Fishery Data Series No. 93-55

Age and Size Statistics for Rainbow Trout Collected in the Susitna River Drainage During 1992

by

David S. Rutz

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ABSTRACT

During 1992, 672 rainbow trout *Oncorhynchus mykiss* were sampled using hook and line gear from two study reaches in Lake Creek and the Talachulitna River and from one study reach in Peters Creek. In addition, 142 rainbow trout were sampled from the Deshka River using both electrofishing gear and hoop traps. Rainbow trout ranged in fork length from 190 millimeters to 552 millimeters and age ranged from 2 to 8 years. At all sites, the mean length-at-age increased with age. Significant differences occurred in mean lengths, length distributions, age compositions, and mean length-at-ages of rainbow trout captured between some reaches in study streams and between some study streams between years. In combination, these data suggest that multiple stocks of rainbow trout inhabit the Susitna River basin. Limited recovery of tagged fish, however, suggests that migrational movements occurred between some study reaches, and between some streams. Fish captured in upper Lake Creek were recaptured in lower Lake Creek, and fish captured in the lower Talachulitna River were recaptured in Shell Creek.

Significant differences in age composition and mean length-at-age for select Susitna River tributaries sampled during 1989, 1990, 1991, and 1992 suggest that age and size compositions vary annually. Such findings make management for historic size and age compositions difficult, and show the importance of collecting data over a period of years. Lastly, the occurrence of few trout over 510 millimeters fork length (the size limit defined in the Cook Inlet Rainbow Trout Management Plan for trophy trout) and the slow growth rate of Susitna River basin trout relative to other Alaskan waters containing trophy trout suggest that Susitna River rainbow trout stocks are not viable candidates for management as trophy fisheries under the Cook Inlet Rainbow Trout Management Plan.

KEY WORDS: rainbow trout, age composition, mean length-at-age, length distribution, mean length, Susitna River Drainage, Lake Creek, Peters Creek, Deshka River, Talachulitna River, and migration.

INTRODUCTION

During 1991, 234,683 angler-days were expended by recreational anglers fishing in the Susitna River drainage (Figure 1). This effort represented approximately 10% of the total fishing effort expended by recreational anglers in Alaska during 1991 (Mills 1992) and represented an increase in recreational angler effort in the Susitna River drainage of over 130% over the past decade (Mills 1980-1992). This growing popularity is expected to continue as the number of recreational services (e.g. sport fish lodges, charter and guiding operations) grows and the quality of fishing access continues to improve throughout the Susitna River drainage. Though the majority of sport fishing effort expended in the Susitna River drainage appears to be directed towards harvesting anadromous stocks of Pacific salmon *Oncorhynchus* (Hepler and Vincent-Lang 1988), a significant portion is also believed to target the area's stocks of wild rainbow trout *Oncorhynchus mykiss*.

The Susitna River drainage has historically supported one of the largest sport fisheries (in terms of harvest) for wild rainbow trout in Alaska (Mills 1992). Harvests of rainbow trout from Susitna River drainage waters remained fairly stable throughout most of the 1980s, ranging from 14,952 to 23,081, with a 1980-1988 mean of 17,887 (Figure 2). More recent trends since 1988, however, indicate a substantial decline in harvests. Harvests during 1989, 1990 and 1991 totalled only 10,044, 9,440 and 12,908 rainbow trout, respectively. It is unknown whether this decline is attributable to overexploitation in the sport fishery, changes in stock densities, shifts in angler ethics (i.e., an increase in catch and release), or simply a result of more restrictive regulations recently imposed on the sport fishery. The declines in harvest, coupled with increasing effort, however, have sparked an upsurge in public awareness regarding the conservation and welfare of this valuable resource. In particular, recreational anglers worry that the larger and older rainbow trout are becoming increasingly vulnerable to overexploitation by the sport fishery.

In response to this concern, the Alaska Board of Fisheries (ABOF) adopted the Cook Inlet Rainbow/Steelhead Trout Management Policy (CIRTMP) during 1986. This policy (ADF&G 1986) calls for the protection of the area's wild rainbow trout stocks by maintaining the historic age and size compositions and stock densities while maximizing the recreational benefits of this resource. The policy provides fishery managers with a wide spectrum of sport fishing regulatory options, including gear restrictions, time and area closures, bag limit changes, and catch and release regulations, to govern the management of the area's wild rainbow trout fisheries for stated objectives. These regulations were adopted, however, with little understanding or knowledge of the biology and structures of the area's wild rainbow trout stocks nor of their historic age and size compositions. As a result, fishery managers have little information other than harvest trends estimated through postal surveys (Mills 1992) to evaluate the impact of their management strategies on the long-term health of the area's wild trout stocks.

The lack of historic stock structure and age and size composition information for rainbow trout stocks of the Susitna River drainage has forced fishery managers to take a more conservative approach to managing the drainage's wild rainbow trout stocks to assure that the policy goals of the CIRTMP are achieved. Also, it is likely that even more restrictive fishing regulations may become necessary if effort directed towards the stocks continues to

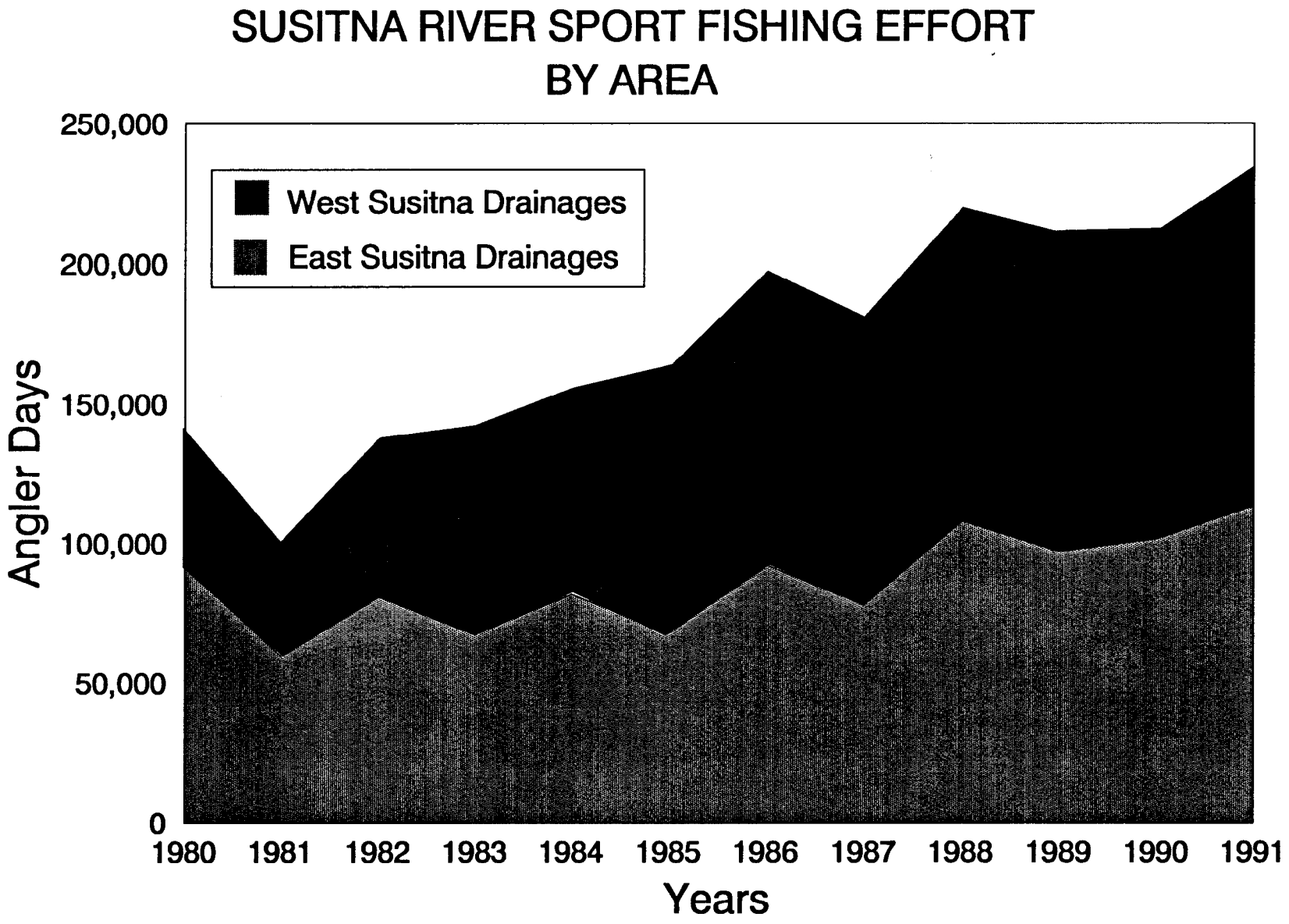

Figure 1. Angler-days of fishing effort expended by recreational anglers fishing Susitna River basin streams, 1980-1991 (Mills 1981-1992).

