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OCCURRENCE OF FISH IN THE VICINITY OF PROPOSED SITES OF TWO
NUCLEAR ELECTRIC PLANTS ON THE LOWER COLUMBIA RIVER

Robert J. McConnell
and
George R. Snyder
Fishery Research Biologists

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BUREAU OF COMMERCIAL FISHERIES
BIOLOGICAL LABORATORY
2725 MONTLAKE BLVD. E., SEATTLE, WASHINGTON 98102

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INTRODUCTION

Engineers and biologists must have knowledge of fish behavior to plan for resource protection and migration patterns are a critical part of this behavior. This report describes the results of 2 years of research on the occurrence of fish at the proposed sites for two thermal (nuclear) electric plants on the lower Columbia River. The area of study was the section of the Columbia between river miles 70 and 78 (Figure 1) that includes the two proposed thermal electric plant sites. At river-mile 73 is the site of Portland General Electric's "Trojan" plant and at river-mile 78 the site of Clark and Cowlitz County Public Utility District's "Kalama" plant. Fish were sampled at: (1) two beaches near river-mile 70, (2) two beaches near river-mile 78, and (3) purse seine sites A, B, and C at river-mile 73 (Fig. 1).

FISH SAMPLING

Equipment

The purse seine gear (Fig. 2) was developed at Brownlee Reservoir, Idaho (Durkin and Park, 1967). The purse net was 152.4 m long by 9.1 m deep. Two beach seine nets were used; one 76.2 m long by 6.1 m deep, the other was 152.4 m long and tapered from 2.7 m to 3.7 m at the bunt end. Because of mesh size, nets sampled fish 40 mm and larger.

