

STATE OF ALASKA

*Jay S. Hammond, Governor*



Annual Performance Report for

DISTRIBUTION, ABUNDANCE AND NATURAL  
HISTORY OF THE ARCTIC GRAYLING IN  
THE TANANA RIVER DRAINAGE

by

*Jerome Hallberg*

ALASKA DEPARTMENT OF FISH AND GAME  
*Ronald O. Skoog, Commissioner*

SPORT FISH DIVISION  
*Rupert E. Andrews, Director*

Section J

Study R-I Distribution, Abundance and Natural History of the Arctic Grayling in the Tanana River Drainage	Page No.
---	----------

Abstract	1
Recommendations	2

Job No. R-I-A Population Structure, Migratory Patterns and Habitat Requirements of the Arctic Grayling	Jerome Hallberg
--	-----------------

Background	2
Objectives	2
Techniques	3
Findings	3
Population Estimates	3
Length and Age Structure	6
Survival Rates	12
Development Projects Affecting the Chena River Headwater Tributary Investigations of the Chena River	12
East Fork of the Chena River	14
North Fork of the Chena River	16
South Fork of the Chena River	16
West Fork of the Chena River	19
Length and Age Data of Grayling Sampled on Headwater Surveys of the Chena River	19
Discussion	21
Piledriver Slough Study	21

Job No. R-I-B Creel Census of the Sport Fishery in the Tanana River Drainage	Jerome Hallberg
---	-----------------

Background	25
Objectives	25
Techniques	25
Findings	25
Badger Slough Creel Census	25
Upper Chena River	26
Literature Cited	26

## RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations  
of Alaska

Project No.: F-9-10

Study No.: R-I Study Title: DISTRIBUTION, ABUNDANCE AND  
NATURAL HISTORY OF THE ARCTIC  
GRAYLING IN THE TANANA RIVER  
DRAINAGE

Period Covered: July 1, 1977 to June 30, 1978

## ABSTRACT

Population estimates of Arctic grayling, Thymallus arcticus (Pallas), greater than 150 mm fork length, conducted on four sections of the lower 80 km (50 miles) of the Chena River showed an increase in three of these areas while the fourth showed a slight decrease. The average estimated population of the four combined areas is 282 grayling/km (452 grayling/mile). Grayling in the four sections were predominantly immature in that 97.3% were less than 270 mm fork length.

Recruitment of age III grayling in the lower Chena was 44.5% and was the predominant age group. Age III grayling had a mean fork length of 208 mm while the mean length of all age groups combined (n=229) was 199 mm. Data on age and length composition of fish sampled during population estimates on the lower Chena are presented.

Survey data including physical, chemical and biological features of the four major headwater tributaries to the Chena River are presented.

Fifty percent of the grayling sampled in the East, North, South and West forks of the Chena River were adults. The mean fork length of grayling captured in the East Fork was 353 mm. The average of all four systems was 286 mm. The presence of young-of-the-year grayling in the four headwater streams indicates that these are spawning streams.

Creel census on Badger Slough showed that 3,993 total angler hours yielded a harvest of 3,594 grayling (0.9/angler hour). The average size of Badger Slough grayling entering the creel was 238 mm. Age and length composition and angler profile data collected during Badger Slough creel census are presented.

A creel census on the upper Chena River showed that 13,536 total angler hours were expended to harvest 9,406 grayling (0.7/angler hour). Mean fork length in the upper Chena River creel was 208 mm.

## RECOMMENDATIONS

It is recommended that:

1. Population estimates on index sections of the Chena River should be continued.
2. Creel census programs should be continued on the Chena River system with emphasis on obtaining statistically based catch data.
3. Recruitment and survival rates for grayling in the Chena River should continue to be monitored.
4. Monitoring of development projects affecting the Chena River should be continued.
5. Work should continue on headwater investigations of major river systems in the Tanana drainage.

Job R-I-A Population Structure, Migratory Patterns and Habitat Requirements of the Arctic Grayling.

## BACKGROUND

The Chena River, a clearwater tributary to the Tanana River, flows through the city of Fairbanks and is the heaviest fished grayling stream in Interior Alaska.

To keep abreast of the ever fluctuating numbers of Arctic grayling found within the mainstem of the Chena River, index sections were established to determine trends in population structure.

Standard mark and recapture methods to determine grayling populations were started in 1968 by Van Hulle and continued by Roguski and Winslow (1969), Roguski and Tack (1970) and by Tack (1971-1976).

Information also obtained during the population estimates are length frequencies, annual survival rates, and age and length composition. Except for the lower 10 miles of the North Fork which parallels the Chena Hot Springs Road, the major tributaries of the Chena River, the East, South, West and upper North forks are largely inaccessible to the angling public and information was needed on what these streams contribute to the main river in terms of fish and fish habitat. Thus, surveys on these four major headwater tributaries were conducted during the reporting period.

## OBJECTIVES

1. Determine Arctic grayling populations and age class structure in index sections of the Chena River.

2. To keep abreast of the development projects affecting the fish habitat of the Chena River and other tributaries of the Tanana system.
3. Conduct headwater tributary investigations of the larger clearwater streams in the Tanana drainage to determine what these waters contribute to the overall system in terms of fish and fish habitat.
4. Assess the effects of dikes placed across Piledriver Slough (preventing entry of Tanana River water) in establishing this slough as a clearwater stream.

## TECHNIQUES

The Chena River sections referred to in this report are the same as in previous years, and are repeated here for convenience (Table 1, Fig. 1).

Grayling for population and length composition studies were captured by a boat mounted electrofishing unit described by Van Hulle (1968) and Roguski and Winslow (1969). Three passes through each section on three successive days were made and grayling greater than 150 mm fork length were marked by punching a small hole through the dorsal fin.

Population estimates were made using the techniques of the Schumacher-Eschmeyer, Schnabel, and Petersen as described in Ricker (1958). Calculations of survival rates also follow those outlined in Ricker.

Grayling scales used for age determination were individually cleaned and mounted on 20 mil acetate using a Carver press at 20,000 psi, heated to 200°F for 30 sec. The scales were read on a Bruning 200 microfiche reader.

A Hach Model AL-36-WR water test kit was used to measure pH, alkalinity and hardness.

A 12' Avon rubber raft was used for transportation during headwater tributary surveys.

The metric system is used for fish measurements and water temperatures in keeping with standard Sport Fish Division reporting methods. All other measurements are in the English system or are presented in both systems.

## FINDINGS

### Population Estimates

Population estimates of Arctic grayling, Thymallus arcticus (Pallas), were conducted in sections 2a, 2b, and 6 and in the area just above the

Table 1. Chena River study sections.

