

Fishery Data Series No. 02-07

Seasonal Movements and Length Composition of Northern Pike in the Dall River, 1999-2001

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Alaska Department of Fish and Game

Division of Sport Fish



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Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H_A
deciliter	dL			base of natural logarithm	e
gram	g	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	catch per unit effort	CPUE
hectare	ha	and	&	coefficient of variation	CV
kilogram	kg	at	@	common test statistics	F, t, χ^2 , etc.
kilometer	km	Compass directions:		confidence interval	C.I.
liter	L			correlation coefficient	R (multiple)
meter	m	east	E	correlation coefficient	r (simple)
metric ton	mt	north	N	covariance	cov
milliliter	ml	south	S	degree (angular or temperature)	°
millimeter	mm	west	W	degrees of freedom	df
		Copyright	©	divided by	÷ or / (in equations)
		Corporate suffixes:		equals	=
		Company	Co.	expected value	E
		Corporation	Corp.	fork length	FL
		Incorporated	Inc.	greater than	>
		Limited	Ltd.	greater than or equal to	≥
		et alii (and other people)	et al.	harvest per unit effort	HPUE
		et cetera (and so forth)	etc.	less than	<
		exempli gratia (for example)	e.g.,	less than or equal to	≤
		id est (that is)	i.e.,	logarithm (natural)	ln
		latitude or longitude	lat. or long.	logarithm (base 10)	log
		monetary symbols (U.S.)	\$, ¢	logarithm (specify base)	log ₂ , etc.
		months (tables and figures): first three letters	Jan,...,Dec	mid-eye-to-fork	MEF
		number (before a number)	# (e.g., #10)	minute (angular)	'
		pounds (after a number)	# (e.g., 10#)	multiplied by	x
		registered trademark	®	not significant	NS
		trademark	™	null hypothesis	H_0
		United States (adjective)	U.S.	percent	%
		United States of America (noun)	USA	probability	P
		U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	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

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				

Time and temperature					
day	d				
degrees Celsius	°C				
degrees Fahrenheit	°F				
hour	h				
minute	min				
second	s				

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				

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NORTHERN PIKE IN THE DALL RIVER, 1999-2001**

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TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ii
LIST OF FIGURES.....	ii
LIST OF APPENDICES.....	ii
ABSTRACT.....	1
INTRODUCTION.....	1
OBJECTIVES.....	3
Description of Study Area.....	4
METHODS.....	4
Radiotelemetry.....	4
Length Composition.....	7
Data Analysis.....	8
RESULTS.....	8
Length Frequencies.....	8
Radio Tags.....	10
DISCUSSION.....	13
ACKNOWLEDGMENTS.....	15
LITERATURE CITED.....	15
APPENDIX A: Dall River Fisheries Management Plan.....	17
APPENDIX B: History of Dall River Regulations.....	21

LIST OF TABLES

Table	Page
1. Sport fishing effort and harvest and catch of northern pike for the Dall River and the Yukon River 1978-2000.	2
2. Number of pike fitted with radio transmitters in length groups and in river sections in the Dall River Area, 1999 and 2000	6
3. Comparison of lengths of pike sampled in 1988, 1989, 1999 and 2000.....	9
4. Comparison of lengths of pike sampled by river section in 1999, 2000.....	9
5. Locations of radio transmitters, Dall River pike study, 1999, 2000, 2001	11
6. Comparison of lengths of pike sampled in 1988 by month	14

LIST OF FIGURES

Figure	Page
1. Study area in the Dall River and Little Dall River drainages.	5
2. Date of entry into Dall River Area as recorded by automated receiving station at Dall River mouth.....	12

LIST OF APPENDICES

Appendix	Page
A. Dall River Fisheries Management Plan as of 15 December 2000	18
B. History of regulations for the northern pike fishery in the Dall River.....	22

ABSTRACT

Radiotelemetry was used to examine site fidelity and movement of northern pike in the Dall River area of the Yukon Flats during the spawning season. A fixed remote data logging station was used at the mouth of the Dall River to detect movement into and out of the drainage. Location and fate data were captured by the use of tracking antennae mounted on boats and aircraft. Locations of northern pike in this area were examined from early summer 1999 to fall 2001. A total of 42 radiotelemetry tags were implanted in June 1999. A total of 15 tags were believed to have failed during the 1999 season, so an additional 20 tags were implanted in 2000. Tag locations and fates were documented during tracking events from 1999 through fall 2001. Proportions of live fish with radio-implants within the Dall River during the summer season (June-September) ranged from .60 to .94. (SE = .08, .001) during the three years of radio-tracking.

Length composition of northern pike ≥ 450 mm FL was estimated in 1999 and 2000. The proportion of northern pike larger than 720 mm FL was 0.24 (SE= 0.03) and in 2000 0.31 (SE=0.02).

Key Words: Yukon River Region, Dall River, northern pike, *Esox lucius*, migration, radio telemetry, stock status.

INTRODUCTION

Construction of the Dalton Highway in the mid 1970s provided improved access to the Dall River for anglers. Since that time, a summer season sport fishery has developed which targets mostly northern pike. Local residents have expressed concern over encroachment by outside visitors and by what they perceive as a depletion of resources. There have been several actions by the Board of Fisheries in response to concerns over this resource.

