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KOTZEBUE SOUND SHEEFISH INVESTIGATIONS

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(From AYK Area 1968 Anadromous Fish Investigations)
Annual Technical Report

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1968 ATR
AYK Sheefish

KOTZEBUE SOUND SHEEFISH INVESTIGATIONS, 1968

INTRODUCTION

Sheefish or innconu (Stenodus leucichthys), a member of the whitefish family Coregonidae, are distinguished by a large mouth, extended lower jaw and large scales. Much larger than whitefish, they often weigh as much as 50 to 60 pounds. Sheefish are distributed throughout Arctic North America and Siberia. In Alaska sheefish are found primarily in the Kuskokwim, Yukon, Selawik and Kobuk River drainages. Sheefish are considered anadromous in Alaska waters although resident populations are known to occur in the upper Yukon River system.

In the Kotzebue Sound area, sheefish are found in the Kobuk and Selawik Rivers. After breakup of the river ice in late May or early June, sheefish ascend the Kobuk and Selawik Rivers and during late September spawn in the upper reaches of these main rivers. Following spawning, sheefish move downstream into the brackish-saline waters of Hotham Inlet, Kobuk Lake and Kotzebue Sound and spend 7 to 8 months there.

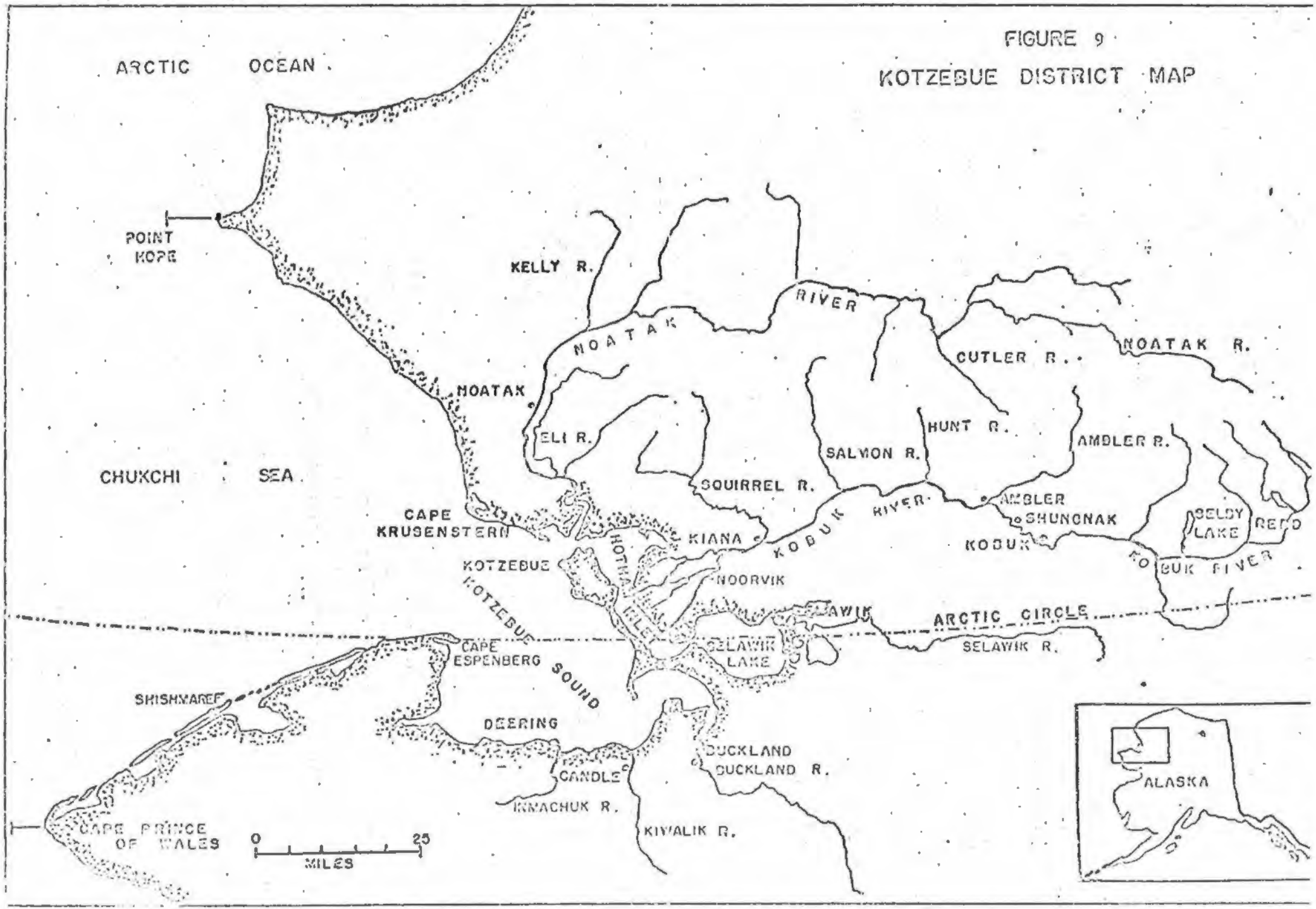
Residents of the Kotzebue Sound area (see Map, Figure 9) utilize sheefish for subsistence purposes. Subsistence fishermen along the Kobuk River take moderate amounts of sheefish with gill nets as they migrate upstream toward their spawning grounds and also capture sheefish with gill nets during the post-spawning downstream migration period. Also, some residents of the upper Kobuk River harvest sheefish near the spawning grounds with beach seines. In the Selawik area, fishermen take sheefish with gill nets and by jigging with lures under the ice in the Selawik Lake-Inland Lake area.. Kotzebue residents take sheefish for subsistence under the ice with gill nets and by jigging with lures.