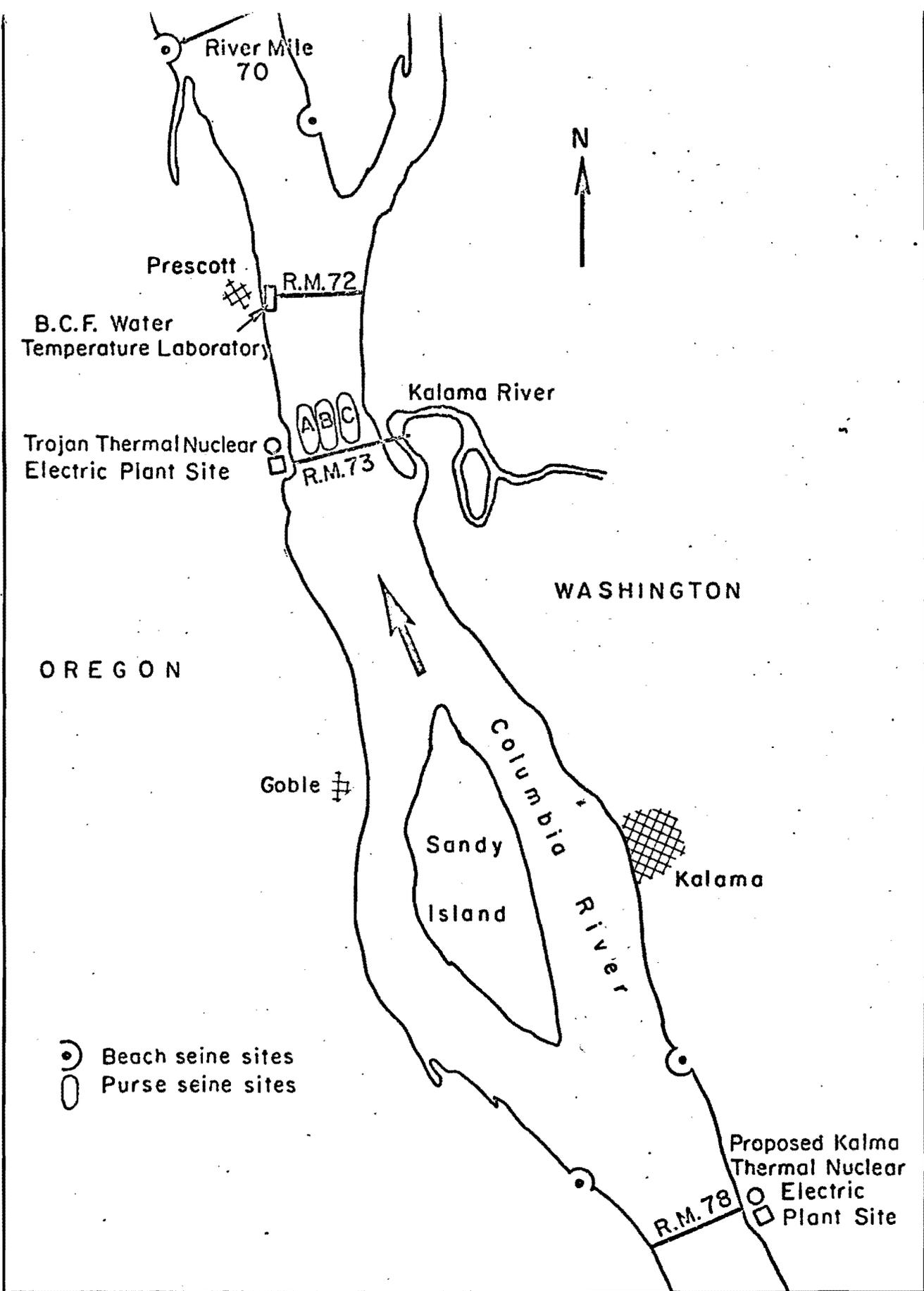


Figure 1.--Study area--lower Columbia River.

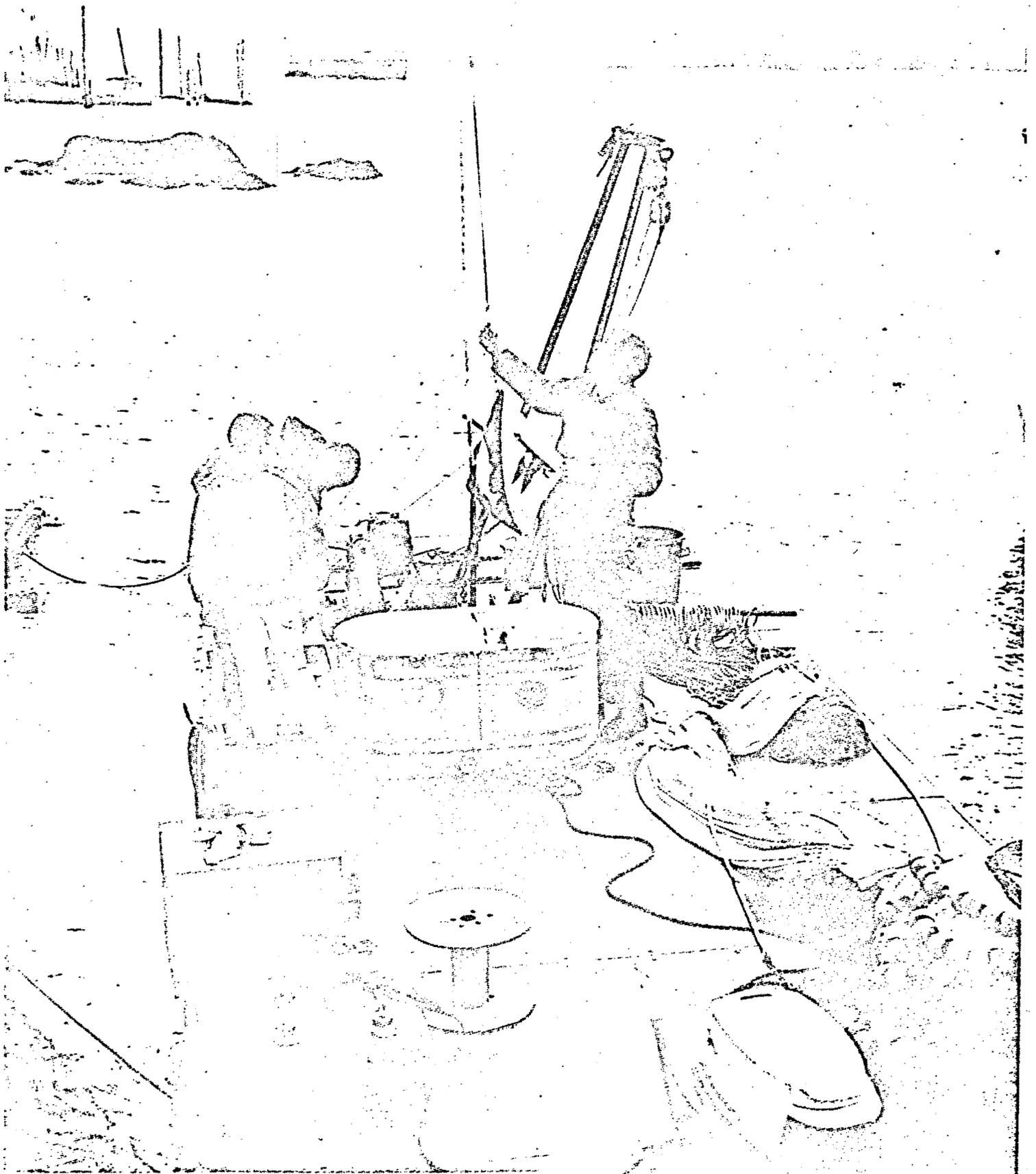


Figure 2a.--Purse seine barge used to sample fish in the lower Columbia River.

