

# Data from the Arctic Grayling Sport Fishery on the Kakisa River, Northwest Territories, 1979

M.R. Falk, G. Low, D.V. Gillman, and  
G.W. Carder

Western Region  
Department of Fisheries and Oceans  
Winnipeg, Manitoba R3T 2N6

June 1980

## Canadian Data Report of Fisheries & Aquatic Sciences No.199



Government of Canada  
Fisheries and Oceans

Gouvernement du Canada  
Pêches et Océans

## **Canadian Data Report of Fisheries and Aquatic Sciences**

These reports provide a medium for filing and archiving data compilations where little or no analysis is included. Such compilations commonly will have been prepared in support of other journal publications or reports. The subject matter of Data Reports reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Numbers 1-25 in this series were issued as Fisheries and Marine Service Data Records. Numbers 26-160 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Data Reports. The current series name was changed with report number 161.

Data Reports are not intended for general distribution and the contents must not be referred to in other publications without prior written clearance from the issuing establishment. The correct citation appears above the abstract of each report.

## **Rapport statistique canadien des sciences halieutiques et aquatiques**

Ces rapports servent de base à la compilation des données de classement et d'archives pour lesquelles il y a peu ou point d'analyse. Cette compilation aura d'ordinaire été préparée pour appuyer d'autres publications ou rapports. Les sujets des Rapports statistiques reflètent la vaste gamme des intérêts et politiques du Ministère des Pêches et des Océans, notamment gestion des pêches, techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les numéros 1 à 25 de cette série ont été publiés à titre de Records statistiques, Service des pêches et de la mer. Les numéros 26-160 ont été publiés à titre de Rapports statistiques du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 161.

Les Rapports statistiques ne sont pas préparés pour une vaste distribution et leur contenu ne doit pas être mentionné dans une publication sans autorisation écrite préalable de l'établissement auteur. Le titre exact paraît au haut du résumé de chaque rapport.

Canadian Data Report of  
Fisheries and Aquatic Sciences

No. 199

June 1980

DATA FROM THE ARCTIC GRAYLING SPORT  
FISHERY ON THE KAKISA RIVER, NORTHWEST  
TERRITORIES, 1979

by

M.R. Falk, G. Low, D.V. Gillman, and  
G.W. Carder

Western Region  
Department of Fisheries and Oceans  
Winnipeg Manitoba R3T 2N6

This is the 30th Data Report  
from the Western Region, Winnipeg

© Minister of Supply and Services Canada 1980

Cat. No. Fs 97-13/184

ISSN 0706-6465

Correct citation for this publication is:

Falk, M.R., G. Low, D.V. Gillman, and G.W. Carder. 1980. Data from the Arctic grayling sport fishery on the Kakisa River, Northwest Territories, 1979. Can. Data. Rep. Fish. Aquat. Sci. 199: iv + 13 p.

## TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT/RESUME . . . . .	iv
INTRODUCTION . . . . .	1
MATERIALS AND METHODS . . . . .	1
Creel census . . . . .	1
Biological sampling . . . . .	1
Tagging . . . . .	1
Data analysis . . . . .	1
ACKNOWLEDGMENTS . . . . .	2
REFERENCES . . . . .	2

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1 Map of the upper Mackenzie River showing the location of the Kakisa River . . . . .	3
2 Map of the Kakisa River showing the locations fished by anglers, 1979 . . . . .	4
3 Map of the Kakisa River showing the sampling locations for tagging Arctic grayling . . . . .	5

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1 Information on the creel census and fishing periods on the Kakisa River, 1979 . . . . .	6
2 Information on the catch, effort and catch per unit of effort for Arctic grayling during the creel census period from the Kakisa River, 1979 . . . . .	6
3 Information on the total catch and harvest of Arctic grayling from the Kakisa River, 1979 . . . . .	6
4 Creel census summary from the Kakisa River, 1979 . . . . .	7
5 Summary of information on the origin of anglers and hours fished as determined during the creel census period on the Kakisa River, 1979 . . . . .	8
6 Summary of weight-length relationship statistics for angled Arctic grayling from the Kakisa River, 1979 . . . . .	9
7 Annual survival and mortality rates for Arctic grayling from the Kakisa River, 1979 . . . . .	9
8 Summary of recapture information for Arctic grayling tagged in the Kakisa River, 1977-79 . . . . .	10
9 Water and air temperatures recorded during the creel census period, 1979 . . . . .	10
10 Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for angled Arctic grayling from the Kakisa River, 1979 . . . . .	11

## LIST OF TABLES cont'd

<u>Table</u>	<u>Page</u>
11 Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for angled and tagged Arctic grayling from the Kakisa River, 1979 . . . . .	11
12 Number and mean fork length by length interval for tagged Arctic grayling from the Kakisa River, 1979 . . . . .	12
13 Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for angled Arctic grayling from the Kakisa River, 1979 . . . . .	13
14 Number and mean fork length by age group for tagged Arctic grayling from the Kakisa River, 1979 . . . . .	13
15 Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for angled and tagged Arctic grayling from the Kakisa River, 1979 . . . . .	13

## ABSTRACT

Falk, M.R., G. Low, D.V. Gillman, and G.W. Carder. 1980. Data from the Arctic grayling sport fishery on the Kakisa River, Northwest Territories, 1979. Can. Data Rep. Fish. Aquat. Sci. 199: iv + 13 p.

During May 1979 a creel census, biological sampling and tagging study was conducted on the Arctic grayling sport fishery on the Kakisa River, Northwest Territories. The 764 anglers interviewed spent 2990 hours fishing with success rates for grayling of 1.3 per angler and 0.3 per angler-hour. The total catch was estimated to be 1008 grayling with 83 percent retained, resulting in a total harvest of 854 (808 kg).

Data on the sport fishery and the biology of Arctic grayling from the Kakisa River in 1979 as well as tag return information are presented in tabular form.

Key words: angling; catch composition; catch/effort; sport fishing statistics; fishery management; life history; monitoring; population structure; tagging.

## RESUME

Falk, M.R. G. Low, D.V. Gillman, and G.W. Carder. 1980. Data from the Arctic grayling sport fishery on the Kakisa River, Northwest Territories, 1979. Can. Data Rep. Fish. Aquat. Sci. 199: iv + 13 p.

