

## RESEARCH PROJECT SEGMENT

*State:* Alaska

*Project No.:* F-9-3

*Name:* Sport Fish Investigations of Alaska.

*Study No.:* G-1

*Study Title:* Inventory and Cataloging.

*Job No.:* G-1-C

*Job Title:* Inventory and Cataloging of Kenai Peninsula, Cook Inlet, and Prince William Sound Drainages and Fish Stocks.

*Period Covered:* July 1, 1970 through June 30, 1971.

## ABSTRACT

Cataloging and inventory activities were performed on 28 Kenai Peninsula lakes. Eighteen of these waters contained game fish with the rainbow trout, Salmo gairdneri, the most common species. Biological and physical characteristics of these lakes are presented.

The Kenai River subsistence fishery for eulachon, Thaleichthys pacificus, was monitored. One hundred forty-seven of the 393 permits issued were returned. The average catch per permit was 238.2 fish with a projected total harvest of 61,217 eulachon. A description of this fishery is outlined.

A tagging study was initiated on black rockfish, Sebastes melanops, in Resurrection Bay. Ninety-eight fish were tagged but no recoveries have been observed. A description of the stomach deflation technique is presented.

## RECOMMENDATIONS

Retain the present objectives of the study with emphasis directed toward the following:

1. Conduct a limited creel census at the outlet of Crescent Lake during early June to determine the duration of Arctic grayling spawning.
2. Initiate lake surveys in the portion of the Kenai National Moose Range selected for commercial tent camps and in the West Forelands area on the western side of Cook Inlet.
3. Eliminate the requirement for eulachon subsistence permits for the Kenai River and extend the season to June 1.

## OBJECTIVES

1. To determine the environmental characteristics of the existing or potential recreational fishery waters of the job area and to obtain estimates of existing and/or potential angler use and sport fish harvest.
2. To evaluate application of fishery restoration measures and availability of sport fish egg sources.
3. To assist as required in the investigation of public access status to the area's fishing waters and to make specific recommendations for segregation of public fishing access sites.
4. To evaluate multiple water-use development projects (public and private) and their effects on the area's streams and lakes for the proper protection of sport fish resources.
5. To investigate, evaluate, and develop plans for the enhancement of anadromous and resident fish stocks.
6. To provide recommendations for the management of sport fish resources in these waters and direct the course of future studies.

## TECHNIQUES USED

Lakes were surveyed employing standard methods (Lake and Stream Survey Manual, 1971). Chemical data were obtained with a Hach AL-36-WR Kit and a P-100 Ross depth finder was used to record bottom contours. Fish populations were sampled with 125' x 6' monofilament gill nets having five

mesh sizes, ranging from 3/4- to 2-inch bar measure.

The effort, harvest, and catch rates of eulachon in the Kenai River were determined by analysis of voluntarily returned subsistence permits.

The techniques for tagging black rockfish in Resurrection Bay are described in detail in the findings section of this report to provide better continuity.

## FINDINGS

### Lake Surveys

Basic surveys were conducted on 28 lakes during this report period. The general area and number surveyed were as follows: Kenai National Moose Range - 14; Chugach National Forest - 10; Private Land - 4. Surveys on the Kenai National Moose Range were directed primarily toward obtaining information on lakes adjacent to the Swan Lake and Swanson River Canoe Portage Systems, for eventual expansion of these systems. Lakes were also surveyed in the northeastern portion of the refuge for the possible establishment of commercial tent camps for sport angling as these camps are being phased out in the canoe portage system. Surveys on the Chugach National Forest were confined chiefly to lakes where Arctic grayling, Thymallus arcticus, and rainbow trout, Salmo gairdneri, have been transplanted or stocked. Table I shows the location, surface acreage, and maximum recorded depth of the lakes surveyed during 1970.

TABLE I Location, Surface Acreage, and Maximum Depth of Lakes Surveyed, Kenai Peninsula, 1970.

