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STATE OF ALASKA

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ANNUAL REPORT OF PROGRESS, 1960-1961

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-2

SPORT FISH INVESTIGATIONS OF ALASKA

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Introduction

This report of progress consists of the Job Completion Reports from the State of Alaska's Federal Aid in Fish Restoration Project F-5-R-2, "Sport Fish Investigations of Alaska".

The current Project is composed of eighteen separate studies and were designed to evaluate the various aspects of the State's recreational fisheries resources. The information gathered will provide the necessary background data for the development of future programs. During the current segment continued emphasis was placed on overall inventorying of accessible waters and the evaluation of general catch data.

Several problems of immediate concern appeared sufficiently defined to warrant independent studies. As a result, two independent creel censuses, one experimental silver salmon egg take and a Resurrection Bay area silver salmon population study were instigated. Data accumulated from prior jobs dealing with the Arctic grayling has resulted in the formulation of three separate investigations during the current segment.

The rapid expansion of Alaska's population is being reflected in the ever increasing numbers of "No Trespassing" signs encountered in the vicinity of population centers. Fortunately, much of Alaska's fishing waters are still in the public domain. An aggressive program of acquiring access to fishing waters, instigated in 1959, was continued during the present segment. Increased emphasis is being placed on this job and the successful continuation of this activity, now and in the immediate future, will forestall many of the serious recreational use problems currently facing other states.

The enclosed progress reports are fragmentary in many respects and the interpretations contained therein are subject to re-evaluation as the work progresses.

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECTS
COMPLETION OF 1960 - 1961 SEGMENT

State: ALASKA

Project No: F-5-R-2

Name: Sport Fish Investigations
of Alaska

Job No: 3-B

Title: Investigation of the
Tanana River Grayling
Fisheries

Sub-Title: Migration Study

Period Covered: July 1, 1960 to May 1, 1961.

Abstract:

A total of 9,210 Arctic Grayling were tagged during the 1960 Field season. All fish were quieted before tagging by placing them in an MS-222 solution. After recording the fork length, a yellow plastic subcutaneous tag was inserted beneath the ventral surface between the anal opening and pectoral fins. With the exceptions of the 1958 Goodpaster River tag return data and the 1959 Chatanika River tag returns, the following report is based on tag returns from the 9,210 grayling handled during the summer of 1960.

Tag recoveries in 1959 and 1960 from the Fish and Wildlife Service "tag" study on the Goodpaster River in 1958 have been used to indicate a definite migration trend of the Arctic Grayling into the Delta Clearwater. It has been theorized that age and/or size of the grayling may be a factor in stimulating this upstream migration.

Fishermen utilizing the Delta Clearwater in the spring of 1960 reported a mass movement of adult grayling upstream during mid-May. The adults made their way up the main river and came to rest in the two forks. They remained there until mid-June at which time the adults drifted downstream and

established themselves on the riffle habitats. At approximately the time that the adults were moving down the Delta Clearwater immature grayling appeared at the mouth and started an upstream migration. This upstream movement of immatures lasted until the middle of August. Early in September the immature grayling drifted out of the Clearwater and were soon followed by the adults.

Poor stream conditions in the Spring and Fall on the Chatanika River have thus far been a successful deterrent in the efforts to pin down the adult migration pattern. The immature grayling movement was well documented in 1960. These younger fish moved into the main tagging area, i.e., Power House Tailrace, in early May. Tag returns showed an upstream movement into the many tributaries during most of the summer. Warmer water and a lesser flow in the main Chatanika as compared to the tributaries at this time may be a factor. Downstream movement of immature grayling started in early September during a period of adverse stream conditions which clouded the final downstream migration picture.

Field data collected on the Chatanika indicates that a large percentage of the "young-of-the-year" fish drift out of the upper watershed and are lost to the fishery. All waters of the Chatanika are diverted into the Davidson Ditch during the height of the grayling downstream movement and the series of siphons which the fish must pass through may cause eventual death.

In general, all Tanana River grayling stocks are subjected to limited utilization for several reasons: The adult spawning runs occur during the period of high water which reduce the catch; adults remain in the upper headwater streams for the most part and are not cropped by the average fisherman, and during the adult downstream migration in the Fall, sportsmen are hunting moose. What utilization of the fishery that does occur falls upon the two to five year old age class which are still immature fish.

Objectives:

To determine the migratory trends of the Arctic Grayling in the Tanana River drainage; specifically to study the inter-relationship between the Goodpaster River and the Delta Clearwater and intra-stream movements of grayling in the Delta Clearwater and Chatanika River.