En mai 1979, un recensement, un échantillonnage biologique et un programme d'étiquetage ont été réalisés dans le cadre de la pêche sportive de l'ombre arctique dans la Kakisa River (Territoire du Nord-Ouest). Les 764 pêcheurs sportifs touchés par l'enquête ont passé 2990 heures à pêcher l'ombre arctique avec un taux de succès de 1.3 ombre par pêcheur et de 0.3 par heure-pêcheur. Le total des prises a été évalué à 1008 ombres arctique dont 83 pour cent ont été retenues, soit une pêche de 854 poissons (808 kg).

Le présent article donne sous forme de tableaux des données sur la pêche sportive et sur la biologie de l'ombre arctique dans la Kakisa River en 1979, ainsi que des renseignements sur le retour des étiquettes.

Mots-clés: pêche à la ligne; composition des prises; prises/effort; statistiques sur la pêche sportive; gestion des pêches; cycle biologique; contrôle; structure de la population; étiquetage.

## INTRODUCTION

In 1979, a creel census, biological sampling and tagging study was conducted on the Kakisa River, situated 80 km west of Hay River, Northwest Territories (Fig. 1). The Kakisa River supports a popular sport fishery in the spring (May) for Arctic grayling, *Thymallus arcticus* (Pallas). Moshenko and Low (In prep.) describe the fishery which has been under investigation since 1971. Results from previous studies (1971-78) have been reported by Falk and Dahlke (1975) and Moshenko and Low (In prep.).

This report presents results from the 1979 study.

## MATERIALS AND METHODS

## CREEL CENSUS

During the period 12 May to 22 May 1979, a creel census and biological sampling program was conducted on the Kakisa River. Creel census techniques were adapted from Falk et al. (1973, 1974). Figure 2 illustrates the major areas utilized by anglers on the Kakisa River during 1979. Anglers were interviewed on these locations or as they left the river at the end of a day's fishing. As many anglers as possible were questioned as to place of residence, numbers of fish caught, released and retained by species, and hours fished. Anglers were considered successful if fish were caught regardless of species or size. On occasions when all anglers could not be interviewed, census workers recorded the number of anglers observed but not interviewed.

## BIOLOGICAL SAMPLING

A portion of Arctic grayling from the anglers' creel was sampled for fork length ( $\pm 1$  mm), round weight ( $\pm 25$  g), sex and maturity, and scales. Maturity was determined by examination of the gonads and coded according to the following:

<u>Female</u>	<u>Male</u>
<u>Immature</u>	
1-Ovaries granular in texture, up to full length in body cavity, hard and triangular in shape, firm membrane; eggs distinguishable.	6-Testes putty-like firmness, tubular and scalloped in shape, long and thin and may be full length in body cavity.
<u>Mature</u>	
2-Current year's spawner; ovaries fill body cavity; eggs nearing full size but not loose.	7-Current year's spawner; testes large and lobate; white-purplish in color; milt not expelled by pressure.
<u>Ripe</u>	
3-Ovaries greatly extended, fill body cavity; eggs full size; eggs expelled by slight pressure.	8-Testes full size; white and lobate; milt expelled by slight pressure.

FemaleMale

## Spent

4-Spawning complete, ovaries flaccid; seed eggs apparent; presence of residual mature eggs.

9-Testes flaccid, with some milt, blood vessels obvious with pink-violet coloration.

## Resting

5-Non-virgin; not spawning in current year.

10-Non-virgin; not spawning in current year.

Fish of unknown sex were coded as 0.

Scale samples were taken from the left side of the fish above the lateral line just posterior to the leading edge of the dorsal fin and stored dry for later examination. Scales were cleaned, placed between two glass slides, and the annuli counted on an image produced by an Eberbach micro-projector (x60). Scale age was recorded as being equal to the number of completed annuli.

## TAGGING

A total of 197 Arctic grayling from the Kakisa River were tagged using Floy tags, and live-sampled for fork length ( $\pm 1$  mm) and scales. Thirty-four grayling were captured from 11 to 14 May in a hoop net (diam. 1.7 m, 30 m leads) situated immediately below the bridge (Fig. 3). The hoop net was removed on 14 May when longnose suckers replaced grayling as the dominant catch. The remaining 163 tagged grayling were angled from 11 to 16 May by project personnel at the locations illustrated in Fig. 3.

## DATA ANALYSIS

Biological data collected during the 1979 study were manipulated using an IBM 370/168 computer based at the University of Manitoba and a terminal located at the Freshwater Institute. The Statistical Analysis System (1972) was used to generate length, weight, age, sex and maturity summaries and to perform basic calculations. Some analyses were performed using a Hewlett-Packard programmable calculator (Model 9810-A).

Total annual mortality rates (natural and fishing) were calculated using the methods outlined by Robson and Chapman (1961). Weight-length relationships were determined using the following power equation:

$$\text{Log}_{10} W = a + b (\text{Log}_{10} L); S_b =$$

Where: W = weight in grams  
L = fork length in millimetres  
a = Y-intercept  
b = slope of the regression line, and  
S<sub>b</sub> = standard deviation of b.

Relative condition factors (K) were determined using the formula:

$$K = \frac{W \times 10^5}{L^3}$$

Scientific names for the fish species obtained from the Kakisa River during 1979 are

according to Scott and Crossman (1973) as follows: Arctic grayling, *Thymallus arcticus* (Pallas); northern pike, *Esox lucius* Linnaeus; walleye, *Stizostedion vitreum* (Mitchill); lake whitefish, *Coregonus clupeaformis* (Mitchill); and longnose sucker, *Catostomus catostomus* (Forster).

#### ACKNOWLEDGMENTS

The authors thank the Kakisa River anglers for their co-operation during the 1979 creel census. A special thanks goes to C. Read who determined scale ages for grayling. Hay River Fisheries and Oceans staff helped build the camp and supplied field support. Figures were prepared by Graphic Services, Freshwater Institute. To all, the authors are very grateful. R. Moshenko reviewed the manuscript and provided useful suggestions.