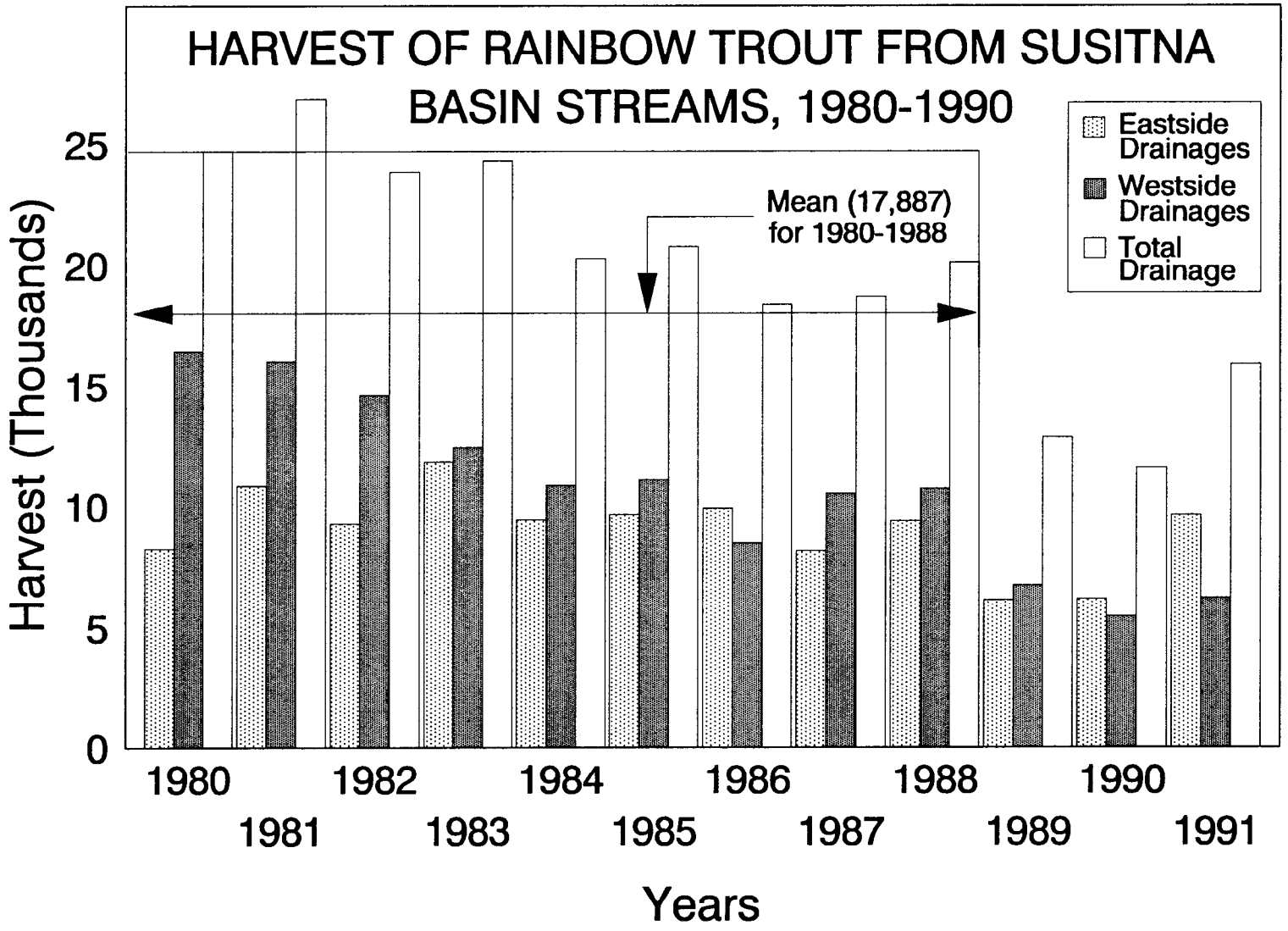

Figure 2. Harvest of rainbow trout by recreational anglers fishing Susitna River basin streams, 1980-1991 (Mills 1981-1992).

increase. Although fishing opportunities may be needlessly reduced in some cases as a result of these actions, this conservative approach is warranted given the paucity of historic stock-specific data for these stocks and the growing popularity directed at the stocks.

To guide the development of management criteria for wild rainbow trout stocks of the Susitna River basin under the directives set forth in the CIRTMP, a study was initiated by the Alaska Department of Fish and Game (ADF&G) during 1989 to establish a baseline database of age and length composition statistics for selected Susitna River wild rainbow trout stocks. A secondary objective of this study was to evaluate the structures of these stocks. These data will be used to examine the effectiveness of past and present management strategies directed towards maintaining the historic integrity of these stocks while continuing to provide for maximum diversified recreational fishing opportunities. These data will also be used to evaluate and implement new strategies which may be applied in the future. This investigation is viewed as a first phase effort to acquire needed data relative to the biology of wild rainbow trout of the Susitna River drainage and the harvest of these stocks. Results of past work are summarized in Bradley (1990, 1991), and Rutz (1992).

The objectives of the research during 1992 were to:

1. estimate the age composition, mean length, and mean length-at-age of rainbow trout sampled by hoop traps and electrofishing in the mainstem of the Deshka River;

2. estimate the age composition, mean length, and mean length-at-age of rainbow trout sampled by hook and line in two selected reaches of Lake Creek and the Talachulitna River;

3. estimate the age composition, mean length, and mean length-at-age of rainbow trout sampled by hook and line in the North Fork of the Kashwitna River and Peters Creek;

4. test the hypothesis that there is no short-term mortality in rainbow trout captured with direct current (DC) electrofishing gear; and,

5. test the hypothesis that there are no spinal injuries in rainbow trout captured with direct current (DC) electrofishing gear.

This report summarizes findings related to objectives one (1) through three (3). The findings of objectives four (4) and five (5) will be submitted for publication to the North American Journal of Fisheries Management and will be submitted to U.S. Fish and Wildlife Service's Federal Aid Section as partial requirement for this year's study.

METHODS

Study Area

The Susitna River drainage is comprised of hundreds of clear and glacial tributaries originating from two major mountain ranges (Talkeetna and Alaska ranges). The river generally flows in a southerly direction into upper Cook

Inlet (Figure 3). Four tributaries of this system were sampled during the period of this study: Lake and Peters creeks and the Talachulitna and Deshka rivers. Two of these study tributaries were further divided into upper and lower study reaches. Sampling efforts on the North Fork of the Kashwitna River by the members of the Alaska Fly Fishing Association were thwarted due to unseasonably high water conditions. Sampling reaches on Lake Creek were subdivided by regulatory management area (catch and release versus allowable harvest areas; lower and upper reaches, respectively) and on the Talachulitna River by reaches differing in angler effort (high versus low angler use; lower and upper reaches, respectively). Sample reaches were identified and numbered on U.S. Geological Survey maps (scale 1:250,000) and stream reach identification numbers were entered on all data collection forms.

Sample reaches were defined as follows:

Lake Creek:

Lower Reach: from its confluence with the Yentna River to about 5.6 km upstream.
Upper Reach: from the upstream terminus of the lower reach to the outlet of Chelatna Lake, a distance of 86 km.

Talachulitna River:

Lower Reach: from its confluence with the Skwentna River upstream 5.2 km.
Upper Reach: from the outlet of Judd Lake downstream to a point called mid-way (Highline Lake Area), a distance of 58 km.

Deshka River:

from its confluence with the Susitna River upstream to the forks, a distance of 42.1 km.

