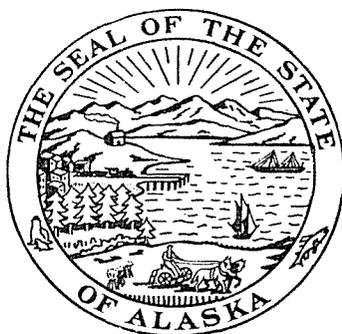


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STATE OF ALASKA

William A. Egan, Governor



ANNUAL REPORT OF PROGRESS, 1969 - 1970

FEDERAL AID IN FISH RESTORATION PROJECT F-9-2

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME

Wallace H. Noerenberg, Commissioner

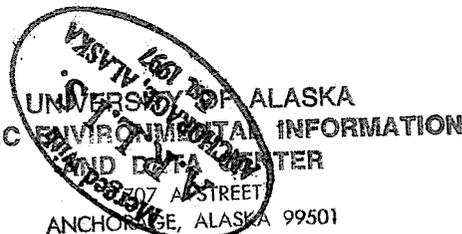
Alaska DIVISION OF SPORT FISH

Rupert E. Andrews, Director

Howard E. Metsker, Coordinator

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INTRODUCTION

This report of progress consists of Job Segment Reports from the State of Alaska, Federal Aid In Fish Restoration, Project F-9-2, "Sport Fish Investigations of Alaska".

The studies reported herein are investigations evaluating the sport fish resources of the state. Recreational and other impacts on the fishery resources necessitates a continuous endeavor of ascertaining facts and knowledge of the fisheries. The 24 jobs reported on are of a continuing nature. The investigations are composed of 11 projects involved with the inventory and cataloging of the sport fish waters of the state, sport fishery creel censuses, and access. Fish species that received special investigational effort include: Dolly Varden, anadromous fish, grayling, sheefish, whitefish, pike, char, and salmon. The information gathered from the combined studies provides necessary background data for a better understanding of management problems and constitutes a basis for necessary future investigations.

The subject matter contained in these reports is incomplete, and the findings and interpretations subject to re-evaluation as work progresses.

- b. Continue attempts to obtain an index of spawning rainbow trout in the Naknek River; place tagging emphasis upon fish in the 250 - 450 mm length group; attempt to obtain biological data from fish taken in the Bay of Islands fishery; and conduct aerial surveys of other rainbow trout spawning areas in the Naknek River system.
2. In the Alagnak (Branch) River watershed:
 - a. Continue to monitor the Kulik River rainbow trout fishery.
 - b. Investigate the rainbow trout fisheries at the outlets of Kukaklek and Nonvianuk lakes, Battle River, and Moraine Creek.
 - c. Determine the king salmon escapement in the Alagnak (Branch) River.
3. In the Ugashik River watershed:
 - a. Continue to sample the Arctic grayling population at the outlet of Lower Ugashik Lake in early August.
 - b. Conduct sampling, tagging, and tag-recovery efforts on grayling at the Ugashik Narrows in late August and early September to ascertain the extent of movement from the outlet area.
 - c. Determine the effectiveness of existing bag limits and regulations in retaining the quality of the fishery.
4. Expand the rainbow trout life history program in the Iliamna drainage and Talarik Creek to include migrational and spawning patterns and growth rates which are essential to understanding the trophy rainbow trout populations of the watershed.
5. In the Nushagak River, Wood River lakes, and Tikchik Lake systems:
 - a. Conduct further fishery surveys with emphasis on early spring and fall months.
 - b. Survey all connecting rivers in the Wood River system during early spring to locate rainbow trout spawning areas.
 - c. Survey potential grayling spawning creeks to further the study of grayling populations in the Wood River lakes system.
 - d. Continue sampling and tagging rainbow trout and grayling populations.

OBJECTIVES

1. To determine the status of sport fish stocks within the job area.
2. To record the environmental characteristics of the existing and potential recreational fishing waters of the job area.
3. To enumerate king salmon spawning stocks in the Naknek River, its tributaries, and in the Alagnak (Branch) River.
4. To determine the impact of other anadromous and freshwater fishery uses in relation to existing recreational anadromous and resident fish stocks, and to investigate, evaluate and develop plans

for the enhancement of other anadromous fish stocks.

5. To investigate multiple-use water projects (both public and private) and to assess their effects on the area watersheds.
6. To determine the need for and implementations of fishery restoration measures, including location of suitable sport fish egg sources.
7. To assist in the investigation of public access status to the sport fishing waters of the job area and to make recommendations for specific public access sites.
8. To provide recommendations for the management of sport fishing resources in these waters and direct the course of future studies.

TECHNIQUES USED

Species composition and distribution was determined by the use of gill nets and hook and line.

King salmon escapement in the Naknek River system was estimated by aerial and float surveys.

Fork lengths were recorded in the field to the nearest millimeter by the use of rigid, portable measuring boards.

White tube-type anchor tags in the 25,000 - 26,999 series and similar red tags in the 00800 - 00999 series were applied with Floy (Dennison) FD-67 tagging guns without the use of anesthetic.

The instantaneous population estimate of grayling, fully recruited to the fishery in the Lower Ugashik Lake outlet, was conducted by six anglers using hook-and-line gear over a seven-day period. The Schumacher and Eschmeyer modification of the Schnabel multiple census population estimate was employed for a population estimate.

Creel census information was obtained through angler interviews.