#### REFERENCES

- FALK, M.R., D.V. GILLMAN, and L.W. DAHLKE. 1973. The 1972 sport fisheries in Great Bear and Great Slave lakes, Northwest Territories. Can. Fish. Mar. Serv. Tech. Rep. Ser. CEN/T-73-3: 100 p.
1974. 1973 creel census data from sport fishing lodges on Great Bear and Great Slave lakes, Northwest Territories. Can. Fish. Mar. Serv. Data Rep. Ser. CEN/D-74-5: 28 p.
- FALK, M.R., and L.W. DAHLKE. 1975. Creel and biological data from streams along the south shore of Great Slave Lake, 1971-74. Can. Fish. Mar. Serv. Data Rep. Ser. CEN/D-75-8: 87 p.
- MOSHENKO, R.W., and G. LOW. (In prep.) The Arctic grayling sport fishery on the Kakisa River, Northwest Territories, 1971-78. Can. MS Rep. Fish. Aquat. Sci. (Title provisional).
- ROBSON, D.S., and D.G. CHAPMAN. 1961. Catch curves and mortality rates. Trans. Am. Fish. Soc. 90(2): 181-189.
- SCOTT, W.B., and E.J. CROSSMAN. 1973. Freshwater Fishes of Canada. Bull. Fish. Res. Board Can. 184: 966 p.
- STATISTICAL ANALYSIS SYSTEM. 1972. North Carolina State University, Raleigh, North Carolina.



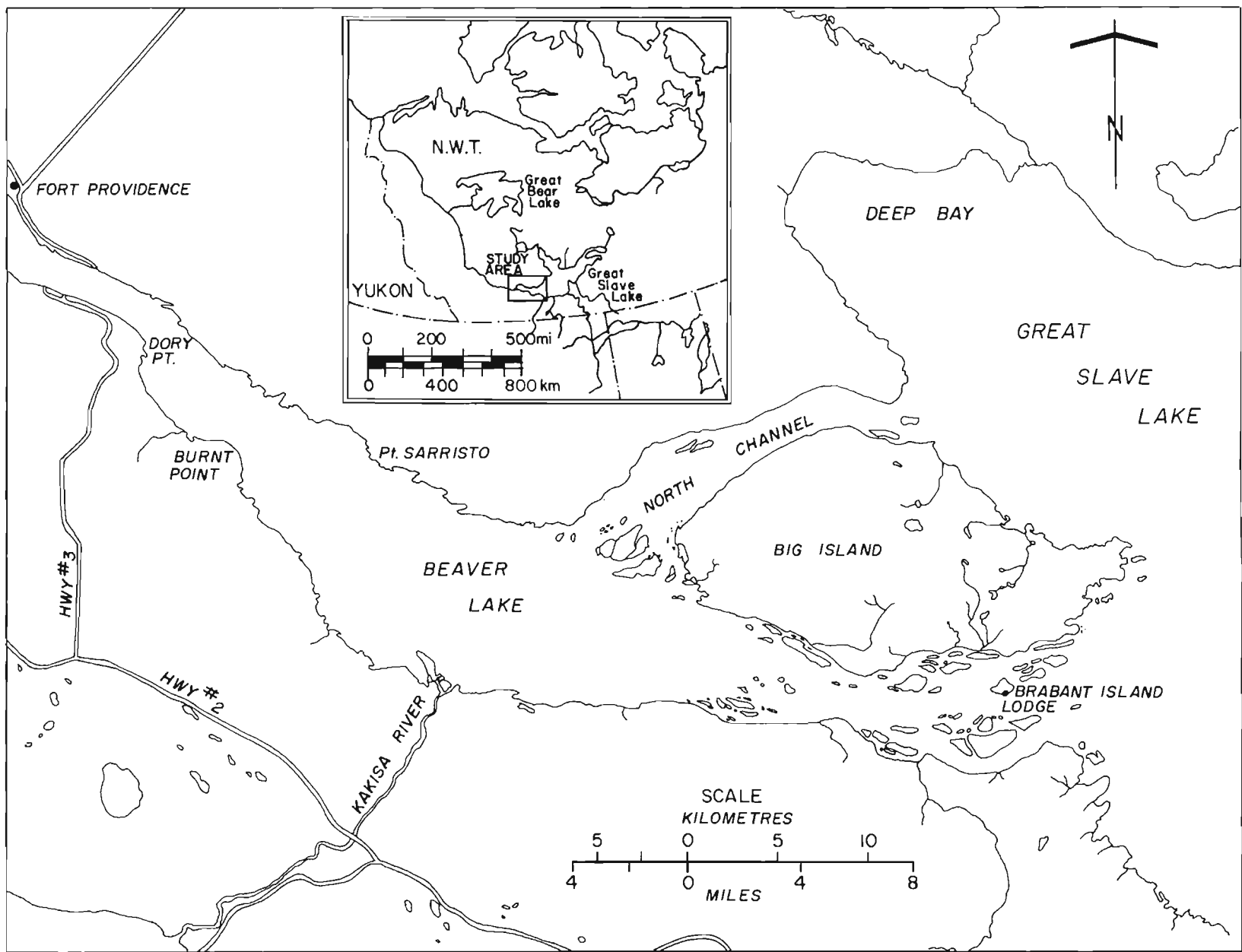


Fig. 1. Map of the upper Mackenzie River showing the location of the Kakisa River.

