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STATE OF ALASKA  
Walter J. Hickel, Governor

ANNUAL REPORT OF PROGRESS, 1967 - 1968

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-9

SPORT FISH INVESTIGATIONS OF ALASKA

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## INTRODUCTION

This report of progress consists of findings and work accomplished under the State of Alaska Federal Aid in Fish Restoration Project F-5-R-9, "Sport Fish Investigations of Alaska."

The project during this reporting period was composed of 21 separate studies. Of these, seven jobs continued the inventorying and cataloging of the numerous waters, providing a comprehensive index of the State's recreational waters. Nine jobs accomplished special studies involving Dolly Varden, grayling, silver salmon, king salmon and sheefish, among others. The remaining five jobs are designed to accomplish creel census, migration, access and silver salmon egg-take studies. The egg-take study, Job 7-F, was inactive because egg-takes were accomplished under other projects.

Special reports on specific phases of the Dolly Varden Life History Study have been published in the Department's Research Report series.

The information gathered from all of these studies provides the background necessary for better management and assists in development of future investigational studies.

The subject matter contained within these reports is often fragmentary in nature. The findings may not be conclusive and the interpretations contained therein are subject to re-evaluation as the work progresses.

## RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.

Project No: F-5-R-9 Title: Sheefish and Pike Investigations of the Upper Yukon and Kuskokwim Drainages with emphasis on Minto Flats Drainages.

Job No: 17-B

Period Covered: July 1, 1967 to June 30, 1968.

## ABSTRACT

This report presents information on the biological and ecological study of the sheefish (inconnu), Stenodus leucichthys nelma (Pallas), and the northern pike, Esox lucius (Linnaeus), in Interior and Arctic Alaska.

In 1967 sheefish research consisted of collecting information on movements and run-timing, spawning, food habits, age and growth and an experimental egg take. The pike research project in the Minto Flats was initiated in 1967 with major emphasis on an age and growth study, sport fishery, and food habits.

Sheefish movements were studied by direct observation and through a tagging program. During 1967, 239 sheefish were tagged and released in the study areas. Tag recoveries in the Kobuk-Selawik drainage provided preliminary information on sheefish movements in Northwest Alaska.

Limited food habits data indicate that northern pike fingerlings are the most important summer food item of Minto Flats sheefish, while Holitna River sheefish feed mainly on three species of salmon fingerlings.

Comparison of growth of sheefish from four Alaska populations indicates relatively rapid growth and a short life span for fish from the Holitna River, Koyukuk River, and Minto Flats area; but slower growth with a longer life span for Kobuk River fish.

Sheefish in the Koyukuk River spawn in the vicinity of Hughes in late September and early October. In 1967 spawning was observed along four spawning bars in this area.

A sheefish egg take was conducted on the Koyukuk River on October 1. Eggs were incubated at the Fire Lake Hatchery. The majority hatched in early March. After hatching, 2,100 fry were placed in aquaria at the Alaska Water Laboratory. Fry survival at four weeks was close to 100 percent.

Pike in the Minto Flats grow slowly with fish 64 cm in length averaging 10 years of age. A 15-pound pike from the Flats averages from 17 to 18 years old.

The summer diet of Minto Flats pike is composed mainly of small pike.

The Minto Flats sport fishery is one of the most productive in the State and pike over 15 pounds in weight are common.

## RECOMMENDATIONS

Primary objectives of sheefish research in 1968-69 should be an increased tagging program and to obtain estimates and indices of spawning populations of sheefish.

Since large numbers of sheefish in the Selawik-Kobuk drainage could be easily tagged and since these fish are more subject to recapture than sheefish in other drainages, it is suggested that more sheefish be tagged in these areas in cooperation with the Division of Commercial Fisheries.

An effort should be made to obtain estimates of sheefish spawning populations through construction of a weir and use of aerial survey in conjunction with the tagging program.

It is recommended that the egg take project be continued and enlarged. Techniques for artificial rearing should be refined and suitable areas accessible to population centers should be located for experimental stocking of sheefish fry and fingerlings.

With the possible inauguration of ferry service between Dawson and Circle, the sport fishing possibilities on tributary streams of the Yukon River in this area should be investigated. Data on sheefish subsistence and sport take should be collected and, in addition, educational efforts should be made to acquaint the public with the sport fishing potential of the sheefish.

The pike study should continue in the Minto Flats area, with emphasis on the sport fishery, and be expanded to include other upper Tanana River waters for comparative data.

#### OBJECTIVES

1. To become more familiarized with the study area and to locate suitable populations of these species of fish, with emphasis on studying patterns of movements and the timing of migrations.
2. To determine spawning dates, areas, pre- and post-spawning movements, and rearing areas.
3. To compare age and growth rates of fish from different waters of the study areas.
4. To determine the feasibility of a sheefish egg take and to develop artificial rearing techniques.
5. To assess the present and potential sport fisheries of these species in the study areas.

#### TECHNIQUES USED

Pike used in the present study were taken by hook and line and gill net. Sheefish were captured by hook and line, beach seine, and 5-, 6-, and 8-inch stretch mesh gill nets of 60- to 100-foot lengths. In the Minto Flats, sheefish taken by set gill net suffered 100% mortality due to the high water temperature. Trolling proved quite successful but the catch per effort was low. A technique was perfected whereby the sheefish feeding near the surface of the water in the center of the channel could successfully be taken alive by drifting an 80-foot, 5-inch stretch mesh gill net in the slow moving waters of the Tolovana River.

Sheefish were tagged with yellow spaghetti tags in all study areas except the Holitna River where Peterson disc tags were used. Pike were tagged with steel jaw tags.

Scale samples and length and weight data were collected. When possible, data on food habits and maturity were collected from the specimens taken.

Data were collected on other fish species as time permitted.