Section Number	Section Name	River Miles*	Section Length	
			km	mi
1	River Mouth to University Ave.	0-6 (0-9.7)	9.7	6
2a	University Ave. to Peger Road	6-8 (9.7-12.9)	3.2	2
2b	Peger Road to Wendell Street	8-11 (12.9-17.7)	4.8	3
3	Wendell St. to Wainwright RR Bridge	11-14.5 (17.7-23.3)	5.6	3.5
4	Wainwright RR Bridge to Badger Slough	14.5-21.5 (23.3-34.6)	11.3	7
5	Badger Slough		26.6	16.5
6	Badger Slough to Little Chena	21.5-24.5 (34.6-39.4)	4.8	3
7	Little Chena River		99.0	61.5
8	Little Chena to Nordale Slough	24.5-31 (39.4-49.9)	10.5	6.5
9a	Nordale Slough to Bluffs	31-55.5 (49.9-89.3)	39.4	24.5
9b	Bluffs to Bailey Bridge	55.5-63 (89.3-101.4)	12.1	7.5
10	Bailey Bridge to Hodgins Slough	63-79 (101.4-127.1)	25.7	16
11	Hodgins Slough to 90 Mi. Slough	79-90 (127.1-144.8)	17.7	11
12	90 Mi. Slough to First Bridge	90-92 (144.8-148.0)	3.2	2
13	First Bridge to Second Bridge	92-94.5 (148.0-152.1)	4.0	2.5
14	Second Bridge to North Fork	94.5-102 (152.1-164.1)	12.1	7.5
15	North Fork of Chena River		56.3	35
16	East Fork of Chena River		99.8	62
17	West Fork of Chena River		56.3	35

\* km in parentheses

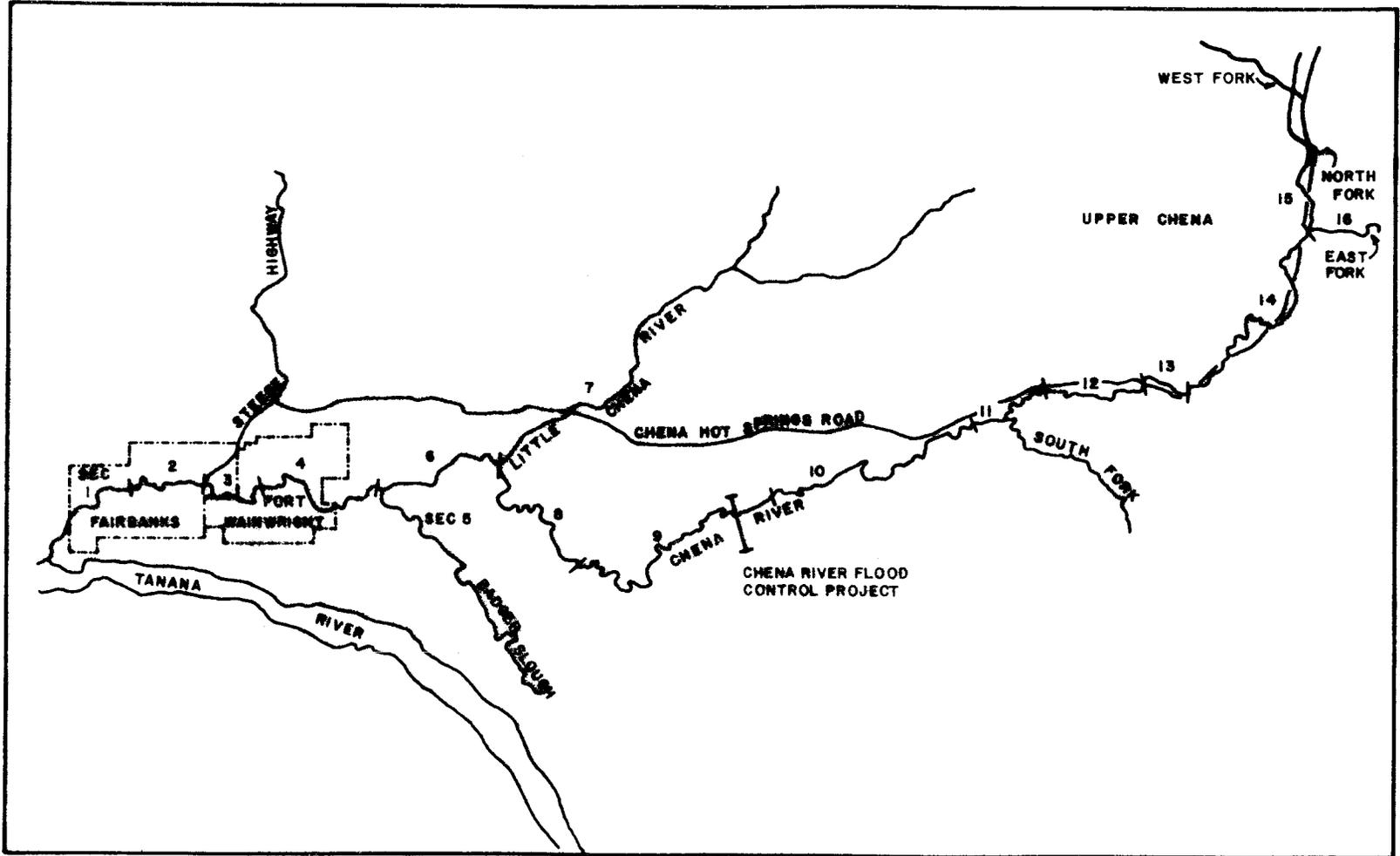


FIGURE I. CHENA RIVER STUDY SECTIONS

Chena River Lakes flood control dam site, mile 44 to 47 (Fig. 1), presently under construction. Section 2, which lies adjacent to Fairbanks, and the dam site which will be directly impacted during times of flooding due to the impoundment of water are both critical areas needing yearly information. Section 6 is a 3 mile section of the Chena River which is located between the mouths of Badger Slough and the Little Chena River. This area, because it has not been exposed to heavy development or angling pressures and is easily accessible, has been used as the control section in our population estimates.

The population estimates calculated by the Schnabel and the Schumacher-Eschmeyer methods are presented in Table 2. A summary of population estimates conducted on these four index sections of the Chena River from 1968 to 1977 appear in Table 3. Number of grayling per mile dropped somewhat from 1976 in Section 2b; the other three sections show a slight increase. (There are no apparent reasons for such fluctuations and monitoring of these index sections will continue to reveal if the Chena River grayling populations continue to rise.)