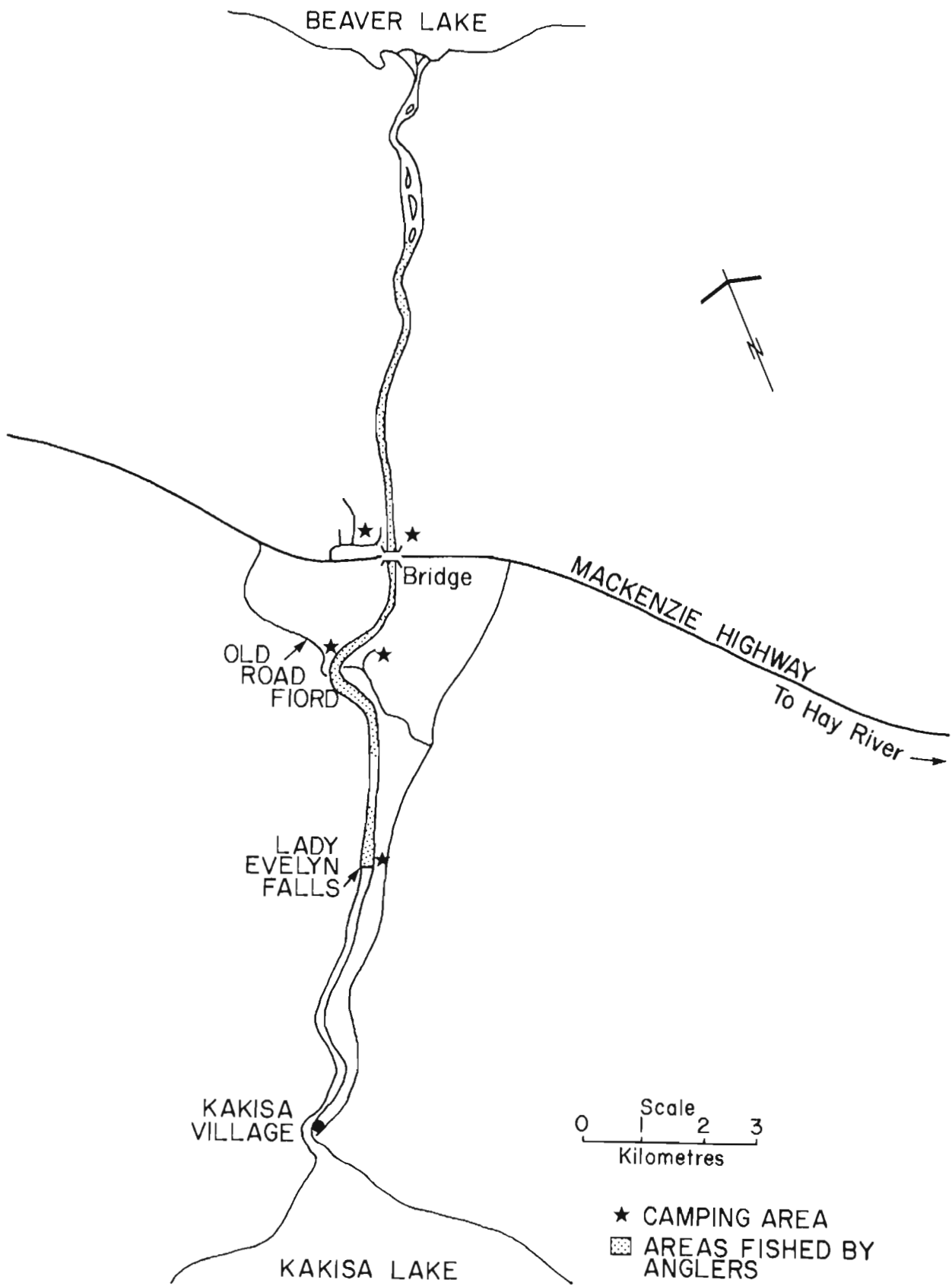


Fig. 2. Map of the Kakisa River showing the locations fished by anglers, 1979.

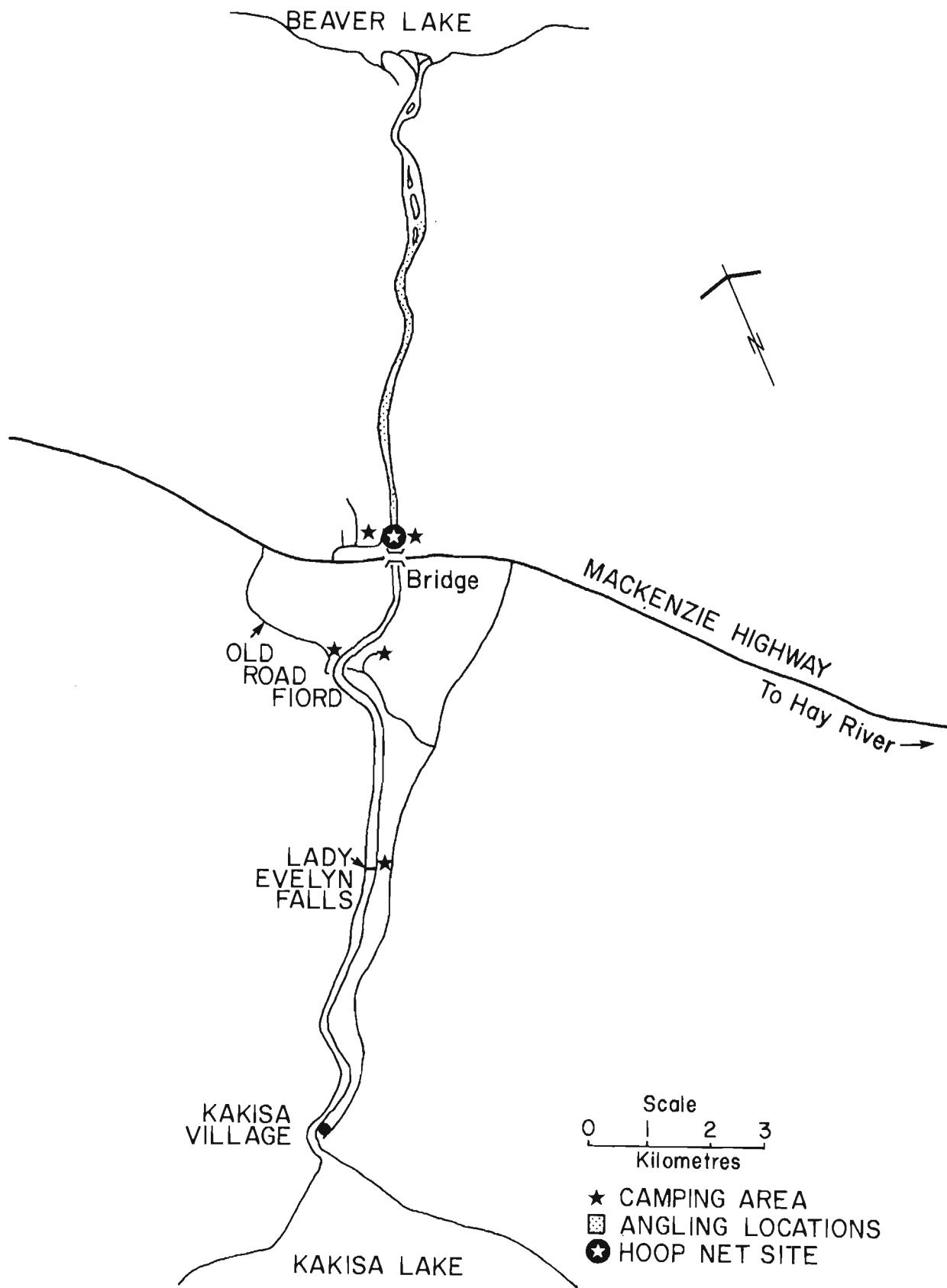


Fig. 3. Map of the Kakisa River showing the sampling locations for tagging Arctic grayling, 1979.

Table 1. Information on the creel census and fishing periods on the Kakisa River, 1979.