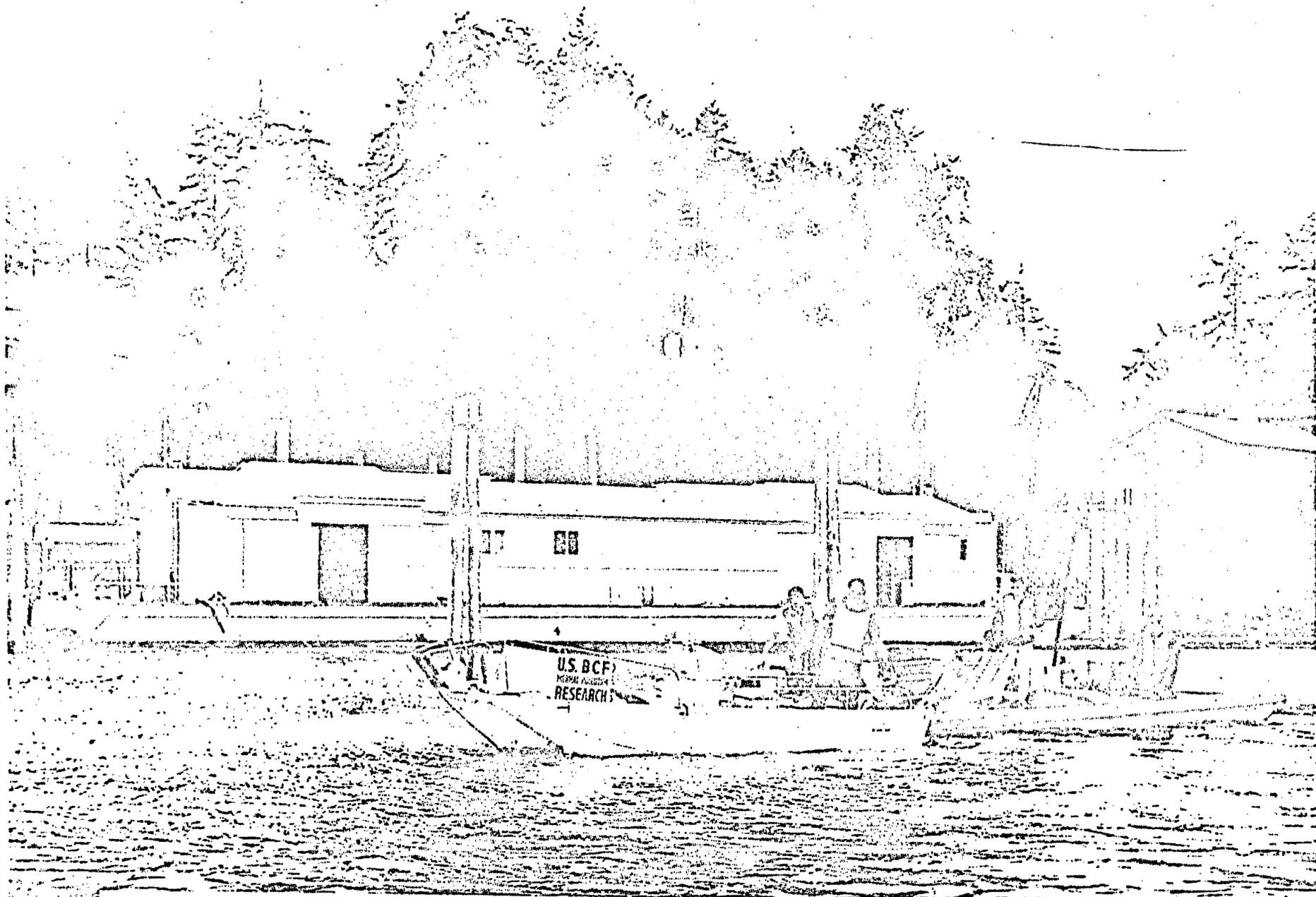


Figure 2b.--Purse seine barge used to sample fish in the lower Columbia River.
Crew is just beginning to set the net for fishing.

Procedure

Purse seining was conducted at the Trojan site from January 1968 through December 1969. Beach seining was carried out below the Trojan site from March 1968 through February 1970, and from March 1969 through February 1970 downstream from the Kalama site.

Sampling was scheduled on a weekly basis, with the three purse seine sets (A, B, and C) made on the same day of the week; the fishing sequence was randomized. Beach seine sets were made in pairs downstream from either the Trojan or Kalama site. The sets were within a 2-hour period, and usually the four beaches were fished the same day.

All captured fish were identified, counted, and released into the river; representative numbers of salmon and trout were weighed and measured (Fig. 3). Sampling data were transcribed for automatic data processing.

Catch per unit of effort (CPUE) is defined as the number of fish captured per set with 152.4 m of net.

SPECIES COMPOSITION

Twenty-seven species of fish (Table 1) were captured in the study area.