A limited commercial fishery exists near the village of Kotzebue. About 10 to 20 fishermen using set gill nets and by jigging with lures through the ice take sheefish in small quantities for primarily the local markets in northwestern Alaska. A few sheefish are shipped to stores in Anchorage and Fairbanks. To date lack of adequate processing and cold storage facilities along with a very limited market has restricted expansion of the commercial fishery.

A slowly developing interest in taking sheefish for sport fishing is occurring. Sheefish are often difficult to land once hooked, especially the larger fish. The best sport fishing areas are located near Selawik after breakup in the spring and in the fall on the upper Kobuk River.

FIGURE 9

KOTZEBUE DISTRICT MAP



OBJECTIVES

Basic life history studies of the Kotzebue sheefish populations and accurate records of the subsistence and commercial harvest are essential for proper management of the fishery. In order to develop sound management practices, biological investigations initiated in 1966 were continued in 1968 with emphasis on the following objectives:

1. Obtain accurate records of the subsistence and commercial harvest data.

2. Obtain age-sex-size composition and fecundity data.

3. Obtain estimates of spawning populations and observe spawning behavior, and in addition, ascertain if consecutive annual spawning occurs.

4. Determine movements of populations and seasonal abundance on a year-round basis.

METHODS AND MATERIALS

The following methods and materials were used in the Kotzebue sheefish studies:

1. Subsistence catch data was obtained primarily by personal interviews of fishing families in the following villages: Kotzebue, Selawik, Noorvik, Kiana, Ambler, Shungnak and Kobuk. Catch questionnaire forms were distributed to those fishermen not contacted. Records of commercial catches were obtained from fish tickets and personal interviews with fishermen and processors.

2. Age-sex-size composition data was collected by sampling the commercial, subsistence and Department test catches taken in Kotzebue Sound, Hotham Inlet, Selawik area and the Kobuk River. Lengths were measured from the tip of the snout to the fork of the tail in centimeters. Weight was recorded in pounds. Sex was determined by examination of the gonads when possible, or by external examinations of sexually mature fish on the spawning grounds. Sex could not be determined for sheefish caught in the winter or spring. Scale smears were taken in the area above the lateral line and between the dorsal and adipose fin and then placed in envelopes to be later mounted on glass microscope slides for age determination.