Introduction:

Early studies of the migratory behavior patterns of the Arctic grayling, Thymallus arcticus, conducted by Fish and Wildlife Service field crews established several general trends. The grayling populations inhabiting the tributaries of the Tanana River watershed during the summer months move downstream to the main Tanana River prior to winter freeze-up. An unknown segment of these populations may be capable of wintering in some of the tributaries. Whether the spring "run" is strictly for spawning has not been determined and the exact dates of the upstream movement have not been recorded with any degree of accuracy. Finally, all past studies have pointed out a general inter-movement, i.e., random or feeding within the individual tributaries, during the summer months. The attempt of the present migration investigation has been designed to change this general information into specifics.

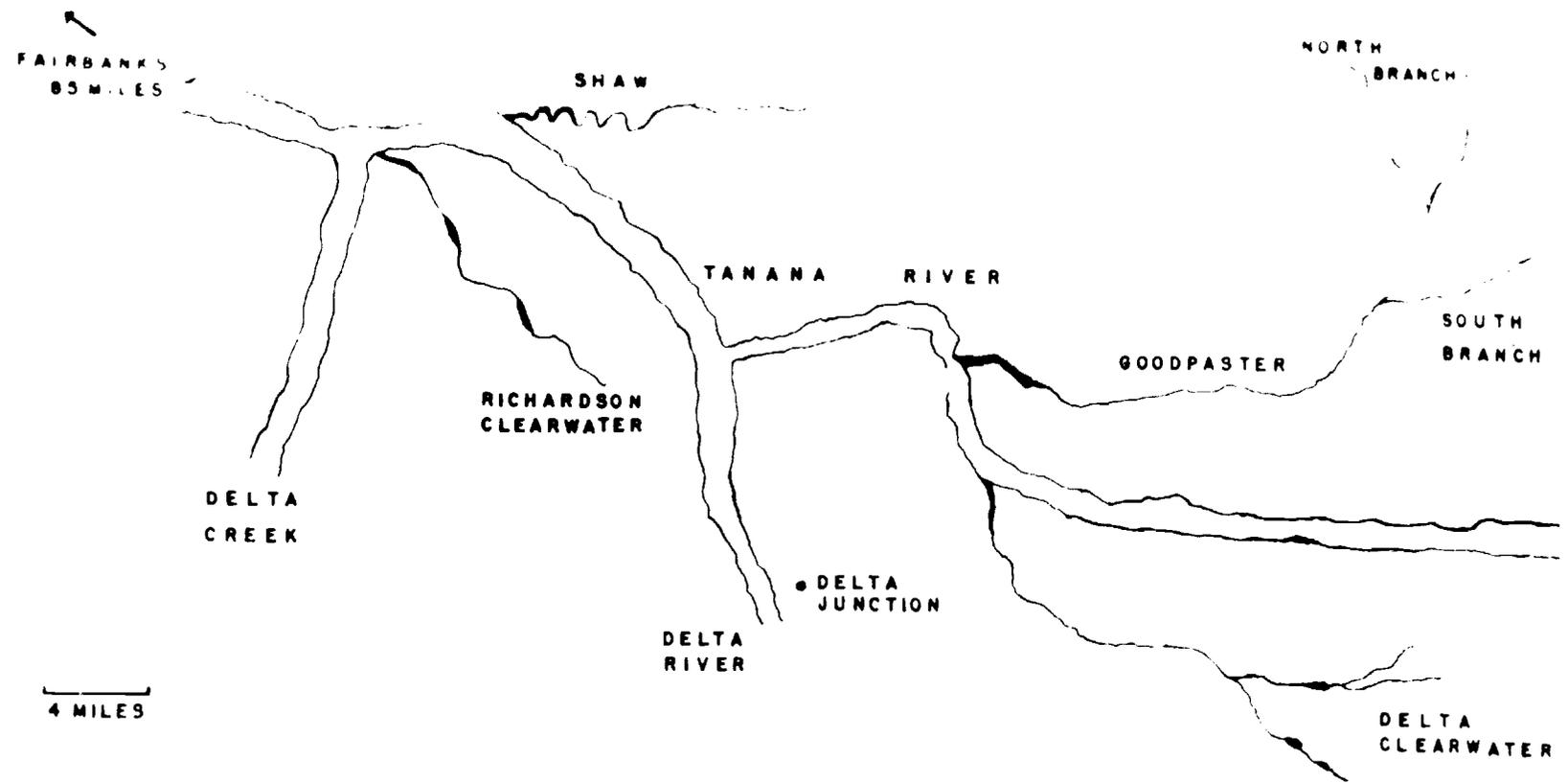
In the spring of 1960, a tagging program was initiated to fill the gaps in our present knowledge of grayling movements in the Tanana River watershed. The purpose of this investigation was two-fold: First, to establish and interpret these movements so that a sound management program could be formulated to assure a proper and lasting utilization of this important fishery of Interior Alaska; and second, to advance our knowledge of this interesting species.