Juvenile chinook (O. tshawytscha) made up 85 percent of the total salmonid catch; young coho (O. kisutch) comprised 14 percent. Steelhead trout (S. gairdneri), cutthroat trout (S. clarki), sockeye (O. nerka), and chum salmon (O. keta) were captured in that order of abundance. The threespined stickleback (G. aculeatus) was the most numerous non-salmonid--

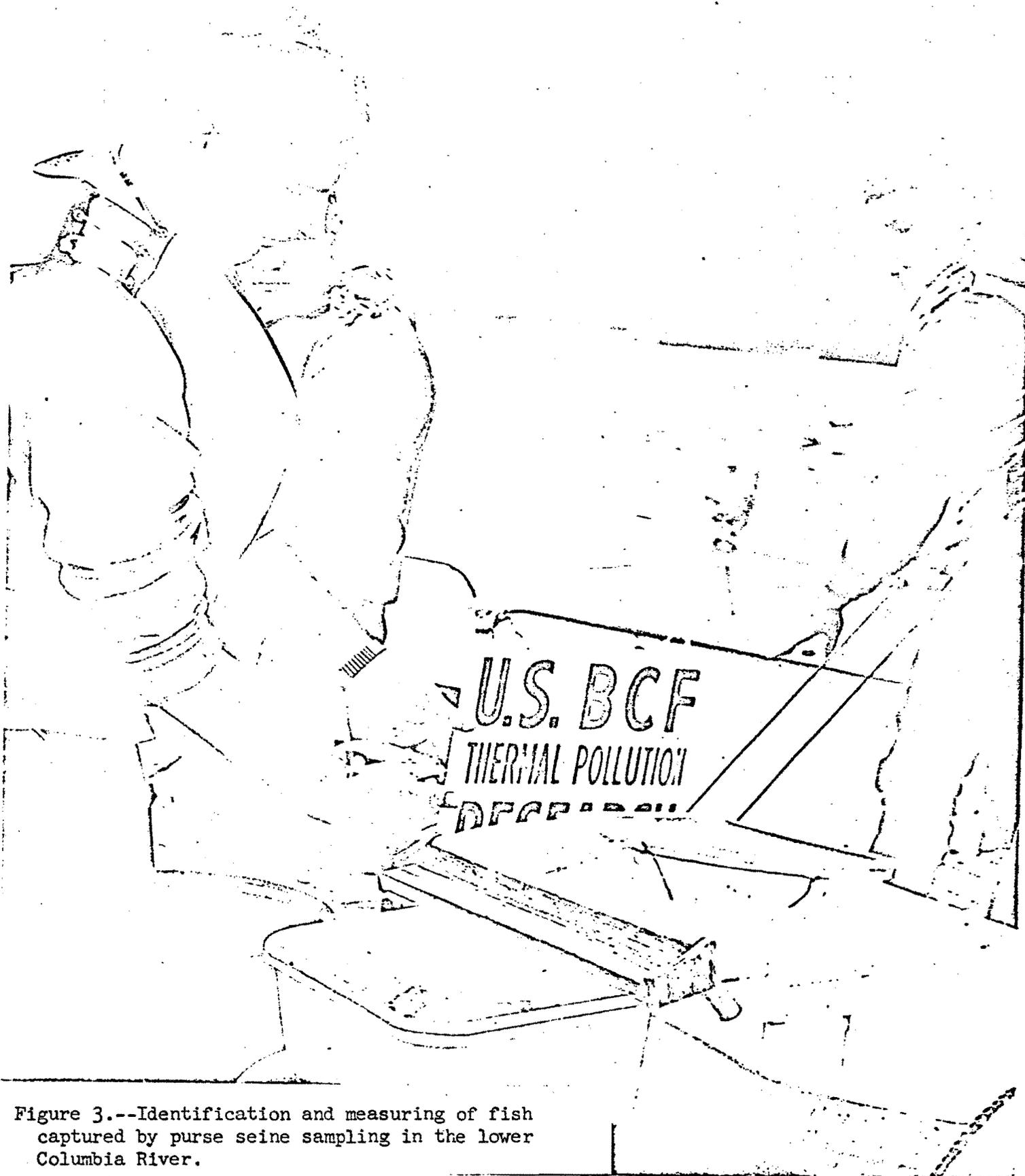


Figure 3.--Identification and measuring of fish captured by purse seine sampling in the lower Columbia River.

Table 1.--Species composition and abundance of fish captured by purse seine sampling in the area of the lower Columbia River between river mile 70 and river mile 78.