Peters Creek:

from its confluence with the Kahiltna River to the Petersville Road.

Data Collection

Rainbow trout were collected from mid-June through mid-September 1992. Past research has shown that age and size compositions of rainbow trout differed significantly by gear types (Bradley 1991). For this reason, and to allow sampling to be representative of the fish caught in the sport fishery, hook and line gear was used exclusively to sample fish for the length and age portion of the study. Hook and line sampling was conducted with both conventional spin and fly casting equipment with terminal gear consisting of artificial lures and/or salmon roe as bait.

The electrofishing portion of this study was conducted on the Deshka River and results of that portion of this study will be presented to the North American Journal of Fisheries Management for publication. Past research indicates that electrofishing gear tends to be biased towards capturing larger fish (Junge and Libosvarsky 1965). However, because a new wave form of electricity was

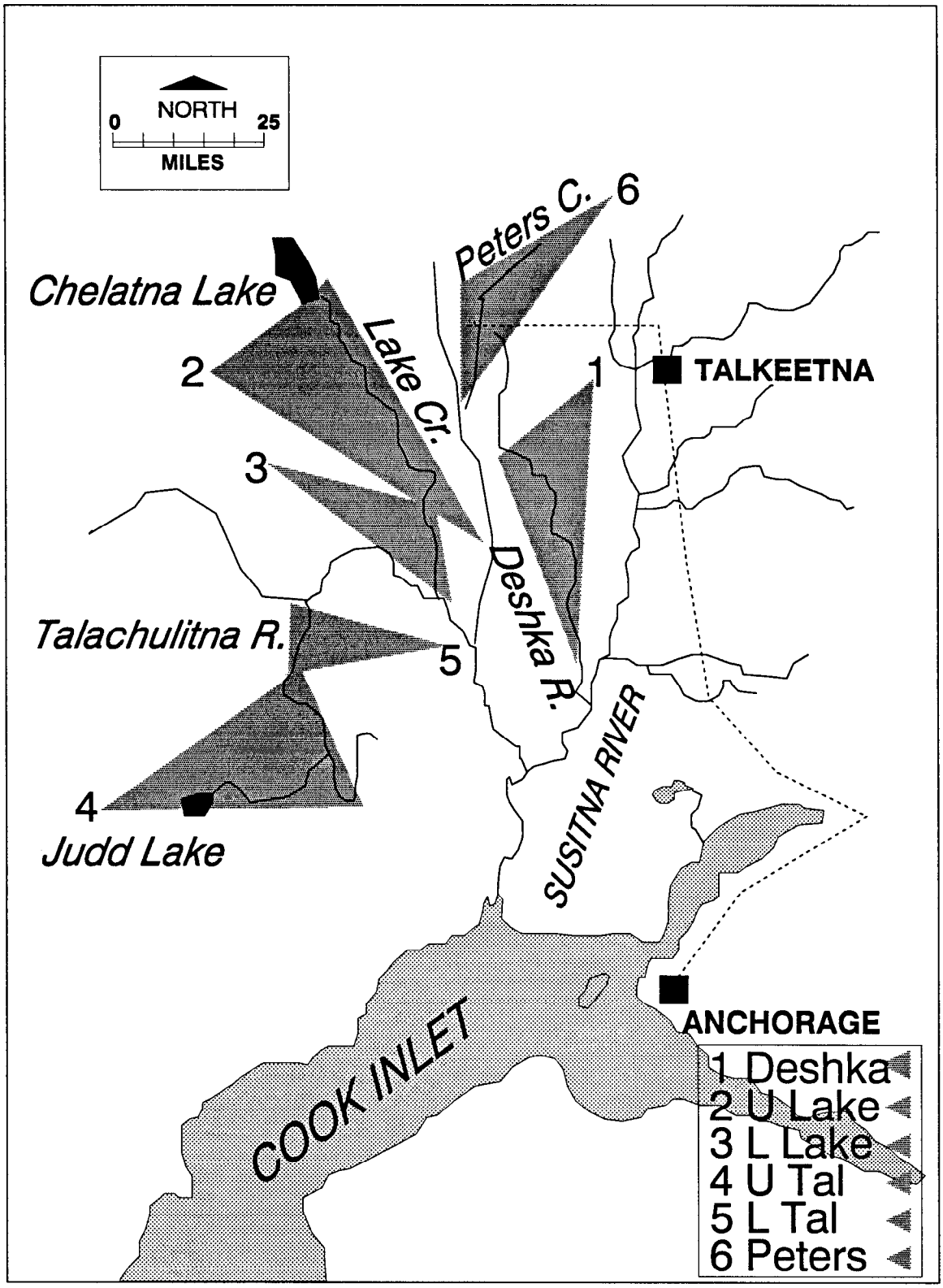

Figure 3. Map of study reaches sampled during 1992.

used for this study, age and length statistics of those fish captured using this gear type were compared with those captured with hook and line gear.

Sampling was conducted by two groups. Select lodge operators were the primary samplers. Members of various sport fishing associations provided additional age and length information from their catches within the project area. Department personnel worked closely with the volunteers to ensure that sampling techniques mimicked those of the department.

The fork length (FL) of all collected rainbow trout was measured to the nearest 1 millimeter. At least five scales were collected from all rainbow trout over 175 mm FL from the left side of each fish about two rows above the lateral line and on a diagonal row downward from the posterior insertion of the dorsal fin (Alvord 1954; Maher and Larkin 1955). Scales were cleaned and placed in coin envelopes labeled with appropriate identification. Scales were later transferred to gum cards and thermohydraulically pressed against acetate cards. Resulting impressions were projected on a microfiche reader from which ages were determined. Otoliths and scales were collected from all sampling mortalities. Insufficient numbers of mortalities (four fish) prevented conducting any type of comparisons between age structures. In addition, all rainbow trout over 175 mm FL sampled by department personnel were tagged with an individually numbered Floy anchor tag and released. The tag numbers of all previously marked rainbow trout were recorded and the fish released.

Data Analysis

The numbers of adult rainbow trout collected were summarized by study reach and sampling period. Mean lengths and length distributions were calculated for each study reach using standard procedures. Length distributions were compared among sampling sites using a Kolmogorov-Smirnov two-sample test (Sokal and Rohlf 1969).

The age compositions of the rainbow trout sampled at each study site were estimated. Letting p_{hi} equal the estimated proportion of age class h in stratum i, the variance of p_{hi} was estimated as (Scheaffer et al. 1979):

$$V(\hat{p}_{hi}) = \hat{p}_{hi}(1-\hat{p}_{hi})/(n_i-1), \quad (1)$$

where:

n_i = the number of legible scales read from samples collected during stratum i.

The hypothesis that the age compositions were independent between study reaches (i.e., the same for all study reaches) was tested using chi-square contingency table tests. These chi-square tests were conducted at an alpha level of 0.05 and were performed using the CHISQUARE module of the software package MINITAB (MINITAB 1988). In some cases it was necessary to pool age classes to assure a minimum expected cell value of 5.

Mean length-at-age for rainbow trout sampled from each study reach was estimated as:

$$\bar{l}_a = \frac{\sum_{i=1}^{n_a} l_{ai}}{n_a}, \quad (2)$$

where:

$\bar{l}_a$ = mean length at age a;

l_{ai} = length of i^{th} fish at age a; and

n_a = number of fish at age a.

The variance of $\bar{l}_a$ was estimated as:

$$\text{Var } \bar{l}_a = 1/n_a \sum_{i=1}^{n_a} (\bar{l}_{ia}-l_a)^2/(n_a-1). \quad (3)$$

Analysis of variance procedures (ANOVA) were used to test the hypothesis that there were no differences in mean length-at-age between reaches when controlling for age and that there was no interaction between these two factors. The analysis was carried out separately for each age group using the SAS GLM procedure for general linear models (SAS 1988).

RESULTS

Catches

During 1992, 672 rainbow trout were collected from mid-June through mid-October 1992 (Table 1). Of the fish caught, 47 and 36 were caught in the upper and lower reaches of Lake Creek, respectively; 59 and 366 in the upper and lower reaches of the Talachulitna River, respectively; and 38 from Peters Creek. The remaining 126 fish were captured at the Deshka River[1]. Sampling success appeared to be positively correlated to spawning concentrations of salmonids as these were the only areas where large concentrations of rainbow trout were evident.