Fishing Season				Creel Census Period				Angler-Interviews	
From	To	Days	Percent Fished	From	To	Days	Percent Censused	Conducted	Possible
11 May	22 May	12	100	11 May	22 May	12	100	764	891

Table 2. Information on the catch, effort and catch per unit of effort for Arctic grayling during the creel census period from the Kakisa River, 1979.

No. Anglers	No. Caught	No. Released	No. Retained	Percent Retained	Hours Fished	Hours Fished per Angler	No. Caught		No. Retained
							per Angler-Day	per Angler-Hr	per Angler-Day
764	972	164	808	83	2990	3.9	1.3	0.3	1.1

Table 3. Information on the total catch and harvest of Arctic grayling from the Kakisa River, 1979.

No. Caught	No. Released	No. Retained	Release Mortality	Total Harvest	Harvest per Angler
1008	171	837	17	854	0.96

Table 4. Creel census summary from the Kakisa River, 1979.

Date (D/M)	No. Anglers Interviewed		Percent Successful	A. Grayling			N. Pike			Walleye			L. Sucker			L. Whitefish			Hours Fished	No. Caught	
	Successful	Unsuccessful		C <sup>a</sup>	R <sup>b</sup>	K <sup>c</sup>	C	R	K	C	R	K	C	R	K	C	R	K		per Angler	per Angler- Hr
11/5	10	3	23.1	36	7	29	-	-	-	-	-	-	-	-	-	-	-	37.0	2.8	1.0	
12/5	11	10	52.4	32	9	23	-	-	-	-	-	-	-	-	-	-	-	73.0	1.5	0.4	
13/5	9	10	47.4	31	0	31	-	-	-	-	-	-	-	-	-	-	-	59.5	1.6	0.5	
14/5	2	5	28.6	5	0	5	-	-	-	-	-	-	-	-	-	-	-	16.0	0.7	0.3	
15/5	9	5	64.3	31	20	18	1	0	1	-	-	-	-	-	-	-	-	49.0	2.7	0.8	
16/5	21	10	67.7	81	17	64	2	0	2	-	-	-	-	-	-	-	-	123.5	2.6	0.7	
17/5	14	14	50.5	44	6	38	5	0	5	-	-	-	2	2	0	-	-	86.5	1.8	0.6	
18/5	22	43	33.9	68	18	50	10	1	9	-	-	-	-	-	-	-	-	186.0	1.2	0.4	
19/5	97	117	45.3	228	51	177	29	4	25	1	0	1	9	9	0	9	0	904.5	1.3	0.3	
20/5	163	154	51.4	392	36	356	51	9	42	-	-	-	41	37	4	4	1	1351.5	1.5	0.4	
21/5	8	23	25.8	15	0	12	3	0	3	-	-	-	-	-	-	-	-	90.0	0.5	0.2	
22/5	1	4	20.0	5	0	5	1	0	1	1	0	1	-	-	-	-	-	14.0	1.4	0.5	
Total	12	398	48.0	972	164	808	102	14	88	2	0	2	52	48	4	13	1	2990.0	-	-	
Mean	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	0.4	
Percent Retained						83.1			86.3			100			7.7			92.3			
No. Caught per Angler-Hr						0.33			0.03			<0.01			0.02			<0.01			
No. Caught per Angler						1.27			0.13			<0.01			0.07			0.02			

<sup>a</sup>Number caught.

<sup>b</sup>Number released.

<sup>c</sup>Number retained.

Table 5. Summary of information on the origin of anglers and hours fished as determined during the creel census period on the Kakisa River, 1979.

Origin	Anglers Interviewed		Hours Fished	
	No.	%	No.	%
Northwest Territories	427	55.9	1576.5	52.7
Alberta	323	42.3	1373.5	45.9
Ontario	3	0.4	5.0	0.2
British Columbia	3	0.4	10.0	0.3
U.S.A.	8	1.0	25.0	0.8
Total	764		2990.0	

Table 6. Summary of weight-length relationship statistics for angled Arctic grayling from the Kakisa River, 1979.

Sex	N	Y-Intercept (a)	Slope (b)	Standard Deviation of b ( $S_b$ )	95% Confidence Interval of b
Male	94	-4.3066	2.774	0.119	2.538 - 3.010
Female	103	-3.9064	2.624	0.152	2.323 - 2.925
Combined	199	-4.0888	2.692	0.093	2.510 - 2.874

Table 7. Annual survival and mortality rates for Arctic grayling from the Kakisa River, 1979.

Sample	Sex	N	Age Classes Used	Survival (S)	SE of S	Var of S	95% C.I. of S	Annual Mortality Rate (A)
Creel Census	Male	62	7-11	0.4741	0.0460	0.0021	0.3822-0.5661	0.5259
	Female	65	7-11	0.4711	0.0450	0.0020	0.3810-0.5661	0.5289
	Combined	128	7-11	0.4708	0.0321	0.0010	0.4067-0.5350	0.5292
Tagged	Combined	111	7-10	0.4555	0.0349	0.0012	0.3857-0.5252	0.5445
Combined	Male	65	7-11	0.4880	0.0444	0.0020	0.3993-0.5767	0.5120
	Female	69	7-11	0.4729	0.0436	0.0019	0.3856-0.5601	0.5271
	Combined	239	7-11	0.4628	0.0236	0.0006	0.4155-0.5100	0.5372

Table 8. Summary of recapture information for Arctic grayling tagged in the Kakisa River, 1977-79.

Tagging Information		Recapture Information		
Date (D/M/Y)	Fork Length (mm)	Location	Date (D/M/Y)	Elapsed Time (Days)
8/5/77	415	Kakisa R.	16/5/79	738
8/5/77	420	Kakisa R.	22/5/79	744
12/5/79	418	Kakisa R.	22/5/79	10
11/5/79	437	Kakisa R.	26/5/79	14

Table 9. Water and air temperatures recorded during the creel census period, 1979.

Date (D/M)	Water Temperature (°C)		Air Temperature (°C)	
	Maximum	Minimum	Maximum	Minimum
11/5	4.0	3.0	-	-
12/5	4.0	3.0	19.0	8.0
13/5	4.5	4.0	16.0	6.0
14/5	4.5	3.0	19.5	5.5
15/5	5.0	2.0	20.0	4.0
16/5	5.5	2.0	20.0	10.0
17/5	5.5	3.0	20.0	10.0
18/5	5.5	3.0	18.0	11.0
19/5	5.5	4.0	22.0	1.0
20/5	6.0	3.5	20.0	5.5



Table 10. Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for angled Arctic grayling from the Kakisa River, 1979.