In 1988 and 1989 the Alaska Department of Fish and Game (ADF&G) conducted a project designed to assess the population of pike residing in the Dall River (Arvey and DeCicco 1989; Arvey and Burkholder 1990). Investigators learned that a portion of the pike that use the Dall River travel downstream in the Yukon river to Hess Creek and upstream of Stevens Village to at least Old Lost Creek. This suggested an open population, which precluded estimating abundance of pike in the Dall River without extending the scope of the 1988 and 1989 study design. Data obtained on the size of pike sampled in the Dall River during the summer of 1988 and 1989 indicated that over 34% of these fish were greater than 720 mm FL (30 in TL; Arvey and Burkholder 1990).

Sport fishing effort is estimated by the statewide harvest survey (Mills 1979-1994); Howe et al 1995, 1996, 2001 a, b, c, d; Walker et al. *In prep*; Table 1). The maximum estimated sport harvest of pike from the Dall River between 1978 and 2000 occurred in 1983 and was an estimated 1,794 pike (Table 1). In 1987 regulations were changed (Appendix B) and estimates of sport harvest since that time have been less (Mills 1979-1994; Howe et al. 1995, 1996, 2001a, b; Table 1). Investigators believe the levels of harvest on pike in the Dall River since 1987 were within sustainable levels.

Up to 87% of pike caught from 1990 to 2000 in the Dall River were released by anglers. Estimated fishing effort (angler days) on the river remained stable between 1988 and 1992, varying between 217 and 438 days. Estimated fishing effort in 1993 increased to 845 days, and has averaged more than 600 days in the 5-year period from 1996-2000 (Table 1).

A survey was conducted in 1995 to assess the level and type of recreational use of the Dall River (Burr and James 1996). The survey estimated that 330 people (92% non-local) visited the river between May 26 and September 5 in 107 boats and stayed on average 2 days each. Local use was greatest in June with 20% of visitors from Stevens Village; local use dropped to 2% in July.

Table 1.-Sport fishing effort and harvest and catch of northern pike for the Dall River and the Yukon River 1978-2000.

Year	Yukon River		Dall River	
	Northern Pike	Angler Days	Northern Pike	Percent ^a
Harvest				
1978	2,583	259	177	7%
1979	1,446	394	723	50%
1980	2,498	250	499	20%
1981	2,718	498	1,014	37%
1982	3,551	473	455	13%
1983	3,318	405	1,794	54%
1984	2,960	1,428	1,752	59%
1985	2,132	139	416	20%
1986	3,470	596	1,407	41%
1987	<i>Regulation</i> 2,492	545	866	35%
1988	<i>Change</i> 3,526	217	418	12%
1989	3,516	438	125	4%
1990	2,474	273	372	15%
1991	4,454	359	559	13%
1992	3,590	224	342	10%
1993	2,347	845	352	15%
1994	1,968	455	215	11%
1995	1,937	1,018	350	18%
1996	2,502	341	334	13%
1997	1,870	694	414	22%
1998	1,452	360	182	13%
1999	2,418	687	862	36%
2000	1,277	316	257	20%
1990-2000 Average	2,501	526	398	16%
1995-2000 Average	2,036	620	428	20%
Catch ^b				
1990	17,717	273	1,810	10%
1991	13,895	359	1,029	7%
1992	14,801	224	1,042	7%
1993	13,502	845	2,645	20%
1994	11,694	455	1,308	11%
1995	15,828	1,018	2,463	16%
1996	25,502	341	1,358	5%
1997	13,367	694	1,961	15%
1998	12,349	360	1,304	11%
1999	20,213	687	3,320	16%
2000	13,589	316	1,740	13%
1990-2000 Average	15,887	526	1,824	12%
1995-2000 Average	17,452	620	2,081	13%

^a Percent of total catch or harvest of pike in the Yukon drainage.

^b Information available from 1990-2000 only. Anglers may have harvested or released fish tallied as “catch”.

The primary purpose of most (94%) visitors was to fish for pike. Sport fishing effort was estimated to be 553 angler days by 300 anglers during the time of this survey. Total catch during this survey was estimated at 1,325 pike of which 340 were kept and 985 were released.

With information from the survey, local residents remained concerned over the use of this resource, and showed a renewed desire to work with ADF&G toward a mutually agreeable solution to the issues surrounding the Dall River sport fishery. In 1999, a Dall River Working Group composed of ADF&G (Sport Fish Division), the Stevens Village Natural Resource Department (SVNRP) members of the Fairbanks and Delta advisory committees, and the Yukon Flats National Wildlife Refuge cooperatively drafted a fishery management plan for the Dall River (Appendix A). The goal of this planning process was to maintain a high quality northern pike stock for the benefit of local and non-local users. All parties are concerned with the maintenance of a viable, quality northern pike stock in the Dall River drainage.

A primary focus of this fishery management plan was to establish a special management area in which large sized northern pike would be protected by eliminating or greatly restricting the harvest of large fish. In 2001, regulations were approved by the Alaska Board of Fisheries that created the Dall River Special Management Area, based upon the preliminary results of this effort. The daily bag and possession limit was changed to 4 fish less than 30 inches, and one over 48 inches in order to protect large fish (Appendix B).

OBJECTIVES

The research goals for this study were to describe the pike stock inhabiting the Dall River in terms of the fidelity of pike to the Dall River Area¹ and in terms of the proportion of adult pike in the sample in large² size categories. This radiotelemetry study was used to determine the degree of fidelity of these fish to the area and if a change in regulation designed to reduce harvest of large fish in the Dall River watershed would likely be effective. Additionally, description of the proportion of pike in adult length categories in 1999 and 2000 was needed to serve as a benchmark for future comparisons.