#### Length and Age Structure

The length frequency distribution of 1,050 grayling captured by electro-fishing in the lower 76 km (47 miles) of the Chena River during the 1977 population studies appears in Fig. 2. The mean fork length of grayling in sections 2a, 2b, 6 and the area near the dam site was 192 mm. The peak of length distribution in these four areas occurs at 170-210 mm (50.6% of total). After this group, the numbers of larger fish decrease rapidly. The length frequency in percent of sample in each individual section appears in Table 4. The percentage of mature grayling (greater than 270 mm; Roguski and Tack, 1970) in the lower Chena for 1977 was 13.5%, down considerably from the 31.1% in 1976 (Hallberg, 1977). The lower Chena River has long been considered good rearing and feeding habitat for smaller grayling with the larger fish found further upstream. Tack (1971) pointed out that rearing grayling (age I and II) are concentrated in the lower 50 miles (80 km) and only a small percentage of mature grayling are found there.

Age determinations by scale analysis were made from a random subsample of 229 grayling (scales collected from every fourth fish captured). Age-length information presented in Table 5 shows that Age Class III was the predominant age group, accounting for 44.5% of the total sample, and Age Class II was the second largest with 33.6%. The mean fork lengths of these two groups, age II (176 mm), and age III (208 mm) correlate closely with the length distribution peak of 170-210 mm. The percentage of age IV fish is down from previous years and is discussed in the section on Survival Rates.

The mean fork length of the fish in the subsample was 199 mm. This corresponds relatively close to the 192 mm mean fork lengths of the original 1,050 samples shown in Fig. 2.

Table 2. Grayling population estimates in four sections of the Chena River, 1977.

River Section	Date	Length of Section		Schnabel Estimate		Schumacher-Eschmeyer Estimate		90% Confidence Limits Schumacher-Eschmeyer
		km	mi	GR/km	GR/mi	GR/km	GR/mi	GR/km
2a	7/5-8	3.2	2	299	481	318	511	298-343
2b	7/11-14	4.8	3	298	479	318	511	280-370
6	7/18-21	4.8	3	167	269	173	278	170-177
Dam Site km 71-76	7/26-30	4.8	3	272	437	315	507	283-359

Table 3. Grayling population estimates for various sections of the Chena River, 1968-1977.

River Section	Year*	Dates	GR/km	GR/mi
2a	1971	8/30-9/3	681	1,095
	1972	6/22-26	414	666
	1973	7/20-23	291	469
	1974	6/26-28	55	89
	1976	7/19-21	257	413
	1977	7/5-8	318	511
2b	1968		681	1,095
	1969		1,175	1,890
	1970	7/2-10	1,532	2,465
	1971a	6/2-7	2,024	3,257
	1971b	8/30-9/3	2,325	3,741
	1972	6/22-26	914	1,471
	1973	7/3-14	422	679
	1974	6/25-28	399	642
	1976	7/22-24	406	654
	1977	7/11-14	318	511
	6	1968	Date Unknown	281
1969		Date Unknown	567	913
1970		5/26-30	478	769
1971		6/21-24	366	589
1972		6/19-20	206	331
1973		7/16-17	242	389
1974		8/13-15	86	138
1975**		7/10-14	190	306
1976		7/28-30	163	262
1977		7/18-22	173	278
9a at Dam Site (km 71-76)	1972	6/27-29	1,134	1,824
	1973	7/18-19	497	800
	1974	7/9-11	259	416
	1976	8/4-6	304	489
	1977	7/26-30	315	507

\* Data prior to 1976 from Tack (1976).

\*\* Only 63 fish used in this estimate - results should be regarded with caution.

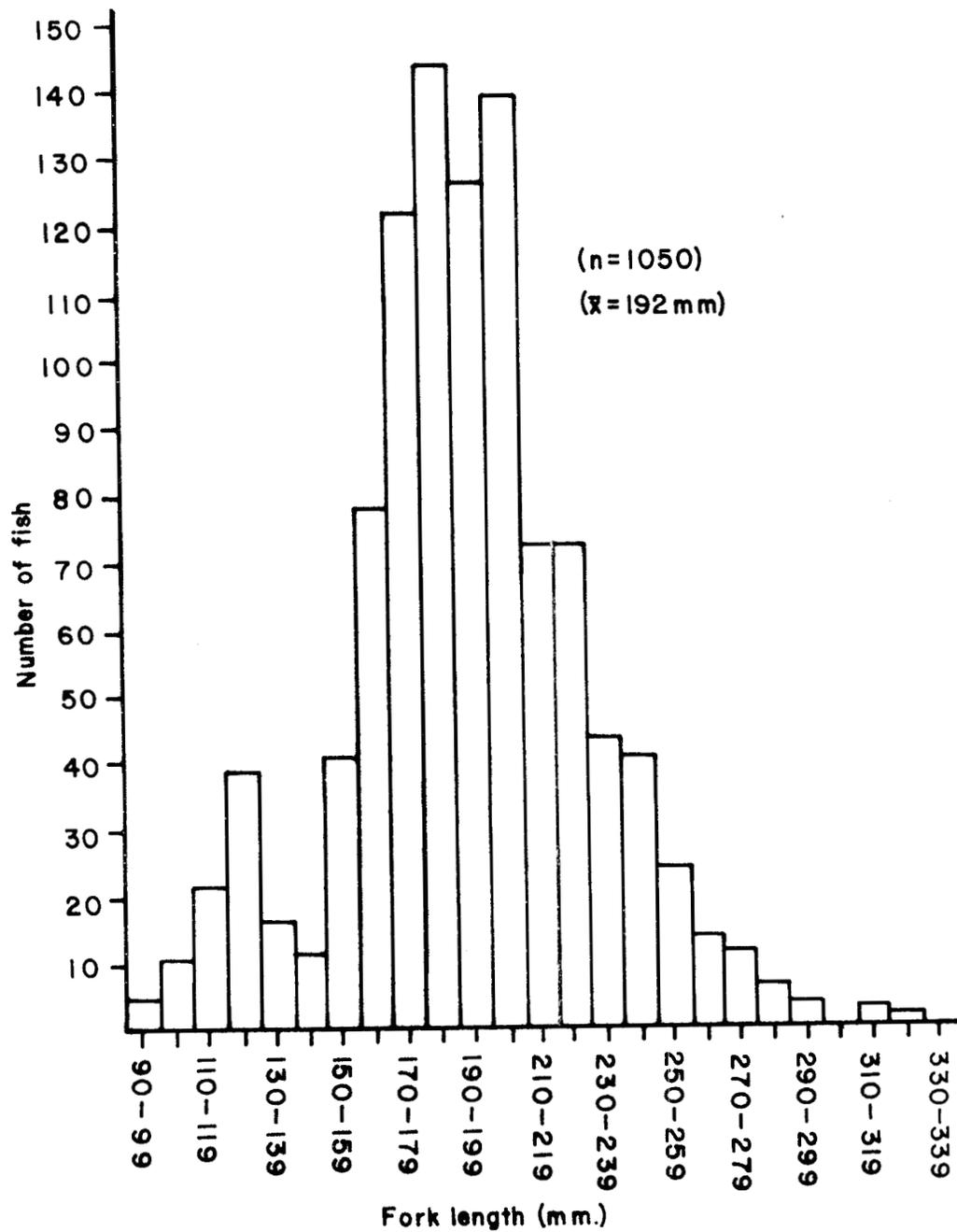


Figure 2 Length Frequency of Grayling captured by electrofishing from Sections 2a,2b,6, dam site.