3. Fecundity information was collected from test catches (untagged fish) taken near the spawning grounds on the upper Kobuk River. Estimates of the fecundity of eight (8) female fish, selectively sampled over a wide size

range, were calculated by weighing a subsample count of 1,000 eggs compared to the total weight of both ovaries of each fish.

4. Aerial surveys of known spawning grounds of the Kobuk River were conducted using a small single engine aircraft (Supercub). An extensive reconnaissance aerial survey of the Selawik River was conducted for the first time.

5. Spawning ground observations were limited to recording daily air and water temperatures. Known spawning areas were marked and the depth of river and the type of streambed gravel were noted.

6. Movements and seasonal abundance of sheefish populations were determined by a tag and recovery program. Sheefish were captured for tagging with mainly set gill nets in the upper Kobuk River area and with drift gill nets in the Selawik area and, to a lesser extent, with rod and reel in both areas. Spaghetti tags (plastic tubing) individually numbered were inserted through the flesh in the vicinity of the dorsal fin. Notices, informing native fishermen of the tag and recovery program, were posted in each village. A reward of $1.00 was offered for each tag returned along with scale samples and the date and location of the tag recovery.

Assistance in planning and conducting some of the field studies was given by Mr. Ken Alt of the Division of Sport Fish. Also Mr. Dennis Kogl of the Division of Sport Fish assisted in the field projects.

RESULTS

Subsistence and Commercial Catches

In Table 37 Kotzebue Sound area subsistence and commercial catches for the Kobuk River villages, Kotzebue and Selawik are presented. Recorded catches are believed to represent approximately 90 percent of the actual harvest. Sheefish taken by both commercial and subsistence fishermen in the Selawik Lake and Hotham Inlet, Kotzebue Sound areas are mostly immature fish. The total subsistence catch during the period from the fall of 1967 to the fall of 1968 was 31,293 sheefish compared to the 1966-67 catch of 22,390. The greater subsistence catch during the 1967-68 season was due to an increased fishing effort by Kotzebue residents and also increased accuracy in the recording of subsistence catch data. On the other hand, Selawik and the Kobuk River subsistence catches experienced a decline mainly due to less intensive fishing effort. Very few sheefish were taken by upper Kobuk River residents during the fall due to an unexpected early freeze-up of the river.

TABLE 37

SUBSISTENCE AND COMMERCIAL SHEEFISH CATCHES
KOTZEBUE DISTRICT, 1967-1968

Village	Fishermen Interviewed	Number of Sheefish
	SUBSISTENCE CATCH	
Noorvik	35	1,910
Kiana	25	766
Ambler	14	559
Shungnak	13	837
Kobuk	5	270
Subtotal	92	4,342 (June, 1968-October, 1968)
Kotzebue	48	21,871 (October, 1967-July, 1968)
Selawik	38	5,080 (April, 1968-November, 1968)
TOTAL DISTRICT CATCH	178	31,293
	COMMERCIAL CATCH	
Kotzebue	17	2,375 (October, 1967-September, 1968)

A total of 17 commercial fishermen harvested 2,375 sheefish (15,367 pounds) averaging approximately 6.5 pounds each. The commercial catch during the 1967-68 season was at least double that of the 1966-67 catch as a result of the establishment of a locally operated fishermen's cooperative in Kotzebue which provided an increased outlet for the catch.

Age-Sex-Size Composition Data

During the 1968 field season, the commercial Kotzebue catch and the upper Kobuk River spawning population was sampled for age, sex, size composition data. The Kotzebue commercial catch samples have not been analyzed to date. In Table 38 the upper Kobuk River sheefish age, sex and size composition data for 1968 is shown. Samples were collected near the spawning grounds and include both tagged and untagged fish which are sexually mature. A total of 469 sheefish was captured and approximately 88 percent were taken with set gill nets of 5-1/2, 6 and 6-1/2 inch mesh (stretched measure) while the remainder were taken with hook and line.