Common name	Species composition Scientific name ^{1/}	Totals
1. Chinook salmon	<i>Oncorhynchus tshawytscha</i>	26,532
2. Threespine stickleback	<i>Gasterostus aculeatus</i>	16,325
3. Coho salmon	<i>Oncorhynchus kisutch</i>	4,275
4. American shad	<i>Alosa sapidissima</i>	3,435
5. Peamouth chub	<i>Mylocheilus caurinus</i>	1,845
6. Yellow perch	<i>Perca flavescens</i>	864
7. Steelhead trout	<i>Salmo gairdneri</i>	524
8. White crappie	<i>Pomoxis annularis</i>	335
9. Starry flounder	<i>Plalichthys stellatus</i>	246
10. Mountain whitefish ^{2/}	<i>Prosopium williamsoni</i>	200
11. Carp	<i>Cyprinus carpio</i>	193
12. Largemouth Bass	<i>Micropterus salmonides</i>	129
13. Largescale sucker	<i>Catostomus macrocheilus</i>	113
14. Brown bullhead	<i>Ictalurus nebulosus</i>	102
15. Cutthroat trout	<i>Salmo clarki clarki</i>	85
16. Cottus species	Cottidae	75
17. Sockeye salmon	<i>Oncorhynchus nerka</i>	61
18. Northern squawfish	<i>Ptychocheilus oregonensis</i>	61
19. Troutperch	<i>Percopsis transmontana</i>	36
20. White sturgeon	<i>Acipenser transmontanus</i>	29
21. Smallmouth bass	<i>Micropterus dolomieu</i>	17
22. Eulachon	<i>Thaleichthys pacificus</i>	12
23. Bluegill	<i>Lepomis macrochirus</i>	5
24. Pacific lamprey	<i>Lampetra tridentata</i>	4
25. Red-sided shiner	<i>Richardsonius balteatus</i>	3
26. Longfin smelt	<i>Spirinchus dilatatus</i>	2
27. Chum salmon	<i>Oncorhynchus keta</i>	1
		55,509

^{1/} From American Fisheries Society Special Publication No. 2, 1960.

^{2/} The A.F.S., Special Pub. No. 2, lists this species as a salmonid; it is included in non-salmonids in this report.

consisting of nearly 30 percent of the total number of fish captured.

OCCURRENCE OF FISH IN THE STUDY AREA

Young salmon were present in this area throughout the year and were most abundant during April, May, June, and July.

Juvenile chinook were captured every month during the 2 years of sampling. The largest numbers of chinook were captured in July 1968 and July 1969. Young coho were captured in greatest numbers during April 1968 and May 1969 (Fig. 4).

Only 61 yearling sockeye were captured, the majority during May (1969) and June (1968). The peak catch of steelhead and cutthroat trout was in May. Four juvenile chum were captured, one during April 1969 and three in May 1970.

Three non-salmonid fish captured in the area contribute substantially to the commercial and sports fisheries of the Columbia River. These are the American shad, the Columbia River smelt, and the white sturgeon. Most of the migrant juvenile American shad were captured each year during October. In February 1970, adult Columbia River smelt were captured at three of the beach seine sites. White sturgeon were captured in the study area throughout the year with the peak catch in May. Juvenile starry flounder were readily captured in beach seines throughout the year below the Trojan site. However, only one specimen was taken above the mouth of the Kalama River--perhaps indicating the upstream limit of their range. Threespined stickleback, Columbia River chub, and the starry flounder were captured throughout the year (Fig. 5).