## FINDINGS

### Study Areas

Sheefish research in 1967 was conducted in the Chatanika and Tolovana Rivers in the Minto Flats area, the Holitna River, Koyukuk River, and Kobuk River (Figures 1, 2, and 3). Pike research was confined to the Minto Flats area.

A trip was taken to the Nowitna River in late September, but no sheefish were taken either by hook and line or gill net. It was decided to temporarily drop the Nowitna River as a study area since the period of reported greatest sheefish abundance in the Nowitna River conflicts with the spawning dates on the more accessible Holitna, Koyukuk, and Kobuk Rivers.

The Minto Flats study area was reached by motor vehicle and riverboat, while other study areas were reached by commercial airline and short boat trip.

### SHEEFISH INVESTIGATIONS

#### Movements and Run-Timing

##### Minto Flats Area:

Sheefish were reportedly taken in the lower Tolovana River in late May and early June. An immature sheefish was taken in the Chatanika River at the mouth of Goldstream Creek on June 19.

A well defined sheefish upstream migration was observed from June 19 to July 13, travelling mainly up the Tolovana River then into the Chatanika River. The progress of these sheefish could be followed because the fish were feeding heavily on northern pike fingerlings near the surface of the water.

The run appeared to be the heaviest the nights of June 21, 22 and 23, between 6:30 and 10:30 p.m., and it is estimated by visual observation that over 100 sheefish a night were passing upstream. Some of these fish did not enter the Chatanika but continued up the Tolovana. It is not known if sheefish spawn in the Tolovana River.

Most of the fish taken in the Minto Flats area were mature. The spawning run continues up the Chatanika River and reaches the vicinity of the Elliott Highway bridge in late August and September.

Spawning occurs in the upper Chatanika River in early October. The fish then migrate downstream and probably overwinter in the lower Tolovana or Tanana River. Nineteen sheefish were tagged in late June and July, 1967 in an effort to further document sheefish movements (Figure 1). In conjunction with this, a weir was constructed across the upper Chatanika River at the Elliott Highway bridge in early August. The main objectives of the weir were to tag and enumerate all spawning sheefish. The weir was washed out by the Fairbanks flood, but will be rebuilt in 1968.

##### Holitna River:

With little time spent on the Holitna River in 1967, no definite idea of sheefish movements could be formulated. In general, sheefish enter the Holitna River in June and both mature and immature fish are available to fishermen in June and July. The spawning population proceeds upriver later in the summer.

Sampling the sheefish population 17 miles upriver from the mouth of the Holitna River from July 21 to 24, yielded 91 sheefish. Of this sample 86 were tagged. The one tag recovery made at Napakiak, 300 river miles below Sleetmute, in October substantiates the belief that Holitna River sheefish overwinter in the lower Kuskokwim River area.