As noted in previous years (see 1967 Technical Report), hook and line gear is more selective toward capturing the more active male sheefish while gill nets tend to capture a greater proportion of females. In 1968 males appeared to be more abundant based on the larger number captured in gill nets. Males comprised 58.8 percent of the total sample. The average fork length for males was 77.0 cm while the average weight was 11.3 pounds. Males ranged in age from 7+ to 15+. Among males, the dominant age class was 9+ (27.5%) and 10+ (25.0%). The average fork length for females was 96.7 cm and the average weight was 27.1 pounds. Females ranged in age from 9+ to 21+. The most dominant age classes among females were 13+ (16.1%), 14+ (25.4%), 15+ (16.1%) and 16+ (14.0%).

In Table 39 the age and sex composition for upper Kobuk River sheefish sampled from the spawning areas is summarized for the year 1966-68. Due to the selectivity of the gear used (gill nets, beach seines and rod and reel) for sampling it is difficult to determine the actual sex ratio of the spawning run. In general, for males the age classes 8+, 9+ and 10+ were predominant during the three years. Males are capable of first becoming mature at age 7+. The oldest age male sheefish found was age 15+. Although males mature earlier than females, they do not live as long. Females are capable of first becoming mature at age 9+. The maximum age achieved by females observed to be 21+ years. In general, during the years 1966-68, the predominant age classes among females were 13+, 14+, 15+ and 16+ years.

Fecundity Relationship

In Table 40 the relation of the size of fish and the ovary weight to the number of eggs for Kobuk River sheefish is presented. As to be expected, there

AGE, SEX AND SIZE COMPOSITION OF SPAWNING SHEEFISH
UPPER KOBUK RIVER, 1968

Age Class	MALES Number	MALES Percent	MALES Fork Length 1/	MALES Weight 2/	FEMALES Number	FEMALES Percent	FEMALES Fork Length	FEMALES Weight	COMBINED SEXES Number	COMBINED SEXES Percent	COMBINED SEXES Fork Length	COMBINED SEXES Weight
7+	2	0.7	66.7	6.0					2	0.5	66.7	6.0
8+	24	8.7	68.8	7.5					24	5.1	68.8	7.5
9+	76	27.5	72.3	8.7	1	0.5	76.0	10.0	77	16.4	72.3	8.6
10+	69	25.0	74.0	9.8	4	2.1	85.0	18.3	73	15.6	74.6	10.2
11+	32	11.6	79.6	12.4	7	3.6	85.0	16.7	39	8.3	80.6	13.2
12+	18	6.5	85.0	15.2	11	5.7	90.7	20.6	29	6.2	87.2	17.3
13+	34	12.3	86.6	16.4	31	16.1	94.7	24.4	65	13.9	90.5	20.2
14+	15	5.4	86.1	16.3	49	25.4	95.5	25.7	64	13.7	93.3	23.5
15+	6	2.2	90.1	18.7	31	16.1	96.1	26.4	37	7.9	95.1	25.1
16+					27	14.0	99.0	29.4	27	5.8	99.0	29.4
17+					13	6.7	102.8	33.7	13	2.8	102.8	33.7
18+					9	4.7	106.2	37.5	9	1.9	106.2	37.5
19+					6	3.1	107.1	37.0	6	1.3	107.1	37.0
20+					3	1.6	110.2	43.0	3	0.6	110.2	43.0
21+					1	0.5	112.0	44.0	1	0.2	112.0	44.0
TOTAL	276	100.0	77.0	11.3	193	100.0	96.7	27.1	469	100.0	97.5	17.8