<u>Lake</u>	<u>Location</u>	<u>Surface Acreage*</u>	<u>Maximum Observed Depth (Ft.)</u>
Barabara	T9N R5W Sec. 19, 20, 29, 30	760	58
Bench	T6N R1E Sec. 11, 14	90	24
Birch Tree	T9N R6W Sec. 19	112	23
Camp Island	T6N R8W Sec. 5, 8	412	55
West Camp Island	T6N R8W Sec. 7	29	55
Char	T3N R3W Sec. 1	10	22
Cisca	T5N R9W Sec. 6	65	26
Cleaver	T3N R2W Sec. 6	7	7
Fetus	T3N R2W Sec. 6, 7	15	26
Grayling	T2N R1W Sec. 12, 13	25	50
Grebe	T6N R8W Sec 8, 9, 16, 17	355	39
Grouse	T1N R1W Sec. 1	9	20
Grouse	T8N R6W Sec. 14, 22, 23	456	47
South Grouse	T8N R6W Sec. 22	53	3

TABLE 1 (Cont.) Location, Surface Acreage and Maximum Depth of Lakes Surveyed, Kenai Peninsula, 1970.

<u>Lake</u>	<u>Location</u>	<u>Surface Acreage*</u>	<u>Maximum Observed Depth (Ft.)</u>
Southwest Grouse Hall	T8N R6W Sec. 22	17	3
Johnson	T5N R9W Sec. 20, 21	41	14
Llerun	T6N R1E Sec. 15, 22	43	35
Lower Longmare	T9N R6W Sec. 20, 29	33	37
Lynx	T5N R9W Sec. 30	40	10
Nuthatch	T9N R6W Sec. 19	50	16
Lower Paradise	T9N R6W Sec. 29, 30	16	22
Upper Paradise	T3N R2E Sec. 15, 22	157	59
Robinson	T3N R3E Sec. 6, 7, 12	205	109
Sevena	T5N R9W Sec. 8	14	27
Tern	T5N R10W Sec. 1, 2	71	19
Preachers Pond	T5N R2W Sec. 12, 13	50	15
Twig	T1N R1W Sec. 27	2.5	15
	T9N R6W Sec. 19	28	17

\*Acreages determined by map grids from USGS maps (1:63,360)

Gill net sampling produced game fish in 18 lakes, with rainbow trout the most common species taken. Other species taken in the order of their abundance were: Arctic char, Salvelinus alpinus; longnose suckers, Catostomus catostomus; Arctic grayling; red salmon, Oncorhynchus nerka; Dolly Varden, S. malma; silver salmon, O. kisutch; round whitefish, Prosopium cylindraceum; and king salmon, O. tshawytscha. Threespine stickleback, Gasterosteus aculeatus, were found in all lakes surveyed below the 1,100-foot elevation. Gill net results are summarized in Table 2.

TABLE 2 Gill Net Summaries of Lakes Surveyed, Kenai Peninsula, 1970.

<u>Lake</u>	<u>Survey Date</u>	<u>Species*</u>	<u>No. Fish</u>	<u>Length Range (mm)</u>	<u>Mean Length</u>	<u>Catch/Hr.**</u>
Barabara	7/15	No Fish Taken				
Bench	6/25	GR	30	115-365	135.3	0.65
Birch Tree	7/8	No Fish Taken				
Camp Island	7/29	RT	70	155-430	310.3	1.19
		RWF	28	175-380	309.1	0.47
		LS	21	211-491	432.5	0.36
		RS	2	171-181	176.0	0.03
		AC	1	260	--	0.02
West Camp Island	8/2	SS	2	176-189	182.5	0.06
		RT	1	165	--	0.03

TABLE 2 (Cont.) Gill Net Summaries of Lakes Surveyed, Kenai Peninsula, 1970.