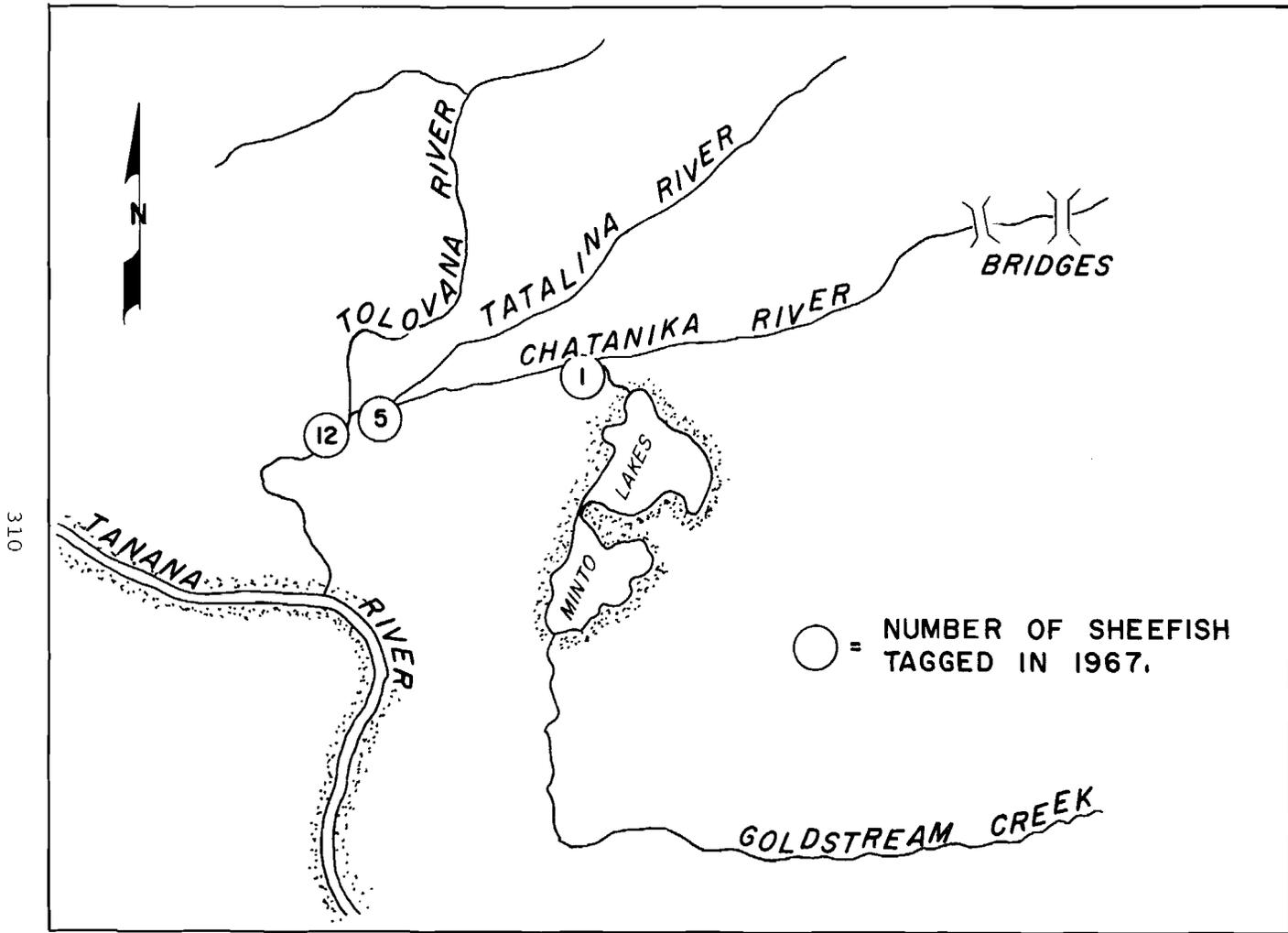


FIGURE 1. MINTO FLATS STUDY AREA SHOWING 1967 TAGGING LOCATIONS.

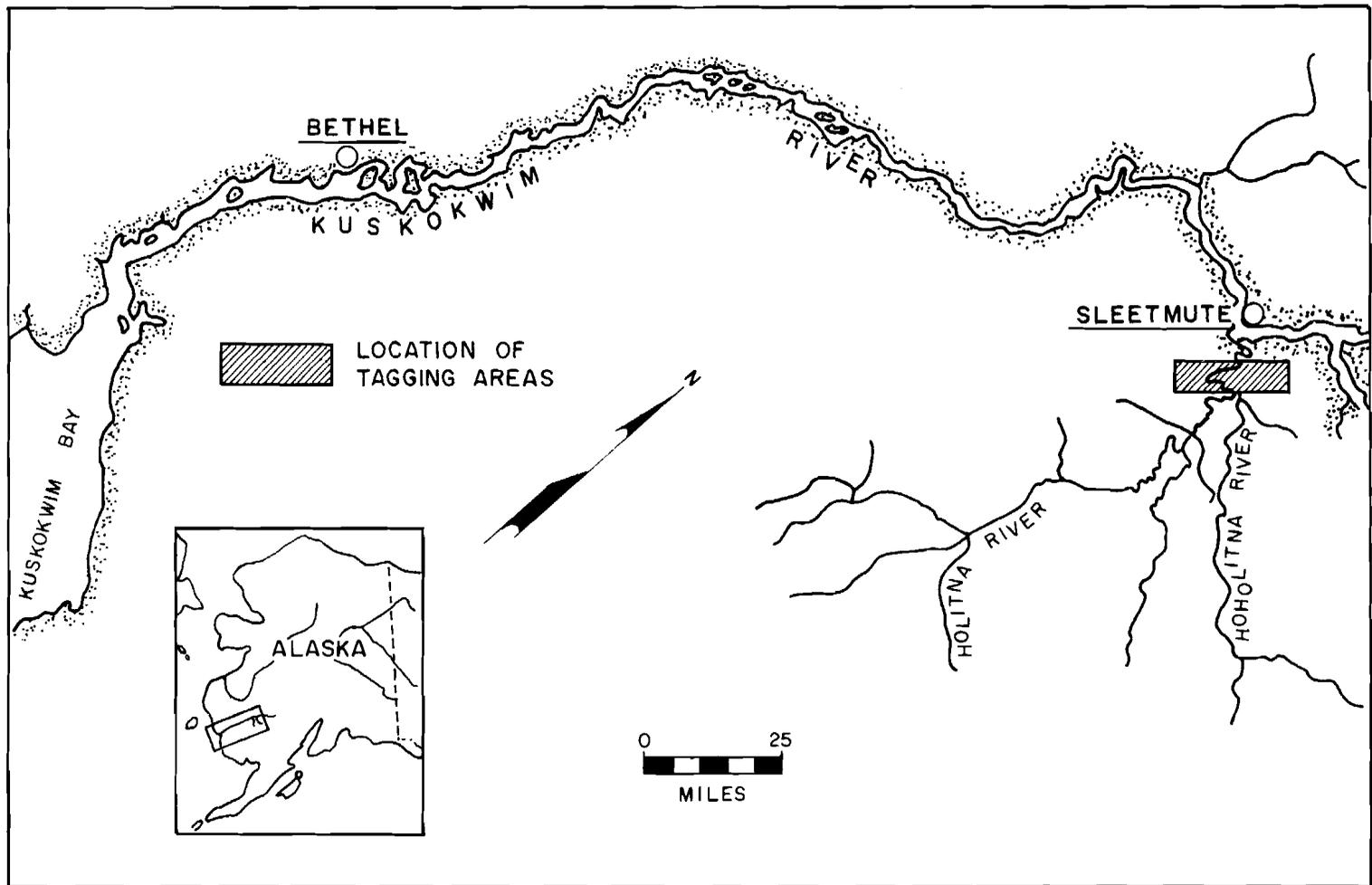


FIGURE 2. HOLITNA RIVER STUDY AREA SHOWING LOCATION OF SHEEFISH TAGGING AREAS.