1/ Centimeters
2/ Pounds

AGE COMPOSITION OF SPAWNING S[illegible]ISH UPPER KOBUK RIVER, 1966-1968

Age Class	1966 MALES No.	1966 MALES %	1966 FEMALES No.	1966 FEMALES %	1966 COMBINED SEXES No.	1966 COMBINED SEXES %	1967 MALES No.	1967 MALES %	1967 FEMALES No.	1967 FEMALES %	1967 COMBINED SEXES No.	1967 COMBINED SEXES %	1968 MALES No.	1968 MALES %	1968 FEMALES No.	1968 FEMALES %	1968 COMBINED SEXES No.	1968 COMBINED SEXES %
7+	5	7.5			5	3.4	10	9.6			10	4.9	2	0.7			2	0.5
8+	19	28.4			19	12.8	22	21.2			22	10.8	24	8.7			24	5.1
9+	7	10.5	3	3.7	10	6.8	18	17.3	1	1.0	19	9.4	76	27.5	1	0.5	77	16.4
10+	10	14.9	7	8.6	17	11.5	12	11.5			12	5.9	69	25.0	4	2.1	73	15.6
11+	10	14.9	7	8.6	17	11.5	16	15.4	5	5.0	21	10.3	32	11.6	7	3.6	39	8.3
12+	11	16.4	10	12.4	21	14.2	14	13.5	7	7.1	21	10.3	18	6.5	11	5.7	29	6.2
13+	3	4.5	17	21.0	20	13.5	8	7.7	19	19.2	27	13.3	34	12.3	31	16.1	65	13.9
14+	2	3.0	14	17.3	16	10.8	4	3.8	29	29.3	33	16.3	15	5.4	49	25.4	64	13.7
15+			8	9.9	8	5.4			15	15.2	15	7.4	6	2.2	31	16.1	37	7.9
16+			3	3.7	3	2.0			8	8.1	8	3.9			27	14.0	27	5.8
17+			4	5.0	4	2.7			8	8.1	8	3.9			13	6.7	13	2.8
18+			4	5.0	4	2.7			4	4.0	4	2.0			9	4.7	9	1.9
19+			2	2.5	2	1.4			2	2.0	2	1.0			6	3.1	6	1.3
20+			1	1.2	1	0.7			1	1.0	1	0.5			3	1.6	3	0.6
21+			1	1.2	1	0.7									1	0.5	1	0.2
TOTAL	67	100.0	81	100.0	148	100.0	104	100.0	99	100.0	203	100.0	276	100.0	193	100.0	469	100.0

TABLE 40

RELATION OF SIZE OF FISH AND OVARY WEIGHT TO NUMBER OF EGGS
FOR KOBUK RIVER SHEEFISH, 1968

Sample Number	Age	Fork Length (cm)	Body Weight (lbs.)	Estimated No. of eggs	No. of eggs per pound of body weight	Ovary Weight (lbs.)	Percent Body Weight	No. of eggs per pound of ovary weight
1	9+	76.0	10.0	90,722	9,072	1.9	(19.0)	47,748
2	11+	78.6	14.0	124,868	8,919	2.1	(15.0)	59,461
3	12+	89.1	18.0	158,444	8,802	3.1	(17.2)	51,110
4	14+	94.5	23.0	174,766	7,599	4.1	(17.8)	42,626
5	13+	89.8	25.0	235,000	9,400	5.2	(20.8)	45,192
6	13+	105.6	33.5	310,381	9,265	7.2	(21.5)	43,108
7	17+	106.6	34.0	271,158	7,975	5.7	(16.8)	47,572
8	19+	117.1	47.0	459,381	9,774	9.8	(20.9)	46,876

was a definite trend toward an increase in fecundity as the size of fish increased. Fecundity ranged from 90,722 to 459,381 eggs per fish. Ages of the eight (8) fish selectively sampled for fecundity ranged from 9+ to 19+ years. The ovary weight of each fish accounted for, on the average, approximately 19 percent of the total body weight. The number of eggs per pound of body weight averaged 8,923.

Estimate of Spawning Population Size

In the fall of 1968, aerial surveys of sheefish schools distributed in the Kobuk and Selawik Rivers were conducted. In 1967 aerial survey methods appeared promising for obtaining an index of spawning population size. During 1968, aerial surveys were expanded considerably. The upper Kobuk River was surveyed from below Kalla to point 20 miles upstream from the mouth of the Selby River, a distance of approximately 50 miles. A total of 4,963 sheefish were observed in the Kobuk River, usually in the same locations observed in 1967.

For the first time the Selawik River was surveyed for concentrations of sheefish. An extensive survey was conducted covering a total distance of approximately 170 river miles. A total of 1,383 sheefish was observed.

