Volume 13 Study R-1

STATE OF ALASKA

William A. Egan, Governor

Annual Progress Report for

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

by

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Volume 13 Report No. R-1

RESEARCH PROJECT SEGMENT

State: Alaska

Project No.: F-9-4 *Name:* Sport Fish Investigations of Alaska.

Study No.: R-1 *Study Title:* Distribution, Abundance, and Natural History of the Arctic Grayling in the Tanana River Drainage.

Period Covered: July 1, 1971 to June 30, 1972.

ABSTRACT

Grayling, Thymallus arcticus, population levels in section 2b of the Chena River rose to 3,741 grayling per mile but decreased in section 6 to 589 grayling per mile.

Capture rate with the electrofishing boat as an abundance index is discussed.

Age I grayling are more concentrated between miles 21 and 50 of the Chena River during the summer months. Mature grayling are abundant in the upper East Fork of the Chena River at this time.

A preliminary survey of the Salcha River fish is given.

Intrastream movement of grayling larger than 150 mm is minimal and random during the summer. Furthermore, from one summer to the next, grayling of this size tend to be found in the same area. Upstream movement of age I and II grayling during the summer is evident.

Meristic and morphometric data from two North Slope and one interior grayling samples showed many significant differences and it is likely that grayling in the two areas survived the Ice Age in different refugia (McPhail and Lindsey, 1970).

Grayling approached the Mineral Lake outlet spawning grounds via Little Tok River and arrived May 25 with the water temperature still at 0°C. Spawning began June 4 when the water temperature reached 4°C.

A preliminary hooking mortality study showed grayling able to withstand a great deal of rough handling.

Grayling survived the 1970-71 winter in three of eight marginal lakes that had been experimentally stocked.

RECOMMENDATIONS

It is recommended that:

1. Grayling population estimates be continued in the Chena River and expanded to other rivers of the Tanana drainage as time allows.

2. The relative abundance and capture rate of all species of fish encountered during grayling population estimates be determined.

3. The timing and composition of the spring upstream migration of grayling in the Chena River be determined.

4. Grayling age determination be validated using scales of known-age fish.

5. Scales from grayling inhabiting waters with various chemical and physical characteristics and from different latitudes be collected for study of growth limiting factors.

6. Meristics be taken on grayling from all waters studied.

7. The incubation of grayling eggs and early behavior of grayling be studied at Mineral Lake Outlet.

8. Grayling over wintering studies be continued.

9. A creel census of the Chena River below the proposed dam site be conducted in cooperation with the Branch of River Basin Studies, U. S. Fish and Wildlife Service.

10. Experimental stocking be continued to determine conditions necessary for grayling survival and growth in lakes and ponds.

TECHNIQUES USED

An alternating current shocker boat (described by Van Hulle, 1968) was used to capture grayling for population estimation and length frequency studies. In 1971 each river bank was shocked alternately for 30 minutes.

The Schnabel tag and recapture method was used for obtaining population estimates. The adipose fin was removed to mark the fish.

The section designations for the Chena River are defined in Table 1.

Monofilament gill nets, 125' x 6' with five graduated mesh sizes ranging from 1/2 to 2 1/2 inch bar measure were used to sample grayling stocked in lakes and ponds. Thirty and 50' gill nets of 1/2-, 1-, 1 1/2-, and 2-inch bar mesh panels were used at Mineral Lake and during float trips to sample streams.

TABLE I Chena River Study Sections.

Section No.	Section Name	River Miles	Section Length (Mi.)
1	Mouth to University Ave.	0 - 6	6
2a	University Ave. to Peger Rd.	6 - 8	2
2b	Peger Rd. to Wendel St.	8 - 11	3
3	Wendel St. to Wainwright RR Bridge	11 - 14.5	3.5
4	Wainwright RR Bridge to Badger Slough	14.5 - 21.5	7
5	Badger Slough		16.5
6	Badger Slough to Little Chena	21.5 - 25	3.5
7	Little Chena River		61.5
8	Little Chena to Nordale Slough	25 - 31.5	6.5
9a	Nordale Slough to Bluffs	31.5 - 55.5	24
9b	Bluffs to Bailey Bridge	55.5 - 63	7.5
10	Bailey Bridge to Hodgins Slough	63 - 79	16
11	Hodgins Slough to 90 Mile Slough	79 - 90	11
12	90 Mile Slough to first bridge	90 - 92	2
13	First bridge to second bridge	92 - 94.5	2.5
14	Second bridge to North Fork	94.5 - 102	7.5
15	North Fork of Chena River		35
16	East Fork of Chena River		62

A Ryan recording thermometer was used to monitor temperatures on the Mineral Lake spawning grounds. The continuous recording obtained was rounded to the nearest degree Celsius.

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

An IBM 360 computer was used to analyze the Chena River tag recovery data and the age and growth data. A user's guide, defining all terms and giving the program of analysis was constructed for each project and is on file at the Fairbanks office.

A Bausch and Lomb microprojector was used for determining age of grayling from scales. All scales were cleaned using an enzyme solution and mounted between glass slides.

Meristic counts and morphometric measurements were made in accordance with Hubbs and Lagler (1958), except that head length, postorbital length, and interorbital width were measured from bone to bone. Gill raker counts were made on the excised first left arch. All lateral line scales were counted. Measurements were treated as percent of either head or standard length.

NDINGS

b R-I-A *Population Structure, Summer Distribution, and Interspecific Competition in the Chena River and Other Tributaries of the Tanana River.*

jectives

1. To determine the age composition of grayling in selected sections of the Chena River and compare growth rates of fish from these sections to determine whether separate populations exist within the river.

2. To determine the extent and timing of intrastream movements.

3. To determine relative abundance of grayling and other species in selected sections of the Chena and, if time permits, in the Goodpaster and Delta Clearwater rivers.

pulation Estimates

Grayling, Thymallus arcticus, population estimates were conducted in ctions 2b and 6 of the Chena River in June, 1971, and in sections 2a and between August 30 and September 3 (Table 2). Chena River population timates since 1968 are summarized in Table 3.

BLE 2 Grayling Population Estimates, Chena River, 1971.

iver ction	Date	Length of Section (Mi.)	No. Marked	Schnabel Estimates (GR/Mi.)	95% Confidence Limits (GR/Mi.)
2a	8/30 - 9/ 3	2	274	1,095	702 - 4,222
2b	6/ 2 - 6/ 7	3	762	3,257	2,397 - 5,768
2b	8/30 - 9/ 3	3	991	3,741	2,806 - 6,235
6	6/21 - 6/24	3	837	589	503 - 726

TABLE 3 Grayling Population Estimates in the Chena River, 1968-1971.