Lake	Survey Date	Species*	No. Fish	Length Range (mm)	Mean Length	Catch/Hr.**
Char	7/30	AC	24	298-400	337.0	0.48
Cisca	8/2	RT	2	500-565	532.5	0.05
Cleaver	7/29	No Fish Taken				
Fetus	7/29	No Fish Taken				
Grayling	8/25	GR	91	115-320	196.5	1.98
Grebe	8/1	RT	37	162-520	353.2	0.57
		LS	20	440-545	481.2	0.31
		RS	1	166	--	0.01
Grouse	7/14	DV***	427	201-555	349.5	1.12
		RS & SS determined by past escapement surveys				
Grouse	7/17	No Fish Taken				
South Grouse	7/16	No Fish Taken				
Southwest Grouse	7/16	No Fish Taken				
Hall	8/5	No Fish Taken				
Johnson	6/27	RT	27	155-475	263.1	0.58
Llerun	7/9	LS	9	320-475	414.6	0.18
		AC	3	307-334	322.0	0.06
		RT	2	380-385	382.5	0.04
Lower Longmare	8/10	No Fish Taken				
Lynx	7/8	RT	23	165-442	346.9	0.53
		LS	2	225-230	227.5	0.04
Nuthatch	7/11	LS	20	160-510	404.1	0.47
		RT	12	216-365	314.0	0.28
		AC	1	355	--	0.02
Lower Paradise	7/2	GR	129	125-390	305.2	2.83
		RT	1	335	--	0.07
Upper Paradise	7/9	GR	45	165-380	306.6	0.91
Robinson	6/10	No Fish Taken				
Sevena	6/23	RT	26	156-417	279.7	0.57
Tern	7/24	RWF	64	125-390	317.9	1.33
		DV	24	125-445	279.3	0.50
RS & KS determined by past escapement surveys						
Preacher Pond	7/14	DV determined by past creel census				
Twig	7/8	RT	5	398-499	435.4	0.21
		AC	2	423-464	443.5	0.08

\*RT - Rainbow trout

DV - Dolly Varden

AC - Arctic char

GR - Arctic grayling

LS - Longnose sucker

SS - Silver salmon

RS - Red salmon

KS - King salmon

RWF - Round whitefish

\*\*Catch per gill net hour; 125' x 6' variable mesh gill nets.

\*\*\*Determined from gill net catches made during the winter of 1962.

## Kenai River Eulachon Fishery

A gill net subsistence fishery for eulachon (smelt or hooligan), Thaleichthys pacificus, occurs annually during April and May in the lower Kenai River. This fishery is not generally considered conventional sport fishing, but mainly recreational in nature. The conventional dip netting technique is precluded due to relatively large stream flows averaging about 2,500 cfs during the fishery. It is believed this fishery can fill an important recreational need during the spring when fishing on the western Kenai Peninsula is generally poor. Kenai River eulachon are available during a period when most trout streams are closed to fishing and salmon are not yet available. Razor clam digging is presently the primary source of recreation during this period.

During 1970, the fishery was governed by the following regulations: (1) a subsistence permit issued by the Department of Fish and Game was required, (2) gill nets were allowed if the bar mesh size did not exceed one inch, (3) eulachon fishermen must be physically present at the net at all times it is being fished.

The fishery occurs primarily on a one-half mile section of the Kenai River adjacent to the city of Kenai. The fishing area is characterized by a sandy beach and wide tidal fluctuations ranging from -4.5 - 24.8 feet. The Kenai River was open to eulachon subsistence fishing from its terminus with Cook Inlet to the outlet of Skilak Lake, approximately 45 miles upstream. To date, these fish have been observed a distance of 28 miles upstream from the mouth.

Nearly all eulachon are taken with a gill net attached to a pole ranging from 10 - 16 feet in length. The net is drifted perpendicular to the shore and guided in the current by a rope attached to one end. Since the Kenai River is glacial (250 tons of suspended sediment discharge per day) there is little light penetration to affect gill net efficiency. Fishing is done primarily at low tide or during the early flood, or ebb, stage of the tide. Tidal influence extends to the Eagle Rock area 12.5 miles upstream.

A total of 393 subsistence permits were issued during the fishery. This is a 102.6% increase over the 194 permits issued in 1969. A summary of the subsistence permits is presented in Table 3. Kenai River subsistence permits returned totaled 147 constituting 37.4% of the permits issued. Fifty-one (34.7%) permits returned showed anglers did not fish, or no eulachon were taken. Permit holders fished an average of 1.9 days.