Length Interval (mm)	N	Males				Females				Combined				F/M Ratio	No. Unknown									
		Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.	Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.			Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.			
330-339	1	339	-	420	-	1.08	0.0	-	-	-	-	-	-	1	339	-	420	-	1.08	0.0	-	-		
340-349	1	346	-	580	-	1.40	100.0	-	-	-	-	-	-	1	346	-	580	-	1.40	100.0	-	-		
350-359	-	-	-	-	-	-	-	3	353	0.6	587	23.1	1.34	66.7	3	353	0.6	587	23.1	1.34	66.7	-	-	
360-369	3	365	4.2	633	11.5	1.31	33.3	3	364	3.8	667	90.2	1.38	66.7	6	364	3.6	650	60.3	1.34	50.0	1.00	-	
370-379	5	376	3.4	680	51.0	1.28	60.0	5	375	3.8	672	61.0	1.28	100.0	10	375	3.4	676	53.2	1.28	39.0	1.00	-	
380-389	4	386	2.1	750	57.7	1.30	75.0	9	384	2.5	771	73.6	1.37	88.9	13	384	2.6	765	67.4	1.35	84.6	2.25	-	
390-399	7	395	4.0	786	51.3	1.27	57.1	10	398	2.0	800	58.1	1.27	90.0	17	396	3.1	794	90.7	1.31	76.5	1.43	-	
400-409	7	403	2.6	854	59.7	1.30	100.0	19	404	3.0	862	101.1	1.31	100.0	26	404	2.8	860	90.7	1.31	100.0	2.71	-	
410-419	9	416	3.0	921	55.8	1.28	100.0	15	413	2.9	923	65.8	1.31	100.0	24	414	3.1	922	61.0	1.30	100.0	1.67	-	
420-429	8	422	2.9	915	76.2	1.22	100.0	11	423	3.1	945	86.3	1.25	100.0	20	423	3.0	937	81.6	1.24	-	1.38	1	
430-439	12	434	3.1	1070	133.6	1.31	100.0	7	434	2.7	1071	102.5	1.31	100.0	20	434	2.8	1077	120.4	1.32	-	0.58	1	
440-449	14	445	3.0	1091	84.0	1.24	100.0	12	443	2.6	1138	113.9	1.31	100.0	26	444	2.9	1113	99.8	1.27	109.0	0.86	-	
450-459	12	454	3.4	1163	85.6	1.25	100.0	7	453	3.1	1120	101.3	1.21	100.0	19	453	3.2	1147	91.4	1.23	100.0	0.58	-	
460-469	7	464	2.9	1186	115.3	1.18	100.0	2	462	2.8	1090	127.3	1.11	100.0	9	464	2.9	1164	117.4	1.17	100.0	0.29	-	
470-479	1	472	-	1240	-	1.18	100.0	-	-	-	-	-	-	1	472	-	1240	-	1.18	100.0	-	-	-	
480-489	3	484	3.0	1413	224.8	1.25	100.0	-	-	-	-	-	-	3	484	3.0	1413	224.8	1.25	100.0	-	-	-	
Total	94						90.0	103						96.0	199								1.10	2
Mean		425	31.8	981	212.8	1.26			412	25.9	911	172.0	1.29			418	29.4	946	195.2	1.28				

Table 11. Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for angled and tanned Arctic grayling from the Kakisa River, 1979.

Length Interval (mm)	N	Males				Females				Combined				F/M Ratio	No. Unknown									
		Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.	Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.			Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.			
320-329	-	-	-	-	-	-	-	-	-	-	-	-	-	1	392	-	-	-	-	-	-	-	-	1
330-339	1	339	-	420	-	1.08	0.0	-	-	-	-	-	-	1	339	-	420	-	1.08	0.0	-	-	-	-
340-349	1	346	-	580	-	1.40	100.0	-	-	-	-	-	-	1	346	-	580	-	1.40	100.0	-	-	-	-
350-359	-	-	-	-	-	-	-	3	353	0.6	587	23.1	1.34	66.7	3	353	0.6	587	23.1	1.34	66.7	-	-	-
360-369	3	365	4.2	633	11.5	1.31	33.3	3	364	3.8	667	90.2	1.38	66.7	6	364	3.6	650	60.3	1.34	50.0	1.00	-	-
370-379	5	376	3.4	680	51.0	1.28	60.0	5	375	3.8	672	61.0	1.28	100.0	10	375	3.4	676	53.2	1.28	39.0	1.00	-	-
380-389	4	386	2.1	750	57.7	1.30	75.0	9	384	2.5	771	73.6	1.37	88.9	13	384	2.6	765	67.4	1.35	84.6	2.25	-	-
390-399	7	395	4.0	786	51.3	1.27	57.1	10	398	2.0	800	58.1	1.27	90.0	17	396	3.1	794	90.7	1.31	76.5	1.43	-	-
400-409	7	403	2.6	854	59.7	1.30	100.0	19	404	3.0	862	101.1	1.31	100.0	26	404	2.8	860	90.7	1.31	100.0	2.71	-	-
410-419	9	416	3.0	921	55.8	1.28	100.0	15	413	2.9	923	65.8	1.31	100.0	24	414	3.1	922	61.0	1.30	100.0	1.67	-	-
420-429	8	422	2.9	915	76.2	1.22	100.0	11	423	3.1	945	86.3	1.25	100.0	20	423	3.0	937	81.6	1.24	-	1.38	1	
430-439	12	434	3.1	1070	133.6	1.31	100.0	7	434	2.7	1071	102.5	1.31	100.0	20	434	2.8	1077	120.4	1.32	-	0.58	1	
440-449	14	445	3.0	1091	84.0	1.24	100.0	12	443	2.6	1138	113.9	1.31	100.0	26	444	2.9	1113	99.8	1.27	109.0	0.86	-	-
450-459	12	454	3.4	1163	85.6	1.25	100.0	7	453	3.1	1120	101.3	1.21	100.0	19	453	3.2	1147	91.4	1.23	100.0	0.58	-	-
460-469	7	464	2.9	1186	115.3	1.18	100.0	2	462	2.8	1090	127.3	1.11	100.0	9	464	2.9	1164	117.4	1.17	100.0	0.29	-	-
470-479	1	472	-	1240	-	1.18	100.0	-	-	-	-	-	-	1	472	-	1240	-	1.18	100.0	-	-	-	-
480-489	3	484	3.0	1413	224.8	1.25	100.0	-	-	-	-	-	-	3	484	3.0	1413	224.8	1.25	100.0	-	-	-	-
Total	94						90.0	103						96.0	199								1.10	2
Mean		425	31.8	981	212.8	1.26			412	25.9	911	172.0	1.29			418	29.4	946	195.2	1.28				

Table 11. Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for angled and tanned Arctic grayling from the Kakisa River, 1979.