The majority of rainbow trout sampled in the upper Lake Creek study reach were primarily taken from one of two locations: (1) from the outlet of Chelatna Lake downstream approximately 8 km, and (2) from a 3.2 km stretch just upstream of the terminus of the lower Lake Creek study reach. Samples from lower Lake Creek study reach were distributed evenly throughout the study reach. The majority of rainbow trout sampled on the upper Talachulitna River study reach were taken from the lower 13 km of Talachulitna Creek and then downstream to its confluence with the Talachulitna River to a location called mid-way (Highline Lake area), a distance of approximately 34 km. Lower Talachulitna River study reach samples were distributed evenly throughout the

[1] Fish sampled from the Deshka River were captured using electrofishing techniques and hoop nets.

Table 1. Number of rainbow trout collected by study reach from select Susitna River tributaries during 1992.

Dates	Deshka River		Peters[c] Creek	Lake Creek[c]		Talachulitna River[c]	
	Elec F[a]	Hoop T[b]		Upper	Lower	Upper	Lower
09/09 - 09/14	86						
09/09 - 09/11		40					
07/15 - 08/16			38				
08/28 - 09/03				47			
09/02 - 09/13					36		
07/24 - 08/30						59	
06/15 - 07/31							198
09/01 - 09/16							168

Total for all locations = 672

[a] Fish were captured using electrofishing gear using straight DC current.

[b] Fish were captured using hoop traps and used as a control group for the electrofishing experiment.

[c] Fish were captured using hook and line.

study reach. Most of the samples from Peters Creek were taken from a 6.8 km stretch of water downstream of the Petersville Road.

Mean Length and Length Distributions

Rainbow trout sampled from all study reaches ranged from 190 mm to 552 mm FL and had lengths ranging from 337 mm to 393 mm FL (Table 2). Rainbow trout sampled from the upper Talachulitna River reach exhibited the lowest mean length while rainbow trout sampled from the lower Lake Creek reach exhibited the largest mean length for the hook and line captured fish (Figure 4). This differed from the previous year's findings which showed that rainbow trout sampled from upper Lake Creek exhibited the lowest mean length and those sampled from the lower Talachulitna River exhibited the largest mean length. As with 1991's findings, rainbow trout captured in lower Lake Creek and lower Talachulitna River exhibited higher mean lengths than those found in the lower reaches of these two streams, however, these difference were not significant (Table 2).

In comparing mean lengths within study reaches between years (1991 and 1992) for both upper and lower Lake Creek and Talachulitna River, only upper Lake Creek showed a significant difference ($P < 0.05$) between years. For 1992, all fish were larger for all ages except for the lower Talachulitna River.

The length distribution (Figure 5) of rainbow trout collected in the Deshka River using electrofishing gear was significantly larger ($P < 0.05$) than trout collected from all the other reaches sampled during 1992 (Table 3). Trout collected from the upper Talachulitna River reach exhibited a distribution weighted in favor of smaller trout in comparison to the other reaches, while trout collected from the lower Lake Creek reach exhibited a distribution weighted in favor of larger trout. These findings were the inverse of the previous year's findings (Rutz 1992). Length distributions of trout sampled by use of hook and line gear were not significantly different ($P > 0.05$).

In only one case did length distributions of trout collected from a study reach sampled during 1992 differ from similar data collected in 1991 (Table 4). Trout collected in the upper Lake Creek reach in 1992 were larger than those collected during 1991. In all other cases, length distributions of trout collected during 1992 were not significantly different than for 1991.

Age Composition Statistics

Rainbow trout sampled from all study reaches during 1992 ranged in age from 2 to 8 years (Table 5). Consistent with the previous year's findings (Rutz 1992), rainbow trout ages 3-6 were the most common at all study reaches. Age compositions of rainbow trout sampled from the upper and lower study reaches in Lake Creek and the Talachulitna River were not significantly different during 1992 ($\chi^2 = 5.0$, 3 d.f., $P > 0.05$ and $\chi^2 = 0.25$, 3 d.f., $P > 0.05$, respectively). Thus the upper and lower reaches of these two streams were combined for further analyses. Lake Creek differed significantly from the Talachulitna River ($\chi^2 = 11.07$, 3 d.f., $P < 0.05$) and Peters Creek ($\chi^2 = 14.43$, 3 d.f., $P < 0.05$) while there was no significant difference between the Talachulitna River and Peters Creek ($\chi^2 = 5.56$, 3 d.f., $P > 0.05$).

Table 2. Mean length of rainbow trout sampled from select Susitna River tributaries during 1991 and 1992.

Stream Reach	Number Measured		Mean Length		Standard Error		Minimum Value		Maximum Value	
	1991	1992	1991	1992	1991	1992	1991	1992	1991	1992
Deshka River[a]		73		393		6.8		253		509
Peters Creek[b]		32		346		8.6		235		457
Lake Creek[b]										
Upper	256	43	319	348	12.3	6.1	200	244	495	450
Lower	252	26	353	368	17.8	12.9	204	232	520	519
Talachulitna R.[b]										
Upper	213	49	346	337	23.4	8.0	200	215	515	444
Lower	262	270	367	340	20.2	4.2	227	190	584	552

[a] Fish were captured using electrofishing gear using straight DC current.

[b] Fish were captured using hook and line.

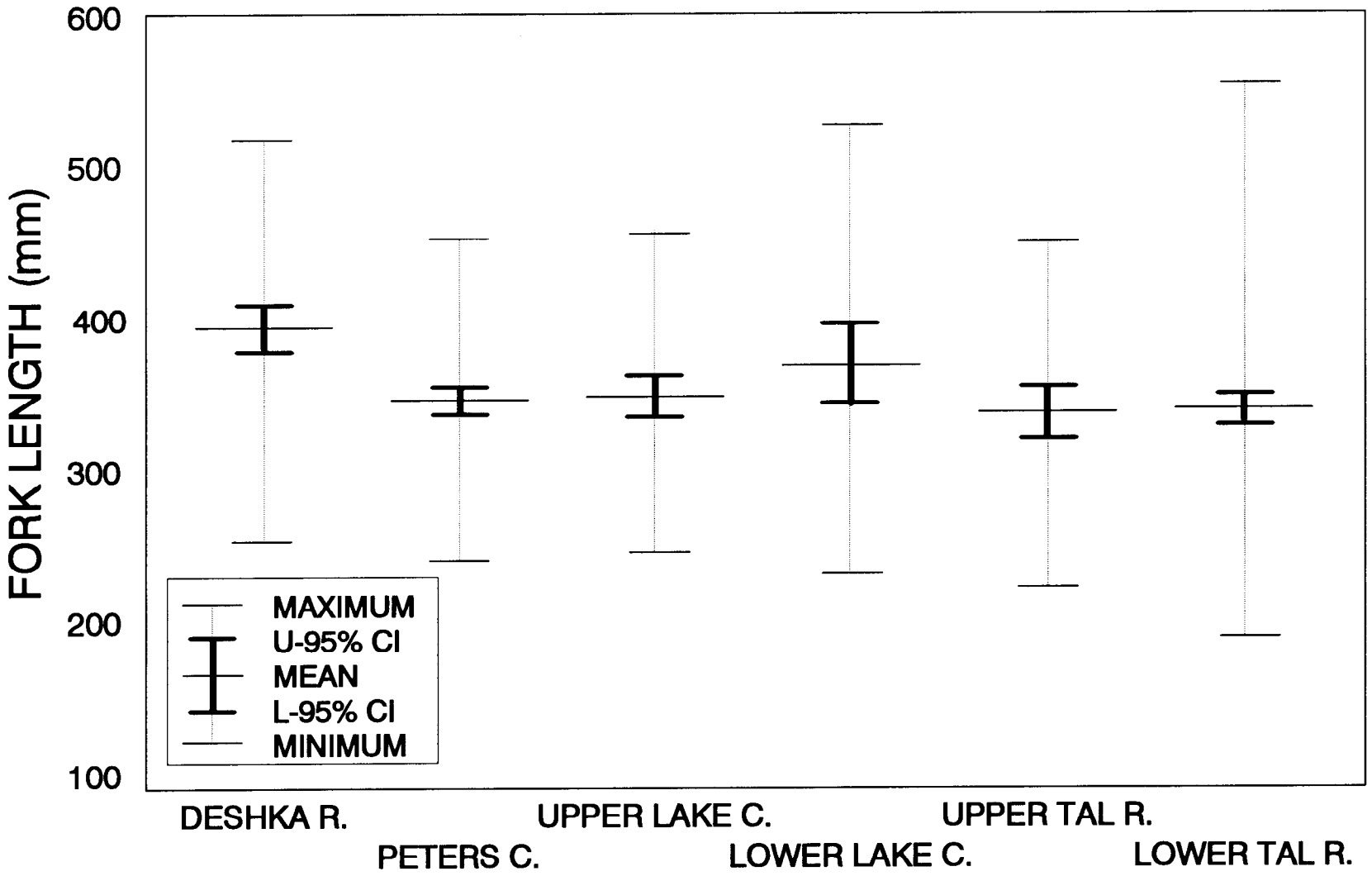

Figure 4. Comparison of mean lengths of rainbow trout among study reaches in the Susitna River drainage during 1992.