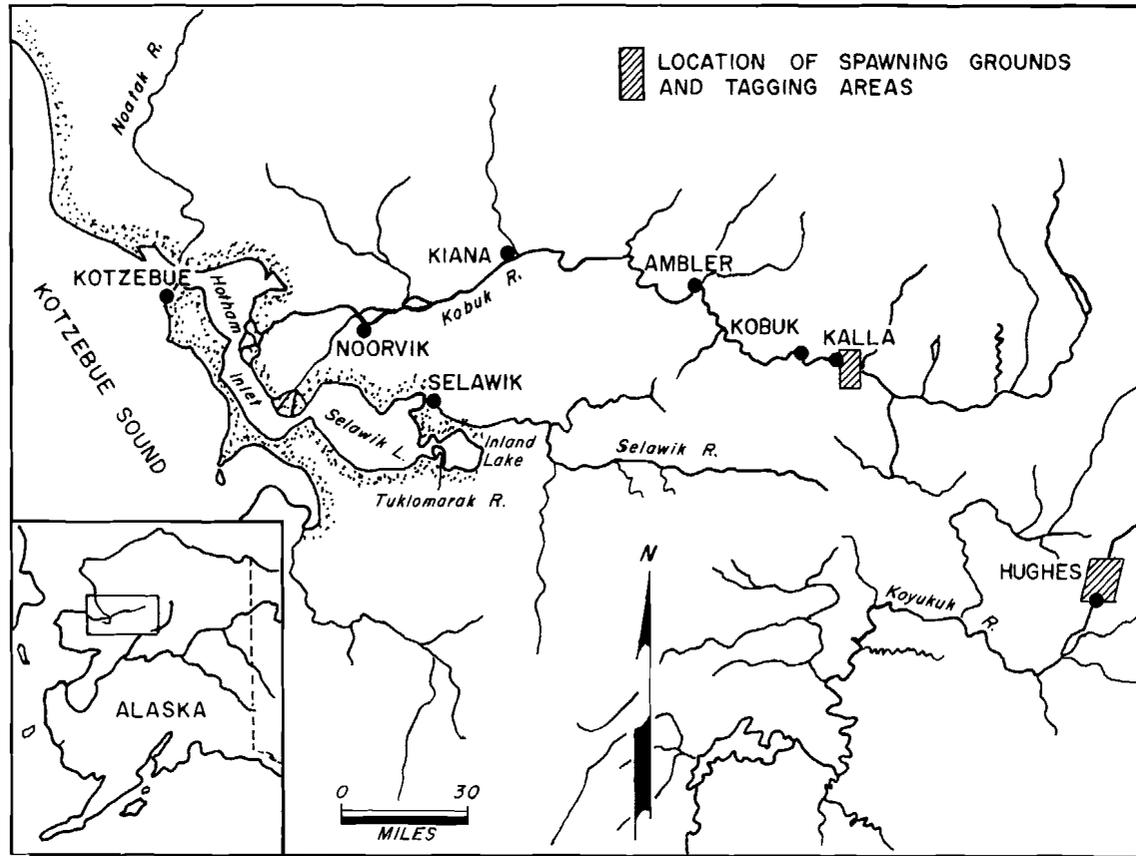


FIGURE 3. MAP OF KOBUK AND KOYUKUK RIVERS SHOWING SPAWNING GROUNDS AND TAGGING LOCATIONS.

Koyukuk River:

According the subsistence fishermen of Hughes and Allakaket, sheefish pass Hughes moving up the Koyukuk River in August. Once the fish reach the vicinity of Allakaket, they reportedly turn around and head downstream to spawn. Sheefish have been reported as far as 50 miles up the Alatna River in early September. Nineteen sheefish were tagged on the Koyukuk River spawning grounds in late September and early October 1967. In 1968, more emphasis will be placed on documenting movements of these fish by tagging and by observing the spawning run upriver from Hughes.

Kobuk River Tagging Data:

The 115 sheefish tagged on the spawning grounds in the Kobuk River in 1967 were tagged in cooperation with the Division of Commercial Fisheries. Forty sheefish were tagged in 1966 by the Division of Commercial Fisheries (Mike Geiger, pers. comm.). As of December 1, 1967, 11 of the fish tagged in 1966 and 13 of those tagged in 1967 had been recaptured by subsistence fishermen along the Kobuk River and in Selawik Lake. These Kobuk tag recoveries provided information on the timing of the downstream postspawning migration and the subsequent upstream migration the following year. Of the sheefish tagged in 1966, three were recaptured on the spawning ground in 1966, five were recaptured at Noorvik and Kiana in mid-June 1967, two were recaptured on Selawik Lake in 1967, and one was recaptured on the spawning ground in 1967 (Figure 3).

The 13 fish tagged and recaptured in 1967 were taken by subsistence fishermen on the spawning grounds and during the postspawning downstream migration. The recapture of two tagged fish in Selawik Lake indicated at least some movement of sheefish between the Selawik and Kobuk drainage.

Age and Growth

Scales from 495 sheefish (50 from the Minto Flats, 87 from the Holitna River, 86 from the Koyukuk River, and 272 from the Kobuk River) were examined in a study to determine sheefish age, longevity, age at sexual maturity, and to compare length and weight range of fish from all four areas.

Sheefish from the Minto Flats ranged in size from 53 to 89 cm fork length with a weight range of 4 to 20 pounds; the Holitna River sample was 53 to 92.5 cm in length with a weight range of 3.5 to 19 pounds; the Kobuk River sample contained fish from 59 to 118 cm in length weighing 5 to 49 pounds; and fish from the Koyukuk River ranged in length from 60 to 103 cm and in weight from 4.5 to 24 pounds.

Since very few sheefish less than six years of age were taken, fork length at the end of each year of life was back calculated according to the method of Van Oosten (1929). The main advantage of using the back calculation method is that, in the absence of the younger age classes, one can determine rate of growth during the early years of life.

Table 1 shows the age composition of sheefish from the various study areas.

TABLE 1. Age Composition of Sheefish Taken in the Study Area in 1967.

Age	Minto Flats	Holitna River	Koyukuk River		Kobuk River	
			Male	Female	Male	Female
III		1				
IV		1				
V	3	3				
VI	13	9	1			

TABLE 1 (Cont.) - Age Composition of Sheefish Taken in the Study Area in 1967.