1977

Table 4. Length frequency (in percent of sample) of 1,050 grayling from four sections of the Chena River, 1977.

Fork Length (mm)	Chena River Section			
	2a	2b	6	dam site
90-99	0.9		0.3	1.0
100-109		0.4	1.9	2.1
110-119	1.7	0.6	4.9	0.5
120-129	5.7	5.0	2.6	0.5
130-139	2.6	2.1	1.3	
140-149	1.3	0.6	2.3	
150-159	6.5	3.4	3.6	2.1
160-169	9.6	10.2	5.9	2.6
170-179	18.1	9.6	9.1	10.5
180-189	11.3	14.2	11.3	19.0
190-199	10.4	8.3	15.0	15.4
200-209	5.2	14.6	19.8	10.0
210-219	8.3	9.6	3.6	6.3
220-229	6.5	10.2	5.5	4.2
230-239	5.7	5.9	2.6	1.5
240-249	3.1	4.0	2.9	6.3
250-259	0.9	0.9	3.6	4.3
260-269	0.4	0.4	1.0	4.8
270-279	0.9		1.3	3.2
280-289	0.9		0.6	2.6
290-299			0.3	1.6
300-309				
310-319			0.6	0.5
320-329				1.0
330-339				
340-349				
n	229	323	308	190
$\bar{x}$	183	190	190	204
Range	95-275	100-260	95-310	90-325

Table 5. Age and length composition of 229 randomly subsampled grayling captured in Sections 2a, 2b, 6 and at the Chena River dam site, 1977.

Fork Length mm	Age Class						Total No.	Length Frequency %
	I	II	III	IV	V	VI		
90-99	2						2	0.9
100-109	3						3	1.3
110-119	4						4	1.7
120-129	5						5	2.2
130-139								
140-149		1					1	0.4
150-159		5					5	2.2
160-169		10	1				11	4.8
170-179		27	3				30	13.2
180-189		16	7				23	10.0
190-199		15	17				32	14.0
200-209		2	25				27	11.8
210-219		1	19				20	8.7
220-229			15	2			17	7.5
230-239			7	2			9	3.9
240-249			5	8	1		14	6.2
250-259			3	3	4		10	4.4
260-269				3	3		6	2.6
270-279				1	3		4	1.7
280-289					1	2	3	1.3
290-299					1		1	0.4
300-309								
310-319						1	1	0.4
320-329						1	1	0.4
n	14	77	102	19	13	4	229	
Age frequency %	6.2	33.6	44.5	8.3	5.7	1.7		100.0
$\bar{x}$ fork length (mm)	112	176	208	245	263	299	199	

## Survival Rates

Monitoring of the recruitment and survival rates of Arctic grayling in the lower Chena River began in 1973, Table 6. Data are based on the assumption that all age classes accessible to the capture equipment are represented in the sample proportionately to their presence within the population. However, the annual survival rates only truly represent survival or presence when applied to Age Classes III and IV, because older grayling tend to migrate further upstream and cause the calculated survival rate to drop below the actual rate (Tack, 1974). Grayling at Age Class III are considered to be the minimum recruitment age that can be calculated as these fish are readily captured by electrofishing and are considered to be representatively sampled.

The age frequency of the 1977 sample (Table 6) reveals that for the second year in a row Age Class III (44.5% of sample) is the predominant age captured.

Survival rates between age classes in the 1977 sample point out that between ages III and IV, a survival rate of only 0.190 was calculated, which is far below the two previous year's survival rate of 0.546 in 1975 and 0.525 in 1976. There is no apparent reason for such a depressed age IV year class after what appeared to be a strong age III class in 1976. Data showed that the percent of age III, IV and V fish in the area of the dam site in 1977 was up in all three age classes from that found in 1976, which may indicate the upstream movement of larger fish from the lower Chena as was suspected by Tack (1971).

## Development Projects Affecting the Chena River

The Chena River Lakes Flood Control Project, presently under contract with the Army Corps of Engineers, was the only active construction project affecting the Chena River in 1977. Most of the effort at the site during 1977 was spent building the control structure. It is here that the flood gates will be installed as well as the fish passage facilities. Completion of the control structure is scheduled for the summer of 1978.

In May of 1977 the Alaska Department of Fish and Game and the National Marine Fisheries Service, under contract with the Corps of Engineers, conducted tests on the performance of Arctic grayling in a 20' section of Model "A" Alaska Steeppass fish ladder which is being considered for the fish passage structure at the Chena River Lakes project. Conclusions from the study indicated that this type of fish ladder was fully accepted by migrating grayling. The best results were from adult grayling. Nearly 100% were able to negotiate the ladder at 15% slope and 4.5 cfs discharge that produced an average velocity in the ladder of 2.6 fps. Juvenile grayling (130 mm - maturity) also did best (92% success) at the highest slope and discharge tested. Yearling grayling (85-130 mm), however, reached their best success rate of 44% at 11.25% slope and 2.9 cfs discharge. The results of this study appear in the final report to the Army Corps of Engineers, Alaska Division (Tack and Fisher, 1977).

Table 6. Survival rates of grayling in the lower 76 km of the Chena River based on age frequency data from 1973-1977.

Age Class	Percent Frequency					$\bar{x}$ Frequency	Annual Survival Rate					Survival Rates Calculated from $\bar{x}$ Age Class Frequency
	1973	1974	1975	1976	1977		1973	1974	1975	1976	1977	
III	60.5	12.1	24.7	28.9	44.5	34.1	.298		.546	.525	.190	.58
IV	18.0	44.1	13.5	15.2	8.3	19.8	.167	.562		.611	.690	.69
V	3.0	24.8	25.8	9.3	5.7	13.7		.157	.740		.300	.52
VI	0.0	3.9	19.1	10.9	1.7	7.1		.077	.115	.137		.13
VII	0.5	0.3	2.2	1.5	0.0	0.9						

## Headwater Tributary Investigations of the Chena River

Detailed information on the use by grayling of small tributary streams and headwater streams in large unsilted rapid runoff systems is, for the most part, lacking. During the 1977 field season, surveys were begun on the larger headwater tributaries of the Chena River to determine what these streams contribute in terms of fish and fish habitat to the overall Chena system. Descriptions of the physical and chemical characteristics of the streams surveyed along with age and length data collected from grayling sampled on these streams are included.