River Section	Year	Dates	GR/Mi.
2a	1971	8/30 - 9/ 3	1,095
2b	1968	---	1,095
	1969	---	1,890
	1970	7/ 2 - 7/10	2,465
	1971a	6/2 - 6/ 7	3,257
	1971b	8/30 - 9/ 3	3,741
6	1968	---	452
	1969	---	913
	1970	5/26 - 5/30	769
	1971	6/21 - 6/24	589
9b	1970	6/ 8 - 7/ 8	1,608
10	1970	6/ 7 - 7/ 7	1,873

Capture Rate

The number of grayling captured per electrofishing hour was recorded for various river sections in 1970 and 1971 (Figure 1). Comparing data for both years within sections indicates decreased capture rates in sections 2b and 6, and an increase in section 10. There was no population estimate in section 10 in 1971 so the trend in that section cannot be verified. In sections 2b and 6, however, population estimates are available for both years. In section 6 both the population estimate and the catch per hour decreased in 1971, but in section 2 b the population estimate increased sharply while the catch per hour decreased. This apparent inconsistency is the result of the August 30 to September 3, 1971, sampling in section 2b which was done during a snow and rain storm. This points up the necessity of sampling under comparable conditions if the capture rate index is to be useful.

In 1971, the number of round whitefish, *Prosopium cylindraceum*, captured per electrofishing hour was 42 in section 10 and 43 in section 11. In 1970, 125 were captured per hour in section 10. The 1970 sampling was done between June 7 and July 7; in 1971, it was done on June 6, thus, the large decrease from 1970 to 1971 may be due to different sampling times corresponding to seasonal movements of this species.

Summer Distribution

Chena River:

In 1970 (Tack, 1971), length frequency data showed age I grayling concentrated in parts of the lower 50 miles of the Chena River. These data

also indicated upstream dispersion among age I and II grayling. However, these findings were qualified because collections were made during population estimation collections, with no special effort made to capture small grayling. During 1971, more emphasis was placed on capturing small grayling.

The results of length frequency sampling in 1971 (Figure 2) show the same distribution as in 1970. Age I grayling were numerous in section 6 but nearly absent from sections 2, and 10 through 14. The small numbers in the upstream sections further supports the hypothesis that age I grayling concentrate in the lower 50 miles of the Chena River. Age I grayling were rarely found in section 2 possibly because pollution is making the lower 21 miles of the Chena River unsuitable for rearing age I grayling.

The length frequency data from 1970 indicated a very low number of mature grayling (over 270 mm) but it was speculated they may be in headwater tributaries during the summer. In July, 1971, float trips were made down the East and South Forks of the Chena River and the Little Chena River.

The East Fork was floated from Van Curler's Bar to its confluence with the North Fork (36 miles). The stream in this section flows swiftly through rocky riffles between large, deep, sand or gravel bottom pools. During the survey from July 20 - 24, the water was clear and ranged in temperature from 7 - 11°C. Young-of-the-year grayling were found in quiet backwaters throughout the section sampled. The length frequency of grayling captured by angling and gill net was included in Figure 2 for comparison with the main Chena River length frequency samples. The higher percentage of large fish in the East Fork sample is felt to be real, though different sampling methods were used.

The South Fork of the Chena River was floated from Beaver Creek to its confluence with the main Chena River (21 miles). The stream flows swiftly between well-defined pools in the upper end but slows considerably near its mouth. The bottom is small cobble and gravel with some sand in pools. During the float trip, from July 21 - 24, the water was clear.

Grayling were captured by angling, seining, and gill nets. Young-of-the-year were abundant but adult grayling were found in relatively small numbers. The length frequency distribution (Figure 3) resembled that of the main Chena sample above mile 50. Most adults were farther up the South Fork or had moved to some other tributary of the main Chena after spawning.

From August 13 - 15, the Little Chena River was floated for 33 miles from Sorrels Creek down to the Chena Hot Springs Road Bridge. Water temperature remained between 7 and 8°C throughout the trip. The stream changes character where Fish Creek enters. Above this point, it is very swift and clear with large cobble and few pools. Grayling fry were found in the pools and several large fish were taken by angling and gill nets. Round whitefish were nearly as numerous as grayling in the net samples.