The comparatively fewer numbers of sheefish observed in the Selawik River (1,383) versus a total of 4,973 sheefish in the Kobuk River was unexpected. Apparently the Kobuk River supports a substantially larger population of sheefish than the Selawik River. Based on the greater number of sheefish usually taken for subsistence annually by Selawik residents, it has been previously presumed that the Selawik River contained a larger spawning population than the Kobuk River. It appears that the Selawik residents are apparently harvesting moderate numbers of Kobuk River sheefish that spend a portion of the winter and spring in the Selawik Lake and Inland Lake areas, in addition to some Selawik River sheefish. This assumption has been more or less confirmed by results to date from our tag and recovery program conducted during the 1966-68 field seasons (see following section).

Seasonal Distribution and Movements

In order to determine the year-round movements of sheefish throughout the Kotzebue Sound area, a tag and recovery program was initiated in 1966 during late September on the upper Kobuk (upstream from the village of Kobuk: 26 miles) and has been expanded considerably each year. In early June, 1968, after breakup, a tag and recovery program was conducted in the Selawik area for the first time. The recovery distribution of tagged sheefish by recovery location for the years 1966-68 is summarized in Table 41.

During the years 1966-68 a total of 490 sheefish was tagged on the

TABLE 41

RECOVERY DISTRIBUTION OF SHEEFISH TAGGED AT UPPER KOBUK RIVER AND SELAWIK AREAS, 1966-1968

Year of Tagging	Number Tagged	Year of Recovery	Kobuk River	Selawik Area	Hotham Inlet	Kotzebue Sound	TOTAL RECOVERIES
UPPER KOBUK RIVER TAGGING							
			Recovery Area (Number and Percent)				
1966	40	1966	4(10.0)				4(10.0)1/
		1967	5(12.5)	2(5.0)			7(17.5)
		1968	2(5.0)		2(5.0)		4(10.0)
		Subtotal	11(27.5)	2(5.0)	2(5.0)		15(37.5)
1967	116	1967	21(18.1)				21(18.1)
		1968	13(11.2)	4(3.4)	2(1.7)	1(0.9)	20(17.2)
		Subtotal	34(29.3)	4(3.4)	2(1.7)	1(0.9)	41(35.3)
1968	334	1968	87(26.0)				87(26.0)
TOTAL	490		132(26.9)	6(1.2)	4(0.8)	1(0.2)	143(29.2)
SELAWIK AREA TAGGING							
1968	458	1968	24(5.2)	17(3.7)			41(9.0)

1/ Recovery Percentage in parenthesis.

upper Kobuk River spawning areas and 143 were recovered for an overall recovery rate of 29.2 percent. Most of the Kobuk River tagged fish were recovered either near the spawning grounds or during the upstream (spawning) or downstream (post-spawning) migrations. Of interest were the Kobuk River fish recovered in the Selawik area (6), Hotham Inlet (4), and Kotzebue Sound (1). These recoveries indicate that sheefish are probably widely dispersed in the saline-brackish waters of Selawik Lake, Hotham Inlet and to a lesser extent in Kotzebue Sound during the winter and spring. Detailed distribution of the Kobuk River sheefish tag recoveries by area for the years 1966-68 is shown in Appendix Tables K, L, and M.

A total of 458 sheefish were tagged and released in the Selawik area. Tagging operations were conducted at the Selawik River, Tuklomarak River, and Inland Lake areas. Since the sheefish at the Selawik area were tagged in early June, several months before the onset of spawning, it was not possible to determine externally the sex of each fish. The tagged sheefish ranged in weight from 2.0 to 40.5 pounds and averaged 16.2 pounds. The length (snout to fork of tail) ranged from 43.5 to 112.0 centimeters and averaged 83.5 centimeters. To date, a total of 41 recoveries (9.0%) have been made. Of particular interest is the significantly high proportion, 5.2 percent (24 recoveries, of tagged fish captured in the Kobuk River during the summer and fall of 1968 versus 3.7 percent (17 recoveries) taken in the Selawik area. Detailed distribution of the Selawik area tagged sheefish in 1968 by recovery area is presented in Table 42.