FINDINGS

Naknek River King Salmon Studies

The subsistence catch of king salmon in the Naknek River is estimated at 400 fish (Nelson, 1970) on the basis of reports received from subsistence permittees. This figure represents a decline from the previous year in spite of the large return of this species. The sharp reduction in fishing time allowed under the subsistence regulations adopted for 1969 evidently affected the catch. Subsistence net operations were authorized only between the hours of 9 AM Saturday and 9 AM Sunday.

Table 1 lists the commercial catch of king salmon in the Naknek - Kvichak district for 1969. The extremely low catches during the early portion of the season reflect the lack of fishing effort at that time-fishermen-processors conflict. Table 2 lists the commercial king salmon catch in this district for the ten-year period, 1960-1969. Despite the late commencement of the fishery, the preliminary district catch of 19,032 fish is the highest recorded since 1951. It is likely that the majority of this catch consisted of fish destined for the Alagnak (Branch) River since it was taken later in the season (Redick, 1967) and was largely in the northern portion of the district.¹

¹Don Siedelman, personal communication.

TABLE 1 Naknek-Kvichak District Commercial Catch of King Salmon, 1969.

<u>Fishing Period</u>	<u>Catch</u>	<u>Fishing Period</u>	<u>Catch</u>
6/ 9-15	21	7/ 3- 4	3,091
6/16-22	87	7/ 5- 6	1,056
6/23-24	198	7/ 7-13	8,849
6/25-26	407	7/14-19	2,607
6/27-28	277	7/20-27	1,934
6/29-30	284	7/28-8/3	194
7/ 1- 2	19	8/ 4-10	8
		Total	19,032*

*Preliminary figure.

TABLE 2 Summary of Commercial King Salmon Catches, Naknek-Kvichak Fishing District, 1960-1969.

<u>Year</u>	<u>King Salmon Catch</u>	<u>Year</u>	<u>King Salmon Catch</u>
1960	17,778	1965	8,047
1961	10,206	1966	5,497
1962	8,816	1967	3,705
1963	4,713	1968	6,398
1964	12,267	1969	19,032*

*Preliminary figure.

Estimates of the escapement were obtained under varying conditions. The King Salmon Creek float survey was completed near the peak of spawning. A period of adequate visibility enabled 2,599 king salmon to be counted. Immediately prior to and during the Big Creek float survey, rainfall increased both the volume of waterflow and turbidity. Less than 1,000 fish were actually counted. A subsequent aerial survey was made to supplement the float trip and an estimated 5,000 fish has been assigned to this segment of the system. The spawning population utilizing the gravels of the main Naknek River was surveyed aurally after the peak of the run. The estimated escapement of 1,200 fish is considered conservative. It should be noted that significant numbers of king salmon were observed moving into the Naknek River after the closure of the fishery on July 13. These unusually late arrivals appeared to be moving upstream past King Salmon Creek, contributing to the Big Creek and, primarily, Naknek River escapement totals. A segment of the population which spawns in the Naknek River, between Big Creek and the Commercial Fisheries Division counting towers, has been observed to reach the peak of spawning later than that of the Big Creek fish.

While escapement estimates for 1969 are not as precise as those secured during the preceding season, it is apparent that the magnitude of the run exceeded that of any year since surveys were begun in 1963. A similar situation may also apply to the entire Naknek River return, although breakdown of the commercial catch between the Naknek and Alagnak stocks must remain highly arbitrary. It seems reasonable to expect

a recurrence of low production years in the near future when the progeny from the smaller escapements of 1964-1967 will comprise the bulk of the total return.

Alagnak (Branch) River Studies

An aerial king salmon escapement estimate in the Alagnak (Branch) River, as reported by the Division of Commercial Fisheries, was 5,000 - 7,000 fish. On the basis of a survey by the same observer, the 1968 escapement was estimated at 7,000 - 10,000 fish. The anomaly of a reduction in escapement in the face of an apparent increase in abundance (see Naknek River king salmon discussion) is explained by a higher rate of exploitation by the commercial fishery. An unusually large amount of fishing time was granted during the probable dates of Alagnak (Branch) River fish migration through the commercial fishing area.

Although the Kulik River was visited briefly during mid-July, no annual sampling of the fishery was done during the reporting period. The Funnel - Moraine Creek confluence was visited during the same period. No rainbow trout were in evidence, lending support to the conclusion that these fish move into this area with the red salmon, O. nerka, run. Battle River was also visited at this time, and a population of rainbow trout was found to be present. These fish were smaller in size and possessed the heavy body and dark spotting characteristic of resident fish, as opposed to light colored fish which may have entered from Kukaklek Lake.

Naknek Rainbow Trout Studies

One hundred five rainbow trout were tagged in the Naknek River during the spring and early summer of 1969. Seventy-seven trout captured by hook and line were tagged on May 13 and 14.

Table 3 depicts the 1969 tag-recovery data. Three recoveries from the 1968 tagging are also included, which brings the total 1968 tagging recoveries to 11 fish, or approximately 16% of the 69 rainbow trout marked during the season.

TABLE 3 Summary of Naknek River Rainbow Trout Tag Recoveries, 1969.

<u>Tagging Location</u>	<u>Date Tagged</u>	<u>Length at Tagging (mm)</u>	<u>Recovery Location</u>	<u>Date Recovered</u>
Lake Camp Area	3/20/68	292	Production Point	9/7
Lake Camp Area	5/20/68	585	Lake Camp Area	9/30
Production Point	4/10/69	419	Upper Boundary	8/26
Snag Point	5/13/69	368	Lake Camp Area	6/19
Snag Point	5/13/69	387	Lake Camp Area	8/7
Snag Point	5/13/69	381	Lake Camp Area	9/18
Tower Point	5/14/68	692	Tower Point	5/13
Lower Rapids	5/13/69	387	Lower Rapids	Unknown
Lower Rapids	6/20/69	390	Lower Rapids	6/22
Lower Rapids	6/20/69	395	Upper Boundary	9/18
Lower Rapids	5/13/69	305	Lake Camp	6/23
Lower Boundary	5/13/69	368	Lower Boundary	7/12

The recapture of one mature female at Towers Point is interesting as this is the same area from which it was captured and tagged in 1968.