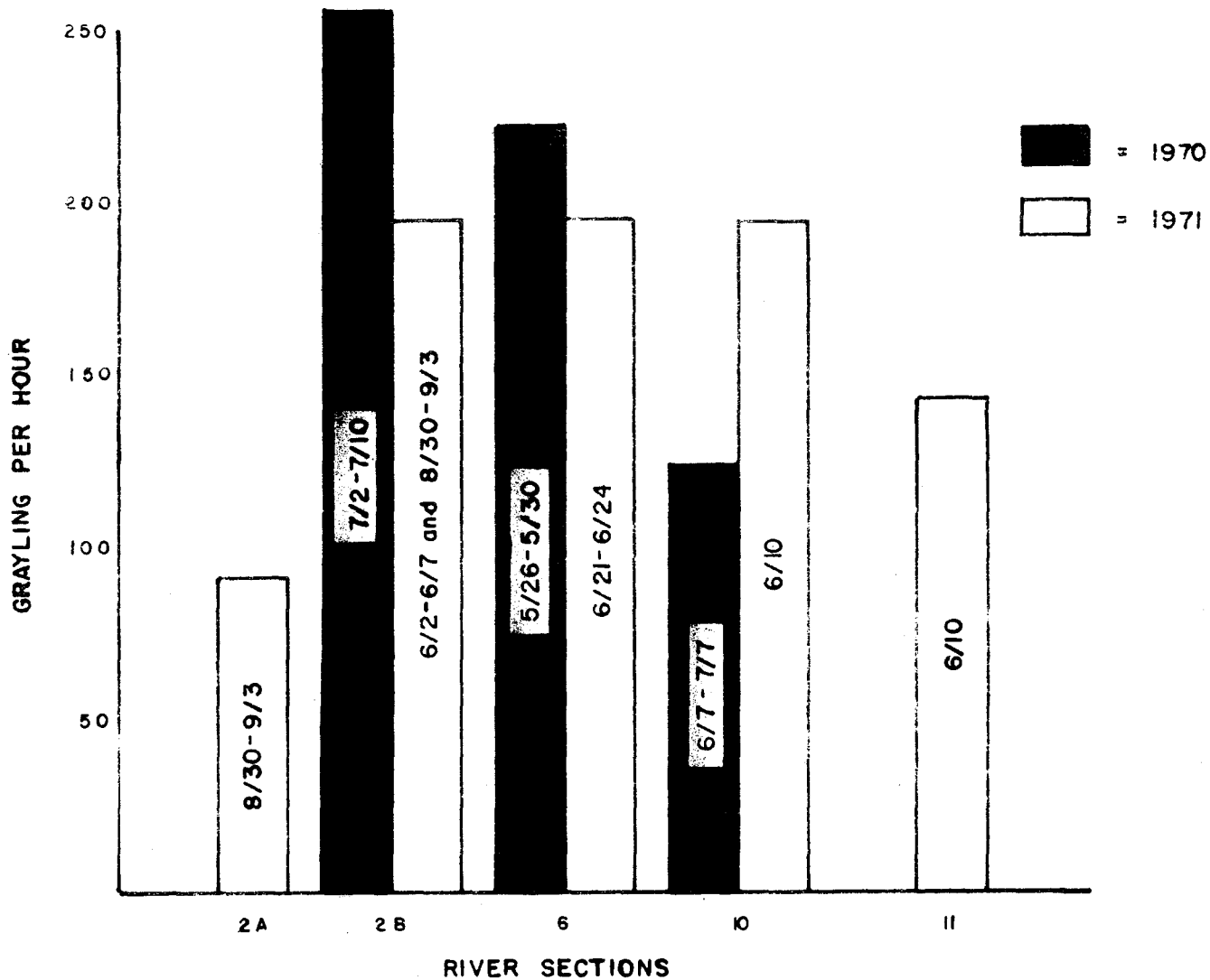
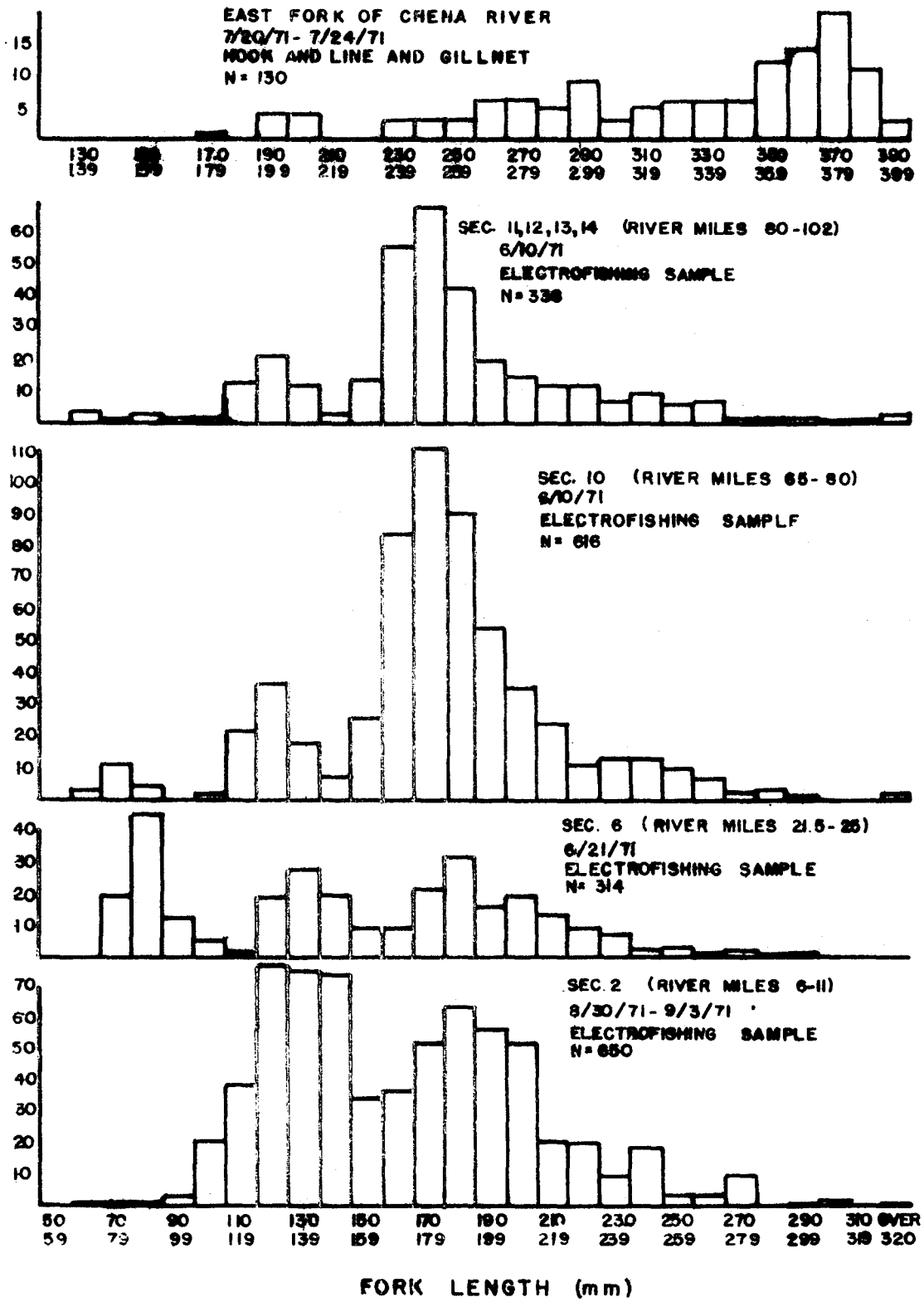


FIGURE 1 NUMBER OF GRAYLING CAPTURED PER HOUR OF ELECTROFISHING IN VARIOUS SECTIONS OF THE CHENA RIVER, 1970 1971



IRE 2 LENGTH FREQUENCIES OF GRAYLING FROM FIVE AREAS OF THE CHENA RIVER, 1971.

Below Fish Creek the current slows, the channel meanders extensively, and because Fish Creek contributes a heavy silt load, the Little Chena becomes quite silty. The source of the silt is Fairbanks Creek, a tributary of Fish Creek, where a mining operation has been active. Silt covers the gravel bottom in all quiet water. Gill nets took grayling and round whitefish throughout this region of turbid water, but angling was ineffective. Young-of-the-year grayling were observed in backwater areas. The length frequency of the fish captured appears in Figure 3.

Young-of-the-year grayling distribution in the Chena drainage includes considerable portions of the major tributaries as well as the main Chena. The North Fork of the Chena was surveyed on July 29 from its confluence with the East Fork to about 10 miles upstream. Many grayling fry were found. Fry were also found at the mouth of Monument Creek (16 miles up the North Fork) and in the West Fork (14 miles up the North Fork) of the Chena. Angel Creek (9 miles up the North Fork) was the only stream surveyed where fry were not found.

Salcha River:

The lower 18 miles of the Salcha River were surveyed by electrofishing on July 10, 1971, to determine grayling length frequency, capture rate, and to collect scales for age and growth studies. The grayling length frequency sample (Figure 4) is similar to those for the lower sections of the Chena River with a predominance of immature grayling.