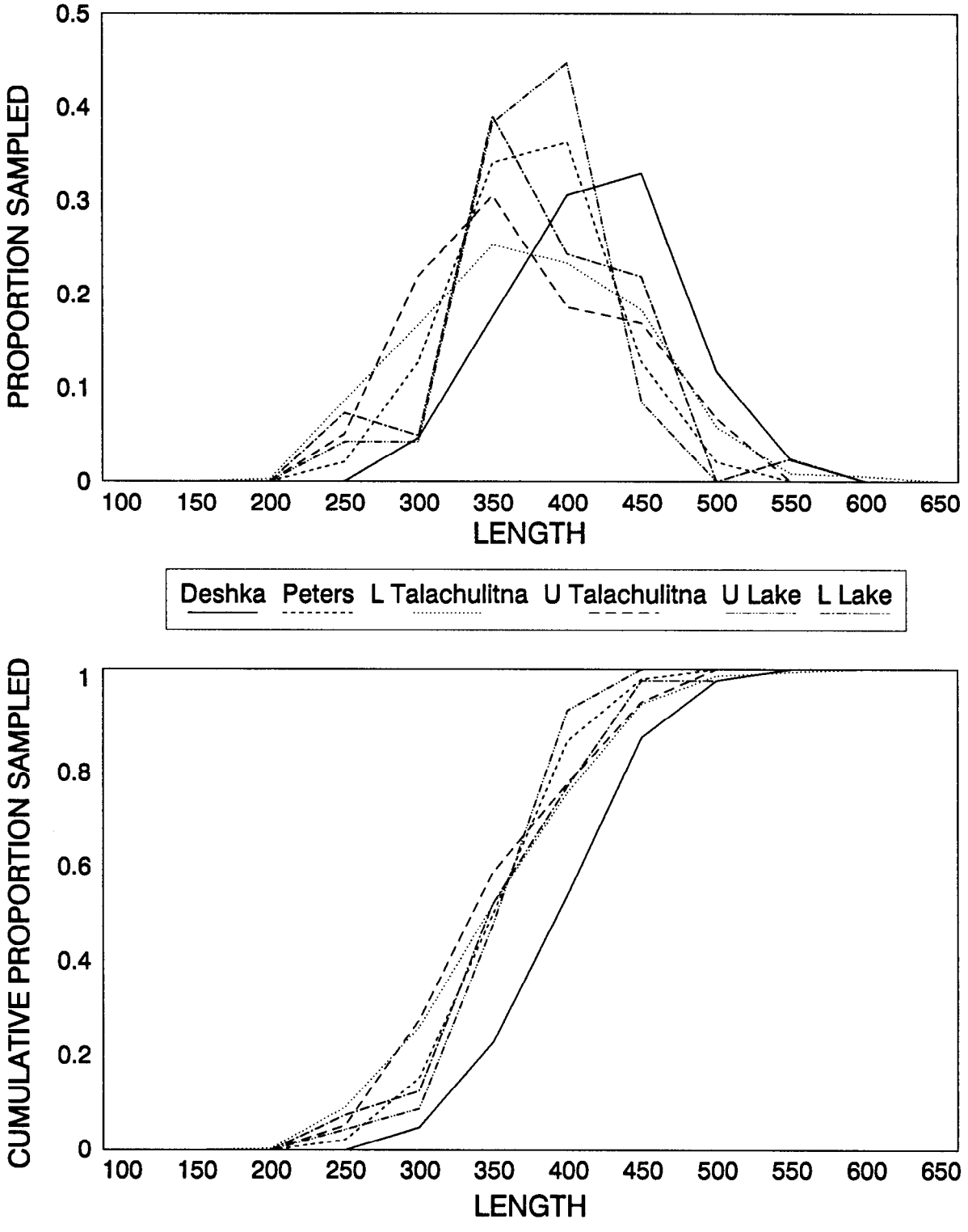

Figure 5. Comparison of length distributions of rainbow trout among study reaches in the Susitna River drainage during 1992.

Table 3. Comparison of length distributions of rainbow trout sampled from select Susitna River tributaries during 1992.

Study Reach	Peters Creek	Upper Lake Creek	Lower Lake Creek	Upper Talachulitna River	Lower Talachulitna River
Deshka[a]	P[b]= .0002	P = .0000	P = .0028	P = .0000	P = .0000
River	D[c]= .3755	D = .4796	D = .3349	D = .4347	D = .3191
Peters		P = .3099	P = .4499	P = .2092	P = .2656
Creek		D = .1999	D = .1744	D = .1991	D = .1517
Upper Lake			P = .0898	P = .0839	P = .0590
Creek			D = .2564	D = .2369	D = .2018
Lower Lake				P = .1687	P = .2421
Creek				D = .2170	D = .1650
Upper Talachulitna					P = .2586
River					D = .1383

[a] Fish were captured using electrofishing gear using straight DC current.

[b] Probability of a greater D with a two-sided alternative hypothesis.

[c] Largest horizontal distance measured between two plotted cumulative frequencies.

Table 4. Between year comparisons of length distributions of rainbow trout sampled from the same study reaches in select Susitna River tributaries during 1991 and 1992.

Study Reach	Upper Lake Creek	Lower Lake Creek	Upper Talachulitna R.	Lower Talachulitna R.
Upper Lake Creek	P[a]= .0000 D[b]= .3705			
Lower Lake Creek		P = .3485 D = .1519		
Upper Talachulitna River			P = .1191 D = .1762	
Lower Talachulitna River				P = .3899 D = .0590

[a] Probability of a greater D with a two-sided alternative hypothesis.

[b] Largest horizontal distance measured between two plotted cumulative frequencies.

Table 5. Age composition and mean length-at-age statistics of rainbow trout sampled from select Susitna River tributaries during 1992.

Sample Site	Age Group	Sample Size	Age composition		Mean Length-at-Age			
			Percent	SE	Mean	SE	L 95% CI	U 95% CI
Deshka River								
	3	3	4.1	2.34	280	14.10	253	308
	4	14	19.2	4.64	343	7.45	329	358
	5	34	46.6	5.88	400	6.11	388	412
	6	20	27.4	5.26	422	11.78	399	445
	7	2	2.7	1.92	482	17.50	449	516
Peters Creek								
	3	8	25.0	7.78	303	12.38	279	327
	4	15	46.9	8.96	340	8.57	323	356
	5	9	28.1	8.80	395	12.82	370	421
Upper Lake Creek								
	3	4	9.3	4.48	278	18.08	243	314
	4	10	23.3	6.52	336	11.07	314	357
	5	27	62.8	7.46	360	6.05	348	372
	6	2	4.7	3.25	374	15.50	343	404
Lower Lake Creek								
	4	10	38.5	9.73	364	26.85	312	417
	5	10	38.5	9.73	367	19.18	331	406
	6	4	15.4	7.22	376	26.52	325	427
	7	2	7.7	5.33	367	33.00	302	432
Upper Talachulitna River								
	3	5	10.2	4.37	252	13.79	225	279
	4	16	32.7	6.77	323	11.85	300	346
	5	23	46.9	7.20	352	9.14	334	370
	6	5	10.2	4.37	402	19.15	364	439
Lower Talachulitna River								
	2	2	0.7	0.52	201	11.50	179	224
	3	35	13.0	2.05	252	5.01	242	261
	4	115	42.6	3.01	317	4.33	308	325
	5	82	30.4	2.80	377	5.21	367	387
	6	29	10.7	1.89	410	7.58	395	425
	7	6	2.2	0.90	455	17.96	419	490
	8	1	0.4	0.37	533			

A shift in age class was observed in some of the study reaches between 1991 and 1992. The lower Talachulitna River reach contained more age 4 and less age 5 rainbow trout than did the previous year's study (Figure 6). In contrast, the upper Lake Creek reach and the upper Talachulitna River reach contained more age 5 and less age 4 than the previous year's study (Figure 6). Overall, the age compositions of rainbow trout sampled between all study reaches during 1992 (Figure 6) differed significantly (χ^2 = 61.07, 15 d.f., $P < 0.05$).