The original tagging program was established on the Chatanika River and the Delta Clearwater. The Chatanika River was a joint study with the River Basins Branch of the Fish and Wildlife Service as the participating agency. Their interests centered around the effects of a recent hydro-electric development on the upper watershed. A two man crew worked the Chatanika and another worked on the Delta Clearwater tagging fish throughout the summer of 1960. As the program progressed it was expanded somewhat to include the Goodpaster River, Richardson Clearwater and Shaw Creek. (Figure 1).

Tagging and Sampling Method:

In all five areas where tagging took place the method used was identical. A bright, yellow subcutaneous plastic

Figure 1. Locations of the Tanana River Tributaries Used in the 1960 Arctic Grayling Migration Study.



tag was inserted under the skin on the ventral surface between the pectoral fins and the anal opening. The tag was positioned in such a manner that even if it had been overlooked at the time of capture, it would serve as an obstacle when the fish was cleaned by the successful angler. Fork length was recorded for all fish tagged during the 1960 operation to help establish yearly growth rates per area.

To advertise the tagging program in the five streams, a bright orange poster was placed at picnic areas, campgrounds, bridges, etc. A news release about the general tagging program, with a reproduction of the poster included, was placed in the Fairbanks newspapers.

The problem of handling the fish during the tagging operation was solved by using a chemical anesthetic Tricaine Methanesulfonate, commonly called MS-222. When large numbers of grayling were handled, the MS-222 solution was repeatedly changed. Nine thousand two hundred and ten grayling were tagged in this manner of which .3 of one per cent, or 28 fish were lost because of the combined effects of handling, tagging and over-concentrations of MS-222.

Several sampling methods were employed on the Chatanika River tagging project. The majority of tagged fish were captured in small, four foot frame sets which blocked movement into some of the tributaries of the Chatanika during the summer. A Lear "back-pack" DC generator was used successfully in the electro-sampling of fish during the early spring activities and to a lesser extent during the summer.

In the other four tributaries of the Tanana River where tagging took place, i.e., Delta Clearwater, Goodpaster River, Shaw Creek and the Richardson Clearwater, the "hook and line" sampling method was used. Artificial flies of various hues helped maintain an average catch per hour of 4.1 for the field crews. Barbed hooks were used when the early efforts using barbless hooks resulted in high escapement of hooked fish.

It is interesting to divert somewhat from the main problem under discussion and explore the "hook and line" sampling success experienced during the 1960 field season. Early Fish and Wildlife Service investigators found it

virtually impossible to either seine or trap the grayling for tagging purposes in many of the Clearwater streams. As a result they turned to the "hook and line" method of capture. The inexperienced crews used on the project in 1960 became so proficient in taking the actively feeding grayling that a record of 337 fish were tagged during a single day. This included the measurement of each fish, the MS-222 treatment and finally the tagging operation. In terms of value received, i.e., fish tagged, this is the recommended method for taking stream grayling. (Table 1).

Tag Return Data:

A. Goodpaster River -- 1958

The Fish and Wildlife Service tagged 1,376 grayling in the Goodpaster River during the summer of 1958. Although the main study dealt with testing three different tag types, the tag return data from this study indicated some very positive trends. (Table 2).

Of the 1,300-odd grayling tagged in 1958, approximately forty-five per cent were from the two year age class. With an apparent migration tendency from the Goodpaster into the Delta Clearwater available food and/or size may be one of the factors stimulating their movement. The theory is now advanced that the Goodpaster River may serve as a "nursery" stream and the resultant grayling eventually mingle into the migrating stocks of other nearby tributaries. On the basis of the present tag return data the movement of grayling from the Goodpaster River cannot be classified as just random behavior.

A closer examination of the age groups for the various 1959 and 1960 tag returns helps strengthen the "nursery" concept for the Goodpaster River. In the 1959 returns (15) from the Delta Clearwater the majority were of the five year age class or four years old in 1958. The 1960 returns in the Delta Clearwater were also predominately in the five year old age class which means they were three years old in 1958. Since forty-five per cent of all grayling tagged in 1958 were two years old, 1961 returns will be extremely important to tie in this age-size relationship if it is a factor.