<u>Age</u>	<u>Minto Flats</u>	<u>Holitna River</u>	<u>Koyukuk River</u>		<u>Kobuk River</u>	
			<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
VII	16	29	3		10	
VIII	11	29	16	7	32	
IX	2	6	6	15	19	1
X	4	7	4	19	14	1
XI	1	1		9	23	7
XII				4	19	9
XIII				2	9	24
XIV		1			6	41
XV						21
XVI						11
XVII						11
XVIII						7
XIX						4
XX						2
XXI						1
	50	87	30	56	132	140

It is felt, with the possible exception of the Holitna River population, that maximum ages of sheefish as given in Table 1 closely approximate the actual longevity of sheefish in these populations. Sheefish in the Koyukuk and Kobuk sample were taken on the spawning grounds and all were sexually mature. The majority of fish from the Minto Flats and Holitna River sample were also sexually mature. Age at sexual maturity for sheefish ranges from 5 to 9 years for males and 8 to 11 years for females.

The whereabouts of the younger age classes of sheefish in the study areas have still not been located.

Figure 4 compares the growth rates of sheefish from the four study areas. Growth rate tables, from which the data for Figure 4 were taken, were compiled for all study areas, but are not included in this report (Table 2).

TABLE 2. Sheefish Age and Growth Increments by Study Area, 1967.

<u>Age</u>	<u>Holitna River</u>	<u>Minto Flats</u>	<u>Kobuk River</u>	<u>Koyukuk River</u>
1	19.7	16.1	16.1	14.6
2	13.2	11.7	8.7	9.0
3	9.5	8.6	6.6	7.3

TABLE 2 (Cont.) - Sheefish Age and Growth Increments by Study Area, 1967.

<u>Age</u>	<u>Holitna River</u>	<u>Minto Flats</u>	<u>Kobuk River</u>	<u>Koyukuk River</u>
4	7.5	8.4	5.8	7.6
5	6.5	7.2	5.8	7.5
6	5.7	6.1	5.5	7.4
7	5.0	4.9	5.6	6.7
8	5.3	4.8	5.1	7.4
9	5.7	4.5	5.1	5.8
10	1.4	6.6	5.3	5.7
11			5.1	5.5
12			4.9	6.0
13			5.0	3.7
14			4.8	
15			4.4	
16			4.3	
17			3.8	
18			4.4	
19			2.5	

In general the sheefish populations studied exhibit a rapid rate of growth during the early years of life. Then, at age III, growth rate levels off and decreases slowly thereafter.

The differences in growth rates during the first few years of life between the various populations of sheefish may be due to availability of food or it may be genetic, but until the rearing areas of the respective populations are located one can only speculate on the apparent differences.

Sheefish from the Kobuk River exhibit a slower rate of growth than sheefish from other areas but, because of their longer life span, attain a larger size.

#### Food Habits

Minto Flats sheefish taken during the summer were feeding heavily on northern pike in the Tolovana River.

Fifteen of the 19 stomachs examined from June 21 to July 28 contained food consisting exclusively of small pike. An average of 10 juvenile pike was found in the stomach of each feeding sheefish.

Sheefish taken 17 miles up the Holitna River in late July were feeding heavily on salmon fingerlings. Salmon fingerlings identified in the stomach samples examined included silver salmon, pink salmon, and chum salmon.