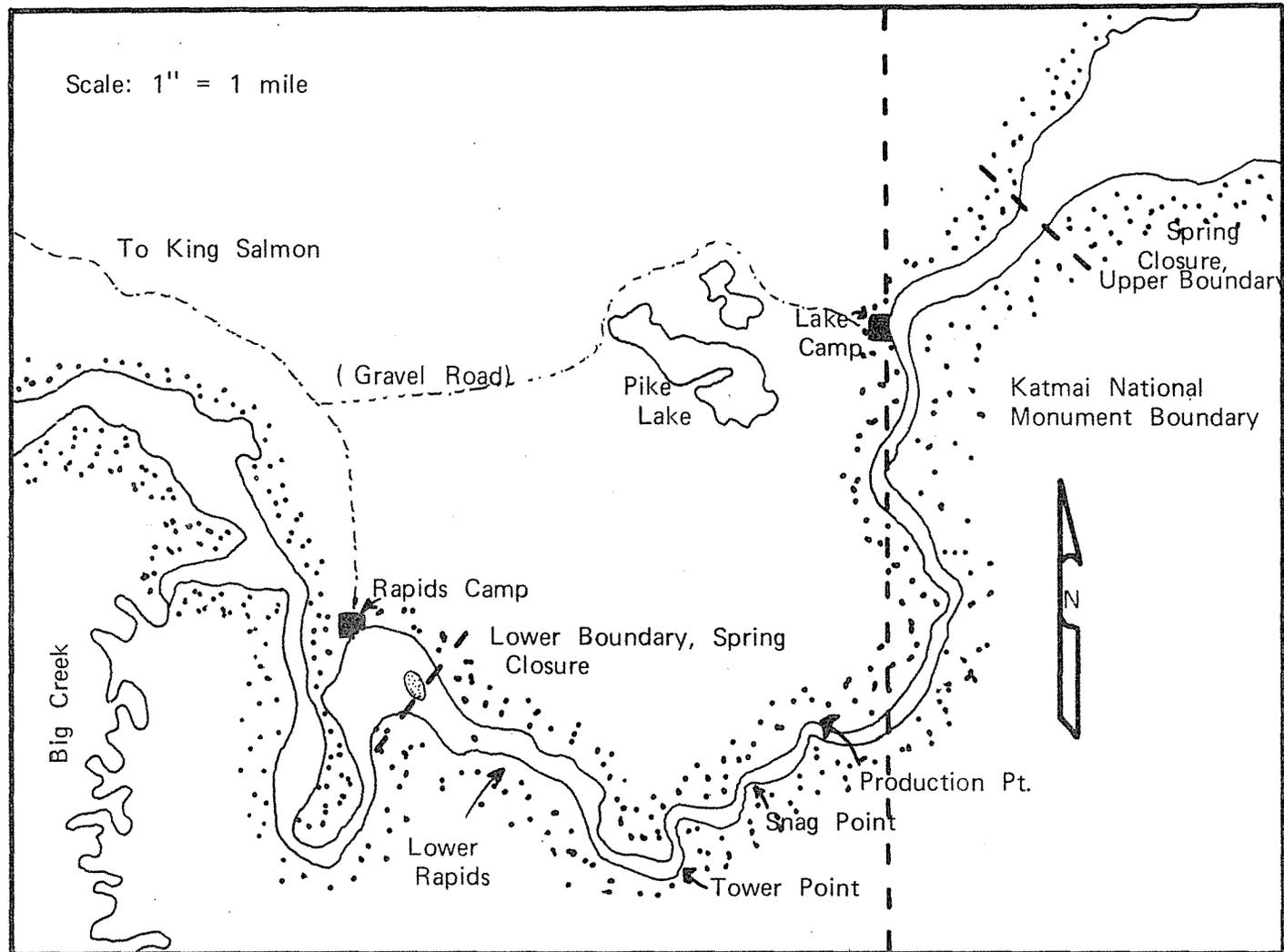


FIGURE 1 UPPER NAKNEK RIVER WATERSHED INDICATING RECOVERY LOCATIONS OF TAGGED RAINBOW TROUT.

More sampling is required before substantial conclusions can be drawn. A portion of the surviving spawning population may return to spawn yearly.

Figure 1 is a map indicating recovery locations of tagged rainbow trout. Six of the nine recoveries displayed an upstream movement toward Naknek Lake.

No aerial surveys of spawning trout were conducted due to the lack of helicopters. Observations from the river seem to indicate a spawning abundance comparable to the previous year.

Iliamna Lake Rainbow Studies

Tagging activities and observations in the Iliamna drainage were conducted from early summer of 1969 through the spring of 1970.

Department personnel captured and tagged fish for determinations of intra-lake and stream movements, and interviewed anglers for creel census information.

The Igiugig-Kaskanak Flats portion of the Kvichak River was studied from mid-June through mid-July, at which time the tagging crew was moved to the Copper River area.

In addition to sampling, tagging, and creel census, stream surveys in the eastern portion of Lake Iliamna were also accomplished on both Gibraltar and Iliamna rivers.

Attention was directed toward Lower Talarik Creek during the final week of August, and studies were made on this stream intermittently throughout the fall. Brief visits were also made during the ice-cover period in late winter and early spring.