Table 1. Results of the 1960 Tagging Program on the Arctic Grayling; Tanana River Watershed.

| <u>1960 Tagging Period</u> | <u>Area</u> | <u>Number Tagged</u> | <u>Tag Returns</u> | <u>Catch per Unit Effort (Field Crew)*</u> |
|---------------------------------------|-------------------|--------------------------|------------------------|--|
| May 1- October 12 | Chatanika River | 4,500 | 688 | - |
| June 12- September 30 | Delta Clearwater | 2,160 | 200 | 4.1 |
| July 26-July 29 August 7-August 13 | Goodpaster River | 2,000 | 12 | 16.7 |
| August 23- August 27 | Richardson Clwtr. | 350 | 6 | 8.3 |
| August 19- August 21 | Shaw Creek | 200 | - | 7.1 |
| | | 9,210 | 900 | |

*Catch per fishing hour by hook and line

Table 2. Tag Returns of 1,550 Arctic Grayling Tagged By the Fish and Wildlife Service in the Goodpaster River-Summer of 1958.

| <u>Area of Returns</u> | <u>1958</u> | <u>1959</u> | <u>1960</u> | <u>Total</u> |
|------------------------|-------------|-------------|-------------|--------------|
| Goodpaster River | 125 | 4 | 8 | 137 |
| Delta Clearwater | 14 | 15 | 23 | 52 |
| Richardson Clearwater | 4 | 3 | - | 7 |
| Shaw Creek | - | - | 2 | 2 |
| Main Tanana River | - | 1 | - | 1 |
| | <u>143</u> | <u>23</u> | <u>33</u> | <u>199</u> |

To follow this theory to its final conclusion, a total of 2,000 grayling were tagged in the Goodpaster in 1960. The age groups were from the two-four year classes and some should appear in the 1961 catch on the Delta Clearwater.

B. Delta Clearwater -- 1960

Efforts on the Delta Clearwater during the 1960 field season produced 2,160 tagged grayling. A total of 200 tags were returned via field crew "hook and line" activities plus creel census coverage at the Campground. No tagging occurred before June 12, 1960 on the Clearwater since tagging crews were occupied in collecting specimens for the racial determination study on other Tanana tributaries.

The tag return data (Table 3) and general observations made during the summer resulted in the recording of a very marked and interesting series of intra-stream migration patterns for the Delta Clearwater grayling population. (Figure 2). Information collected from anglers fishing the Delta Clearwater during May was used for early movement of grayling into the Delta Clearwater; the field crews were occupied elsewhere. Grayling appeared in the Clearwater early in May and reached the height of their migration over the May 15th week-end. "Adult" grayling, i.e., over 12 inches in total length, made up the entire catch during this period.* On June 12, 1960, 100 specimens were collected from the Delta Clearwater. Since no grayling could be found in the main river, it was necessary to travel upstream into the right and left forks for the specimens. These two areas were the only places containing grayling and all fish were over 12 inches in total length. Later examination of the specimens established that the females were "spent" or in a spawned-out condition. Whether or not the actual spawning took place in the Clearwater has not been determined to date. Many trapping and seining attempts to collect "young-of-the-year" from this stream were unsuccessful.

The "adult" grayling moved out of the two forks from June 13th to the 20th. Returns from fifty grayling tagged

*Prior studies have indicated that grayling in Interior Alaska mature at approximately five years of age or 12 inches in length.

Table 3. Tag Return Data from 2,160 Arctic Grayling in the Delta Clearwater - Summer, 1960.

| Type of Movement | June <u>1-15</u> | June <u>16-30</u> | July <u>1-15</u> | July <u>16-31</u> | August <u>1-15</u> | August <u>16-31</u> | Sept. <u>1-16</u> | Sept. <u>16-30</u> | Oct. <u>1-15</u> | Oct. <u>16-31</u> | <u>Total</u> |
|------------------|---------------------|----------------------|---------------------|----------------------|-----------------------|------------------------|----------------------|-----------------------|---------------------|----------------------|--------------|
| Upstream | - | - | 33 | 35 | 27 | 17 | - | 3 | - | - | 115 |
| Downstream | 1 | 1 | 7 | 13* | 2 | 8 | 2 | 8 | - | 1 | 43 |
| No Movement | - | - | 10 | 25 | 3 | - | - | 4 | - | - | 42 |
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| | 1 | 1 | 50 | 73 | 32 | 25 | 2 | 15 | - | 1 | 200 |

*Movement downstream of only one mile-possible effects of the tagging operation.