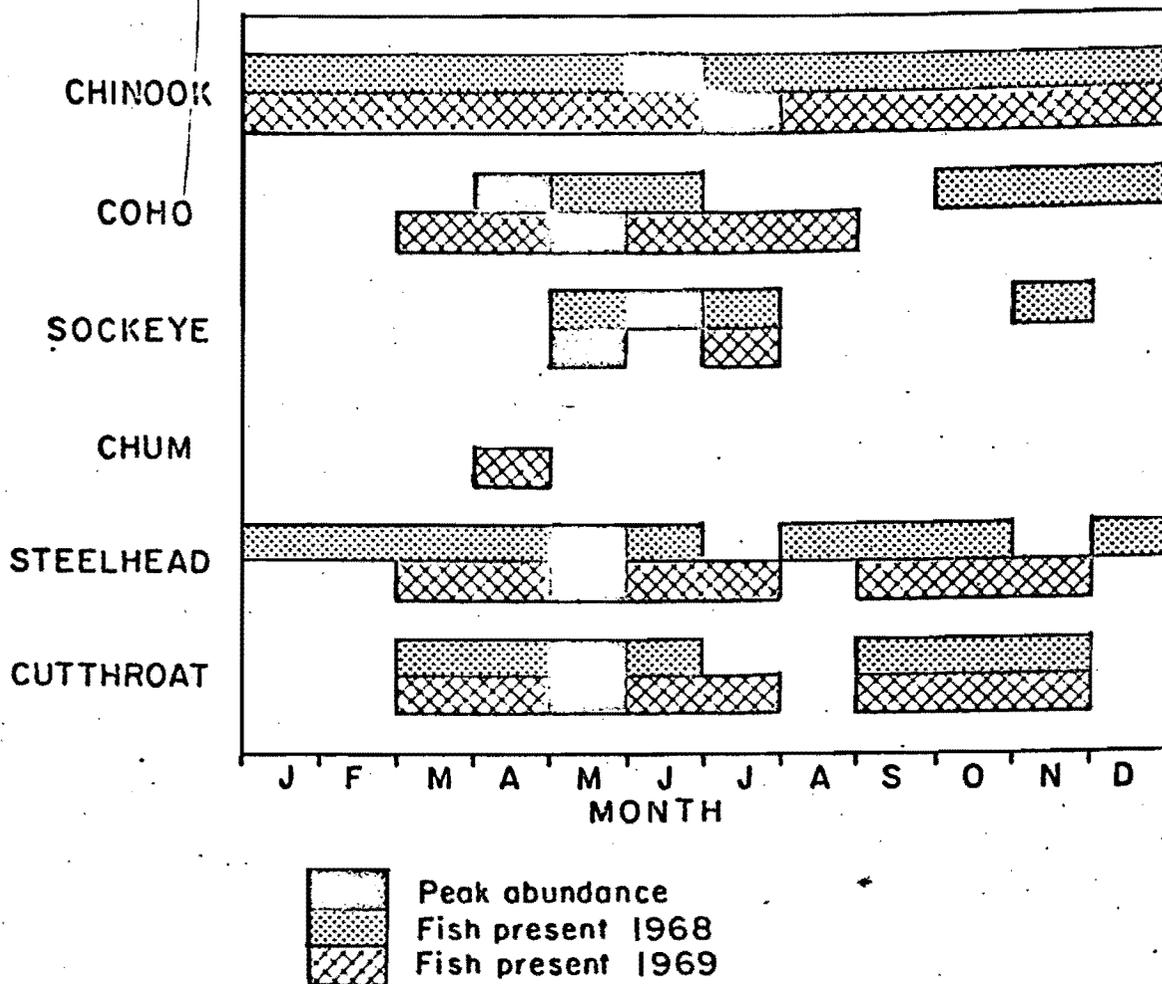
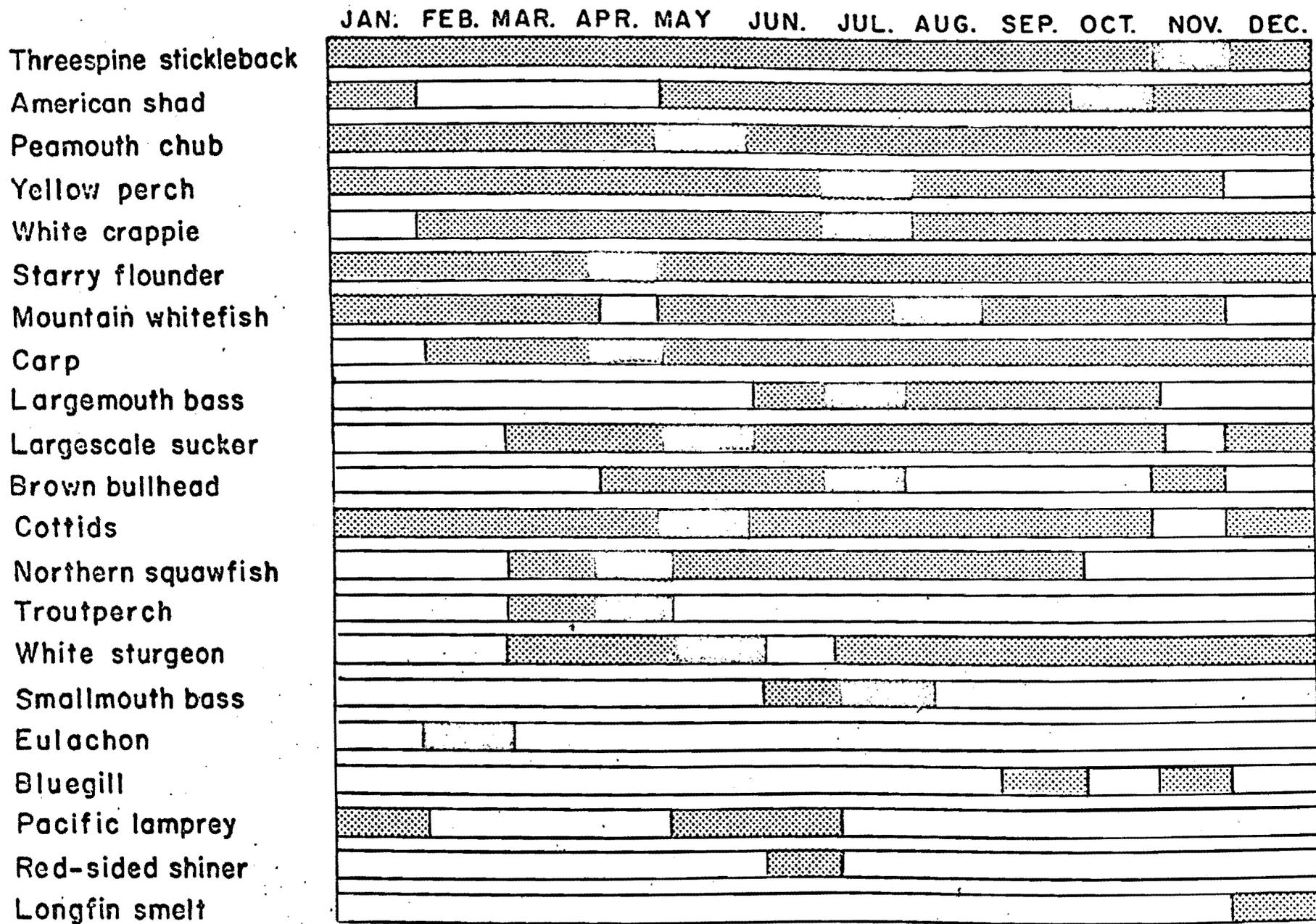