Tagged fish in the Igiugig area totaled 322 rainbow and 161 grayling. At Lower Talarik Creek, 235 rainbow trout were tagged. Numbers of rainbow trout tagged in Copper, Gibraltar, and Iliamna rivers totaled 100, 30, and 11 respectively. Scale samples for age analysis were also collected.

Migrational Movements - Tag Recoveries:

Although no reward was offered for returned tags, angler response was good and was attributed both to posters soliciting the fisherman's cooperation and local encouragement.

Table 4 lists recoveries of numbered tags during the reporting period. A total of 23 recoveries were received, 14 of which were from the 1969 effort and the remainder originating from the preceding year.

Movement of fish from Lower Talarik Creek to both the Kvichak and Newhalen rivers was documented by two recoveries from Igiugig and one from Newhalen.

Migrational patterns were disclosed with a Gibraltar River tagged rainbow trout recovery in the Copper River and an Igiugig tagged rainbow recovered at Belinda Creek.

Tagging in the Kvichak River indicated some summer movement of juvenile rainbow from the river to Iliamna Lake. This movement is supported by six tag recoveries at Igiugig from fish in the 275 - 425 mm length range. These rainbow were tagged earlier in the season in the Kaskanak Flats area, located approximately seven miles downstream from Igiugig.

TABLE 4 Summary of Kvichak Drainage Rainbow Trout Tag Recoveries, 1969.

<u>Tagging Location</u>	<u>Date Tagged</u>	<u>Length at Tagging (mm)</u>	<u>Recovery Location</u>	<u>Recovery Date</u>
Lower Talarik Creek	9/5/68	635	Lower Talarik Creek	9/18/69
Lower Talarik Creek	9/5/68	---	Lower Talarik Creek	8/25/69
Lower Talarik Creek	9/5/68	616	Lower Talarik Creek	6/6/69
Lower Talarik Creek	9/26/68	311	Lower Talarik Creek	6/4/69
Lower Talarik Creek	9/27/68	711	Lower Talarik Creek	9/4/69
Lower Talarik Creek	9/27/68	311	Lower Talarik Creek	6/4/69
Lower Talarik Creek	9/24/68	648	Lower Talarik Creek	9/18/69
Lower Talarik Creek	9/2/68	292	Kvichak River, Igiugig	7/20/69
Lower Talarik Creek	11/1/68	457	Kvichak River	/69
Kvichak River, Kaskanak Flats	5/22/69	405	Kvichak River, Igiugig	6/22/69
Kvichak River, Peck's Creek	7/1/69	360	Kvichak River, 1 mile below Scow Island	7/26/69
Kvichak River, Peck's Creek	7/2/69	360	Kvichak River, Igiugig	8/5/69
Kvichak River, Peck's Creek	7/2/69	390	Kvichak River, Igiugig	/69
Kvichak River, Peck's Creek	7/2/69	340	Kvichak River, Igiugig	7/16/69
Kvichak River, Peck's Creek	7/2/69	290	Kvichak River, Igiugig	7/13/69
Kvichak River, Igiugig	7/4/69	490	Belinda Creek	7/18/69
Kvichak River, Igiugig	7/15/69	420	Kvichak River, Igiugig	8/1/69
Kvichak River, Igiugig	7/16/69	380	Kvichak River, 2 miles downstream from Igiugig	/69
Kvichak River, Peck's Creek	7/17/69	343	Kvichak River, Peck's Creek	7/19/69
Kvichak River, Igiugig	8/22/69	548	Kvichak River, Igiugig	8/23/69

TABLE 4 (Cont) Summary of Kvichak Drainage Rainbow Trout Tag Recoveries, 1969.

<u>Tagging Location</u>	<u>Date Tagged</u>	<u>Length at Tagging (mm)</u>	<u>Recovery Location</u>	<u>Recovery Date</u>
Iliamna River	8/24/69	613	Iliamna River	10/14/69
Lower Talarik Creek	6/4/69	556	Newhalen River	8/26/69
Gibraltar River	8/12/69	390	Copper River	10/2/69

Lower Talarik Creek Observations:

The results of sampling at Lower Talarik Creek have been discussed previously in 12-A reports, with Paddock (1969) graphically presenting length and age frequencies of samples obtained from early June to November. This data shows the presence of juvenile trout in the fishery throughout the summer and early fall, with a gradual reduction in abundance to virtually total absence during the late fall. This is interpreted as a lakeward, or downstream, migration of these juvenile age classes.

It is not fully understood at this time if this juvenile population is migrating into Lake Iliamna for the first time, or if it reflects a lake-to-stream movement earlier in the year with a subsequent migration back to the lakes in the fall.

A run of large trout begins to move into the stream from Lake Iliamna in late August and continues until freeze-up.

Future weir studies will attempt to determine if these fish are entering the stream to spawn, as some indications of fall spawning exist, or if they actually over-winter in the lower stream area.