TABLE 3 Summary of Kenai River Eulachon Subsistence Permits, 1970.

	<u>1969</u>	<u>1970</u>
No. permits issued	194	393
No. permits returned	80	147
No. permits taking fish	59	96
No. net days	125	187
Avg. no. days fished	2.1	1.9
No. permits fishing	143	257
% permits taking fish	73.8	65.3

The residency of the permittees was as follows: Kenai-Soldotna area - 335 (85.2%); other Kenai Peninsula areas - 43 (11.0%); other Alaska areas - 15 (3.8%). The small percentage (3.8) of fishermen from other areas of Alaska evinces there is a substantial latent potential for expanded utilization of this fishery.

Ninety-six permits recording fish were returned with 22,870 eulachon being totaled. The average number of fish per permit was 238.2. The permits showed 187 net-days of effort recorded with a mean of 122.3 eulachon caught per net-day. These catch rates are similar to the 226.7 fish per permit and the 107.0 fish per net-day observed in 1969. The extrapolated catch of Kenai River eulachon was 61,217. This is an 88.8% increase over the projected harvest of 32,430 in 1969. Harvests and catch rates of eulachon in the Kenai River are summarized in Table 4. These projections are based on the following assumptions: (1) the harvest rates are the same for permits not returned as for permits returned, (2) the 113 permits issued for both the Kenai River and Cook Inlet fished these areas in the same ratio as permits issued exclusively for each area. The aforementioned assumptions would probably tend to result in higher catches than actually occurred. To counter this, however, it is probable that all fishermen using this fishery did not obtain permits, thus tending to reduce the projected harvest. The permit system has been in effect only since 1969.

TABLE 4 Summary of the Analysis of Kenai River Eulachon Subsistence Permits, 1969 and 1970.

<u>Year</u>	<u>Observed No. Fish Taken</u>	<u>No. Fish/ Net Day</u>	<u>No. Fish/ Permit</u>	<u>No. Permits Fishing</u>	<u>Projected Harvest</u>
1969	13,380	107.0	226.8	143	32,430
1970	22,870	122.3	238.2	257	61,217