### East Fork of the Chena River:

The East Fork of the Chena River (Fig. 3), which was surveyed from June 21 to 28, originates approximately 60 miles (97 km) above its confluence with the North Fork. The survey was conducted in two sections. The first section, was from the stream's origin down to Van Curler's Bar, a distance of 25 miles. Van Curler's Bar is the site of an abandoned mining area. It also has a small airstrip which is used by a few hunters and fishermen throughout the year. The stream in this area was extremely swift with many shallow riffle areas and numerous log jams making it difficult to float.

The water temperature was between 4° and 5°C and the grayling had not spawned at this time. Those fish autopsied were ripe and most produced sex products when they were merely handled.

The East Fork above Van Curler's Bar averaged 30' in width and 20" in depth; its color ranged from clear to a coffee, humic color.

Bottom composition was primarily large rock and cobble with quantities of smaller gravel mixed with some sand.

Pools were infrequent above Mascot Creek but were more common from there down to Van Curler's Bar. The average depth of the pools was about 5' and only a few were deeper than 10'. Grayling were observed in almost every pool.

Very little aquatic vegetation and invertebrate life were evident here. Stomachs of three adult grayling yielded mostly detritus, with some unidentified fish and insect remains.

Many of the smaller tributaries, both named and unnamed, that were visible from the river were surveyed briefly on foot. Creeks such as Caribou and Mascot are rapid runoff streams with a steep gradient that would prevent fish passage. Those creeks with less gradient were found to contain only large adult grayling at this time of the year.

In the second section of the East Fork from Van Curler's Bar to the mouth (a distance of 35 miles) the river changes very little. Most of the physical characteristics are about the same as the upper half except that the river widens and contains larger and deeper pools.

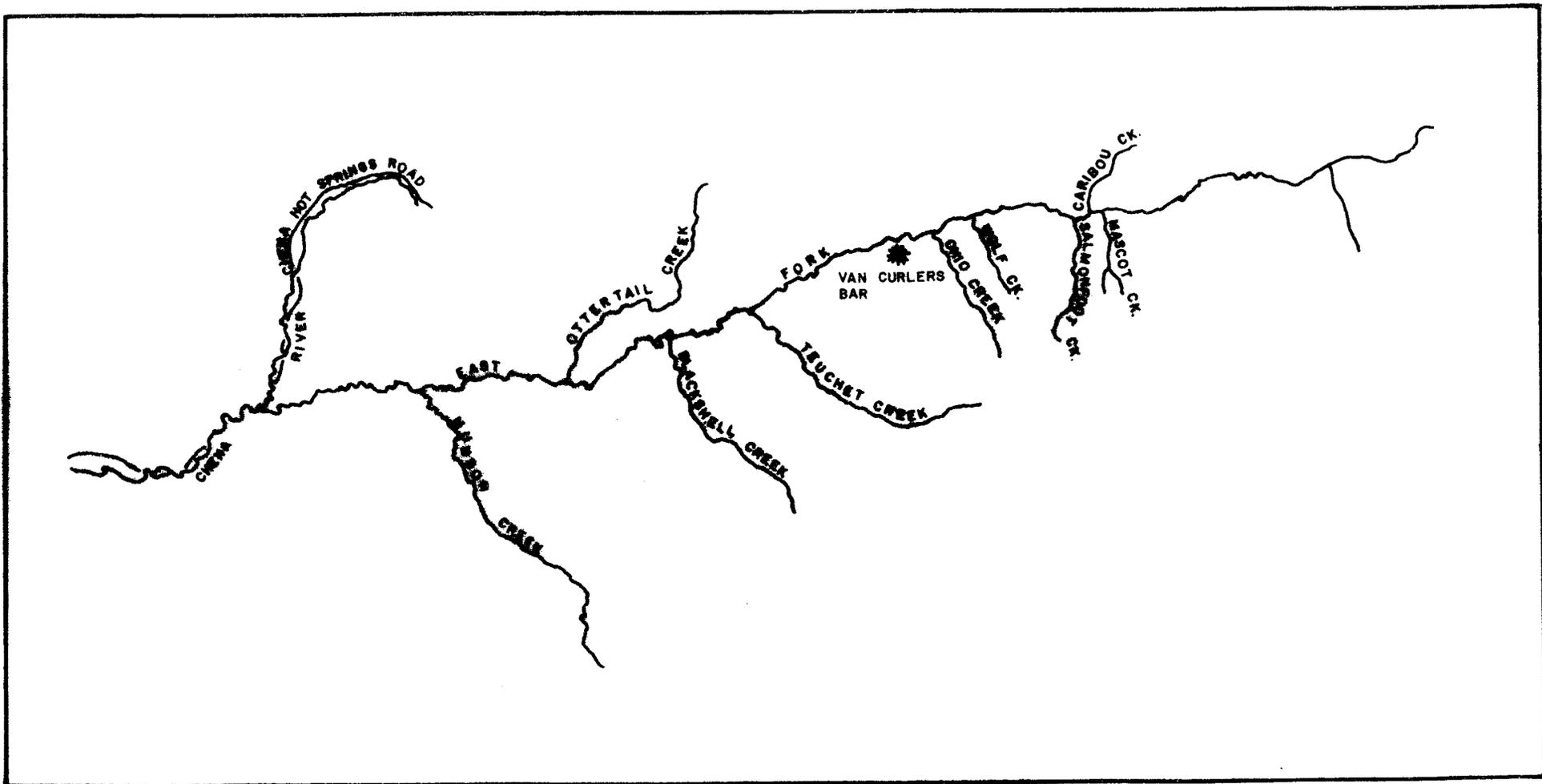


FIGURE 3 EAST FORK CHENA RIVER

Water temperatures were much warmer, averaging 10°C. Adult grayling autopsied in the lower section were mostly spent.

Young-of-the-year grayling 12 mm in total length and burbot, Lota lota (Linnaeus), were caught approximately 5 miles above the confluence with the North Fork of the Chena. Tack (1971) also found young-of-the-year grayling in the quieter backwaters of the lower sections of the East Fork.

Other fish species identified here include round whitefish, Prosopium cylindraceum (Pallas); slimy sculpin, Cottus cognatus Richardson; and longnose sucker, Catostomus catostomus (Forster).

Water chemistries on the East Fork are as follows: pH 9, total hardness 100 ppm, total alkalinity 100 ppm.

#### North Fork of the Chena River:

The North Fork of the Chena River (Fig. 4) from about 1 mile above Boulder Creek to the Chena Hot Springs Road, a distance of 15 miles, was surveyed on foot from August 29 to 31. From there to its confluence with the main Chena, the North Fork and Chena Hot Springs Road parallel one another, thus accounting for the majority of the fishing pressure on this tributary.

The entire North Fork is approximately 35 miles (56 km) long and flows in a southerly direction out of the Tanana Hills.

Its physical appearance is somewhat different from that of the East Fork in that the river is faster and shallower due to the steeper gradient at which it flows out of the surrounding hills. Pools in upper areas were fairly common but averaged only about 3' in depth. Pools in lower sections were larger and averaged about 5' in depth but were less frequent. Average width of the stream was 25' and average depth 15". Bottom material was mainly rock and cobble with very little aquatic vegetation.