DELTA CLEARWATER

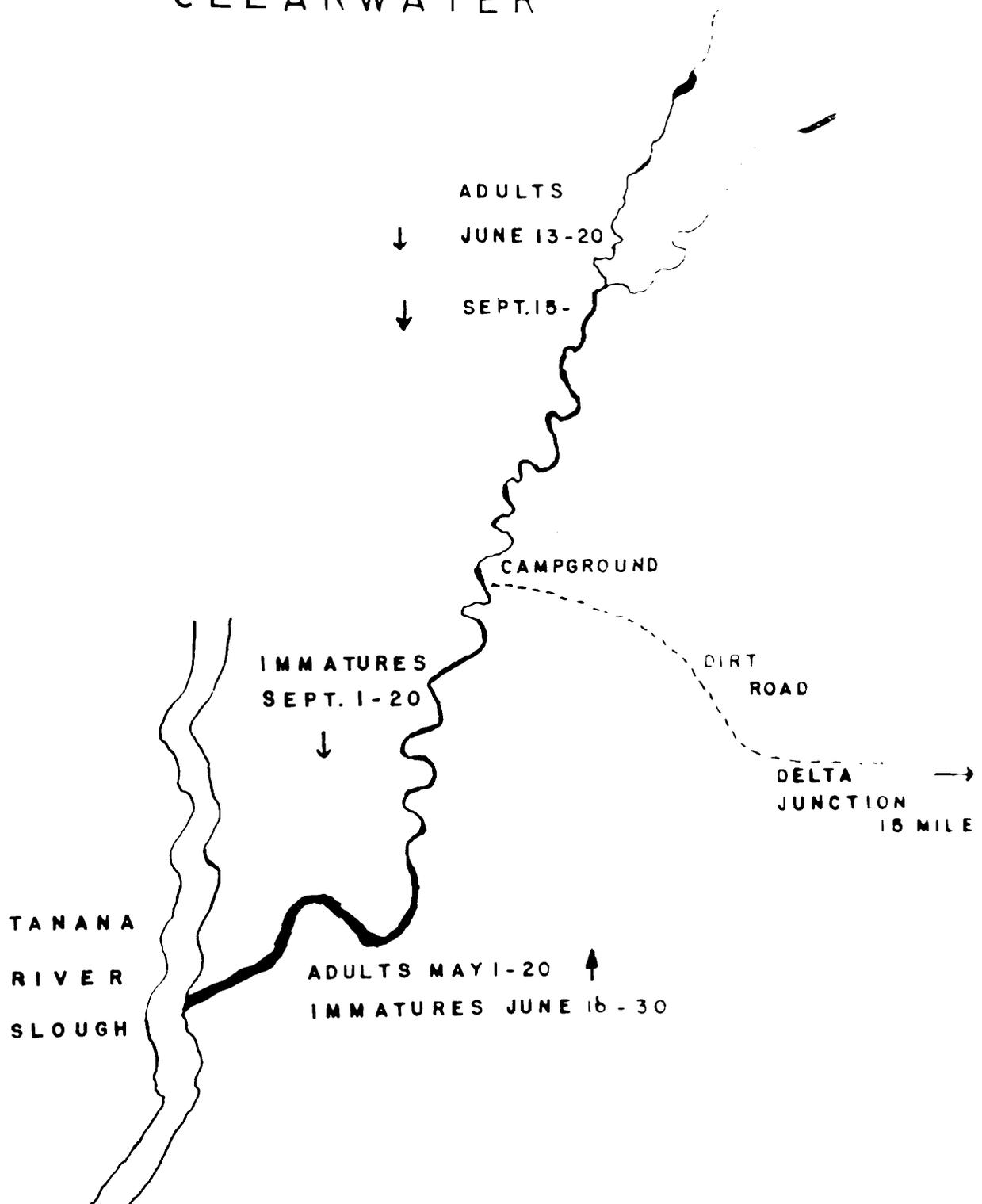


Figure 2. Arctic Grayling Migration Patterns in the Delta Clearwater During the 1960 Season.

in the right fork showed a downstream movement in some cases of fifteen miles in three days. These large fish spread out downstream and occupied the many fine riffles in the main river. As the "adults" were establishing themselves on the riffle habitat a mass movement of "immatures", i.e., grayling under 12 inches in total length, occurred into the Clearwater. Repeated attempts were made to tag as many of these smaller fish as possible during this time and therefore their upstream movement is well documented. (Table 3).

July movement of immature grayling upstream eventually resulted in a complete representation of these fish from the mouth to the branching of the two forks; a distance of approximately 15 miles. By the middle of August the small grayling appeared to have reached the climax of their upstream movement in the Clearwater. Little movement of either group occurred again before September. The actual tag return data during the period September 1st - 15th does not show the true extent of the downstream pattern and daily field crew observations must be supplemented for this void in the data.