Length Interval (mm)	N	Males				Females				Combined				F/M Ratio	No. Unknown									
		Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.	Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.			Length (mm) Mean	Length (mm) SD	Weight (g) Mean	Weight (g) SD	K	Mat.			
320-329	-	-	-	-	-	-	-	-	-	-	-	-	-	1	392	-	-	-	-	-	-	-	-	1
330-339	1	339	-	420	-	1.08	0.0	-	-	-	-	-	-	3	334	4.6	420	0.0	-	-	-	-	-	2
340-349	1	346	-	580	-	1.40	100.0	-	-	-	-	-	-	3	342	3.5	580	0.0	-	-	-	-	-	2
350-359	-	-	-	-	-	-	-	3	353	0.6	587	23.1	1.34	66.7	4	352	1.4	587	23.1	-	-	-	-	1
360-369	3	365	4.2	633	11.5	1.31	33.3	3	364	3.8	667	90.2	1.38	66.7	13	364	2.9	650	60.3	-	-	-	-	7
370-379	5	376	3.4	680	51.0	1.28	60.0	5	375	3.8	672	61.0	1.28	100.0	17	375	3.2	676	53.2	-	-	-	-	7
380-389	4	386	2.1	750	57.7	1.30	75.0	9	384	2.5	771	73.6	1.37	89.0	31	384	2.8	765	67.4	-	-	-	-	18
390-399	7	395	4.0	786	51.3	1.27	57.1	10	398	1.9	800	58.1	1.27	90.0	38	396	2.8	794	54.2	-	-	-	-	21
400-409	8	403	2.4	854	59.7	-	100.0	19	404	3.0	862	101.1	1.31	100.0	56	404	2.4	860	90.7	-	-	-	-	29
410-419	9	416	3.0	921	55.8	1.28	100.0	15	413	2.9	923	65.8	1.31	100.0	48	414	3.0	922	61.0	-	-	-	-	24
420-429	9	423	3.3	915	76.2	-	100.0	12	424	3.0	945	86.3	-	100.0	52	423	2.9	937	81.6	-	-	-	-	31
430-439	12	434	3.1	1070	133.6	1.31	100.0	8	434	2.9	1071	102.5	-	100.0	43	434	2.8	1077	120.4	-	-	-	-	23
440-449	14	445	3.0	1091	84.1	1.24	100.0	13	444	2.9	1138	113.9	-	100.0	41	440	2.7	1113	99.8	-	-	-	-	14
450-459	13	454	3.5	1163	85.6	-	100.0	8	453	3.1	1120	101.3	-	100.0	25	453	3.2	1147	91.4	-	-	-	-	4
460-469	8	465	2.8	1186	115.3	-	100.0	3	461	2.3	1090	127.3	-	100.0	20	464	2.8	1164	117.4	-	-	-	-	9
470-479	1	472	-	1240	-	1.18	100.0	-	-	-	-	-	-	2	471	1.4	1240	0.0	-	-	-	-	1	
480-489	3	484	3.0	1413	224.8	1.25	100.0	-	-	-	-	-	-	3	484	3.0	1413	224.8	-	-	-	-	-	-
Total	98						90.8	108						96.3	400								1.10	194
Mean		426	31.6	981	212.8	-			414	26.4	911	172.0	-			415	28.9	946	195.2	-				

Table 12. Number and mean fork length by length interval for tagged Arctic grayling from the Kakisa River, 1979.

Length Interval (mm)	Males			Females			Combined			F/M Ratio	No. Unknown			
	N	Length (mm) Mean	SD	% Mat.	N	Length (mm) Mean	SD	% Mat.	N			Length (mm) Mean	SD	% Mat.
320-329	-	-	-	-	-	-	-	-	1	329	-	-	-	1
330-339	-	-	-	-	-	-	-	-	2	332	2.1	-	-	2
340-349	-	-	-	-	-	-	-	-	2	340	0.0	-	-	2
350-359	-	-	-	-	-	-	-	-	1	350	-	-	-	1
360-369	-	-	-	-	-	-	-	-	7	363	2.3	-	-	7
370-379	-	-	-	-	-	-	-	-	7	375	3.2	-	-	7
380-389	-	-	-	-	-	-	-	-	18	385	3.0	-	-	18
390-399	-	-	-	-	-	-	-	-	21	395	2.3	-	-	21
400-409	1	402	-	100.0	-	-	-	-	30	403	2.0	-	-	29
410-419	-	-	-	-	-	-	-	-	24	415	2.9	-	-	24
420-429	1	428	-	100.0	1	425	-	100.0	32	423	2.8	-	1.00	30
430-439	-	-	-	-	1	438	-	100.0	23	433	2.8	-	-	22
440-449	-	-	-	-	1	448	-	100.0	15	444	2.4	-	-	14
450-459	1	458	-	100.0	1	456	-	100.0	6	454	3.4	-	1.00	4
460-469	1	467	-	100.0	1	460	-	100.0	11	464	2.8	-	1.00	9
470-479	-	-	-	-	-	-	-	-	1	470	-	-	-	1
Total	4			100.0	5			100.0	201			-	1.25	192
Mean		439	29.6			445	14.2			413	28.1			

Table 13. Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for angled Arctic grayling from the Kakisa River, 1979.