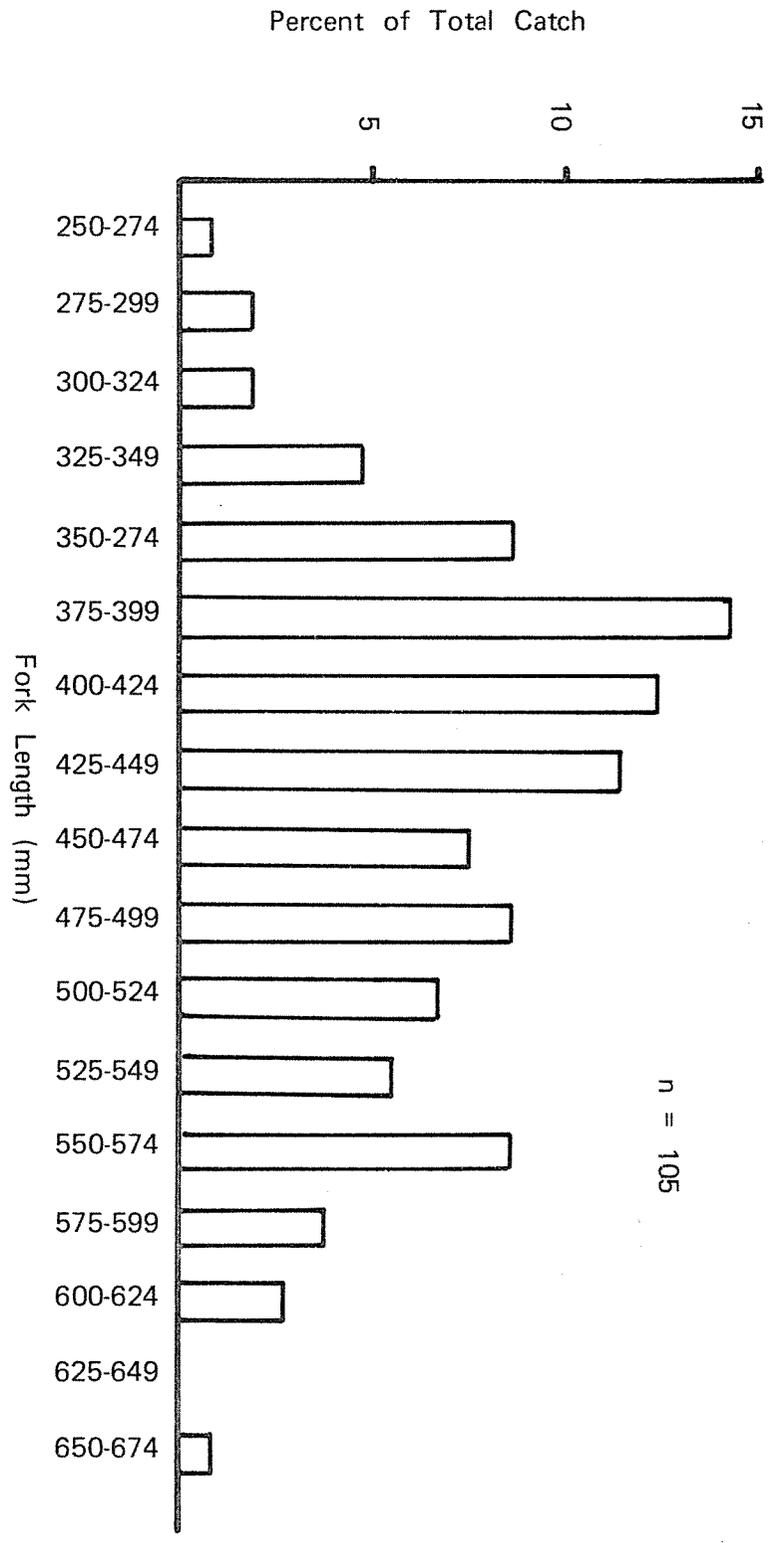
A brief visit on June 4 revealed the presence of 26% spawned-out fish in a small hook-and-line sample (n=23). Since a comparable sample (n=25) taken the previous year on June 11 and 12 contained no post-spawners, it might indicate that the last of the surviving spawners normally make their annual exodus by this date.

Figure 1 of the 12-A report, covering the 1968 season (Paddock, 1969) shows an almost complete absence of fish in the 350 - 475 mm range for the entire June-November period. Winter sampling during the current reporting period has indicated the presence of this size group in the Lower Talarik Creek lagoon during the winter ice fishery. Figure 2 shows the length distribution of a hook-and-line sample obtained on March 1, which consisted almost wholly of immature fish (less than 6% mature). These fish obviously were not in the stream for spawning purposes. They may arrive after the passage of the main upstream spawning run and depart before the last of the non-stream spawners return to Lake Iliamna in early June. It is also possible that these fish constitute a juvenile outmigration of resident stream fish.

In appearance, these fish are of extremely bright silver color, exceeding the brightness of those fish normally emerging from the lake on their spawning migration, and with none of the pink coloration displayed by resident rainbow trout.

It appears that a wide variation in migrational patterns may exist in the Iliamna Lake system.