Immatures began to drift out of the Clearwater about September 6th and by the 15th played a very insignificant part in the field crew catch. The "adult" fish still were numerous on the riffles and feeding continued unabated. However, as the month of September came to a close their numbers were reduced to a three mile area near the mouth. The final tag return on October 30th came from the mouth and attempts to observe grayling in November were unsuccessful because of adverse weather conditions.

One feature of the "adult" downstream migration in the Clearwater should be discussed further; utilization of the fishery at this time of the year. The first moose season in the Fairbanks area begins on August 20th and closes on September 20th. Fishermen on the Delta Clearwater drop their flyrods and pick up their rifles; river traffic up and down the Clearwater is plentiful but no one fishes during this period. Fishing effort dropped to zero and the creel census coverage on the stream was cut short in lieu of limiting activities in the "hook and line" sampling. It is unfortunate that the sportsmen's interests are diverted at the time when 16 to 18 inch grayling are

readily available, not only on the Delta Clearwater, but in most of the tributaries of the Tanana River.

Since the field crews took their samples by "hook and line" in collecting specimens for the racial study and in their tagging program it can be used as a sound indication of what age classes are being cropped each year by the fishing pressure on the grayling stocks living in the Tanana River watershed. From May 20th to June 12th a total of 900 grayling were taken by "hook and line" for the racial study and it is interesting to note that twenty percent of these specimens were sexually mature (using the 12 inch total length as the criterion of maturity). This twenty percent maturity figure can be compared to five percent found mature in the 4,710 grayling taken by "hook and line" during the tagging season of June 12th - October 31st.

The combination of poor stream conditions, weather, grayling migratory behaviour and other interests of sportsmen in the fall, places the brunt of the fishing pressure on the immature stocks. Since natural mortality hits these younger fish the hardest, it is important to have good utilization before nature removes them from the fishery. Spawning stocks of grayling are well protected and under-harvested in the Tanana River watershed because of the factors previously mentioned.

C. Goodpaster River - Richardson Clearwater - Shaw Creek - 1960.

Although these three water areas were included in our general tagging program in 1960 (Table 1), limited information was derived this first year of operation and will not be discussed in this report.

D. Chatanika River - 1960

The tag return data from the Chatanika River was the product of a joint effort between the River Basins Branch of the Fish and Wildlife Service and the Alaska Department of Fish and Game. River Basins had tagged 1,550 grayling in this River during their 1959 field season. The subcutaneous plastic tag used was similar to the one used during the 1960 season by the Department of Fish and Game differing only in the number series and markings.

All field work on the Chatanika River in early spring and late fall is heart-breaking to say the least. This River is typical of the rapid run-off type common in the Interior; fluctuating water levels greatly reduce the efficiency of gill nets, frame sets and fyke nets at this important time in the "adult" migration pattern. Sampling gear is either washed away, clogged with debris or frozen in for the winter. Therefore, the true picture of the adult "runs" into and out of the Chatanika River has not been established to date although much time and hard work has been directed toward that end in 1959 and 1960.

Immature grayling movements in the Chatanika River have been successfully studied for the past two years. Tag return data from the 1960 activities showed a positive upstream and downstream migration. (Table 4). The tagging period covered in 1960 was May 15th to October 12th. Every effort was made during the current study to cover their movements into and out of the many small tributaries of the Chatanika River. The study area covered approximately forty miles of the Chatanika; from Milepost 30 on the Steese Highway to the upper headwaters. (Figure 3).

A total of 1,550 grayling were tagged by a Fish and Wildlife Service field crew in 1959, of which 216 were recaptured in the 1960 season. (Table 5). The joint effort in 1960 resulted in the tagging of 4,500 grayling and 689 tag returns were recorded. The immature movements based on the tag return data are compiled in Table 4.

Electro-shocking and seining of the tailrace area of the hydro-electric power plant located at Milepost 32 produced approximately one third of all grayling tagged in 1960. The tailrace was sampled repeatedly from May 15th until late in June. Emphasis was then shifted to the tributaries where small, four foot frame sets or incline traps were installed to "fish" the upstream migrants. The traps were turned around in late August to "fish" the downstream migrants until stream conditions made effective sampling impractical.