The hourly capture rates were: grayling, 44; round whitefish, 18; longnose suckers, *Catostomus catostomus*, 11; silver salmon, *Oncorhynchus kisutch*, and king salmon, *O. tschawytscha*, fry, 5; and burbot, *Lota lota*, 1.

Age and Growth

About 1,100 grayling scales from several Tanana River drainages and the North Slope were measured for back calculation of lengths. The data were entered on IBM Coding Forms. Analysis will be done next year when sufficient data from all major Tanana River drainages become available to allow for meaningful comparisons.

Chena River Intrastream Movements

The intrastream movement data collected from 1967 through 1970 in the Chena River (Tack, 1971) were re-analyzed using an IBM 360 computer. In the previous hand tabulation analysis, all recapture data were compared to the initial capture data regardless of whether the recapture was first, second, or third. In the present analysis, all combinations of captures were compared (e.g., first to second, first to third, second to third, etc.) resulting in more usable data. The 1971 tag returns were added to previous data raising the number of comparisons from 907 in 1971 to 1,149 for this

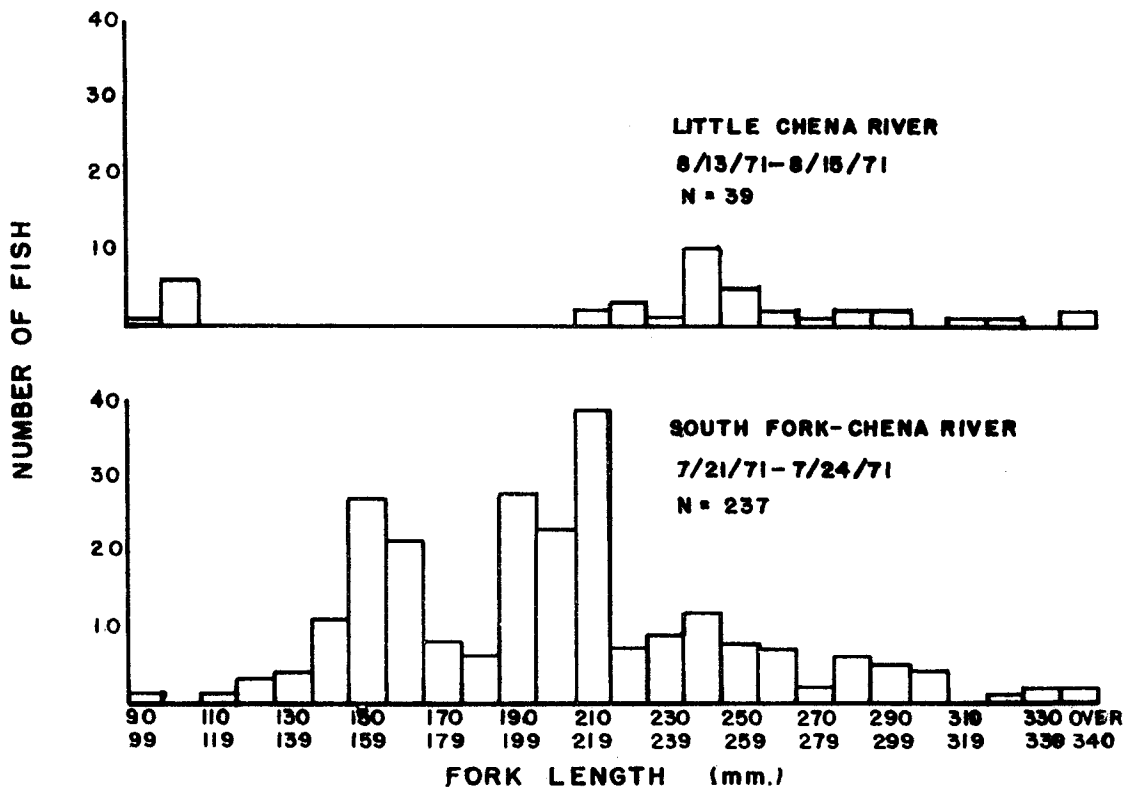


FIGURE 3 LENGTH FREQUENCIES OF GRAYLING CAPTURED BY ANGLING AND BY VARIABLE MESH GILL NETS, LITTLE CHENA RIVER AND SOUTH FORK OF THE CHENA RIVER, 1971.

report. However, since most of the tagging and much of the recapturing was done concurrently with population estimation, restrictions were imposed to reduce the effect of immediate recaptures and incidental movement across section boundaries. Table 5 shows the effect of these restrictions. The week restriction reduces the total data by 273 with most of the loss coming from the no movement category. Addition of the movement restriction causes 64 upstream movements and 111 downstream movements to be shifted to the no movement column. The greater effect on downstream movements probably reflects the practice of releasing fish at the lower boundary of a section.

The restricted data were further broken down by month tagged and month recaptured for same year recaptures (Figure 5) and captures separated by at least one winter (other year recaptures) (Figure 6). Though data are severely dispersed, a breakdown of this nature is necessary to reveal any cyclical pattern of movement that may be occurring.

Comparing only same year captures (Figure 5), it is apparent that most fish remain relatively stationary during the period from May through August, with a slight indication of upstream movement. The possibility that this represents a particular age group moving up while others move randomly is discussed later in this report.

Grayling having overwintered at least once between successive captures (Figure 6) either remain in the same section year around or return to the same section in successive summers. This apparent lack of movement does not rule out the possibility of considerable movement during periods of ice cover, but does show that, if there is winter movement, there is a strong tendency to return to the same summer grounds used in previous years.

TABLE 5 The Effect of Restricting Chena River Grayling Movement Data, 1967-1971.

	Grayling Showing No Movement	Grayling Moving Up	Grayling Moving Down	Total
No restrictions	711	203	235	1,149
Week restrictions*	478	184	214	876
Movement restriction**	918	127	104	1,149
Week and movement restriction	653	120	103	876

*Recaptures within one week of previous capture are excluded.
**Grayling not moving through a section (e.g., from Sec. 6-8) were not considered to have moved.