Juvenile and adult grayling were observed throughout the system, with young-of-the-year found in the lower end. Slimy sculpin were the only other species identified on this trip.

The water had a temperature of 9°C and was clear in color throughout the trip. Water chemistry collected included pH 8.5, total hardness of 100 ppm, total alkalinity 85 ppm.

#### South Fork of the Chena River:

The South Fork of the Chena River was floated using a rubber raft from the mouth of Beaver Creek to the Chena Hot Springs Road, a distance of 18 miles (Fig. 5). The survey was conducted from August 8 to 11.

The South Fork flows northwestward out of a large, broad valley of the Tanana Hills. Only on the east side of the river do the hills abut the

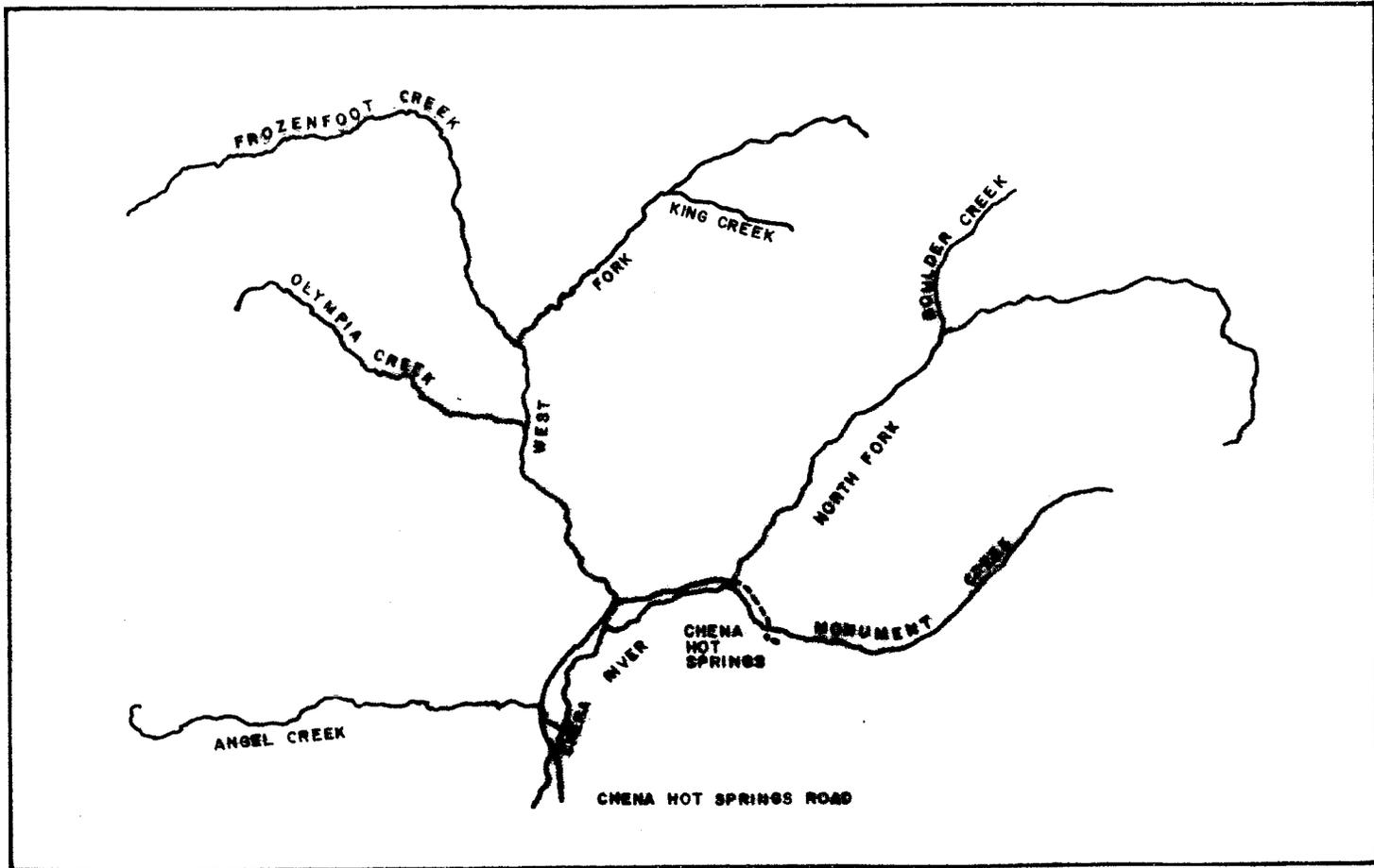


FIGURE 4 NORTH & WEST FORKS CHENA RIVER

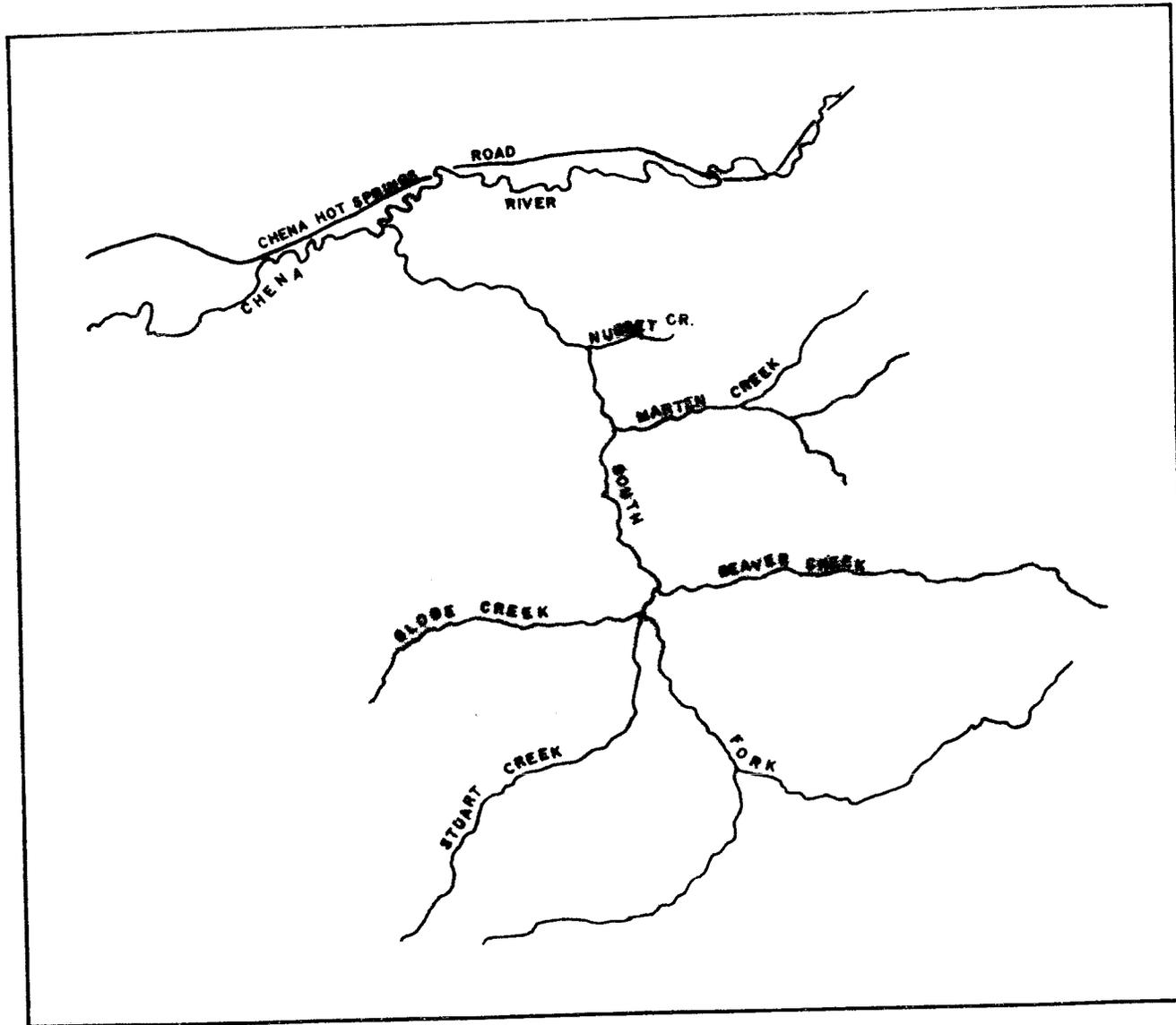


FIGURE 5 SOUTH FORK CHENA RIVER

stream in a few areas. Because of the larger, less steep watershed area, the South Fork has fewer riffle areas and many more pools than do the North and West forks. Pools were common throughout the system, averaging 5' in depth. The average width and depth of the South Fork was 35' wide and 2' deep. There were more signs of aquatic vegetation and invertebrate life here than on the other major tributaries.

Water color remained clear throughout the system. Temperature of the water fluctuated between 9° and 11°C. Other water chemistry information collected included pH 8, total hardness 85 ppm, total alkalinity 85 ppm.

Grayling of all age groups were found in the area surveyed, as were round whitefish, suckers and slimy sculpin. King salmon, Oncorhynchus tshawytscha (Walbaum), were observed from Marten Creek to the confluence with the main Chena River.

West Fork of the Chena River:

The West Fork of the Chena River (Fig. 4) was surveyed from King Creek to the Chena Hot Springs Road (about 15 miles) from August 23 to 26. The West Fork, like the North Fork, is fairly shallow and it had to be surveyed on foot.

Most of the tributaries entering the West Fork are small streams, with extremely steep gradient and are, for the most part, devoid of fish. Only Frozenfoot and Olympia creeks were found to have grayling in them. Young-of-the-year, juveniles and adults were observed and sampled in both of these streams.

The West Fork can also be compared with the North Fork in physical characteristics. Average width was 25', average depth 18". Pools were no more than depressions along the stream banks, perhaps averaging 2' to 3' in depth in the upper reaches. Pools in the lower sections were deeper, averaging 5', but were not as common as in the upper part. Bottom material in the West Fork was mainly rock and cobble with smaller gravel and some sandy areas. The only visible sign of aquatic vegetation was in the slow backwater areas of the lower river where some algal growth was evident.

Water chemistry data collected on the West Fork yielded a pH of 8.5, total hardness of 85 ppm, total alkalinity of 70 ppm; water temperature was 9°C.