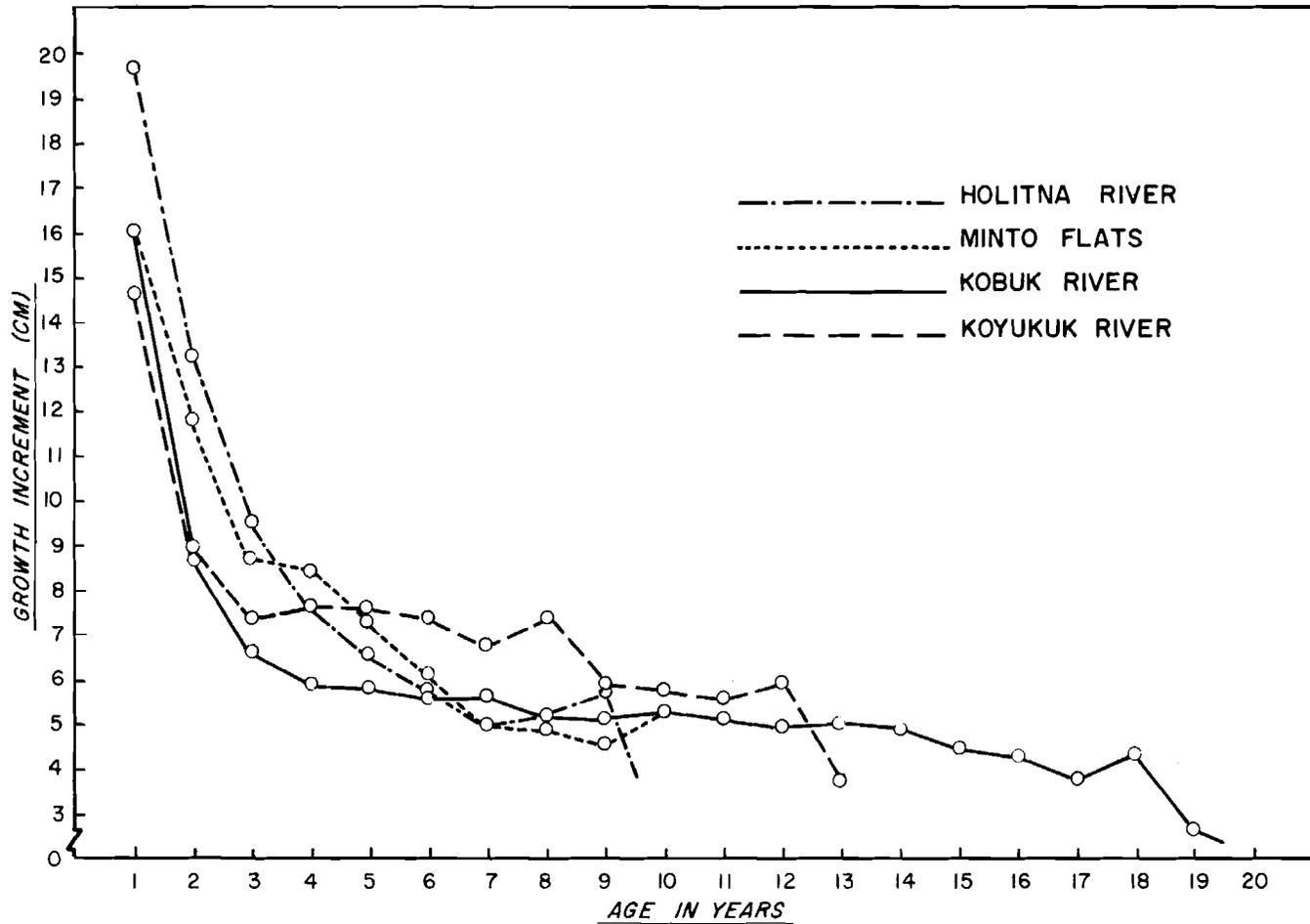


FIGURE 4. AVERAGE ANNUAL INCREMENT OF FORK-LENGTH GROWTH FOR ALASKAN SHEEFISH.

Sheefish taken in the Koyukuk and Kobuk Rivers were on the spawning grounds and were not feeding.

#### Spawning - Koyukuk River

Sheefish in the Koyukuk River spawn in the vicinity of Hughes, approximately 300 miles upstream (Figure 3). In 1967 sheefish began spawning on September 28 and most spawning had been completed by October 2.

The peak of the spawning occurred on September 30 and October 1, with the main activity occurring between 6 and 8:30 p.m. Water temperature at time of spawning ranged from 4.8 to 4.3°C (40.75 to 39.75°F). The four spawning grounds found in 1967 were located 8 miles, seven miles, and six miles above Hughes, and immediately in front of the village of Hughes.

Females on the spawning grounds ranged in weight from 8.75 to 24 pounds. Fecundity studies on five Kobuk River spawning sheefish indicated a range of 167,000 eggs for 18.5-pound sheefish to 315,600 for a 34.25-pound female. The eggs comprise about 20 percent of body weight of spawning females. Sheefish eggs (average diameter 2.5 mm) run approximately 36,000 to 42,000 eggs to a pound. It is possible that the smaller spawning females from the Koyukuk River would have eggs of smaller size and therefore more to a pound.

Spawning behavior is similar to that described by Alt (1967) in the Kobuk River. Females spawn on the surface of the water and males follow underneath and fertilize the eggs. Bottom composition is of differentially sized coarse gravel which seems to be a prerequisite for location of a spawning area. Since the current in the Koyukuk River spawning areas is slower than in the Kobuk River, the majority of the Koyukuk River spawning bars are located over rapids 4 1/2 to 8 feet deep. It is likely that these areas are ice free during the development period of the egg.

Little information on the downstream postspawning migration was obtained but, as in the Kobuk River, the migration is quite rapid.

It is hoped that future observations and tagging efforts will reveal if these sheefish overwinter in the delta area of the Yukon, as is suspected because of their rapid growth.

#### Egg Take

An experimental egg take on the Koyukuk River was successfully conducted on October 1, 1967. The three females (two partially spent) and five males (all partially spent) used for the egg take were taken from the spawning grounds eight miles above Hughes by hook and line. Eggs were stripped from the two partially spent females while the third female had to be cut open as the eggs could not be stripped. Approximately 70,000 eggs were taken.

The main trouble encountered in the operation was that the eggs clumped together after being water hardened. On three jars of eggs, clay was added to prevent clumping. The fourth jar was rotated gently at short intervals for three hours, after which no clumping was observed. Water was changed regularly and the eggs were kept at Hughes until October 3 as no plane was available to take the eggs to the hatchery and no females could be captured after October 1.

A portion of the eggs was placed in Downing jars to eye, but because of the small volume of eggs it was not possible to obtain a good pattern of egg movements in the jars. The remainder of the eggs were placed on screened trays but a fungus growth killed a large number of eggs. All the above difficulties were in part responsible for a 61 percent egg mortality at eyeing.

Water temperature during incubation ranged from 6.7°C (44°F) to 2.8°C (37°F). The majority of fish hatched on March 3 and 4 although some pre-matures were appearing as early as January 20. Hatching success was approximately 35 percent. The fry upon hatching numbered approximately 37,000 to the pound. Immediately after hatching 2,100 fry were placed in aquaria at the Alaska Water Laboratory, College, in an attempt to artificially rear the

young sheefish. The yolk sac had been completely absorbed within 10 days after hatching.

The fry were placed in three separate aquaria with one lot being fed brine shrimp, one lot a culture of algae and protozoa, and the third lot Abernathy mash. Water temperature in all tanks was 6.7°C (40°F) at the start of the experiment and raised to 5.6°C (42°F) after 16 days. On March 25, 22 days after hatching, the fry averaged 14 mm standard length. Scales were not present at this time. The objective of the experiment is to compare growth obtained from hatchery food versus natural food.

It appears that the immediate objectives of the egg take study have been accomplished and that it will be possible to raise sheefish, at least in small numbers, on both hatchery feed and natural food.

### The Sport Fishery

The sheefish, while becoming better known to Alaskan sport fishermen, is still relatively unknown to anglers in other states.

Since most populations of sheefish in Alaska are only accessible by plane and boat, it is difficult to collect creel census information on them.