The objectives of this study were to:

1. test the hypothesis that the proportion (p) of pike sufficiently large (≥ 600 mm FL; 25 in TL) to carry a radio transmitter with a 2-year life that left the Dall River Area during the open water period was less than or equal to 0.20 with $\alpha = 0.10$ such that $\beta = 0.20$ if the true proportion was 0.35; and,
2. estimate the proportion of adult pike vulnerable to sampling gear (≥ 450 mm FL, 19 in TL) inhabiting the Dall River Area that were ≥ 720 mm FL, or ≥ 30 in TL such that the estimate of the proportion was within 5 percentage points of the actual value 95 % of the time.

¹ The Dall River Area for the purposes of the radio telemetry study is defined as the Dall River watershed including the Little Dall River and the Yukon River and connected sloughs within a 5-mi radius of the mouth of the Dall River.

² Large pike are defined as pike larger than or equal to 30 in total length (720 mm FL).

DESCRIPTION OF STUDY AREA

The Dall River is located approximately 25 miles upstream of the Dalton Highway Bridge on the Yukon River approximately 90 miles north of Fairbanks, Alaska. The Dall River drainage is composed of the Dall and Little Dall rivers (Figure 1). These rivers are slow flowing and meandering with interconnected wetlands and small shallow lakes. Northern pike, least cisco *Coregonus sardinella*, humpback whitefish *C. pidschian*, broad whitefish *C. nasus*, sheefish *Stenodus leucichthys*, Arctic grayling *Thymallus arcticus*, burbot *Lota lota*, longnose suckers *Catostomus catostomus*, blackfish *Dallia pectoralis*, and slimy sculpin *Cottus cognatus* are present. King salmon *Oncorhynchus tshawytscha* have been recorded in catches in the lower Dall River but are not believed to spawn within the drainage.

METHODS

RADIOTELEMETRY

Radiotelemetry was used to help determine if pike present in the Dall River Area during May and early June remained in the area throughout the open water season. The length of time radio-tagged pike remained within the Dall River Area before leaving the area was determined, and the degree of dispersal within the Dall River Area was compared from one locating event to another. Investigators believed that strong fidelity to summer feeding areas within the Dall River drainage would be indicated if > 80% of radio-tagged pike were found within this drainage (from May through October). Knowledge of the fidelity of the population to this drainage during this period is critical to managing this fishery since all sport fishing effort presently occurs during this period and the majority of sport angling occurs at the mouth of this drainage.

A remote data logger placed at the mouth of the Dall River recorded the passage of radio tagged northern pike if and when they moved out of the Dall River drainage. In 1999, the data logging station was established at the mouth on 25 May and operated continuously until 8 October. In 2000, the data logging station was operational from 24 April to 21 September. In 2001, the data logging station was operational from 5 June through 26 September. The tracking data were downloaded approximately every two weeks. Ground tracking and movement were used to discern that northern pike radio-tagged in the Dall River Area were alive. The sampling was designed to ensure that a representative sample of northern pike were radio-tagged and that the time of tracking would provide the needed information.

Sampling began in late May as water levels and breakup of ice allowed access to the area. River conditions were monitored from Stevens Village. Only northern pike larger than 25 in TL (600 mm FL) were radio-tagged. These fish were selected by length in proportions similar to length compositions of previous catches (Arvey and Burkholder 1990; Arvey and DeCicco 1989; Table 2).

Northern pike were captured during late May and early June while they were dispersed in the upper portion of the Dall River drainage following spawning. To distribute sampling throughout the drainage, the Dall River Area was subdivided into an upper and a lower section (Figure 1). Roughly two-thirds of the fish fitted with radio tags were captured from the upper section of the Dall drainage because data from previous sampling indicated that during early summer most fish were in upstream locations. Investigators also believed a majority of spawning occurs in the upper parts of the drainage (Table 2). Sampling was conducted by two crews working