Figure 4.--Monthly occurrence of downstream migrant salmon and trout at river sampling sites between river mile 70 and 78 of the Columbia River, 1968-70.



 Peak abundance
 Fish present

Figure 5.--Monthly occurrence of non-salmonid fish at seven sampling sites between river mile 70 and 78 of the Columbia River, 1968-70.

CAPTURE OF MARKED FISH

From information obtained by capture of marked fish, under-yearling juvenile chinook moved from near Bonneville Dam downstream through the sample area in from 2 to 10 days. This was in May 1969 when river flows exceeded 450,000 c.f.s. (Snyder and McConnell, 1970).

In September 1969, marked fall and spring chinook were released into the Cowlitz River and entered the Columbia River (at RM 68) during conditions of low flow. Marked fish from both groups moved upstream and were captured in the Columbia River at the four beach seine sampling stations between river-mile 70 and river-mile 78. They were taken throughout the winter from October 1969 to May 1970.

DISTRIBUTION OF SALMON AND TROUT

The monthly catch of juvenile salmonids for each sampling station during 1968-69 and 1969-70 is given in Appendix A. The same data (expressed in catch per unit of effort) is given in Appendix B.

Beach seines

During 1968-69 and 1969-70, most of the young salmon and trout were captured on the Oregon shore at river-mile 70. In 1968-69 the catch per unit of effort (CPUE) was higher on the Oregon shore than on the Washington shore during all months except August. In 1969-70, the CPUE on the Oregon shore was equal to or higher than captures on the Washington shore in all but the 4 months of May, June, August, and September.

A summary of the beach seine catch is given in Table 2.

Table 2.--River shore distribution of juvenile salmon and trout captured in 1968 and 1970 at the downstream and upstream beach seine sites in the area of the lower Columbia River between river mile 70 and river mile 78.

	Downstream				Upstream	
	1968-69		1969-70		1969-70	
	Oregon Shore	Washington Shore	Oregon Shore	Washington Shore	Oregon Shore	Washington Shore
	Catch per unit of effort					
March	32	14	20	17	11	18
April	342	24	57	27	8	132
May	84	37	82	165	*	353
June	38	34	97	126	323	101
July	51	41	135	60	138	*
August	30	37	64	77	53	6
September	27	19	22	23	17	28
October	60	32	27	10	15	10
November	27	9	22	10	49	6
December	7	6	1	0	0	4
January	1	0	17	*	*	*
February	0	0	9	9	7	5

* Did not fish

The yearly catch of juvenile salmon and trout (1969-70) was equally divided between the upstream sampling sites at river-mile 78, although the monthly catch was variable (Table 2). Dredging operations in the vicinity of Kalama prevented seining on the Oregon shore in May and on the Washington shore in July at the upper beach seine sites (R.M. 78).

Purse seine sampling

Purse seine catches show the CPUE in the Washington third of the river (Area C) was equal to or higher than Area A and B during 9 out of 12 months in 1968, and 6 of the 10 months fished in 1969 (Table 3). Juvenile salmonids were captured in greater numbers in sampling efforts near the Washington portion of the river during 1968 and 1969. On the other hand, more fish were captured by beach seining on the downstream Oregon shore during both years. The occurrence of juvenile anadromous salmonids caught at each sampling station during 1968 and 1969 is shown in Figure 6.

DISTRIBUTION OF NON-SALMONIDS

Seventy-three percent of the non-salmonids were captured on the Oregon side of the river during the study period. This varies with the species of fish. For example, 82% of the shad were captured on the Oregon side of the study area. Eighty-four percent of the eulachon were captured on the Washington side of the river. The catch of non-salmonids at each of the seven sampling stations is given in Table 4.

Table 3.--Catch per unit of effort (CPUE) of salmon, steelhead, and cutthroat trout by purse seine sampling points, 1968-69.