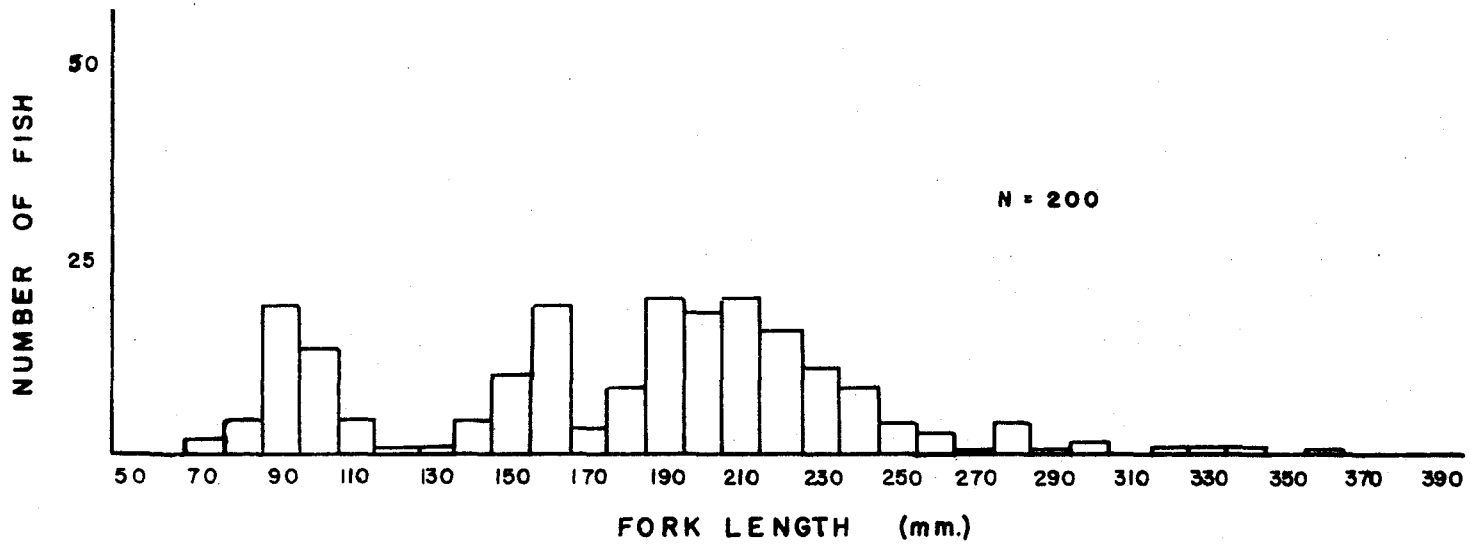


FIGURE 4 LENGTH FREQUENCY OF GRAYLING TAKEN BY ELECTROFISHING IN THE SALCHA RIVER BETWEEN MILES 0 AND 20, JULY 10, 1971.

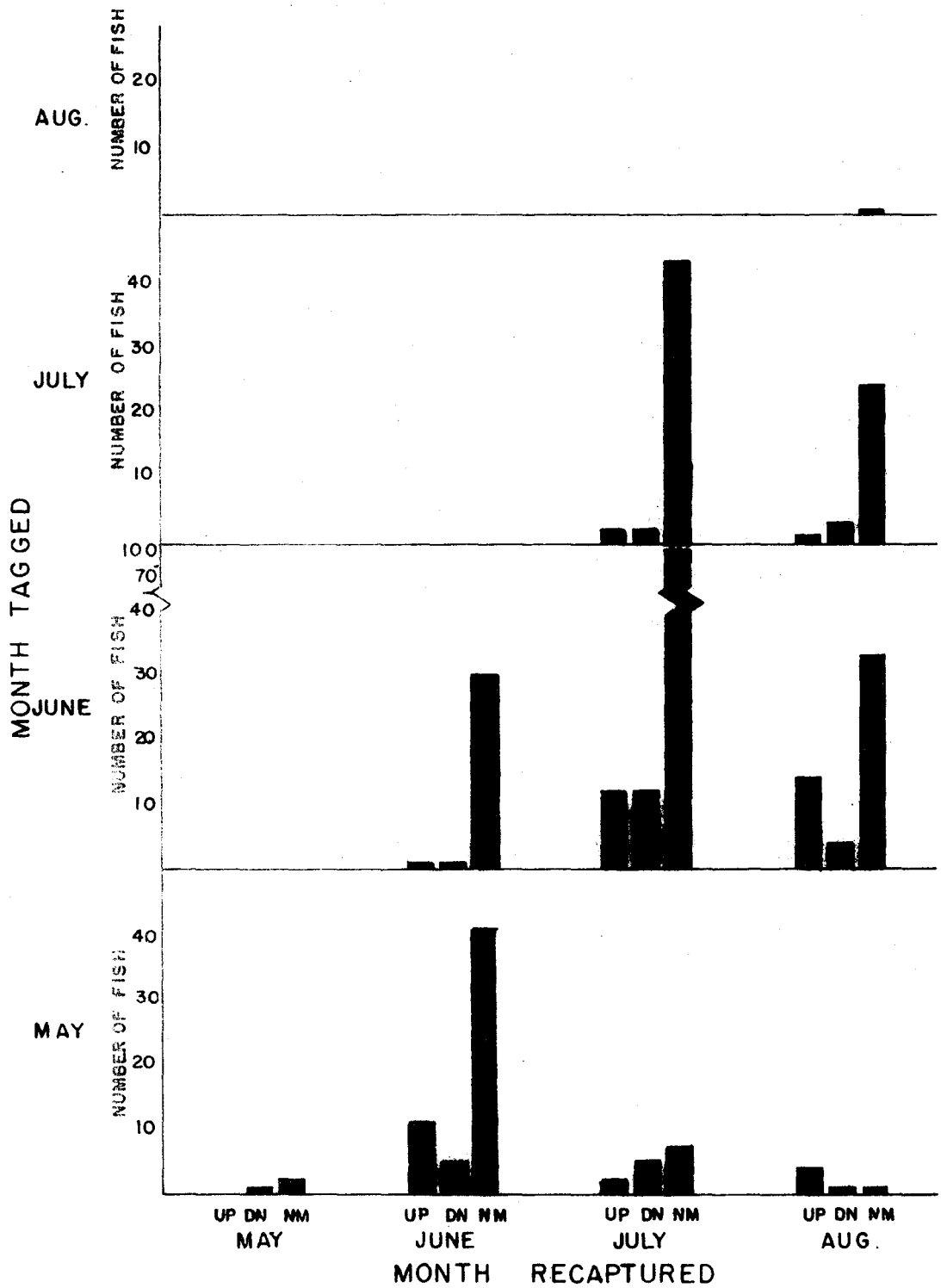
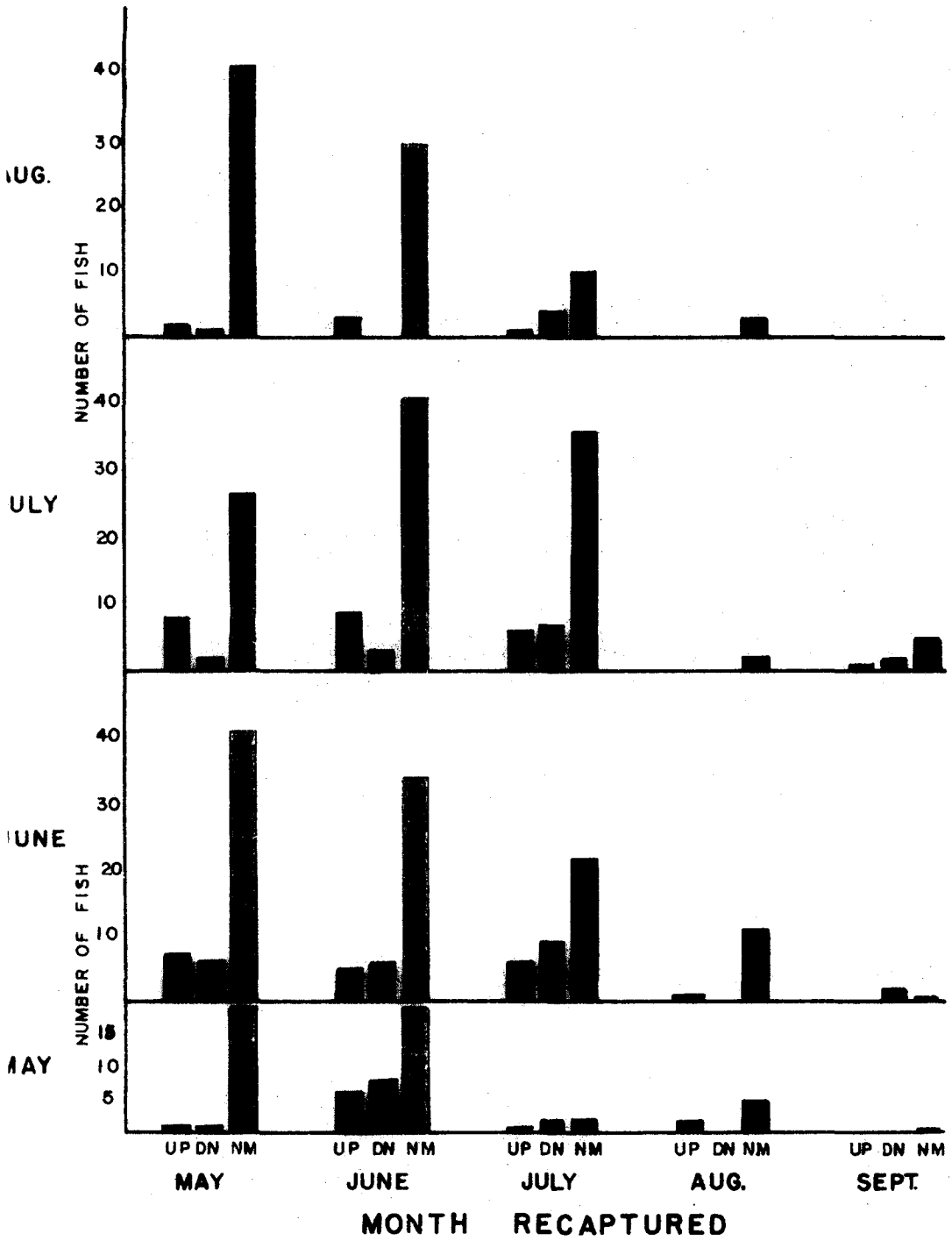


