout Sampled for Length Data		
	Anglers	Effort	Rainbow Trout		Lake Trout	Sport	Test		Sport	Test	
Date	Interviewed	(hrs)	Catch	CPUE[a]	Catch	Fish[b]	Fish[c]	Total	Fish[d]	Fish[e]	Total
6/08	7	26	68	2.62	3	5	14	19	1		1
6/09	16	61.5	76	1.24		6	0	6			
6/10	2 [f]	10	13	1.30		0	6	6			
6/11	14	69	122	1.77	1	7	2	9			
6/12	9	40	46	1.15	1	2	0	2			
6/13	7	28	27	0.96		2	3	5			
6/14	5	9.5	7	0.74		0	3	3			
6/15	11	70.5	66	0.94	1	6	2	8		1	1
6/16	7	51	84	1.65		4	3	7			
6/17	14 [f]	69	83	1.20	1	2	4	6		1	1
6/18	10	51	52	1.02	1	2	13	15			
6/19	2	14	26	1.86		1	0	1			
6/20	4	28	5	0.18		2	8	10			
6/21	7	41	41	1.00		1	3	4			
6/22	11	27	37	1.37	1	1	0	1	1		1
6/23	8	46.5	38	0.82	1	4	8	12	1		1
6/24	7	42	61	1.45	1	1	5	6			
6/25	6	34	34	1.00	1	0	5	5			
6/26	0	0	0	0	0	0	9	9			
6/27	4	28	17	0.61		1	1	2		1	1
6/28	3	16.5	7	0.42	1	0	1	1			
6/29	3	18	15	0.83		2	0	2			
6/30	2	12	10	0.83	1	0	0	0			
TOTAL	159	792.5	935	1.18	14	49	90	139	3	3	6

[a] CPUE is calculated by dividing the total catch by the total effort.

[b] All sport-caught rainbow trout that were sampled for length, weight and age were Floy tagged, except for one fish on 17 June and one fish on 29 June.

[c] All rainbow trout sampled in the test fishery were Floy tagged, except for one each on the following dates: 15 June, 20 June, 24 June, and 26 June.

[d] All lake trout sampled in the sport fishery were Floy tagged, except for the one sampled on 22 June.

[e] The three lake trout sampled in the test fishery were Floy tagged.

[f] Three angler interviews were missed on 10 June, and three on 17 June.

APPENDIX B

Appendix B1.-Computer files and software used to produce this report.

Data files:	Description
S0080IAA.DTA	Alagnak River creel census angler interview data
S0080CAA.DTA	Alagnak River creel census angler count data
S008BBAA.DTA	Alagnak River rainbow trout test fish AWL samples
S008BBBA.DTA	Alagnak River rainbow trout sport fish AWL samples
S008BBCA.DTA	Alagnak River lake trout sport fish AWL samples
S008BBDA.DTA	Alagnak River lake trout test fish AWL samples

Analysis programs:	Description
KS2M.EXE	A program developed by ADF&G Sport Fish Division, Research and Technical Services staff for conducting Kolmogorov-Smirnov two-sample tests.
BBXP.EXE	A series of programs that used biological files to produce tables of mean length and weight by sex and age group. The program also produces a data set which may be used in Excel (tm) to create graphs.