A limited creel census in the Minto Flats in 1967 revealed that sport fishermen took 15 sheefish in July. In addition, Sport Fish personnel took 24 sheefish by hook and line. Trolling with daredevils seemed to be the most productive sport means of taking sheefish in the Minto Flats in 1967. Little information is available on the sport take on the upper Chatanika River in late fall or on the sport take on the Holitna, Koyukuk, or Kobuk Rivers. Parties of sport fishermen travelling to the Holitna River at Sleetmute in June and July reported good catches of sheefish.

## PIKE INVESTIGATIONS - MINTO FLATS

### Introduction

With the rapid acceptance of the northern pike, (Esox lucius), as a sport fish in Interior Alaska and with the growing number of boats and small planes being used to reach virgin fishing areas, the Minto Flats area west of Fairbanks is becoming increasingly popular as a sport fishing area. This area has a large pike population and contains many trophy sized pike over 15 pounds in weight.

Little information is available concerning the biology and ecology of pike in the Minto Flats and other Alaskan waters. Pike research in the Minto Flats in 1967, carried out in conjunction with sheefish research, was concerned mainly with determining pike growth rate.

Scale samples were collected from 339 pike in 1967. The majority of the fish were collected by hook and line. Stomachs were examined from 87 pike in the food habits study. Creel census information was collected whenever possible.

### Movements

Pike were present in the Minto Flats when field work commenced in late May. Spawning had occurred by this time. It is not known whether pike overwinter in the Minto Flats area or drop down into the Tanana River. Dissolved oxygen checks at four locations on the lower Tolovana and Chatanika Rivers in late February showed oxygen concentrations ranging from 5 ppm at the mouth of the Tolovana River to 2 ppm at the mouth of the Chatanika River.

Pike are available in the Minto Flats area during the summer and fall. The movement in the Flats during the summer appears to be random. Two hundred and two pike were tagged with jaw tags at the junction of Goldstream Creek with the Chatanika River; the junction of Chatanika River and Tatalina River; the junction of Tatalina-Chatanika with the Tolovana River; the Rock Island Slough. Of the four tagged fish recovered, two were recovered in the same area while the others were recovered only a few miles away.

TABLE 3. Length and age of 100 pike taken in Minto Flats, Alaska in 1967.

Age at Capture	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>	<u>VII</u>	<u>VIII</u>	<u>IX</u>	<u>X</u>	<u>XI</u>	<u>XII</u>
Frequency	10	4	1	0	4	2	4	8	6	8	6	9
Length range each age class (cm)	12.5 to 19.0	19.5 to 24.0	31.0	-	37.6 to 45.8	48.0 to 55.0	50.1 to 57.9	47.5 to 60.0	54.0 to 69.8	56.5 to 69.5	62.5 to 73.4	69.6 to 77.8
Mean Length of each age class (cm)	16.8	21.7	31.0	-	41.9	51.5	52.3	53.8	61.2	62.6	67.9	73.4
<u>Continued</u>												
Age at Capture	<u>XIII</u>	<u>XIV</u>	<u>XV</u>	<u>XVI</u>	<u>XVII</u>	<u>XVIII</u>	<u>XIX</u>	<u>XX</u>	<u>XXI</u>	<u>XXII</u>	<u>XXIII</u>	
Frequency	6	7	3	2	7	4	2	2	2	2	1	
Length range each age class (cm)	70.2 to 87.5	75.3 to 88.4	77.7 to 88.8	81.0 to 88.3	83.1 to 94.6	93.2 to 97.8	91.5 to 104.1	97.5 to 104.0	98.0 to 99.1	93.9 to 98.0	106.5	
Mean length of each age class (cm)	77.3	81.1	84.8	84.6	89.1	95.1	97.8	100.7	98.6	96.0	106.5	

Little is known concerning pike movements on the spawning grounds in the Minto Flats. Spawning occurs after breakup in the vast complex of lakes and sloughs in the Flats.

#### Age and Growth

A sample of scales from 100 pike was read using a Baush and Lomb Micro-projector. Since the annuli were difficult to distinguish, alternate methods of determining age were attempted. The use of otoliths and cross sections of dorsal fin rays was tried, but with little success.

The results of the age and growth study are presented in Table 3. The wide length range of each age class is probably as much a function of the aging technique as the variability of rate of growth. Pike from the Minto Flats grow very slowly with a 64 cm 5-pound pike averaging 10 years of age. For some reason growth is very slow from age VI through X.

Rate of growth of Minto Flats pike agrees quite closely with data of Miller and Kennedy (1948) from Great Bear and Great Slave Lake, Canada. A 10-pound pike from Minto will average 85 cm fork length (33.5 inches) and be 14 to 15 years of age; a 15-pound pike will average 94 cm in length (37.2 inches) and be 17 to 18 years old; and a 20-pound pike will average 101 cm in length (39.7 inches) and be 19 to 21 years old.

Miller and Kennedy (1948) state that some males are mature at age V and some females mature at age VI and that all pike are mature at age IX in Great Bear Lake, Canada. The youngest mature male pike from Minto Flats was a 1.5-pound 48 cm fish of age VI. A seven- and ten-year-old female (2 and 3 pounds respectively) were immature while another ten-year-old female (5.5 pounds) was mature.

#### Food Habits

Results of stomach analysis of Minto Flats pike show them to be highly cannibalistic during the summer and fall.

Fifty-two of 87 stomachs examined between June 27 and October 10 contained food. The breakdown was as follows: 41 stomachs contained 150 pike, 10 contained 18 whitefish (*C. sardinella* and *C. lavaretus*), 3 contained 4 ducklings, 2 contained 3 shrews, 2 contained 3 blackfish, 1 stomach contained a burbot, and 1 contained a dragonfly. In early summer the diet consisted almost exclusively of small pike.

#### The Fishery

Presently the Minto Flats pike sport fishery is one of the most productive in the State. The area is accessible either by a 30-minute plane flight from Fairbanks or a riverboat trip from Nenana. This factor is responsible for the low number of fishermen utilizing the area and the resultant high angler success.