The tagging data, in conjunction with the aerial survey data previously discussed, strongly indicates that 1) the Kobuk River sheefish population is probably substantially larger than the Selawik River population and, 2) the Kobuk River sheefish are probably often located in the Selawik area during the winter and spring; and consequently, subject to being harvested by Selawik village subsistence fishermen.

Frequency of Consecutive Annual Spawning

Another prime objective of the tag and recovery program is to determine if sheefish are capable of consecutive annual spawning once sexual maturity is achieved. Recoveries of mature sheefish tagged in previous years on the spawning grounds and recaptured in subsequent years on the spawning areas would verify this assumption. In 1967 a recovery of a spawned-out male sheefish that was tagged on the Kobuk River spawning grounds in 1966 in the same area indicated that some male sheefish are presumably capable of spawning annually. In addition, two mature males that were tagged in 1967 on the Kobuk River spawning area were recaptured in 1968 in the same general area. Also, one male sheefish presumably bound for the upriver spawning areas was captured at Shungnak (41 miles downstream from the spawning grounds) on September 3, 1968. To date no female sheefish tagged in previous years have

TABLE 12

DAILY NUMBER OF SHEEFISH TAGGED IN THE SELAWIK AREA
AND NUMBER AND DATE OF RECOVERIES BY AREA, 1968 1/

Tagging Date	Number Tagged	1968 Recoveries						Total Recoveries 1968
		Selawik Area	Upper Kobuk River Spawning Area	Kobuk	Shungnak	Ambler	Noorvik	
6/2	10				1(9/9)			1
6/3	69	3(7/25;10/9;11/10)					2(10/18;6/25)	5
6/4	44	2(6/15;10/10)	1(9/16)			2(8/10;9/3)		5
6/5	15							0
6/6	30	1(10/15)	1(9/24)					2
6/7	9	1(9/25)				1(9/14)		2
6/8	44	2(6/21;7/2)	1(9/15)					3
6/9	62		1(9/?)				1(6-7/?)	2
6/10	35	1(8/24)	2(9/24)		2(9/9,27)	1(9/1)		6
6/11	22	3(10/10,15;11/10)					2(6/25;8/24)	5
6/12	41						1(10/15)	1
6/13	45	2(8/20,30)	1(9/16)	1(9/12)			2(6/26;7/3)	6
6/14	22	2(6/24;10/22)						2
6/15	10						1(10/7)	1
TOTALS	458	17	7	1	3	4	9	41(9.0) 2/

1/ Recovery dates in parenthesis.
2/ Percentage recovery in parenthesis.

been recaptured subsequently on the spawning areas. However, it is noteworthy to mention that a female sheefish, tagged on the Kobuk River spawning grounds in 1967 (state of maturity unknown), was recaptured at Ambler (88 miles downstream from the spawning grounds) on August 14, 1968. It is possible that this fish was probably bound for the upper spawning areas.

Recoveries of sheefish, mostly males, tagged in 1967 and recovered during the fall or spring of 1968 in the lower portion of the Kobuk River were recorded. Whether or not these sheefish were bound for the upriver spawning areas in the spring or were migrating downstream in the fall following spawning is not known. Some immature sheefish migrate upstream in the lower portion of Kobuk River each year.

Since comparatively large numbers of sheefish (334) were tagged on the upper Kobuk River spawning grounds in 1968, it is expected that future recoveries of tagged sheefish on the spawning grounds in subsequent years will provide additional information on the frequency of consecutive annual spawning of sheefish.

Spawning Observations

In 1966 and 1967, spawning observations were conducted by the Department during late September on the upper Kobuk River, between 24 and 30 miles upstream of the village of Kobuk. These observations of spawning behavior suggest that sheefish utilized the specific areas having similar physical characteristics: water depths of 4 to 8 feet over differential size gravel in moderately swift current of the main river. Spawning occurs during the later afternoon-early evening hours. Also it was observed in 1966 and 1967 that sheefish eggs, which sink to the stream bottom and lodge in the interstices of the gravel, after being discharged by the female at the surface, are subject to apparently heavy predation by grayling and whitefish.