FIGURE 2 LENGTH FREQUENCY - TALARIK CREEK RAINBOW TROUT, MARCH 1, 1970 SAMPLE



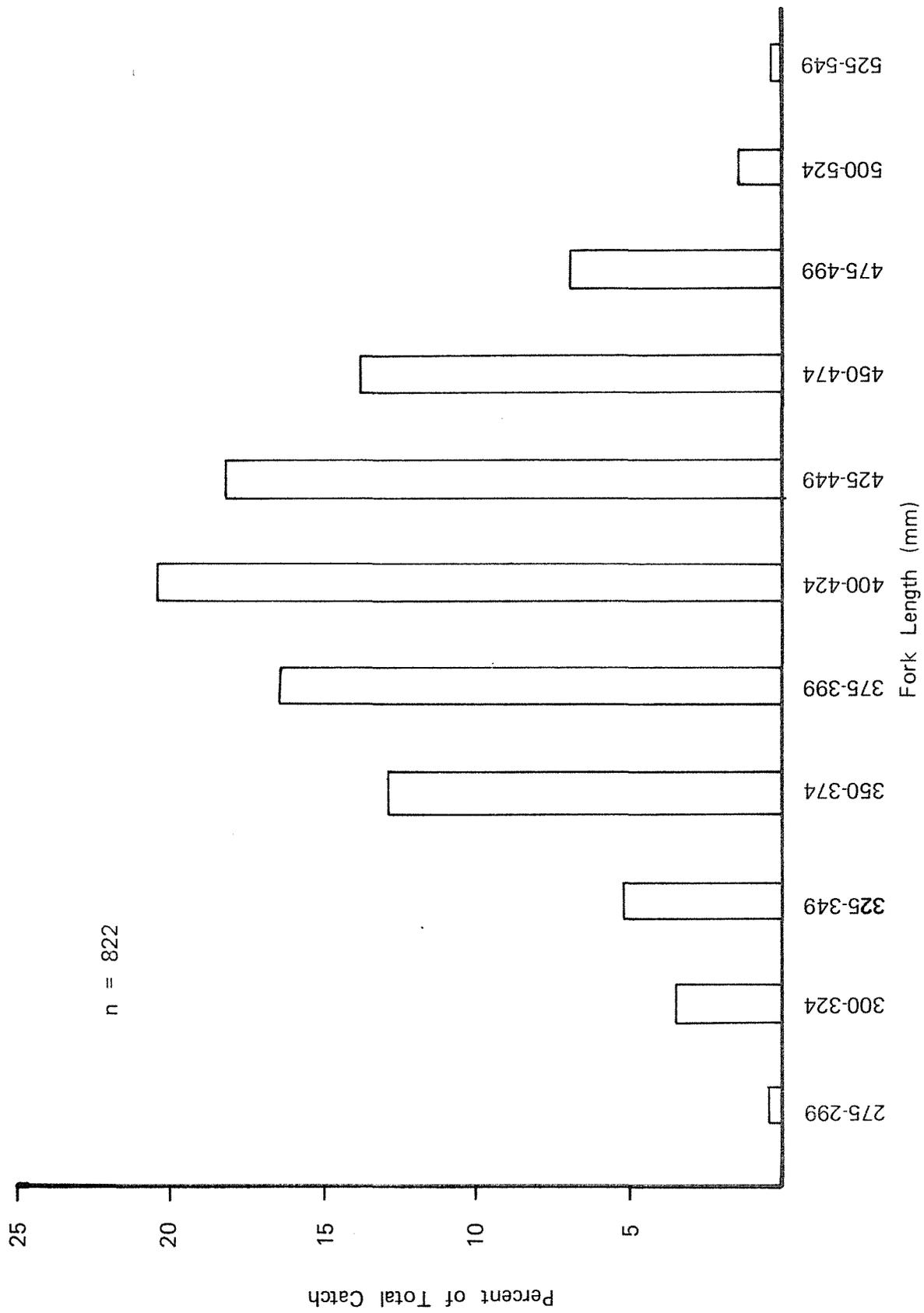


FIGURE 3 LENGTH FREQUENCY OF SPORT-CAUGHT GRAYLING, UGASHIK OUTLET, AUGUST 1-7, 1969.

Ugashik Watershed Studies

Work in this area was confined to the vicinity of the Lower Ugashik Lake outlet from July 31 to August 6. An estimate of the Arctic grayling population in this area was made.

A multiple mark-and-recapture method was used in making this population estimate. The fish were recaptured with hook and line. The outlet area was broken down into subareas. A tagging and recovery effort was noted for each. Evaluation of the data using a Schumacher and Eschmeyer modification of the Schnabel multiple census method (Ricker, 1958) indicated a population estimate of 1,952 fish with a 95% confidence interval of 1,492 - 3,023 fish present.

Upon completion of the seven-day program, an underwater reconnaissance of the entire area was made by three divers using snorkel gear. These observations indicated that tagged fish were present in all groups of fish. Observations also indicated that the ratio of tagged fish to untagged fish was quite high, with an estimated 60% of the fish having been tagged. This information further indicates that the true population value is nearer the low end of the confidence interval (1,442 fish) for the following possible reasons:

1. Non-random tagging and recovery effort was exerted throughout the outlet area.
2. Data was evaluated for the entire outlet area rather than by subarea; thus, non-random mixing of marked and unmarked fish throughout the outlet area could account for the discrepancy. Tag recovery information indicated some movement between areas, with 11.7% of the recoveries made in areas other than those in which the fish were tagged. The majority of movement was either lateral or downstream.
3. Non-uniform availability of marked and unmarked fish to the sampling gear. The effect of this is minimal because of the relatively large number of multiple recaptures. Twenty of the 169 recoveries were caught twice and two were caught three times.

Length-frequency data for the sample taken at the outlet is presented in Figure 3. It should be noted that a very small portion of the population is "trophy" size (more than 500 mm in length). The mean length of the sample is 406 mm, which is comparable to the mean length of the 1968 hook-and-line sample (401 mm, n=238).

During the 1969 sampling effort, 49 recaptures were made of fish originally tagged at the Ugashik River outlet during the previous year. Other returns have now brought the total recoveries from the 1969 tagging sample (n=206) to approximately 26%. This is an indication of (1) the ability of grayling to survive a catch-and-release situation and, (2) an indication of the limited size of the population in question.

Wood River Lakes Studies

Three trips through the Wood River system were made by boat. During each trip, tributary streams and connecting rivers were surveyed. The sport fish species present were sampled and tagged. These surveys were conducted from June 29 through July 10; July 18 - 27; and August 19 - 28. The July 18 - 27 survey did not cover the complete system because of low water conditions. All major tributary streams and connecting rivers were surveyed. These Wood River system surveys yielded preliminary information on distribution and extent of the sport fish species present.