Age (Yr)	Males								Females								Combined								F/M Ratio	No. Unknown
	N	Length(mm)		Weight(g)		K	Mat.	N	Length(mm)		Weight(g)		K	Mat.	N	Length(mm)		Weight(g)		K	Mat.					
		Mean	SD	Mean	SD				Mean	SD	Mean	SD				Mean	SD	Mean	SD			Mean	SD			
3	1	339	-	420	-	1.08	0.0	-	-	-	-	-	-	1	339	-	420	-	1.08	0.0	-	-				
4	9	374	12.9	682	66.7	1.30	44.4	4	376	20.3	665	111.2	1.24	25.0	13	375	14.7	677	78.2	1.28	38.5	0.44				
5	5	402	11.6	872	74.3	1.34	80.0	11	378	17.7	733	110.4	1.35	100.0	16	386	19.3	776	118.5	1.34	93.8	2.20				
6	16	400	21.2	821	126.6	1.28	87.5	18	403	18.3	872	114.8	1.33	100.0	34	401	19.5	848	121.4	1.31	94.1	1.13				
7	31	436	16.0	1045	131.4	1.26	100.0	32	414	16.3	883	129.6	1.24	100.0	63	424	19.5	963	153.1	1.25	100.0	1.03				
8	14	436	18.6	1080	189.1	1.29	100.0	16	426	19.4	1069	156.8	1.37	100.0	31	431	19.1	1078	168.3	1.34	-	1.14				
9	11	452	16.0	1094	144.2	1.18	100.0	11	440	17.5	1049	123.7	1.23	100.0	22	446	17.6	1071	133.1	1.21	100.0	1.00				
10	5	461	18.9	1160	131.9	1.18	100.0	5	440	18.4	1044	99.4	1.23	100.0	10	451	20.9	1102	125.9	1.20	100.0	1.00				
11	1	465	-	1180	-	1.17	100.0	1	446	-	1180	-	1.33	100.0	2	456	13.4	1180	0.0	1.25	100.0	1.00				
Total	93						90.0	98						97.0	192								1.10	1		
Mean	7.0 <sup>a</sup>	424	31.3	974	201.7	1.26	7.0 <sup>a</sup>	413	25.6	916	172.2	1.29	7.0 <sup>a</sup>	418	29.0	945	189.4	1.28								

<sup>a</sup>Indicates mean age.

Table 14. Number and mean fork length by age group for tagged Arctic grayling from the Kakisa River, 1979.

Age (Yr)	N	Males			Females				Combined				F/M Ratio	No. Unknown
		Length(mm)	SD	% Mat.	N	Length(mm)	SD	% Mat.	N	Length(mm)	SD	% Mat.		
4	-	-	-	-	-	-	-	-	8	345	15.0	-	-	8
5	-	-	-	-	-	-	-	-	13	389	19.0	-	-	13
6	-	-	-	-	-	-	-	-	56	399	17.6	-	-	56
7	-	-	-	-	1	425	-	100.0	53	417	16.2	-	-	52
8	1	458	-	100.0	2	458	2.8	100.0	31	434	18.4	-	1.00	28
9	1	428	-	100.0	1	438	-	100.0	20	440	16.8	-	1.00	18
10	1	467	-	100.0	-	-	-	-	7	455	19.3	-	-	6
Total	3			100.0	4			100.0	188			-	1.25	181
Mean	9.0 <sup>a</sup>	451	20.4		8.0 <sup>a</sup>	445	16.3		6.9 <sup>a</sup>	413	28.4			

<sup>a</sup>Indicates mean age.

Table 14. Number and mean fork length by age group for tagged Arctic grayling from the Kakisa River, 1979.

Age (Yr)	N	Males			Females				Combined				F/M Ratio	No. Unknown
		Length(mm)	SD	% Mat.	N	Length(mm)	SD	% Mat.	N	Length(mm)	SD	% Mat.		
4	-	-	-	-	-	-	-	-	8	345	15.0	-	-	8
5	-	-	-	-	-	-	-	-	13	389	19.0	-	-	13
6	-	-	-	-	-	-	-	-	56	399	17.6	-	-	56
7	-	-	-	-	1	425	-	100.0	53	417	16.2	-	-	52
8	1	458	-	100.0	2	458	2.8	100.0	31	434	18.4	-	1.00	28
9	1	428	-	100.0	1	438	-	100.0	20	440	16.8	-	1.00	18
10	1	467	-	100.0	-	-	-	-	7	455	19.3	-	-	6
Total	3			100.0	4			100.0	188			-	1.25	181
Mean	9.0 <sup>a</sup>	451	20.4		8.0 <sup>a</sup>	445	16.3		6.9 <sup>a</sup>	413	28.4			

<sup>a</sup>Indicates mean age.

Table 15. Number, mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for angled and tagged Arctic grayling from the Kakisa River, 1979.

Age (Yr)	N	Males								Females								Combined								F/M Ratio	No. Unknown
		Length(mm)		Weight(g)		K	Mat.	N	Length(mm)		Weight(g)		K	Mat.	N	Length(mm)		Weight(g)		K	Mat.						
		Mean	SD	Mean	SD				Mean	SD	Mean	SD				Mean	SD	Mean	SD			Mean	SD				
3	1	339	-	420	-	1.08	0.0	-	-	-	-	-	-	1	339	-	420	-	1.08	0.0	-	-					
4	9	374	12.9	682	66.7	1.30	44.4	4	376	20.3	665	111.2	1.24	25.0	21	363	20.8	677	78.2	-	-	0.44	8				
5	5	402	11.6	872	74.3	1.34	80.0	11	378	17.7	733	110.4	1.35	100.0	29	387	18.8	776	118.5	-	-	2.20	13				
6	16	400	21.2	821	126.6	1.28	87.5	18	403	18.3	872	114.8	1.33	100.0	90	400	18.2	848	121.4	-	-	1.13	56				
7	31	436	16.0	1045	131.4	1.26	100.0	33	414	16.2	883	129.6	-	100.0	116	421	18.4	963	153.1	-	-	1.06	52				
8	15	438	18.8	1080	189.1	-	100.0	18	430	20.9	1069	156.8	-	100.0	62	432	18.6	1078	168.3	-	-	1.20	29				
9	12	450	16.7	1094	144.2	-	100.0	12	439	16.7	1049	123.7	-	100.0	42	443	17.3	1071	133.1	-	-	1.00	18				
10	6	462	17.1	1160	131.9	-	100.0	5	440	18.4	1044	99.4	1.23	100.0	17	452	19.7	1102	125.9	-	-	0.83	6				
11	1	465	-	1180	-	1.17	100.0	1	446	-	1180	-	1.33	100.0	2	456	13.4	1180	0.0	-	-	1.00	-				
Total	96						90.6	102						97.1	380									1.06	182		
Mean	7.0 <sup>a</sup>	425	31.2	974	201.7	-	7.1 <sup>a</sup>	414	26.2	916	172.2	-	7.0 <sup>a</sup>	416	28.8	945	189.4	-									

<sup>a</sup>Indicates mean age.