FIGURE 5 THE RESTRICTED[1/] NUMBER OF CHENA RIVER GRAYLING RECAPTURED THE SAME YEAR AS PREVIOUSLY CAPTURED, THAT MOVED UP (UP), DOWN (DN), OR SHOWED NO MOVEMENT (NM).

[1/] Recaptures within one week of previous capture were excluded and a fish must move through a section (e.g., from Sec. 6 to 8) to be considered as moving.



RE 6 THE RESTRICTED[1/] NUMBER OF CHENA RIVER GRAYLING RECAPTURED FROM 1967 THROUGH 1971 THAT HAD OVER-WINTERED AT LEAST ONCE BETWEEN SUCCESSIVE CAPTURES THAT MOVED UP (UP), DOWN (DN), OR SHOWED NO MOVEMENT (NM).

[1/] A fish was required to move through a section (e.g., from Sec. 6 to 8) to be considered as having moved.

Data for same year recaptures and other year recaptures from 1967 through 1971 were divided into four fork length groups (Figure 7). The 150 - 199 mm group would contain age II and III grayling; the 200 - 239 mm group, age IV grayling; the 240 - 269 mm group, age IV and V grayling that are primarily immature but developing sex products; the 270+ mm group would contain all mature grayling. Analysis was based on the fork length when tagged. The results are dominated by fish showing no movement both for same year recaptures (Part A) and for other year recaptures (Part B). There is, however, a definite upstream movement among fish in the 150 - 199 mm group. This is in accord with results of length distribution studies reported last year (Tack, 1971) which showed an upstream dispersion during the second and third years of life (i.e., as age I and II fish).

Meristics and Morphometrics

The basic problem of stock identification can be approached in several ways including growth rate, condition factor, scale character, serology, and electrophoresis, but all of these are time consuming methods. It is preferable if some external feature can be measured or counted to effect identification.