Fish species present in the West Fork included young-of-the-year, juvenile and adult grayling, and slimy sculpin and round whitefish.

#### Length and Age Data of Grayling Sampled on Headwater Surveys of the Chena River

The length frequency of grayling sampled in the four major headwater tributaries is shown in Table 7. In all four systems at least 50% of the fish sampled were adult (270 mm or larger) and in the East Fork 97%

Table 7. Length frequency (in percent of sample) of grayling sampled on headwater tributaries of Chena River, 1977.

Fork Length (mm)	East Fork	North Fork	South Fork	West Fork
100-109				
110-119		1.7		
120-129				
130-139				
140-149		1.7		2.1
150-159		1.7	1.6	2.1
160-169		5.0	2.4	4.3
170-179		3.3	1.6	2.1
180-189			2.4	2.1
190-199		5.0	1.6	2.1
200-209		3.3	4.0	8.5
210-219		5.0	4.0	8.5
220-229		8.3		10.4
230-239		6.7	2.4	
240-249			5.6	2.1
250-259		3.3	6.5	
260-269	2.3	5.0	8.1	4.3
270-279		3.3	6.5	2.1
280-289	4.5	3.3	9.7	2.1
290-299		1.7	8.9	6.5
300-309	4.5	1.7	4.8	6.5
310-319	2.3	3.3	7.4	2.1
320-329		1.7	10.5	8.5
330-339	9.1	3.3	4.8	4.3
340-349	15.9	8.3	2.4	6.5
350-359	20.5	8.3	4.0	6.5
360-369	6.8	8.3		2.1
370-379	13.6	6.7	.8	2.1
380-389	6.8			
390-399	9.1			2.1
400-409				
410-419				
420-429	2.3			
430-439	2.3			
n	44	60	123	47
$\bar{x}$	353	271	260	259
Range	260-435	115-375	150-370	145-395

were adults. The East Fork also contained the largest fish, with a mean length of 353 mm (14"), which is far above the 286 mm average of the four systems. Predominately large adult grayling were also found in the upper 54 miles (87 km) of the Goodpaster River (Tack, 1973). The length frequency distribution shown in Fig. 6 for the combined fish sampled in all four tributaries appears normal, with only a small gap (110-140 mm) at the smaller end and a gap of 400-420 mm at the larger end of the scale. Both represent groups difficult to capture.

Age and length composition of grayling captured in the headwater surveys are shown in Table 8. Unlike the lower Chena, where age III grayling were the dominant group, here age V fish were dominant and all age classes between III and VII were nearly equally represented. Also the mean fork lengths of each age class in Fig. 6 compare fairly closely with the peaks that occur in the length frequency graph (Fig. 6).

## DISCUSSION

The four major headwater tributaries of the Chena River, the East, North, South, and West forks harbor mostly adult grayling, at least during the summer months. All of the headwater streams contain suitable habitat for grayling feeding and rearing and their inaccessibility to the average fisherman lets them serve as a reservoir for protection of the heavily utilized Chena River fishery. The presence of young-of-the-year grayling in each system suggest that these are also spawning systems. However, their importance for the production of grayling has not been determined, as grayling spawning has been noted throughout the Chena system (Tack, 1974).