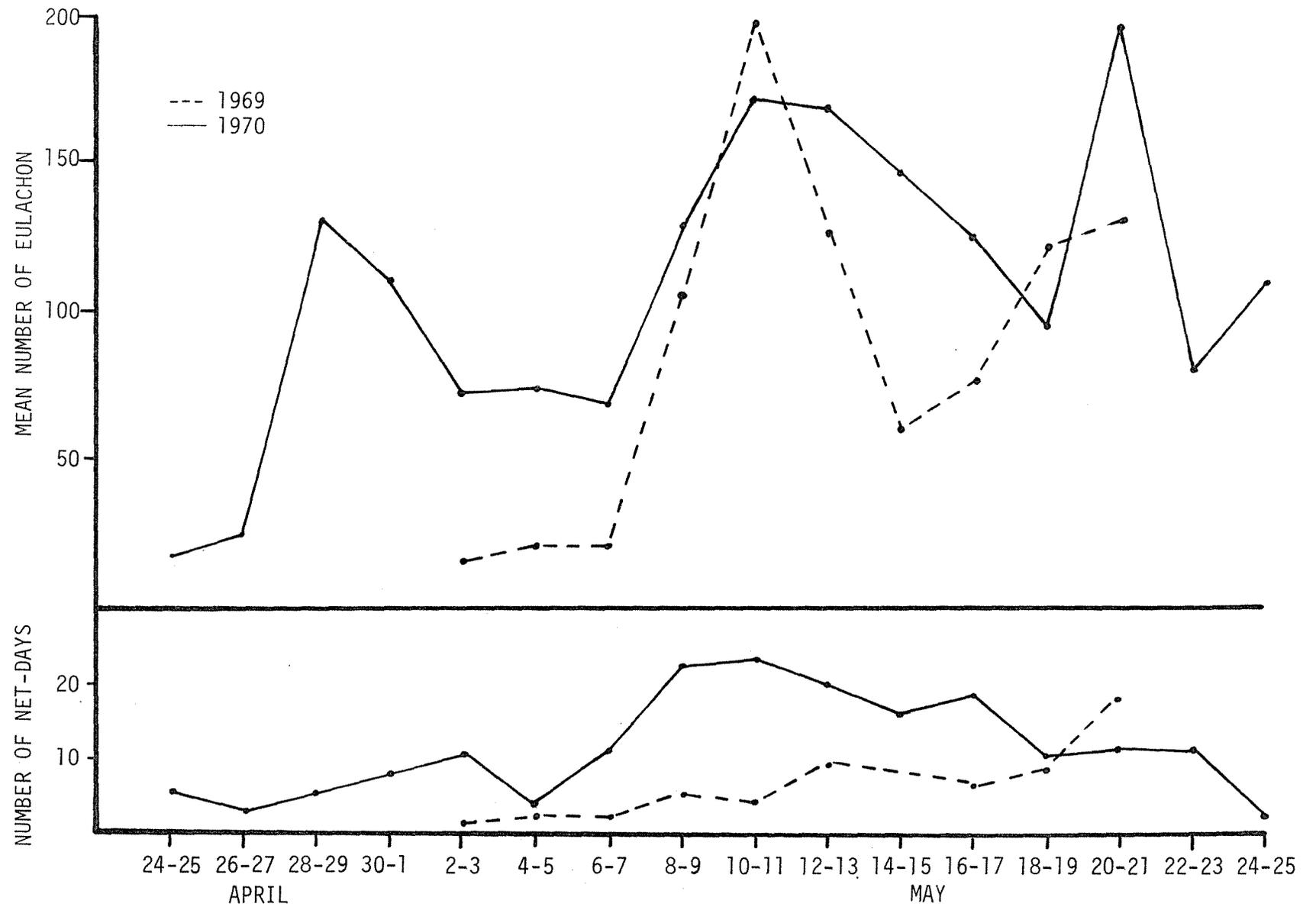


FIGURE 1 CONSERVED EULACHON HARVEST AND EFFORT FROM THE KENAI RIVER, 1969-1970

The Kenai River fishery occurred from April 1 through May 25, when the permits expired. The fishery was terminated on May 25 because it was believed red salmon would be abundant in the Kenai River, although no fish were taken to substantiate this. Five Dolly Varden and 554 Pacific herring, Clupea harengus, were recorded on permits during this period.

The greatest catch per net-day of 218 eulachon occurred on May 10 and 11. Fish were still relatively abundant on May 25 when the permits expired. Figure 1 shows the peak of the fishery occurred during the same period as in 1969.

It is very unlikely that overfishing could occur if the permit system were eliminated. There is only a one-half mile section of beach readily accessible that lends itself to this type of fishery. Also, the river is approximately 400 yards wide in this area during low tide and fishermen can not wade over 30 yards from shore.

#### Resurrection Bay Black Rockfish Tagging

A tagging study was initiated on black rockfish, Sebastes melanops, in Resurrection Bay from May 12 through 14, 1970. The purpose of this program was to determine if black rockfish populations, located at the entrance to Resurrection Bay, were predominately migratory or local stocks. Sport fishing effort on these fish has gradually increased, particularly with the establishment of Army and Air Force recreation camps in Seward in the early 1960's.

Rockfish tagging is a problem since these fish are sensitive to the celerity of pressure changes. The genus Sebastes is physoclistous (their swim bladder does not have a pneumatic duct). Frequently, when physoclists are brought to the surface, their stomachs are everted through their mouths. This is caused by gases in the swim bladder expanding due to an inability to adjust to rapid pressure changes. The bladder is distended and occasionally their eyes are popped.