A partial creel census (contacting approximately 50% of the fishermen) was conducted during July 3 to 21. The 46 fishermen contacted had retained 86 pike and 15 sheefish. Approximately four pike are released for each pike retained. The better producing sport fishing areas are Rock Island Slough, the junction of Tolovana and Chatanika Rivers, the junction of Chatanika River and Goldstream Creek, the Cache, and the Minto Lakes.

The Minto Flats area contains a large number of "trophy" pike (over 15 pounds). In July, seven trophy pike were retained by Minto Flats sport fishermen during the creel census period. Of the 339 pike used in this study 11 weighed 15 pounds or more. These large fish are especially vulnerable in some areas, and at certain times it is possible for an angler to harvest 150 years of northern pike growth in a single day's bag.

Since, as was learned in our age and growth study, pike in the Minto Flats grow at such a slow rate, it is felt that fishing under present regulations might lead to overexploitation of the trophy sized pike. In the Minto

Flats a 15-pound pike is between 17 and 18 years old (approximately 94 cm fork length) while a 20-pound pike is 19 to 23 years old.

In the future, fishing pressure in this area will probably increase and in order to insure that trophy pike will be available to the greatest number of sport fishermen, it will be necessary to limit the take of these larger pike. Since the majority of Minto Flats pike do not live to trophy size, the numerous small pike (10 pounds) could be harvested at present levels.

LITERATURE CITED

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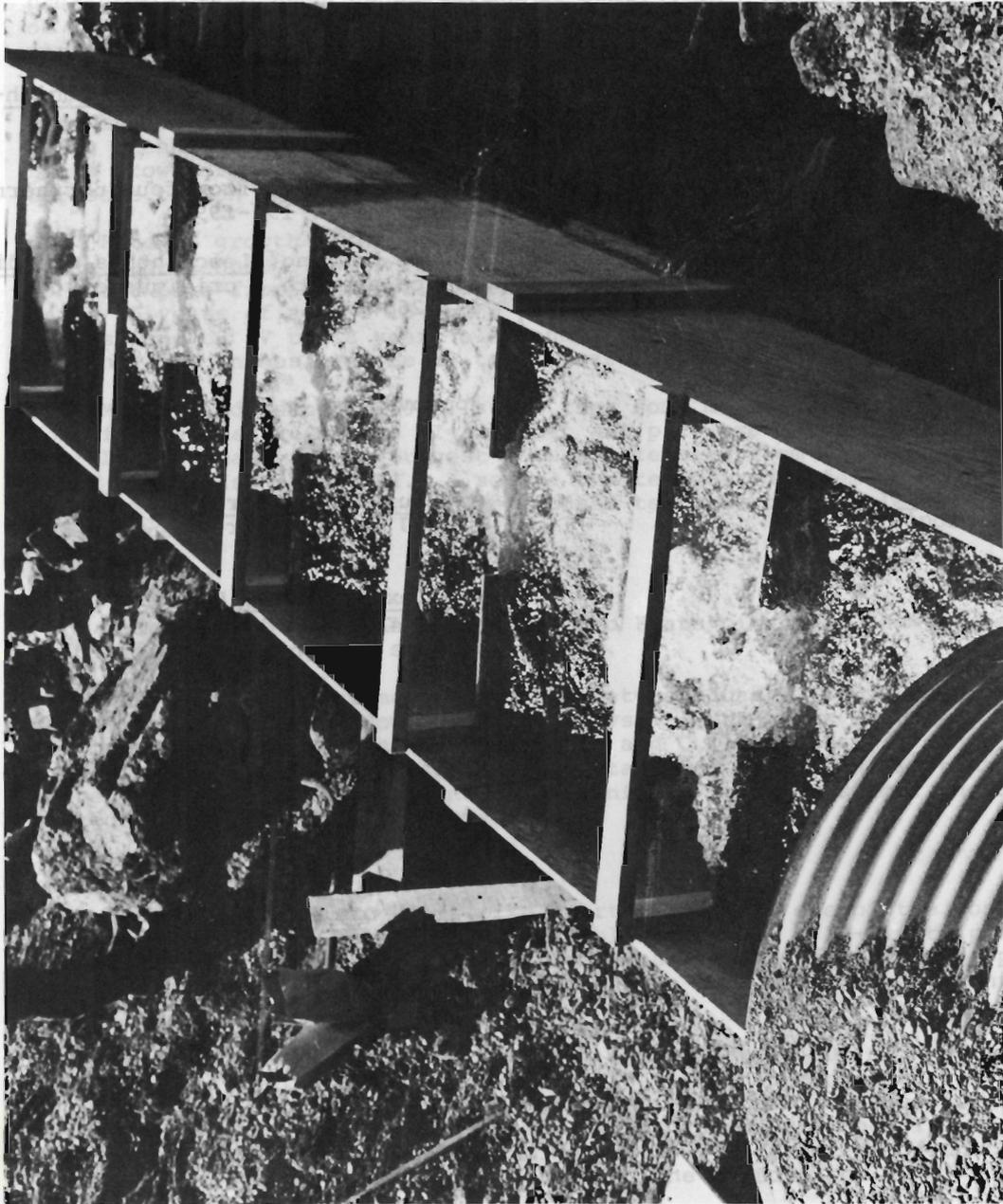
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A Temporary Fish Ladder Constructed in Cooperation with a Local Sportsman's Club, which will Allow Anadromous Cutthroat to Reach Their Spawning Grounds Above a Culvert Washout.

The Minto Flats area contains a large number of "trophy" pike (over 15 pounds). In July, seven trophy pike were retained by Minto Flats fishermen during the creel census period. Of the 339 pike used in this study, 21 weighed 15 pounds or more. These large fish are generally captured