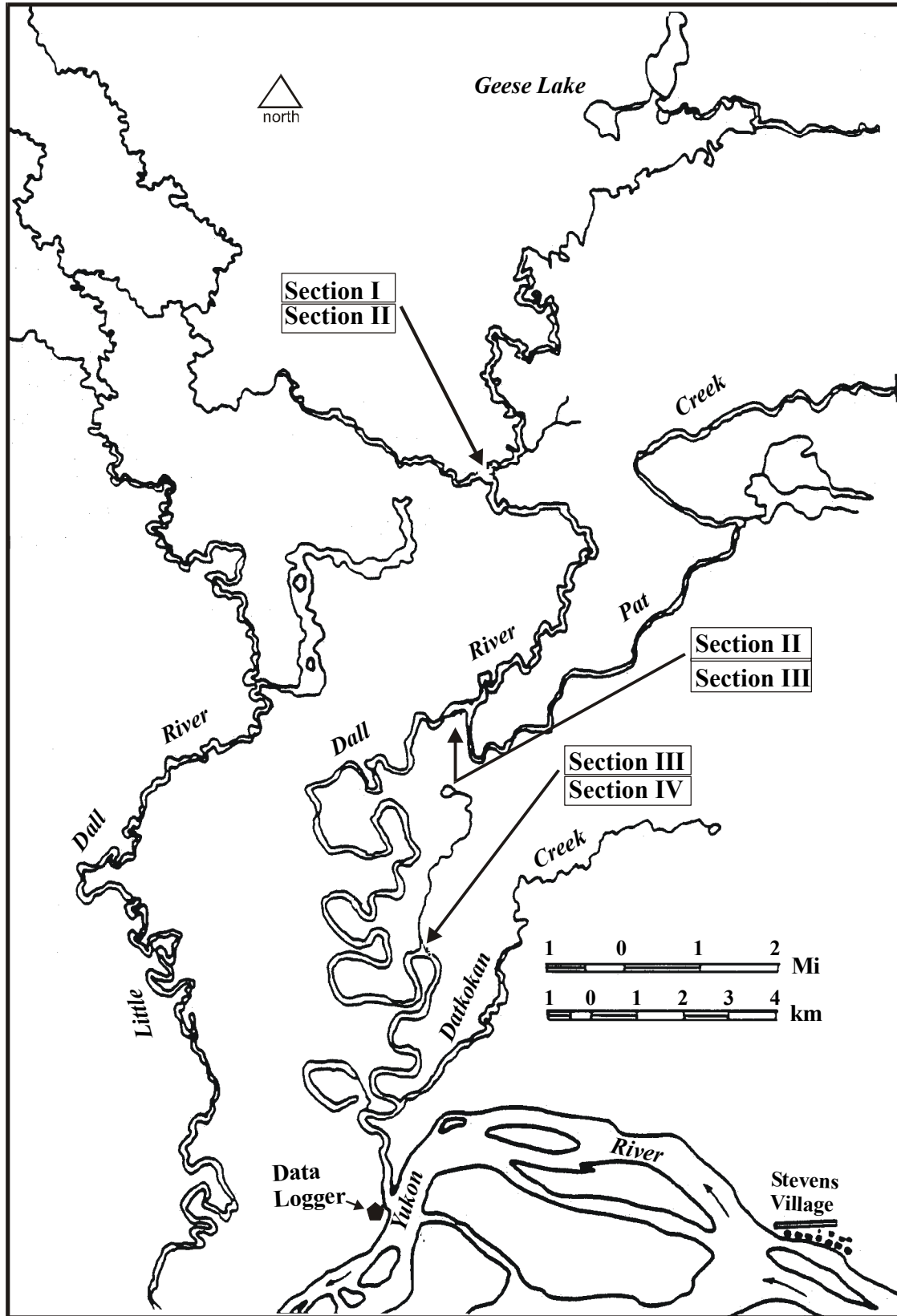


Figure 1.-Study area in the Dall River and Little Dall River drainages.

Table 2.-Number of pike fitted with radio transmitters by length category and in river section and year in the Dall River Area, 1999 and 2000.

Length Category		Numbers of Fish Fitted with Transmitters		
in. TL	mm FL	I & II	III & IV	All
1999				
24	574	0	0	0
26	619	4	0	4
28	669	9	3	12
30	719	5	6	11
32	764	4	2	6
34	812	2	2	4
36	860	1	1	2
38	900	1	1	2
40	955	0	0	0
42	1,000	0	1	1
44	1,055	0	0	0
Totals		26	16	42
2000				
24	574	0	0	0
26	619	0	1	1
28	669	1	3	4
30	719	1	6	7
32	764	1	2	3
34	812	1	0	1
36	860	0	0	0
38	900	0	2	2
40	955	1	0	1
42	1,000	0	1	1
44	1,055	0	1	1
Totals		5	16	21

simultaneously in different sections. Sections I and II were sampled first because access to the upper drainage by boat became problematic as water levels dropped.

All northern pike that were not fitted with radio tags and that had apparently normal appearance and behavior were marked with uniquely numbered Floy tags, scales were collected, and length (mm FL) was recorded. Fish that were fitted with radio tags were anesthetized in water with clove oil immediately after capture (Anderson et al. 1997). LOTEK (MBFT-3L) radio transmitters with unique digital codes and frequencies (149.320-149.800 MHz) were surgically implanted within the coelomic cavity of each northern pike through a 2-3 cm incision along the linea alba, anterior to the pelvic girdle (Hart and Summerfelt 1975). Approximately five sutures were used to close the incision. The outlet incision for the trailing antenna was posterior to the pelvic girdle. The procedure used for the trailing antenna outlet incision was similar to that described by Ross (1982). During the surgical procedure, fresh water was periodically poured over the gills of each northern pike to prevent suffocation. Radio-tagged fish were retained until equilibrium was regained and then released once they were able to vigorously swim away.

The dispersal of radio-tagged fish was determined by data logging stations and aerial and ground tracking events. Aerial tracking was scheduled at regular intervals during the open water season, once during the overwintering period and once during the spawning season. All frequencies were programmed into a Lotek SRX-400 receiver-scanner and then eliminated after location was determined. Locating fish consisted of flying the Dall River Area in a systematic manner and listening for signals from the transmitters with a five-element Yagi antenna with a 9 dBd gain mounted on a fixed-wing aircraft. Location of signal was recorded on a map of the area.

During summer 1999, 42 northern pike were radio-tagged to examine fidelity of northern pike to the Dall River Area. This sample size was selected based on objective criteria for the hypothesis to be tested³ and the survival of at least 30 northern pike with functional tags until at least May 2000. During 2000, an additional 20 northern pike were fitted with new radio transmitters to replace the transmitters lost during 1999.