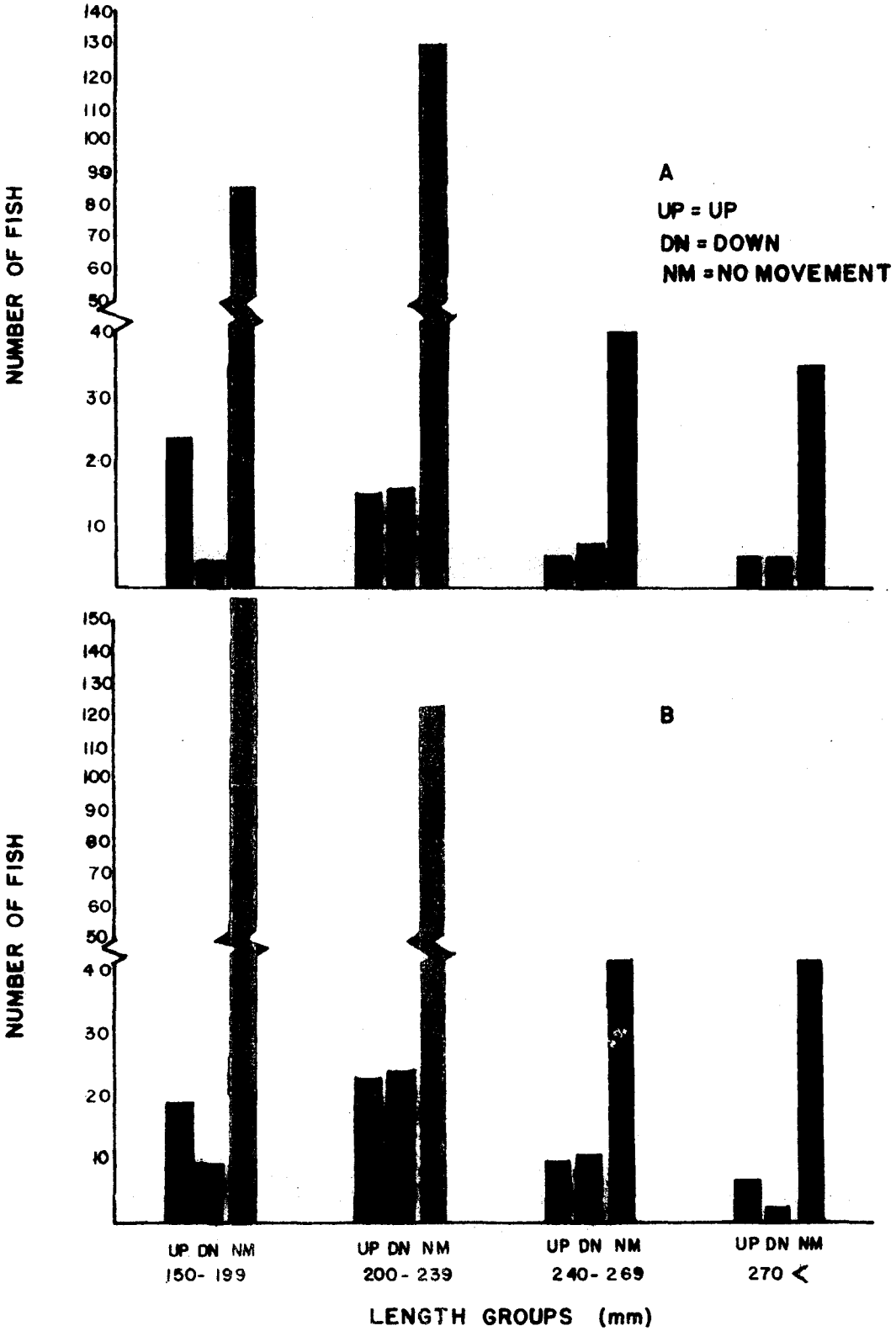
Reed (1961) tested lateral line scale counts on large samples of grayling from 10 different Alaskan waters and found highly significant differences. He also tested the ratio of head length to fork length between the Salcha River and Goodpaster River grayling and found highly significant differences. But in the latter test, he did not allow for differing growth rates and concluded that further analysis by age group was needed. This additional analysis and analysis of other characters measured was never reported.

Svetovidov (1936) used lateral line scales, pelvic and pectoral fin lengths, dorsal fin development, and maxillary length to identify subspecies of grayling in Siberia. On the basis of overlapping lateral line scale counts, variable maxillary lengths and similar dorsal development, Walters (1955) lumped two of Svetovidov's subspecies with the North American grayling. Walters based his conclusions on 69 specimens collected from 12 waters in Arctic Alaska and Canada.

A preliminary study was carried out to find those characters, if any, that varied strongly from one area to another.

Three samples of grayling were obtained. Ten grayling were taken October 8, 1970, 6 to 10 miles upstream from the mouth of the Chena River (64°50'N, 147°30'W). The sample consisted of five females and five males from 208 - 318 mm standard length and ages IV to VIII. Six fish were immature.

The Section Creek (68°35'N, 138°50'W) sample consisted of nine females and eleven males from 192 - 279 mm standard length and ages IV to VIII. These fish were taken on July 22, 1970, near the mouth of Section Creek, a tributary of Accomplishment Creek in the upper Sagavanirktok River drainage.



JRE 7 MOVEMENT OF CHENA RIVER GRAYLING BY MILLIMETER LENGTH GROUPS THAT WERE RECAPTURED THE SAME YEAR AS TAGGED (A), OR IN A DIFFERENT YEAR (B), FROM 1967 THROUGH 1971.

The third sample came from the Kiruktagiak River (68°25'N, 152°45'W), a tributary of the Chandler River of the Colville River drainage. Four females and five males from 174 - 271 mm standard length, ages V - VIII, were collected in August, 1970.

Meristic characters of grayling from the three streams are presented in Table 6. Little difference appeared in the number of rays in the paired fins, but differences, significant at the 1% level, were found in the dorsal and anal fin ray counts. The mean of dorsal ray counts for Kiruktagiak River fish was lower than for Chena River and Section Creek fish. Anal rays of Section Creek fish averaged one ray higher than for fish in the other two streams.

There were generally nine scale rows below the lateral line on fish from each area. All nine fish from the Kiruktagiak River had nine scale rows above the lateral line, but means for this character for the Chena River and Section Creek fish were closer to 10.

The number of scales in the lateral line was the only meristic character in which the North Slope fish differed from the Chena River fish. Grayling from the more northerly waters had fewer scales in the lateral line (84.6, Section Creek, and 87.1, Kiruktagiak River) than fish from the Chena River (92.5).

There was variation, significant at the 1% level, in the total gill raker count among the streams. This was primarily due to variation in the lower arch where the mean for Section Creek fish (10.4) was significantly lower than for the other streams (11.7, Chena River, and 11.4, Kiruktagiak River).

The means for pyloric caecae varied significantly at the 5% level. Here again it was Section Creek (17.3) that was markedly dissimilar from the other two streams (15.8, Chena River, and 15.4, Kiruktagiak River).

Eleven of the 21 morphometric measurements showed significant differences among the three streams (Table 7).

The Chena River values are either the highest or lowest for head length, lower jaw length, orbit diameter, head width, predorsal length, body width, caudal peduncle length, caudal peduncle height, longest dorsal ray, and intermediate for only the interorbital width and pectoral fin length. Of the nine extreme cases, however, seven show a greater difference between Section Creek and the Kiruktagiak River than between the Chena River and one or other North Slope streams. The Chena River fish differed markedly from the North Slope fish only in greater head width and caudal peduncle length.

In contrast to the North Slope grayling, the more southerly Chena River fish had proportionately shorter heads, longer and more slender caudal peduncles, longer lower jaws, greater orbit diameter, and higher gill raker and lateral line scale counts. In all other cases the Chena River grayling either show no significant difference or are intermediate between the two North Slope populations.