The immature movement upstream was steady throughout most of the summer of 1960. General activity was reduced to random movement by late August. The limited downstream drift recorded in Table 4 is perhaps the result of tagging

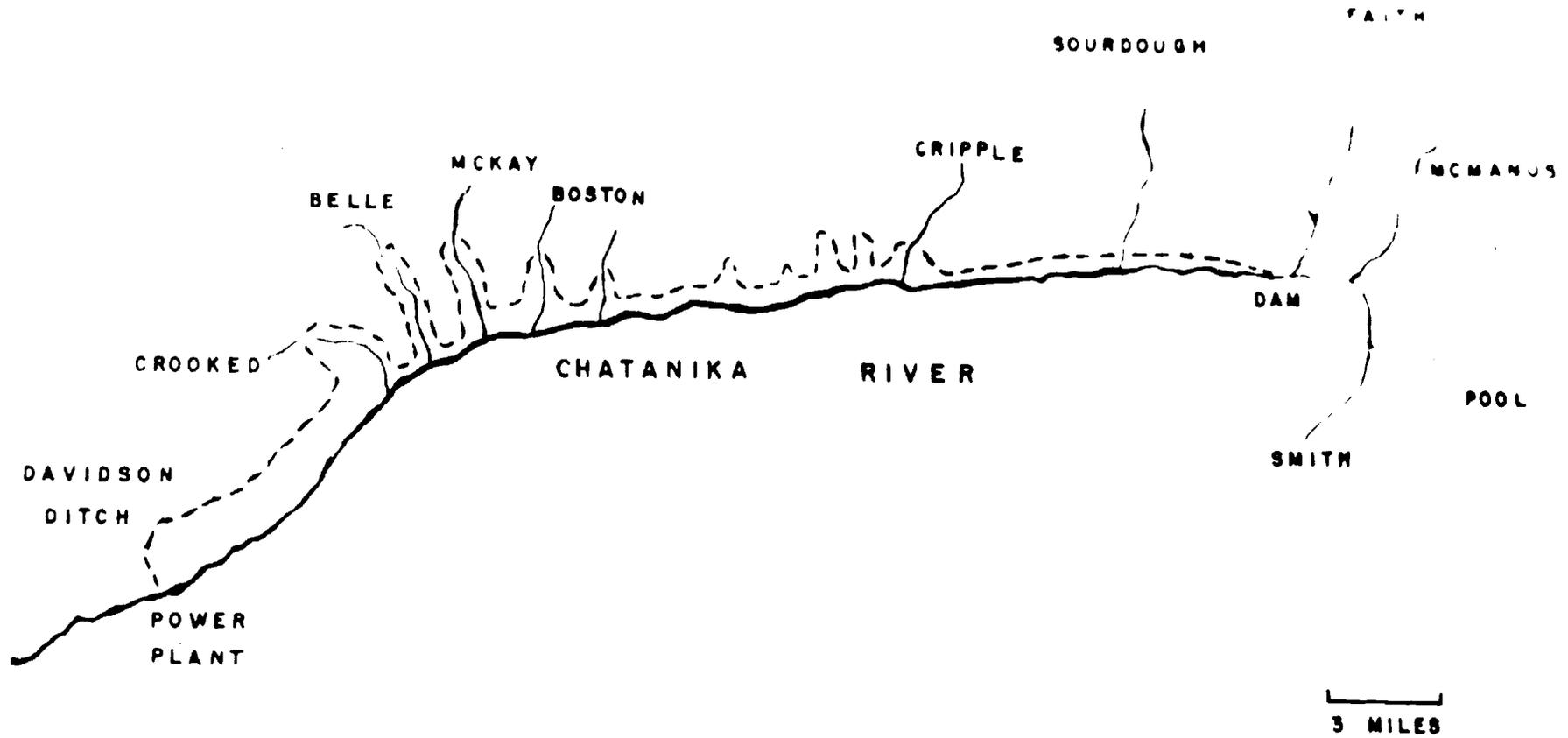


Figure 3. Chatanika River and its Tributaries Showing the Location of the Chatanika Power Company's Turbine Site and the Davidson Ditch.

since it was only one mile from the release point. Early in September the immature grayling began to drift downstream out of the tributaries, unfortunately this was also the period of flooding. In addition, leaves began to fall at this time which clogged the traps and made sampling next to impossible. However, enough data were collected to show a definite downstream move of immatures. (Table 4).

One remarkable feature of the 1959 tag returns is the high percentage (89%) of the recaptured grayling that were taken where they had been released in 1959! They had not moved in relation to the "release point" of 1959 and therefore were listed as "no movement" fish. (Table 5). The forthcoming season on the Chatanika will be important in terms of gathering tag return data and will not necessarily require an extensive tagging effort.

Several environmental factors appear to stimulate the immature grayling during their upstream migration. Water temperatures in the main Chatanika varied as much as 10°F. higher than the cool tributaries in July and August. Since the diversion dam at Milepost 67.8 diverts all flow from the upper watershed into the Davidson Ditch in July and August, the flow in the main Chatanika is greatly reduced. However, the small tributaries maintain a fairly constant flow during this "dewatering" period.