Mean Length-at-Age Statistics

Mean length-at-age increased with age for rainbow trout sampled in all study reaches for 1992 (Table 5). Significant differences ($P < 0.05$) in mean length-at-age were observed for age 3 ($P = 0.0014$), 4 ($P = 0.0143$), and 5 ($P = 0.0005$) while no significant differences ($P > 0.05$) occurred in the older age classes, ages 6 ($P = 0.3026$), and 7 ($P = 0.0587$). In general, rainbow trout sampled from the upper Deshka River and Peters Creek study reaches were larger-at-age than for the other study reaches or streams (Figure 7).

Migration

Insufficient numbers of tag recoveries prohibited making an accurate evaluation concerning migratory patterns of Susitna Basin rainbow trout. The limited tag recoveries from fish sampled at Lake Creek and the Talachulitna River, however, suggest that there may be some extensive migration occurring between the upper and lower study reaches and between other systems within close geographic distance. For example, a fish that was tagged at the headwaters of Lake Creek during 1991 moved downstream a distance of approximately 83 km during a 2-week period, and was recovered at the creek's mouth (Rutz 1992). Also, 13 trout tagged in the no-kill area of Lake Creek migrated freely in and out of the harvest area, a migration which appeared to be triggered by the temporal and spatial availability of food items (salmon eggs). Fish tagged in the Lower Talachulitna River were recaptured in Shell Creek during 1992. Rainbow trout concentrations were only evident where spawning activity of salmonids was evident; once this activity ceased, trout dispersed immediately.

DISCUSSION

Sampling success during this study appeared to be positively correlated to spawning concentrations of salmonids (Rutz 1992). For this reason, it is recommended that future sampling using hook and line gear be conducted during periods of peak availability of spawning salmonids to increase catch rates with this gear type.

Some comparisons can be made between results from 1992 and previous years' data from 1989, 1990 and 1991. All studies showed that rainbow trout sampled from the lower study reaches in Lake Creek and the Talachulitna River using hook and line gear ranged in age from 2 to 8 years and that trout ages 3-6 were the most common captured at both streams (Figure 8). The data also suggest that rainbow trout captured during all years exhibited similar trends in mean length-at-age (Figure 8). However, significant differences ($P < 0.05$) in age compositions occurred for both streams among all years (Table 6).

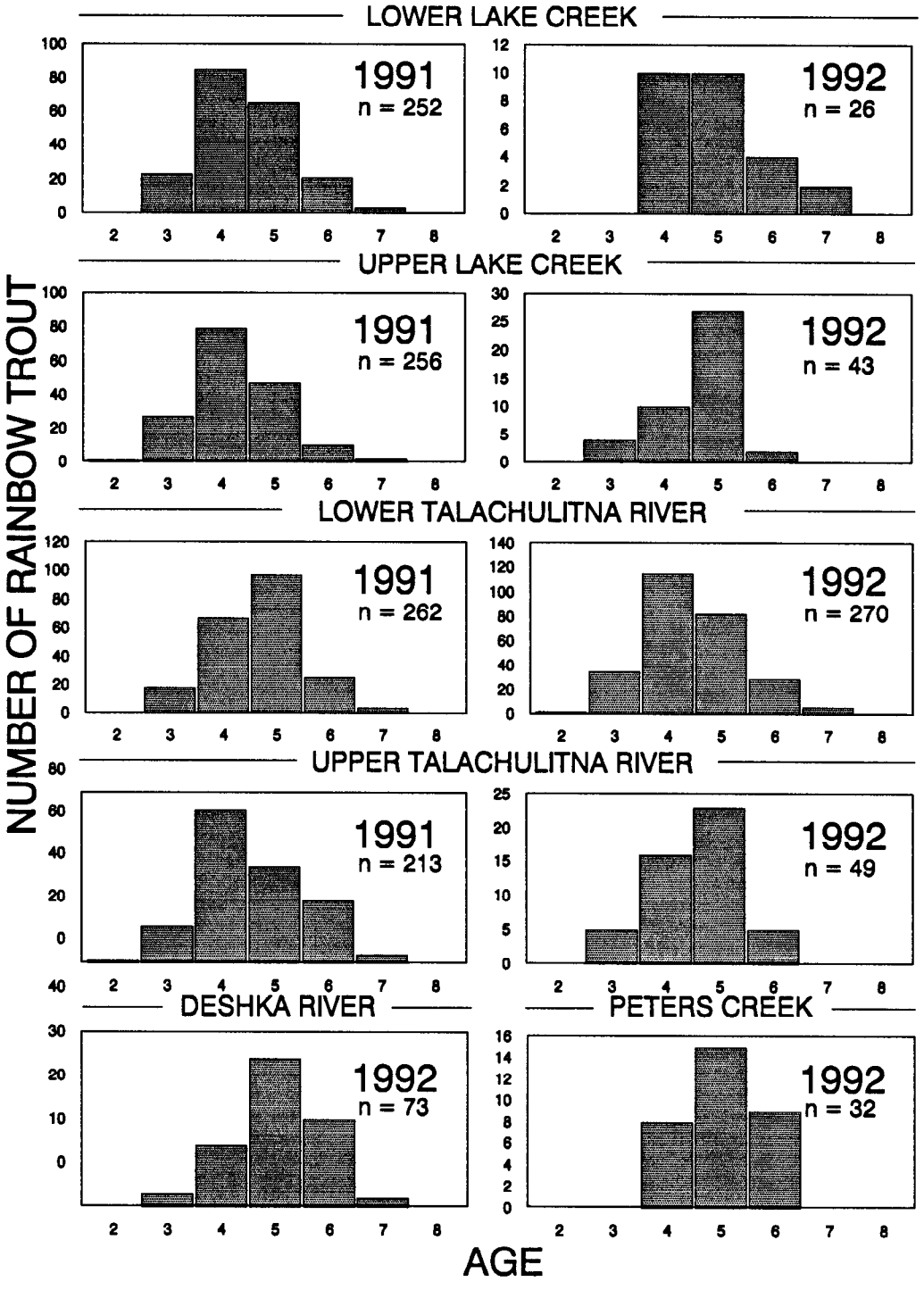

Figure 6. Comparison of age compositions of rainbow trout among study reaches in the Susitna River drainage during 1991 and 1992.