Length Composition

The proportion of adult northern pike ≥ 450 mm FL (19 in TL) in the Dall River that were ≥ 720 mm FL, (30 in TL) at the time of sampling was estimated from samples collected during capture efforts in 1999 and 2000. Though radiotelemetry tracking of fish that were tagged in the Dall River (in 1999 and 2000) occurred in 2001, no additional fish were captured for either radiotelemetry or length composition purposes in the Dall drainage in 2001 in the related Yukon Flats northern pike project.

Previous studies on northern pike have shown that the capture probability with variable mesh gill nets (1-in, 1.5-in, and 2-in) for fish ≥ 450 mm FL (19 in TL) did not vary significantly by size (Roach 1993, 1998, Roach and McIntyre 1999). Tests for length bias in samples from mark-recapture experiments have shown that stratification is generally not necessary when only fish larger than 450 mm FL (19 in TL) are considered (S. Roach, ADF&G, Fairbanks, personal communication). Changes in the length composition of northern pike in the study area were minimized by the short duration of the sampling efforts. The timing of sampling should minimize differences in distribution of fish by sex and size. Radio-telemetry studies of northern

³ To test the hypothesis that the proportion (p) of large pike that leave the Dall River Area during the open water period is less than or equal to 0.20 with $\alpha = 0.10$ such that $\beta = 0.20$ if the true proportion is 0.35. This sample size assumes a tag failure rate of 5%.

pike at Harding Lake and Minto Flats indicated that northern pike were distributed more uniformly by sex and length in early summer compared with spatial distribution during spawning (Roach 1993, 1998; Burkholder and Bernard 1994).

Variable mesh gill nets (1-in, 1.5-in, and 2-in) were used to collect samples to estimate the proportion of fish in size groups. In very shallow water areas, two nets were set within the emergent vegetation, parallel to shore, parallel to each other, and spaced about 10 m apart. Northern pike were actively moved into the nets by splashing. In areas with less extensive shallow vegetated habitat, sets were similar except only one gill net was used and it was placed at the outer margin of the emergent vegetation instead of within the emergent vegetation. In deeper waters habitats, gill nets were set perpendicular to shore and checked at minimum once every hour.

Data Analysis

The proportion of radio-tagged northern pike found within the Dall River Area during each tracking event was considered an estimate of the proportion of northern pike that remained in the Dall River Area up to the time of tracking.

The proportion and variance estimator were:

$$\hat{p} = \frac{x}{n}, \text{ and} \tag{1}$$

$$\hat{V}[\hat{p}] = \frac{p(1-p)}{n-1} \tag{2}$$

where: \hat{p} = the proportion of northern pike that are located in the Dall River Area;

x = the number of northern pike located in the Dall River Area; and,

n = the total number of northern pike located.

Northern pike ≥ 450 mm FL (19 in TL) were included in the length composition sampling. The proportion of large northern pike ≥ 720 mm FL (30 in TL) was estimated from samples to provide a benchmark for future comparisons. The proportion and the variance were calculated as in formula 1 and 2, except that p was the proportion of northern pike larger than ≥ 450 mm (19 in TL) that were also larger than 720 mm FL (30 in TL). The number of northern pike larger than 720 mm FL (30 in TL) was x and n was the number of northern pike captured larger than 450 mm FL (19 in TL).

RESULTS

LENGTH FREQUENCIES

The proportion of northern pike (≥ 450 mm FL) that were ≥ 720 mm FL in the Dall River in June 1999 was estimated to be 0.24 (SE = 0.03) This was similar to data collected in 1988 and 1989 (Table 3). The proportion of large northern pike was similar between the three sampling areas and similar to data collected in 2000 (Table 4).

Table 3.-Comparison of lengths of pike \geq 450 mm FL sampled in 1988, 1989, 1999 and 2000.

Category (inches)	All 1998			All 1989			All 1999			All 2000		
	Sample	p	SE {p}	Sample	p	SE {p}	Sample	p	SE {p}	Sample	P	SE {p}
19-29	627	0.66	0.02	543	0.64	0.03	267	0.76	0.03	251	0.69	0.02
30+	330	0.35		287	0.34		83	0.24		112	0.31	
Total	957			850			350			363		

Data for 1988 and 1989 from Arvey and Burkholder 1990.

Table 4.-Comparison of lengths of pike sampled by river section in 1999, 2000.

Length Category (inches)	1999 Sample								
	Section I			Section II & III			Section IV		
	n	p	SE [p]	n	p	SE [p]	n	p	SE [p]
19-29	61	0.72	0.05	134	0.80	0.03	72	0.74	0.04
30+	24	0.28		34	0.20		25	0.26	
Total	85			168			97		

Length Category (inches)	2000 Sample								
	Section I			Section II & III			Section IV		
	n	p	SE [p]	n	p	SE [p]	n	p	SE [p]
19-29	66	0.70	0.05	135	0.71	0.03	50	0.65	0.05
30+	29	0.30		56	0.29		27	0.35	
Total	95			191			77		

In 1999, three hundred seventy-two northern pike ranging in length from 250 to 960 mm FL were captured, tagged, and released. Three hundred fifty were ≥ 450 mm FL (Table 4). The number of fish sampled in each river section were: 85 in Section I, 168 in Sections II and III, and 97 in Section IV. River sections II and III were combined because of availability of suitable sampling locations.

The proportion of large northern pike ≥ 720 mm FL (30 in TL) in the Dall River in June 2000 was estimated to be 0.31 (SE = 0.02, Table 3). The proportion of large northern pike was similar between the three sampling areas, and similar to the 1999 season's sampling effort.