Rainbow Trout:

This species was found present in all streams which connect lakes: Wood, Agulowak, Agulukpak, Wind,

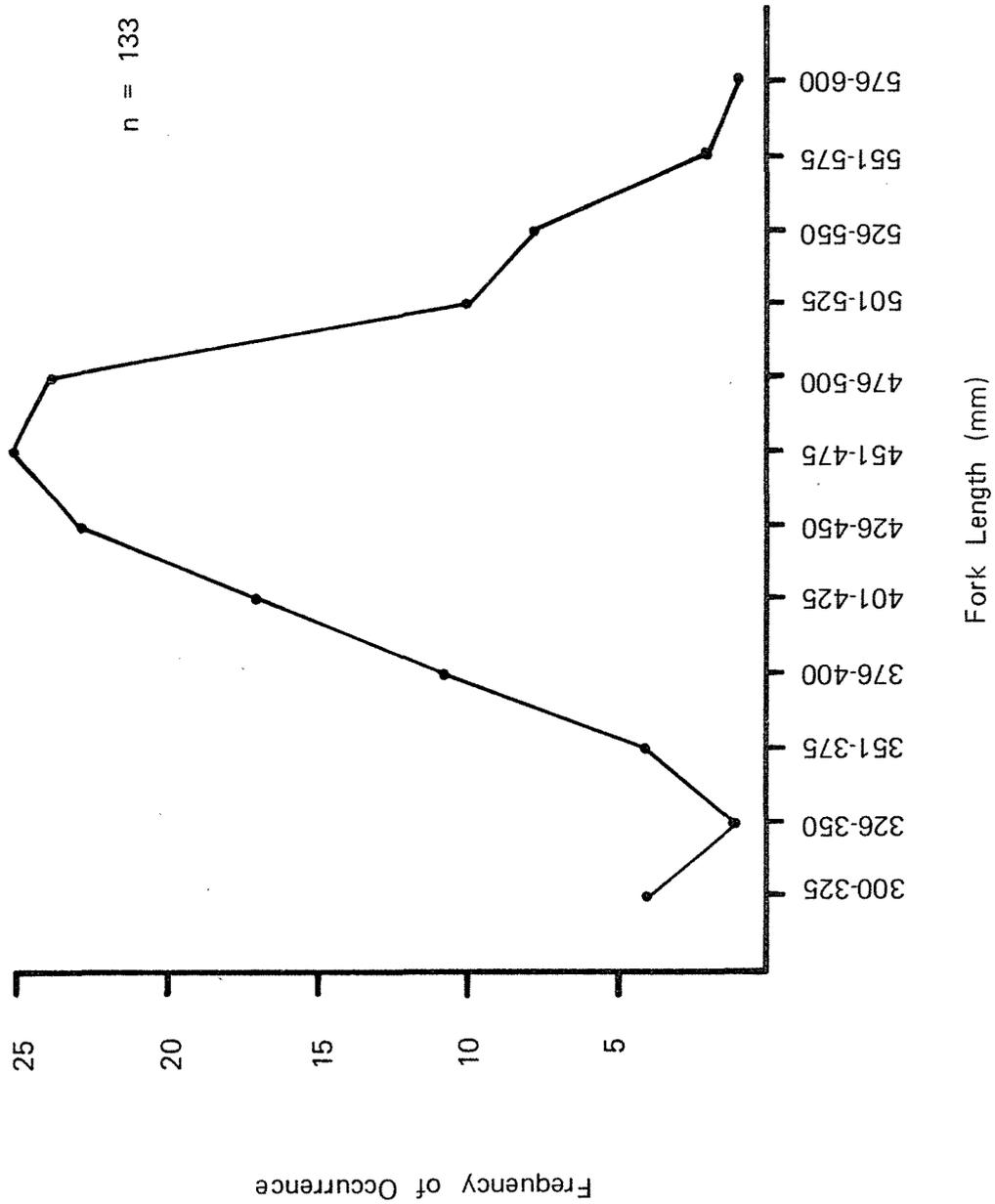


FIGURE 4 LENGTH FREQUENCY OF ARCTIC CHAR TAKEN ON HOOK AND LINE FROM LITTLE TOGIAK RIVER, WOOD RIVERY SYSTEM, JUNE, 1969.

Peace, Grant, and Little Togiak rivers and Lynx and Elva creeks. Rainbow trout were present in small numbers in these systems during the first two surveys, with the number increasing in late summer. Because a small number of fish were sampled, no significant population parameters could be determined.

Arctic Grayling:

This species was found in all streams mentioned above, with the exception of Elva Creek. Significant numbers of grayling were also found in the following tributary streams to the Wood River lakes system: Whitefish, Kema, Hidden Lake, and Tsun creeks. All these streams have small lakes in their drainages.

Table 5 indicates preliminary population parameters for the majority of grayling samples. Parameters were not calculated for all samples because of the small sizes.

TABLE 5 Range and Mean Length of Grayling from the Wood River Lakes System's Streams Sampled During July and August, 1969.*

<u>Stream</u>	<u>No.</u>	<u>Length Range (mm)</u>	<u>Mean Length (mm)</u>
Agulukpak River	26	234-443	359.0
Agulowak River	9	285-349	327.1
Big Whitefish Creek	11	156-285	249.6
Kema Creek	19	267-410	344.9
Tsun Creek	17	261-415	367.1
Wind River	38	257-461	368.3

*Samples did not include all potential grayling waters. Streams sampled where grayling were not found include: Elva, Fenno, Hanson, Happy, Ice, Joe, Moose, Pick, Sam, Silver Horn, Spider, and Sunshine creeks, and Grant River.