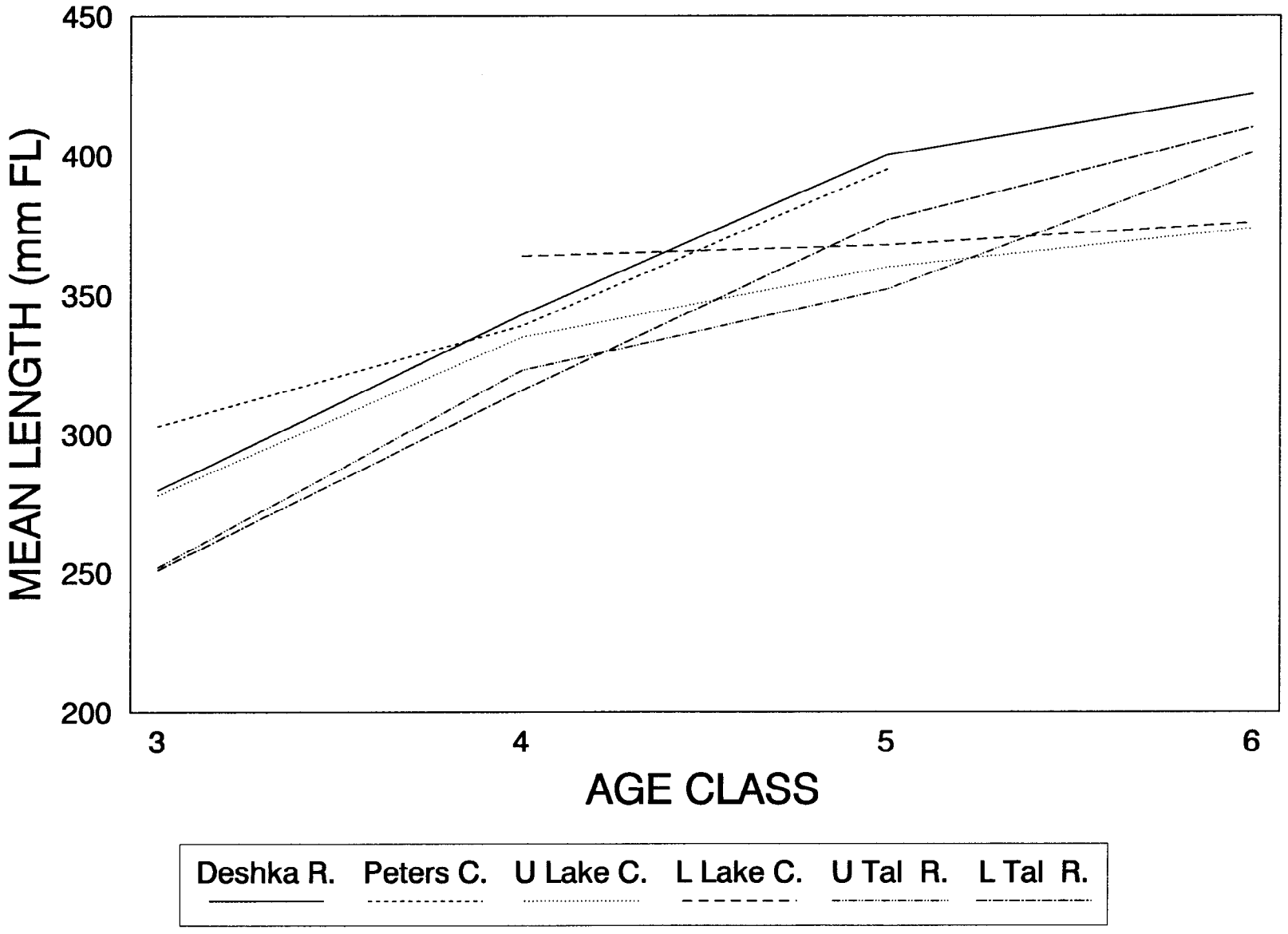

Figure 7. Comparison of mean length-at-age statistics of rainbow trout sampled among study reaches in the Susitna River drainage during 1992.

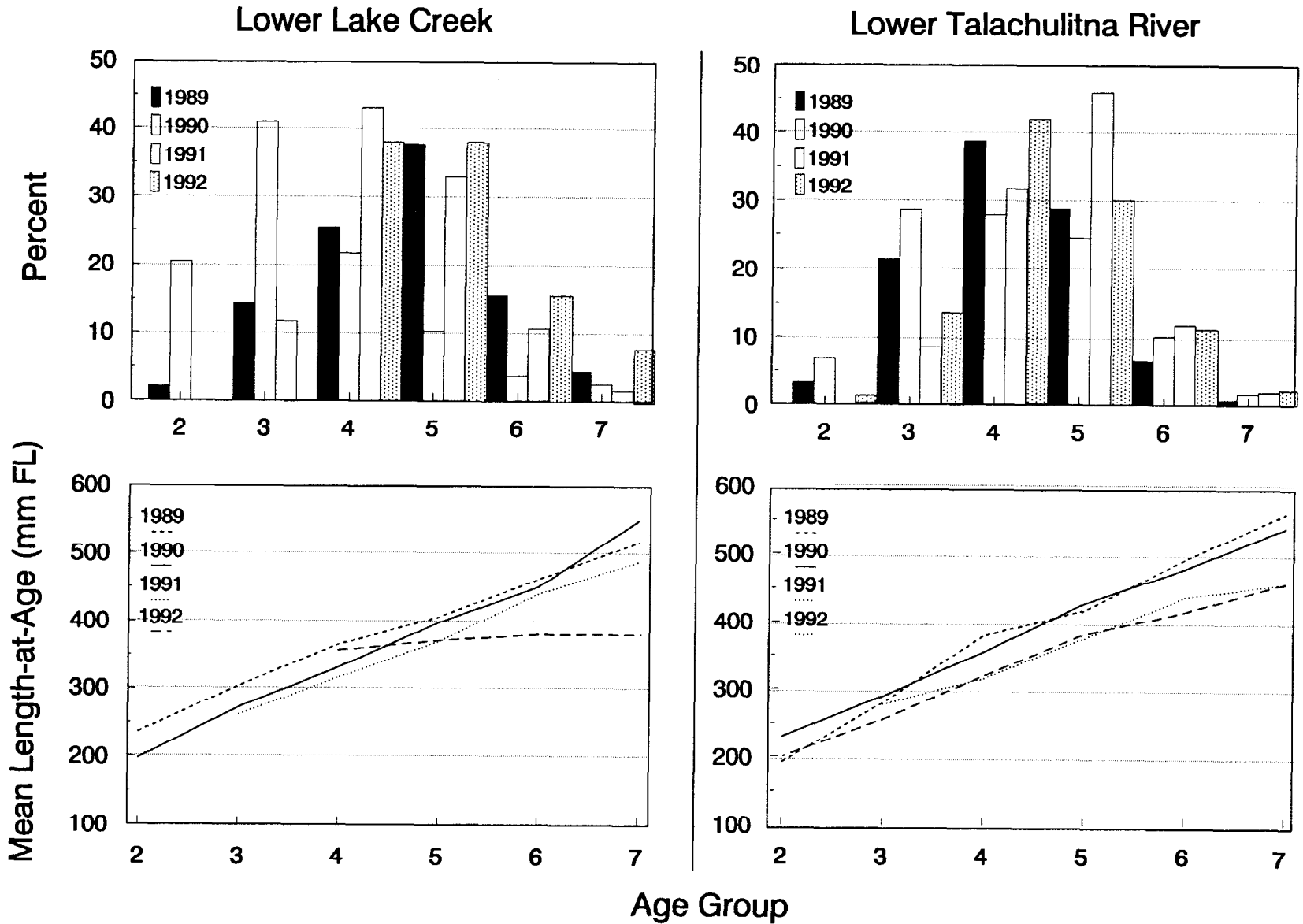

Figure 8. Comparison of age composition and mean length-at-age statistics of rainbow trout sampled using hook and line gear from the lower study reaches in Lake Creek and the Talachulitna River during 1990, 1991 and 1992.

Table 6. Comparison of age composition and mean length-at-age statistics for rainbow trout sampled using hook and line gear from the lower study reaches in Lake Creek and the Talachulitna River from 1989-1992.

Age Group	1989[a] n	1989[a] Percent	1989[a] Mean Length	1990[b] n	1990[b] Percent	1990[b] Mean Length	1991 n	1991 Percent	1991 Mean Length	1992 n	1992 Percent	1992 Mean Length
Lower Lake Creek												
2	2	2.2	237	16	20.5	198						
3	13	14.4	304	32	41.0	273	23	11.7	262			
4	23	25.6	366	17	21.8	332	85	43.1	317	10	38.5	364
5	34	37.8	407	8	10.3	399	65	33.0	371	10	38.5	369
6	14	15.6	463	3	3.8	452	21	10.7	441	4	15.4	376
7	4	4.4	518	2	2.6	550	3	1.5	489	2	7.6	367
All	90	100.0	401	78	100.0	311	197	100.0	353	26	100.0	368
Lower Talachulitna River												
2	4	3.3	193	8	6.7	230				2	0.7	201
3	26	21.5	280	34	28.8	290	18	8.5	278	35	13.0	252
4	47	38.8	380	33	28.0	355	67	31.8	316	115	42.6	317
5	35	28.9	418	29	24.6	428	97	46.0	376	82	30.4	378
6	8	6.6	493	12	10.2	479	25	11.8	437	29	10.7	410
7	1	0.9	560	2	1.7	539	4	1.9	456	6	2.2	455
8										1	0.4	553
All	121	100.0	392	118	100.0	388	211	100.0	367	270	100.0	340

[a] Data from Bradley (1990).