To correct this distended condition a deflation technique, described by Gotshall (1964), was employed. This technique involves inserting an 18-gauge 1/2-inch long hypodermic needle through the abdominal wall at a 45-degree angle, with the point toward the anterior end of the fish. The needle is inserted between the scales just dorsal to the pectoral fin at a point three-quarters the distance from the insertion to the tip of the fin held parallel to the lateral line. Penetration of the bladder becomes evident when escaping gas is heard. The needle is next moved to a vertical position with its point directed slightly dorsally to preclude puncturing the collapsing bladder again. It is important the needle be inserted where the swim bladder adheres to the wall of the abdomen so gases are not released in the body cavity. The rockfish, with the needle in it, is submerged in water to observe when the gases terminate flowing. The deflation technique is considered complete when gases cease to escape and the fish

swims normally. If the stomach is everted through the mouth by the expanded swim bladder, the bladder is first deflated and the stomach pushed back through the throat into its former position with a 1/4-inch diameter plastic rod with rounded ends. The needle is then reinserted to allow any remaining gases to escape.

The principle tagging sites were Rugged Island at the entrance to Resurrection Bay and Cheval Island on the eastern tip of the Aialik Peninsula located 18 and 24 miles south of the city of Seward, respectively.

All rockfish were captured on spinning gear and weighted silver lures. Prior to deflation, fish were anesthetized in a 1:20,000 saltwater solution of MS-222. After the fish were immobilized, they were deflated, tagged, their fork length recorded, a scale sample collected, then placed in a holding tank to recover. The rockfish were tagged with a Floy tag applicator using FD-67F internal anchor flag tags. Tags were inserted behind the inter-neural bones of the musculature on the left side immediately below the center of the dorsal fin.

The first day of tagging, May 12, was confined to the area surrounding Rugged Island. Thirteen rockfish were captured from depths ranging from 15 - 45 fathoms. The fish ranged from 210 - 480 mm, with a mean length of 381 mm. All fish were tagged with a yellow flag tag with no mortalities observed.

The remainder of the tagging operation was conducted in the waters around Cheval Island on May 13 and 14. Eighty-five fish, captured at depths ranging from 20 - 45 fathoms, were tagged. These fish ranged from 285 - 515 mm, with a mean length of 385 mm, and were tagged with a red flag tag. A mortality of two rockfish may have occurred when these fish were released without being properly deflated and were unable to immediately descend to deeper water. An additional ten rockfish captured could not be tagged because they were either severely mutilated by lingcod, Ophiodon elongatus, as they were brought to the surface or they had a severe popeye condition which could not be corrected by inserting a hypodermic needle into the eye cavity to reduce pressure.

Other rockfish captured incidentally during the tagging program in the order of their relative abundance were: red snapper (rasphead rockfish), S. ruberrimus; yellowtail rockfish, S. flavidus; tiger rockfish, S. nigrocinctus. All red snapper were captured in the area surrounding Cheval Island and located in water deeper than black rockfish, generally from depths in excess of 40 fathoms.

An effort was made to recover the tagged rockfish by periodically interviewing anglers from the Army and Air Force recreation camps. Fishermen from these camps exert the greatest fishing effort on this species during the period from about May 15 th July 15, when they change to silver salmon angling. No tagged fish were observed by the military in either recreation camp.

Multiple Use and Access

Access for eventual construction of a weir was obtained on the South Fork of the Anchor River. This two-acre site is located 400 feet above the confluence of the North and South Forks.

LITERATURE CITED

- Alaska Department of Fish and Game. 1971. The Division of Sport Fish - Lake and Stream Survey Manual.
- Gotshall, Daniel, W. 1964. Increasing Tagged Rockfish (Genus Sebastodes) Survival by Deflating the Swim Bladder. California Fish and Game, Volume 50, Number 4: 253-260.
- Logan, Sidney, M. 1970. Inventory and Cataloging of Kenai Peninsula - Cook Inlet - Prince William Sound Drainages and Fish Stocks. Alaska Department of Fish and Game. Federal Aid In Fish Restoration, Annual Report of Progress, 1969-1970, Project F-9-2, 11:65-73.

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