Arctic Char:

This species is the predominant game fish in the Wood River lakes system. Large Arctic char concentrations were present off the mouths of all connecting streams during the spring and early summer red salmon smolt migrations. Limited tag-return information indicates that these fish rapidly move from these areas when the red salmon smolt migration ceases.

Figure 4 illustrates the length-frequency of one typical Arctic char feeding population taken off the Little Togiak River mouth during the first week in July. Significant numbers of char were taken as late as July 7, but by July 9, no Arctic char could be taken by hook and line. This is indicative of a rapid movement elsewhere by this population upon the termination of the smolt migration.

Northern Pike:

This species was found throughout the Wood River lakes system with the largest concentration in Lake

Kulik drainage. Northern pike were sampled by hook and line off the mouth of Grant River. The mean length of a 16-fish sample was 643.5 mm with a 511 - 953 mm range. A pike sample taken near the Agulowak River mouth had a mean length of 468.3 mm (n=24).

Other Projects

No work was accomplished in Togiak Bay or Egegik River drainages during the reporting period.

Several attempts to arrange military transportation of silver salmon, *O. kisutch*, fingerling from Fire Lake Hatchery to a barren lake at Cape Newenham were unsuccessful. No further information on this lake was obtained during the reporting period.

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Prepared by:

Approved by:

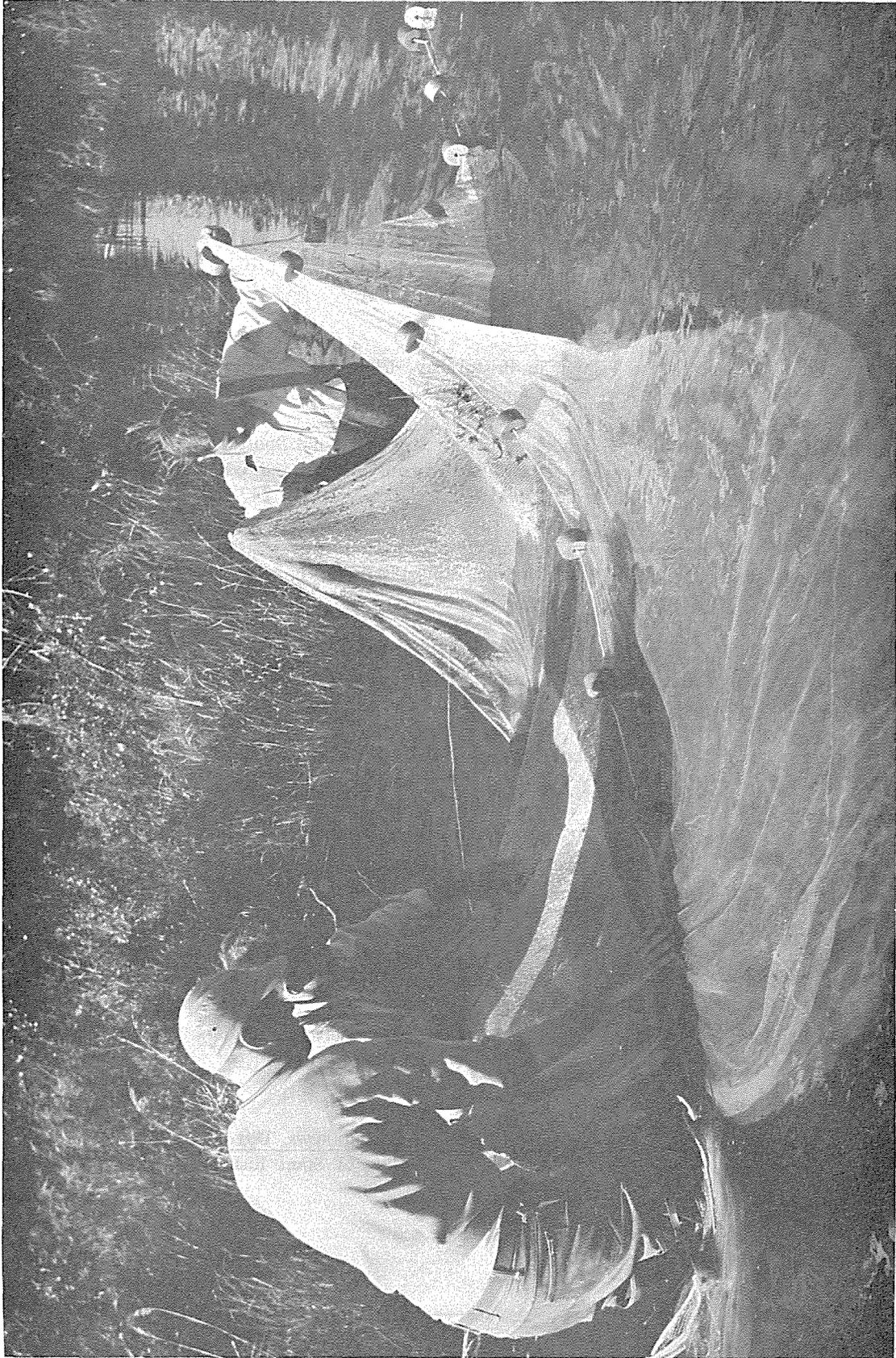
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Fishery Technician

s/Rupert E. Andrews, Director
Division of Sport Fish

Date: April 15, 1970.



BEACH SEINE SET BEING RETRIEVED.