In 2000, three hundred ninety-two northern pike ranging from 227 to 1065 mm FL were captured. Twenty-two were recaptured from the sample of fish tagged and released in 1999. Three hundred sixty-three fish in the 2000 sample were ≥ 450 mm FL (19 in TL; Tables 3 and 4). The numbers of fish sampled in each river section ≥ 450 mm FL (19 in TL) were: 95 in Section I, 191 in Sections II and III, and 77 in Section IV.

RADIO TAGS

Between June 3 and 11, 1999, 42 northern pike were fitted with radio transmitters. The fish ranged in length from 590 mm FL (25 in TL) to 960 mm FL (40 in LT; Table 2). Lengths were selected to approximate the distribution of northern pike larger than 610 mm FL (24 inches) that were sampled in 1988 and 1989.

A total of 15 transmitters were assumed to have been lost from the experiment during the 1999 open water season (Table 5). The signal from one transmitter was never received. One fish (FL 670 mm) was repeatedly captured in sampling gear and eventually died of capture induced stress. Two radio tagged fish were harvested in the sport fishery (FL 655 mm, 29 July; FL 770 mm, 6 Sept.). Two fish were harvested in the subsistence fishery in the Dall River (FL 735, 900 mm, 27 Sept.). Three additional transmitters did not indicate movement between sequential tracking flights nearby on the Yukon River. These were assumed to have been harvested, but showed up on the data logger at the mouth of the Dall the following year, and were included in the analysis.

In 1999 most of the northern pike fitted with radio transmitters (84%) remained within the Dall River drainage through August. At the end of June all fish carrying functional transmitters were still within the Dall River drainage or within 5 miles of the mouth of the Dall River (Table 5). In July most radio-tagged fish exhibited downstream movement and by the end of July two (6%) had traveled out of the drainage and further than 5 miles from the mouth. This downstream trend continued through the remainder of the open water season. By early October most (63%) of the fish carrying functional transmitters were located further than 5 miles from the mouth of the Dall River area.

Before the 2000 tagging event, northern pike radio tagged in 1999 returned to within the Dall River drainage. The peak of this return was between 9 May and 22 May (Figure 2). A few northern pike went up the river before the data logger was installed on 24 April (Figure 2).

In 2000, 85% of northern pike that were tagged and alive were located in the Dall River system or within 5 miles of the mouth through the end of August. Most fish (96%) were still in the Dall River at the end of June. Similar to 1999, downstream movement started to occur during the month of July, with 11% moving further than 5 miles away from the mouth by the end of July.

Table 5.-Proportion of radio transmitters by location, Dall River pike study, 1999, 2000, 2001.

Year	Location	June		July		August		September		Last (10-8-99)	
		Number	p	Number	p	Number	p	Number	p	Number	p
1999	Dall River Area	41	1.00	31	0.94	26	0.84	18	0.67	18	0.37
	Outside Dall River	0	0.00	2	0.06	5	0.16	9	0.33	9	0.63
	Total Functioning Tags	41		33		31		27		27	
	Non-Functional ^a	1	0.02	9	0.21	11	0.26	15	0.36	15	0.36
	Total Possible Transmitters	42		42				42		42	
2000	Dall River	45	0.96	42	0.89	40	0.85	23	0.49		
	Outside Dall River	2	0.04	5	0.11	7	0.15	24	0.51		
	Total Functioning Tags	47	0.90	47	0.90	47	0.90	47	0.90		
	Not Located	4		4		4		4			
	Dead	1		1		1		1			
Total Possible Transmitters	52		52		52		52				
2001	Dall River	28	0.65	34	0.74	29	0.74	21	0.60		
	Outside Dall	15	0.35	8	0.26	6	0.26	13	0.40		
	Total Functioning Tags	47		46		39		34			
	Non-Functioning/dead	4		1		8		13			
	Total Possible Transmitters*	47		46		39		34			

^a non functional tags include 1) fish harvested or killed in sampling gear, 2) transmitters never located, and transmitters moving less than 0.5 km in two sequential tracking efforts.

^b in 2001, transmitter failure due to the end of battery life affected the total possible number of transmitters over the course of the summer and fall seasons.

^c outside of the Dall River Area was defined as being not in the Dall River drainage and more than 5 miles from the mouth.