The loss of the headwater flows may be more important to the fishery than just lack of water. In the early fall, grayling "young-of-the-year" begin to drift out of the headwater streams and are pulled into the Davidson Ditch instead of making their normal run downstream. Thereby, the grayling face a one-way trip which can only result in death. The Davidson Ditch is a waterway paralleling the main Chatanika interspersed with fourteen siphons which assist in maintaining water flows. The end result of the Ditch is the siphon drop to the Power Plant turbines at Milepost 32. Any grayling which happen to survive in some of these siphons without entering the power plant are lost when the Power Company personnel drain the siphons before freeze-up. Losses in the ditch to the fishery will be studied in 1961.

The Steese Highway to Circle has opened the Chatanika to a fair fishing pressure during the summer months. The

Table 4. Tag Return Data Collected from the Chatanika River During the Summer of 1960.

| <u>Type of Movement</u> | <u>May 15-31</u> | <u>June 1-15</u> | <u>June 16-30</u> | <u>July 1-15</u> | <u>July 16-31</u> | <u>August 1-15</u> | <u>August 16-31</u> | <u>Sept. 1-15</u> | <u>Sept. 16-30</u> | <u>Oct. 1-15</u> | <u>Total</u> |
|-------------------------|------------------|------------------|-------------------|------------------|-------------------|--------------------|---------------------|-------------------|--------------------|------------------|--------------|
| Upstream | 4 | 16 | 51 | 39 | 25 | 24 | 10 | 3 | 3 | - | 175 |
| Downstream | - | 3 | 2 | - | 13* | 2 | 11* | 1 | 4 | 7 | 43 |
| No Movement | 145 | 31 | 76 | 36 | 6 | 83 | 56 | 1 | 1 | - | 435 |
| Both Ways | - | - | - | 4 | - | 9 | 5 | 1 | 16 | 1 | 36 |
| | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> |
| | 149 | 50 | 129 | 79 | 44 | 118 | 82 | 6 | 24 | 8 | 689 |

*Movement downstream of one mile-possible effects of the tagging operation.

Table 5. 1959 Tag Returns Collected from the Chatanika River
During the Summer of 1960.

| <u>Type of Movement</u> | <u>May 15-31</u> | <u>June 1-15</u> | <u>June 16-30</u> | <u>July 1-15</u> | <u>July 16-31</u> | <u>August 1-15</u> | <u>August 16-31</u> | <u>Sept. 1-15</u> | <u>Sept. 16-30</u> | <u>Oct. 1-15</u> | <u>Total</u> |
|-----------------------------|----------------------|----------------------|-----------------------|----------------------|-----------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|--------------|
| Upstream | 2 | 1 | - | 6 | - | 1 | 1 | 1 | - | - | 12 |
| Downstream | 3 | | 7 | 2 | 1 | 2 | - | 4 | 1 | 1 | 21 |
| No Movement | 6 | 9 | 2 | 16 | 3 | 28 | 11 | 60 | 42 | 5 | 182 |
| Both Ways | - | - | - | - | - | - | - | - | 1 | - | 1 |
| | <u>11</u> | <u>10</u> | <u>9</u> | <u>24</u> | <u>4</u> | <u>31</u> | <u>12</u> | <u>65</u> | <u>44</u> | <u>6</u> | <u>216</u> |

road passes over the main River at one point and hits many of the small tributaries. This gives the fisherman many access areas. However, utilization of the fishery remains low. The high water conditions found in the Spring and Fall reduce the number of anglers willing to "try their luck". In addition, the moose season diverts their attention away from fishing in the Fall.

Recommendations:

To continue and expand the tagging program already established in the Delta Clearwater, Chatanika River, Goodpaster River, Shaw Creek and Richardson Clearwater.

Attempt to collect additional information concerning the movements of grayling from the Goodpaster River into the Delta Clearwater.

Establish, if possible, the percentage of young grayling lost during their Fall downstream movement because of water diversion into the Davidson Ditch-Chatanika River.

Tag grayling in Shaw Creek and the Tanana River slough during the Spring spawning run to determine what percent of the Shaw Creek run actually moves up the slough to utilize the Shaw Creek spawning sites.

Open all water areas of the Tanana River watershed to year round grayling fishing. This recommendation would only affect two areas now closed in the Spring - Fielding and Tangle Lakes.

Raise to 15 the present 10 per-day bag limit for the Tanana River watershed.

Drop the 20-inch size restriction for the grayling only in the Tanana River watershed.

Submitted by:

Approved by:

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15 May 1961

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