Characteristic	Chena River Sample No.	Chena River Range	Chena River Mean	Chena River Std. Dev.	Section Creek Sample No.	Section Creek Range	Section Creek Mean	Section Creek Std. Dev.	Kiruktagiak River Sample No.	Kiruktagiak River Range	Kiruktagiak River Mean	Kiruktagiak River Std. Dev.	F Value
Dorsal fin rays	10	19-22	21.0	1.05	19	20-23	21.2	0.83	9	19-21	20.0	0.71	5.65*
Anal fin rays	10	10-12	11.1	0.74	17	11-13	12.1	0.43	9	10-12	11.0	0.71	12.70*
Pelvic fin rays	10	10-11	10.2	0.42	17	10-11	10.4	0.26	9	9-11	10.1	0.93	0.85
Pectoral fin rays	10	14-16	15.0	0.82	20	14-16	15.0	0.39	9	14-16	15.0	0.50	0.039
Scales in lateral line	10	88-96	92.5	2.32	17	80-89	84.6	2.06	9	81-95	87.1	4.46	23.37*
Scale rows above lateral line	10	9-11	9.7	0.67	19	9-10	9.9	0.32	9	9- 9	9.0	0.00	14.80*
Scale rows below lateral line	10	8-10	9.1	0.57	18	8- 9	8.8	0.38	8	9- 9	9.0	0.00	1.40
Gill rakers (total)	10	17-21	18.9	1.29	15	15-20	17.4	1.24	9	18-19	18.4	0.53	5.94*
Gill rakers (upper)	10	6- 8	7.2	0.92	16	5- 9	6.9	0.81	9	7- 7	7.0	0.00	0.60
Gill rakers (lower)	10	10-13	11.7	0.82	16	9-13	10.4	1.02	9	11-12	11.4	0.53	8.59*
Pyloric caecae	9	13-21	15.8	3.03	18	13-20	17.3	1.45	9	14-17	15.4	1.13	3.54**

*Significant at the 1% level.
**Significant at the 5% level.

TABLE 7 Comparison of morphometric characters of grayling from three Alaskan streams, 1970.

Characteristic	Chena River				Section Creek				Kiruktagiak River				F Value
	Sample No.	Range	Mean	Std. Dev.	Sample No.	Range	Mean	Std. Dev.	Sample No.	Range	Mean	Std. Dev.	
Head length/ Std. l.	10	16.7-20.2	18.5	1.23	20	17.5-21.8	19.4	0.95	9	19.1-21.0	20.2	0.64	7.14*
Upper jaw l./ Head l.	10	33.3-42.8	37.8	2.88	17	31.1-41.5	35.5	2.61	9	33.3-37.5	35.4	1.54	3.06
Lower jaw l./ Head l.	10	46.0-57.1	50.3	3.58	18	37.8-52.5	46.2	4.26	9	43.4-52.6	48.2	2.94	3.80**
Upper jaw l./ Lower jaw l.	10	68.0-85.0	75.2	5.70	17	62.5-88.2	76.7	7.30	9	66.7-80.8	73.5	4.29	0.78
Post orbital l./Head l.	10	50.0-70.9	54.4	6.10	20	44.2-59.5	51.8	3.87	9	45.2-52.8	49.8	2.59	2.66
Inter orbital l./Head l.	10	22.2-28.0	24.8	1.79	20	19.2-31.3	26.5	3.07	9	20.5-27.3	23.5	2.19	4.40**
Orbit diam./ Head l.	10	30.0-36.9	33.4	2.44	20	25.0-37.8	29.1	3.13	9	29.5-37.5	32.5	2.65	9.27*
Snout l./ Head l.	10	20.5-26.0	23.0	1.86	20	15.4-28.6	23.7	3.10	9	21.4-28.9	24.1	2.27	0.41
Head width/ Head l.	10	56.8-80.4	68.9	6.41	13	53.5-68.9	60.6	5.33	8	50.9-67.5	58.2	5.61	9.11*
Head depth/ Std. l.	10	16.2-21.2	18.5	1.31	9	16.0-20.8	18.9	1.58	6	16.8-20.6	19.1	1.52	0.43
Body depth/ Std. l.	10	19.4-25.5	22.8	1.99	No measurements made				3	19.9-24.0	21.8	2.06	--

Characteristic	Chena River Sample No.	Chena River Range	Chena River Mean	Chena River Std. Dev.	Section Creek Sample No.	Section Creek Range	Section Creek Mean	Section Creek Std. Dev.	Kiruktagiak River Sample No.	Kiruktagiak River Range	Kiruktagiak River Mean	Kiruktagiak River Std. Dev.	F Value
Predorsal l./ Std. l.	10	27.6-33.3	31.0	1.98	20	29.0-34.1	32.0	1.37	9	30.2-35.6	33.3	1.79	4.54**
Body width/ Std. l.	10	12.5-15.3	14.1	0.98	10	11.3-14.6	13.0	0.92	7	10.9-14.0	12.6	1.03	5.76*
Caudal Peduncle l./Std.l	10	14.8-18.3	16.6	1.28	20	11.6-16.9	14.0	1.25	9	12.0-17.1	14.3	1.63	12.31*
Caudal Peduncle height/Std. l.	10	7.5-9.0	8.6	0.43	19	8.3-10.2	9.1	0.56	9	8.2-9.2	8.8	0.34	5.13**
Dorsal base/ Std. l.	7	24.9-31.4	27.8	2.24	20	23.0-30.3	27.0	1.61	8	21.9-29.2	25.9	2.25	2.04
Dorsal l./ Std. l.	7	43.7-63.5	49.8	7.06	19	38.0-52.8	45.8	3.88	8	41.2-51.9	46.8	4.14	1.78
Longest dorsal rays/Std. l.	7	22.1-36.2	26.7	4.72	19	13.7-25.2	21.6	3.26	8	16.6-27.0	23.0	3.66	4.90**
Anal base/ Std.l.	10	10.2-11.6	11.0	0.48	20	8.2-15.6	10.7	1.89	9	6.9-12.4	10.4	1.58	0.36
Pectoral l./ Std. l.	10	16.3-18.9	17.4	0.96	20	16.0-19.2	17.0	0.76	9	16.8-19.5	18.1	0.87	5.32*
Pelvic l./ Std. l.	10	16.6-21.7	18.4	1.63	19	15.1-20.1	17.9	1.20	9	16.8-23.6	19.2	2.16	1.96

*Significant at 1% level
**Significant at 5% level

Of the 11 meristic and 21 morphometric parameters studied, 7 meristic and 11 morphometric measurements showed statistically significant variation among the three stream's populations. The biological significance of many of these differences is probably not great, representing no more than racial variation from area to area or variations resulting from differing growth rates.

Because of their relatively large variance among the streams, the caudal peduncle length and lateral line scales appear to be the most useful characters for the study of geographical variation in Alaska. Initially, it was expected that greater differences might exist between North Slope grayling and the more southerly Chena River fish but this was not borne out.

The significantly lower lateral line scale count for North Slope (McKenzie River) grayling was noted in McPhail and Lindsey (1970). They hypothesized an invasion of the McKenzie River occurred following the last Ice Age by grayling from the Mississippian refugium. The high scale count grayling of the interior, then, would represent grayling that survived the Ice Age in the Beringian refugium. McCart and Pepper (1971) looked at the geographic variation in lateral line scale count and substantiated McPhail and Lindsey's hypothesis.