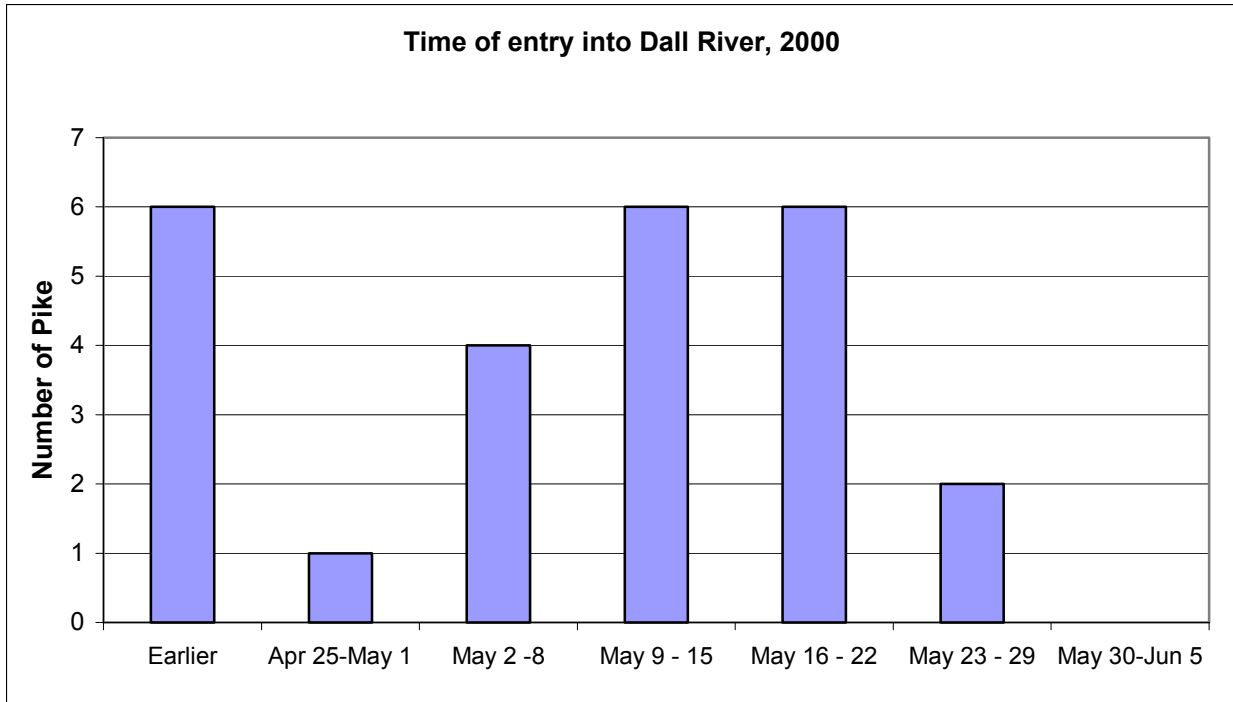


Figure 2.-Date of entry into Dall River Area as recorded by automated receiving station at Dall River mouth.

Similar downward trend occurred throughout the season. By the time the data logger was pulled on 21 September, only 49% were in the Dall River or within 5 miles of the mouth.

In 2001, a substantial portion (19%) of fish tagged in the Dall River were found in the Old Lost Creek drainage during June. In July only 9% of fish that were tagged in the Dall River were found in the Old Lost Creek drainage. Throughout July and August there were four Dall River fish (9 and 10% of all live Dall River radio tags) that consistently remained near the data loggers at the Old Lost Creek drainage. That number fell to one (3% of all live Dall radio tags) during the month of September during a time when fish were exiting the smaller rivers in greater percentages (Table 5). In 2001, transmitter failure due to the end of the battery life decreased the number of total possible transmitters over the course of the summer.

DISCUSSION

Evidence that the behavior of radio-implanted northern pike was similar to northern pike not implanted with radio tags was suggested when three radio-tagged northern pike were reported caught by anglers; Cook and Bergersen (1988) suggested that when radio-implanted northern pike are being caught by anglers, behavior of the northern pike is considered normal.

This study suggests that there is high fidelity to the Dall River area at specific times during all years (1999-2001). Most northern pike return presumably to spawn in late spring, and remain in the river systems until mid summer or later. There is an increasing movement of fish in late summer and early fall as fish exit the smaller rivers to head into the Yukon. Most northern pike left the Dall River area near the end of the open water season: The proportion of northern pike present in the Dall River area was variable during the latter parts of summer in all three years of radio tracking. For June, July, and August of 1999 and 2000, more than 80% of radio-tagged northern pike remained in the Dall River area (Table 5). In 2001 a lesser percentage remained in the drainage.

In 2001, northern pike that were radio-tagged in the Dall River were located in the Old Lost Creek drainage (Table 5). The related project that started in 2001 in the Old Lost Creek drainage provided information about movements of northern pike outside the Dall river drainage, and may provide additional information about movement between drainages after spawning and from year to year. This was the first year for the establishment of remote data logging sites at the mouths of that drainage, and preliminary data shows that up to 19% of northern pike tagged in the Dall River spend a substantial amount of time there during some part of the summer. Completion of the Old Lost Creek study in 2003 will provide insight into the degree of overlap between northern pike that spawn in the Dall River and northern pike that spawn in Old Lost Creek.

Northern pike were sampled in the Dall River area in 1988 and 1989. The proportions of northern pike ≥ 30 in TL estimated from samples in 1988 were .35 (se = 0.02) and .34 (se = 0.03) in 1989 (Table 3). In 1988 sampling was conducted in June, July, and August. Comparisons of the proportion of large northern pike in the samples from each month were not different (Table 6).

Table 6.-Comparison of lengths of pike sampled in 1988 by month.

Length Category (inches)	All 1988			June 1988			July 1988			August 1988		
	Sample	p	SE {p}	Sample	p	SE {p}	Sample	p	SE {p}	Sample	p	SE {p}
19-29	627	0.66	0.02	150	0.65	0.03	114	0.60	0.04	363	0.68	0.02
30+	330	0.34	0.02	81	0.35	0.03	77	0.40	0.04	172	0.32	0.02
Total	957			231			191			535		

Comparison of estimated proportions of large northern pike inhabiting the Dall River area in June 1999 and June 1988 indicates that the size composition of northern pike changed (Table 3). The sample from 2000 compared with the 1988 sample also showed no difference in the proportion of large fish, ($P = 0.16$, $\chi^2=1.9$, $df=1$; $P = 0.24$, $\chi^2=1.4$, $df=1$).