[b] Data from Bradley (1991).

Also, the overall mean lengths of rainbow trout sampled during each year varied (Table 6). In combination, these data suggest that age and size compositions in these streams vary annually. This finding suggests that establishment of a baseline database of age and length composition statistics for Susitna River wild rainbow trout stocks would take several years to compile. Such findings also show the difficulty in managing rainbow trout stocks of the Susitna River basin for historic size and age compositions.

Interestingly, there appeared to be a relative lack of age 2 and 3 trout from the lower reach samples from Lake Creek and Talachulitna River. In both cases, it appeared that the age compositions had shifted 1 year. These shifts in age class may indicate a possible failure of young trout recruiting into the populations during 1991 and 1992. The impact of a possible recruitment failure on each population should be monitored in the future to assure for the continued health of these stocks.

Rainbow trout over 510 mm FL (20 inches) have been defined as trophy class trout in the CIRTMP. Based on the data collected during the 2 years of this study, a study conducted by Sundet (1986) in the Susitna River drainage above Talkeetna (Figure 9), and the 1990 study (Bradley 1991), the Susitna River appears to contain few trout over 510 mm in length. Also, it appears that Susitna Basin rainbow trout are generally shorter lived and experience slower growth rates than those found in other Alaskan systems known to contain trophy class trout (Figure 9). The slow growth rates and short longevity of Susitna River basin rainbow trout are likely correlated to a lack of large lake basins coupled with less productive waters in terms of water temperature and numbers of adult spawning salmon that these systems support. Whatever the reason, these data suggest that Susitna River rainbow trout stocks are not viable candidates for management as trophy fisheries under the CIRTMP.

Limited recovery of tagged fish during 2 years of this study suggest extensive migration occurs between study reaches, particularly reaches within the same tributary and between close geographic tributaries (Rutz 1992). Such findings are supported by previous research conducted on the Susitna River (Sundet 1986) which has documented extensive migratory movements of up to 92 km. These data suggest that rainbow trout populations within the Susitna River drainage are open in terms of recruitment. These findings question the validity of managing areas under unique regulations, such as catch and release, given that fish protected by a catch and release regulation may be vulnerable to exploitation in a sport fishery operating in another area.

Similar to the previous year's results, significant differences occurred in mean lengths, length distributions, age compositions, and mean length-at-ages of rainbow trout captured between some reaches in study streams and between some study streams. In combination, these size and age data suggest the concept that multiple stocks of rainbow trout inhabit the Susitna River basin. Thus, the question still remains as to whether or not rainbow trout populations of the Susitna Basin streams are discrete or part of a larger, more open population, and if they are part of an open population, to what extent these populations overlap. These questions must be addressed before any quantifiable work related to stock abundance can be initiated. However, to address these problems sufficiently would be an expensive proposition in terms of both money and sampling effort.

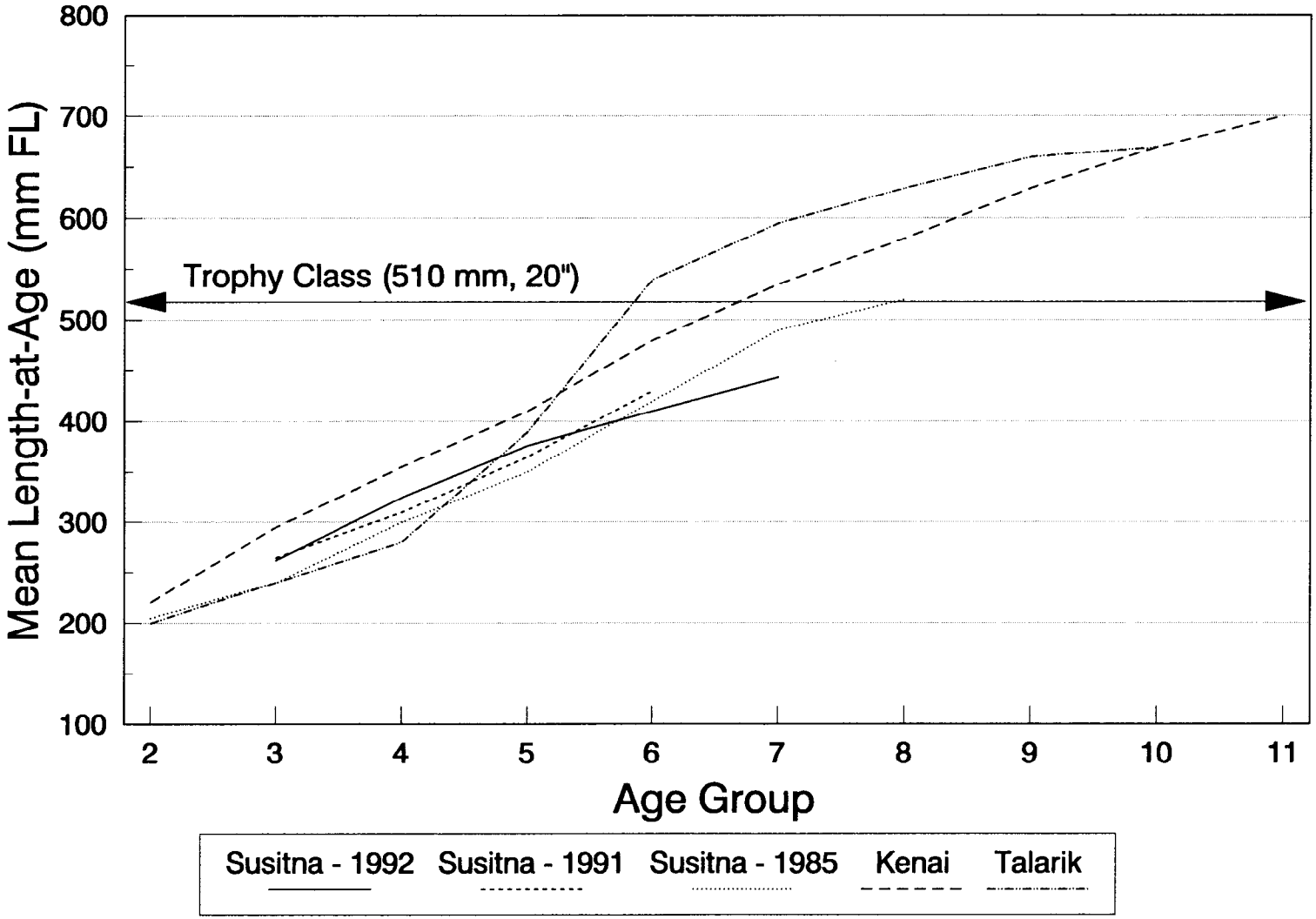

Figure 9. Comparison of mean length-at-age statistics for rainbow trout sampled from several Alaskan river systems.

Lastly, a portion of the 1992 study included testing a different wave form of electricity (straight DC) to determine the feasibility of capturing large numbers of rainbow trout for a more quantitative stock assessment program. This component would determine the amount and severity of electrofishing induced injuries or mortalities associated with capturing fish with this type of gear. Results of this study were submitted for publication to the North American Journal of Fisheries Management. Preliminary analysis, however, indicated that 48% of all captured fish showed some kind of spinal injury.

RECOMMENDATIONS

Given the observed variability in age and size compositions of rainbow trout sampled annually among systems, it is recommended that sampling for age and size composition, based on hook and line surveys, be continued on Lake Creek and the Talachulitna and Kashwitna rivers strictly on a volunteer basis by interested members of the sport fishing public. Three consecutive years of data per study site will help provide the department with a useful foundation of stock age and size parameters to make purposeful management recommendations to the Alaska Board of Fisheries in regards to managing these stocks for historic size and age structure as recommended by the CIRTMP. These data will also prove useful in monitoring possible failures in recruitment to the lower Lake Creek and Talachulitna River stocks suggested by the 1991 data.

Lastly, it is recommended that the use of electricity as a method for capturing rainbow trout be suspended until a less injurious form of electricity is found.

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