During the surveys 240 grayling, all over 150 mm fork length, were tagged using red Floy anchor tags. Recapture of these during the ongoing study or from the creel may yield information as to migration and seasonal movement patterns of grayling in the Chena system.

### Piledriver Slough Study

Plans to study the effect of dikes placed across Piledriver Slough (preventing entry of Tanana River water) in establishing this slough as a clearwater stream similar to Badger Slough were set back this season when the installed blockages washed out because of high Tanana River water levels. The project, under contract with the U.S. Army Corps of Engineers, is part of the Chena River Lakes Flood Control Project. It was hoped that chemical, physical and biological data on the new clearwater stream could be collected during the reporting period. We have since been informed by the Corps that these dikes have been reconstructed and strengthened and are expected to be permanent blockages. In the event this does occur the study on Piledriver Slough will continue.

Table 8. Age and length composition of grayling captured on the four major headwater tributaries of the Chena River. East, North, South and West Forks, 1977.

Length (mm)	Age Class									Total No.	Length Frequency %	
	I	II	III	IV	V	VI	VII	VIII	IX			
100-109												
110-119	1										1	0.5
120-129												
130-139												
140-149	2										2	0.8
150-159		4									4	1.8
160-169		8									8	3.3
170-179		4	1								5	2.0
180-189		1	2								3	1.3
190-199		3	3								6	2.5
200-209		2	10								12	5.0
210-219			11								11	4.6
220-229			9	1							10	4.2
230-239			5	2							7	2.9
240-249			1	4							5	2.0
250-259			2	5							7	2.9
260-269			1	12	3						16	6.7
270-279				4	3						7	2.9
280-289				3	10						13	5.4
290-299				3	4	4					11	4.6
300-309					4	5					9	3.7
310-319				1	1	5					7	2.9
320-329					5	7	3				15	6.3
330-339					2	7	3				12	5.0
340-349						12	6				18	7.5
350-359						6	14	1			21	8.8

Table 8. (Cont.) Age and length composition of grayling captured on the four major headwater tributaries of the Chena River. East, North, South and West Forks, 1977.

Length (mm)	Age Class									Total No.	Length Frequency %
	I	II	III	IV	V	VI	VII	VIII	IX		
360-369						1	6	1		8	3.3
370-379							4	8		12	5.0
380-389							1	2		3	1.3
390-399								4		4	1.8
400-409											
410-419											
420-429								1		1	0.5
430-439									1	1	0.5
440-449											
450-459											100.0
n	3	22	45	35	32	47	37	17	1	239	
Age frequency %	1.3	9.2	18.8	14.6	13.4	19.7	15.5	7.1	0.4		100.0
$\bar{x}$ fork length (mm)	135	170	215	262	295	327	341	380	435	261	

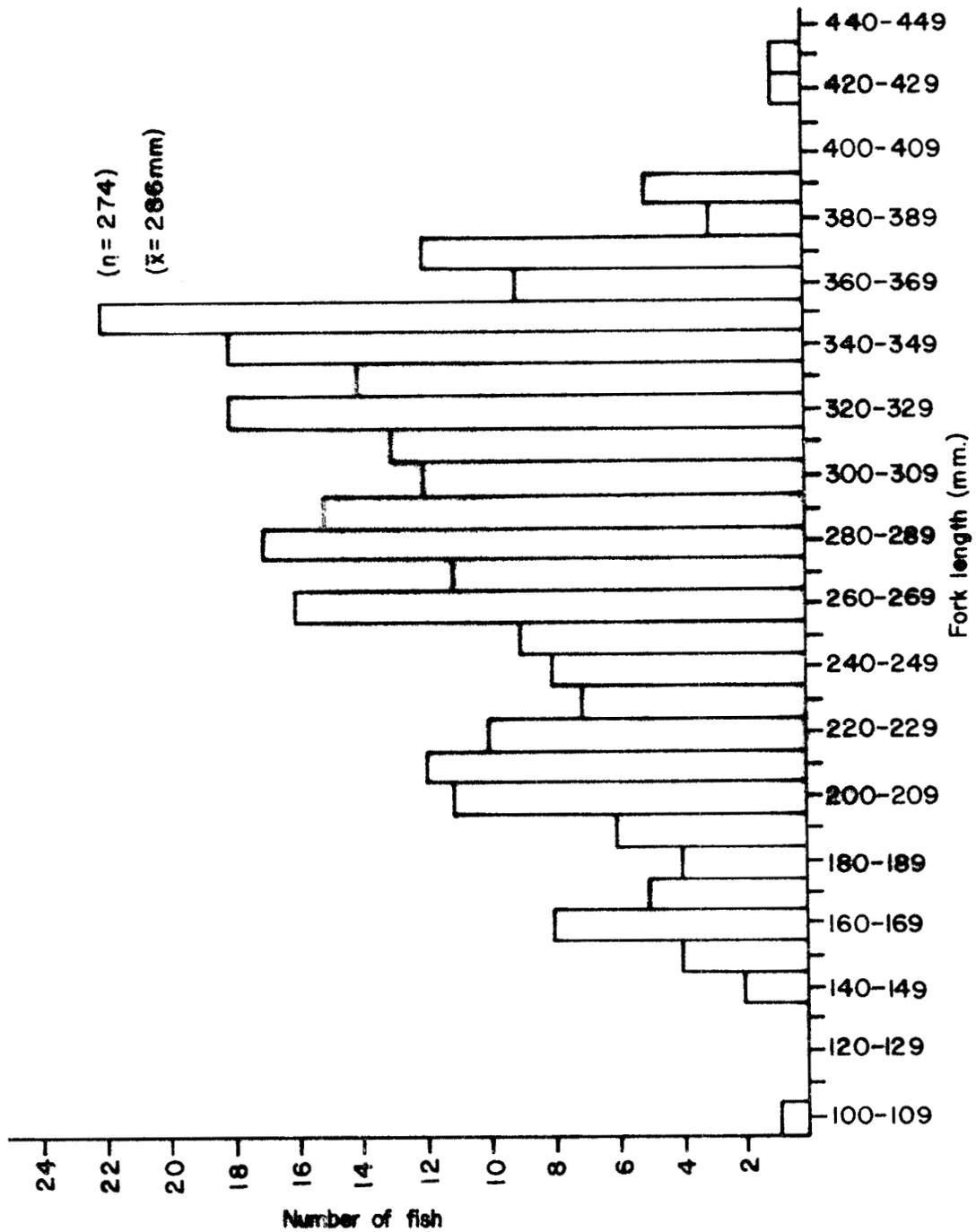


Figure 6 Length Frequency of grayling captured in the headwater tributaries of the Chena River.  
1977