To monitor changes in the spawning population of northern pike inhabiting the Dall River in future years, June sampling is recommended. Results from 1988 and this study indicate that the June sampling provides a representative sample of fish that spawn in the area. In addition, movement of radio tagged northern pike in 1999 and 2000 indicated that northern pike movement increased after the end of June. After June a proportion of the Dall River spawners may not be available to sampling gear deployed in the Dall River drainage. Fish moving into the Dall River area from nearby tributaries could be included in the sample. Also, handling effects may be less of a concern in June than in late summer because of lower water temperatures and the reduced effect of handling stress.

Results from the current study indicated that most northern pike captured within the Dall River in early summer remained within the drainage during the fishing season. Size composition of northern pike estimated from samples collected during the 1999 and 2000 season indicate that the proportion of fish larger than 760 mm FL (30 inches TL) was not different from 1988. However, a substantial number of large (≥ 760 mm) fish are still present. The proportions of northern pike ≥ 760 mm TL (30 in TL) estimated from samples in 1988 were 0.35 (SE = 0.02) and 0.34 (SE = 0.03) in 1989 (Tables 3 and 4).

In 2001 the Alaska Board of Fisheries adopted the current regulations for the Dall River area that were forwarded by the Dall River Working Group (Appendix A). The Dall River Working Group recommended the establishment of a Dall River special management area with special regulations for the purpose of providing protection for large size northern pike. The goal was to maintain a high quality northern pike fishery for all user groups in the Dall River, with a substantial number of northern pike greater than 720 mm FL (30 in TL).

This study found that the northern pike that spawn in the Dall River remain in the Dall River drainage for most of the sportfishing season, and that there was a substantial number of northern pike in the large size category ≥ 720 mm FL (30 in TL) available in the area.

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APPENDIX A
DALL RIVER FISHERIES MANAGEMENT PLAN

DALL RIVER FISHERIES MANAGEMENT PLAN

Purpose of Plan

- To provide the public, state and federal agencies, the Stevens Village Natural Resource agency and the Alaska Board of Fisheries with a clear understanding of the underlying principles by which northern pike inhabiting the Dall River Area will be managed and provide guidance in developing future regulations.

Philosophy of Plan

- Conservative Wild Stock Management
- Protect biological integrity of the wild stock while maximizing the benefits to various users of the stock consistent with the subsistence priority

Goal

- Ensure the long term quality of the northern pike fishery in Dall River Area

Principles/Policies

- Native pike population(s) to be managed for maintenance of historic age and size composition (avoid enhancement or supplementing the wild stocks)
- Maintain opportunities for traditional (subsistence) and recreational use of the northern pike stock

Objective

- Proportion of northern pike 30 inches and longer to be greater than 0.30 in the assessed population.

Issues / Action Items

- Establish a special management area for the protection of large size northern pike
- Evaluate the effective size of the special management area
- Control fishing mortality within special management area; minimize fishing mortality for northern pike > 30 inches
- Evaluate and establish sport fishing regulations that will promote survival of large size northern pike
- Encourage local efforts to minimize mortality of large size northern pike in the subsistence fishery
- Educate prospective anglers concerning proper fish handling techniques
- Educate prospective anglers concerning proper fishing gear
- Reduce friction between local traditional users and non-local recreational users
- Educate non-locals on the extent of private/public land

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Appendix A.-Page 2 of 2.

- Incorporate local knowledge with scientific information to a greater degree in management decisions
- Encourage greater local acceptance of non-local recreational angling as a legitimate use of the Dall River pike resource
- Encourage local economic opportunities associated with recreational use

Definitions

Dall River Area The Dall River Area includes the Dall and Little Dall River drainages.

Benefits The concept of benefit varies with users. Traditional subsistence users seek fish resources for traditional purposes including human food. Village residents have recognized the potential for economic opportunities in providing services to recreational users of the fish and land resources. Urban anglers seek continued opportunity to participate in the fishery; both consumptive and non-consumptive uses are desired.

Quality All groups stress the importance of a quality fishery. In the present context quality is defined as a stock with historic size and age composition. The presence of fish in large size and old age categories is recognized by all groups as an appropriate indicator of stock health.

Assessed Population The assessed population includes the portion of the population that is accessible to the sampling gear used in stock assessment efforts. For northern pike in the Dall River area, this includes fish larger than 450 mm FL (19 inches Total Length).

APPENDIX B
HISTORY OF DALL RIVER REGULATIONS

Appendix B.-History of regulations for the northern pike sport fishery in the Dall River.

These regulations applied to pike fisheries in the entire Region III except for the Tanana River Drainage until 1988.

1959

Regulations before Statehood (Alaska Game Commission)

- Open Season year-round.
- No bag or possession limit.
- No size limit.
- May be taken with gill net, trap, seine, hook and line or spear.

1988

Background regulation established for Yukon R. northern pike

- Open Season year-round.
- Daily bag and possession limit is 10.
- No size limit.

Special regulations for Yukon tributaries accessed by Haul Road (Yukon River - mouth of Tanana River upstream to Hodzana River)

- Open Season year-round.
- Daily bag and possession limit is 5 fish.
- No more than one fish may be over 30-inches.

2001

Dall River Special Management Area

- Open May 20 – September 30,.
- Daily bag and possession limit is 4 fish less than 30 inches and 1 fish over 48 inches.
- No harvest of fish 30 – 48 inches
- No bait