In 1968 spawning observations were not conducted due to an unprecedented early freezeup of the river. At the initiation of tagging studies on September 13, the water temperature was 45° F. On September 25, when the tagging operation was prematurely terminated, the water temperature had dropped to 31.5° F., a decline of 13.5° F. in 13 days. Sheefish spawning, as observed in 1966 and 1967, occurred mainly during the period September 27-29 and water temperatures ranged from 40-43° F. What effect the extremely cold water temperatures had on the success of sheefish spawning in 1968 is unknown. Although several portions of the upper Kobuk River were frozen over, it was observed during an aerial inspection of the river on September 29 that the major sheefish spawning areas were free of ice cover. It is speculated that sheefish spawning occurred at about the normal period of time in late September, although it may be possible that a slight delay in spawning may have occurred. It appears that annual timing of sheefish spawning in the

upper Kobuk River is probably more related to gonad development and timing, and to a much lesser extent, on water temperature.

DISCUSSION AND FUTURE PLANS

During the past three years (1966-1968) important information on the seasonal distribution and movements, spawning behavior, improved subsistence and commercial recording of catch data, fecundity relationship, and age, sex, and size composition of the spawning populations of sheefish have been obtained.

Future plans call for continuation of the tag and recovery projects in the upper Kobuk River and in the Selawik Lake-Island Lake area during 1969. Also an attempt will be made to tag sheefish on the upper Selawik River spawning grounds in late September in order to determine if the Selawik and Kobuk River sheefish runs are two distinct populations.

SUMMARY

1. During the 1967-68 season, a total of 31,293 sheefish was recorded as taken for subsistence in the Kotzebue district. Also a total of 2,375 sheefish was harvested commercially.

2. A total of 469 sheefish was sampled for age, sex and size composition data on the upper Kobuk River spawning areas in 1968. Males comprised 58.8 percent of the total sample. Males averaged 11.3 pounds while females average 27.1 pounds. The most dominant age classes among males were 9+ and 10+ years, while females were comprised of mainly 13+, 14+, 15+ and 16+ year old age classes. Additional comparisons for age and sex class compositions for the years 1966-68 were made for the upper Kobuk River sheefish samples.

3. A total of eight sheefish were selectively sampled over a wide size range in order to develop a fecundity-size relationship. Fecundity for the eight fish ranged from 90,722 to 459,381 estimated eggs per fish. The ovary weight accounted for approximately 19 percent of the total body weight and the number of eggs per pound of body weight averaged 8,923.

4. Aerial surveys of sheefish spawning areas were considerably expanded during the fall of 1968. A total of 4,973 sheefish was observed in the Kobuk River. In the Selawik River, which was surveyed for the first time, a total of 1,383 sheefish was observed. Based on these comparative aerial surveys, it appears that the Kobuk River is a much larger producer of sheefish than the Selawik River.

5. A total of 490 sheefish has been tagged on the upper Kobuk River during the fall of the years 1966-68 and 143 have been recovered (29.2%) to date. Although only relatively few recoveries have been made: Selawik area (6), Hotham Inlet (4) and Kotzebue Sound (1), it is indicated that sheefish are widely dispersed throughout these waters during the winter and spring months.

6. In the Selawik area, a tagging program was initiated in June of 1968 and a total of 458 sheefish was tagged and released. Of interest was the greater percentage (5.2%) recoveries made in the Kobuk River than in the Selawik Lake, Tuklomarak River and Inland Lake areas (3.7%). This data indicates that a relatively large proportion of Kobuk River sheefish are apparently located in the Selawik area during the winter and spring months.

7. In 1968, two mature male sheefish that were tagged in 1967 were recovered on the upper Kobuk River spawning areas. These recoveries indicate that some male sheefish are capable of consecutive annual spawning once sexual maturity is achieved.

8. Due to an unexpected early freezeup of the upper Kobuk River, sheefish spawning behavior observations were not conducted. Although water temperatures were unseasonally cold, near 32° F., it is speculated that sheefish spawning occurred at about the normal period of time (late September).