Sampling Point:	Oregon Side	River Center	Washington Side	Oregon Side	River Center	Washington Side
Year:	1968			1969		
Catch per unit of effort						
January	1	*	*	*	*	*
February	0	0	0	0	0	0
March	3	2	7	1	5	11
April	2	2	10	3	21	24
May	58	79	160	14	88	95
June	128	134	29	10	5	40
July	44	11	6	10	2	25
August	9	4	23	4	1	4
September	3	2	5	3	9	8
October	7	3	12	0	3	2
November	0	3	3	3 *	0	1
December	1	3	3	*	*	*

*Did not fish.

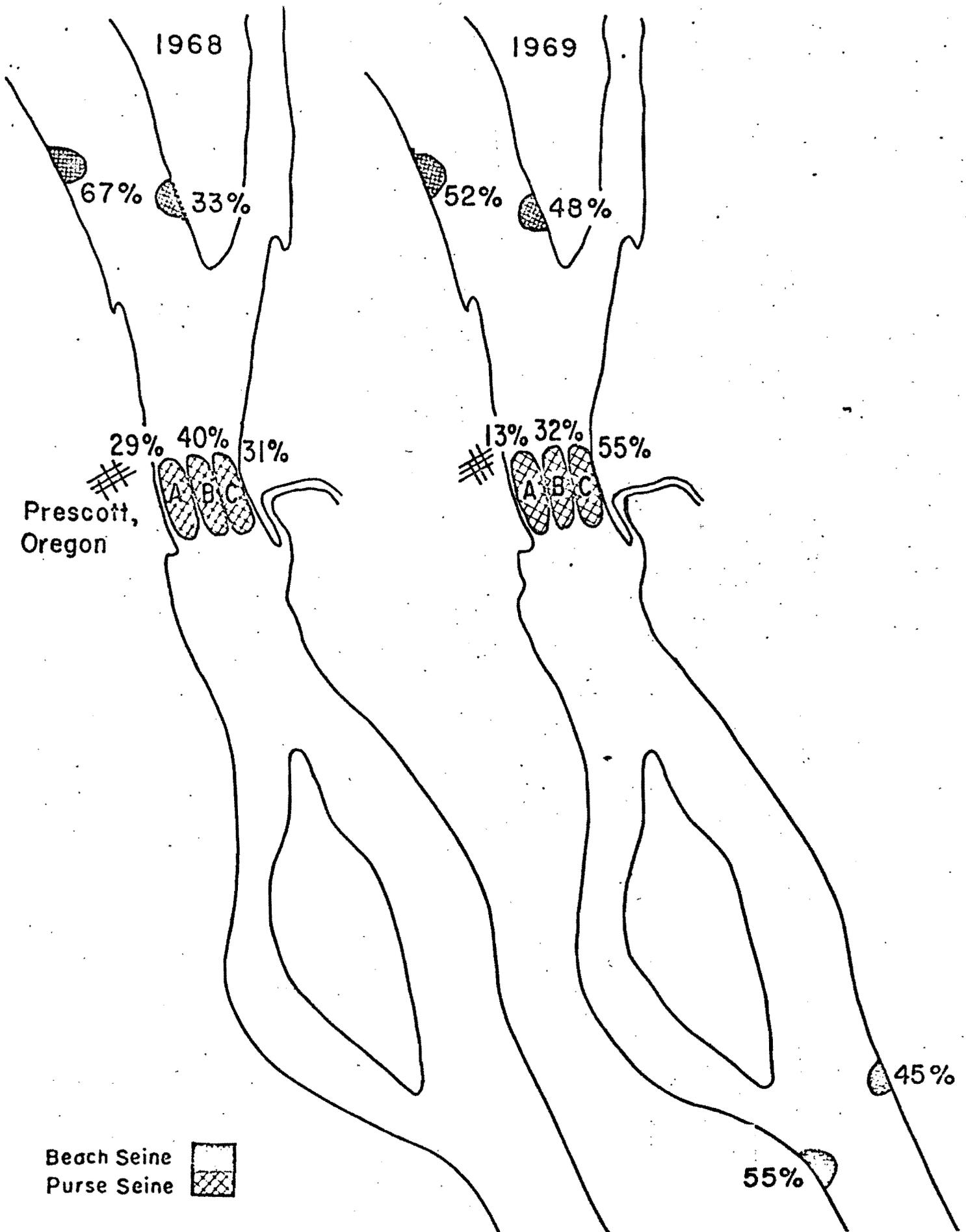


Figure 6.--Percent occurrence of juvenile salmonids at the sampling sites during 1968-69.

Table 4.--Capture of non-salmonid fish in the study area between river mile 70 and river mile 78 in 1968 and 1969. Percentages are based on catch per unit of effort.

	Downstream beach seine sampling		Mid-river purse seine sampling			Upstream beach seine sampling	
	Oregon	Washington	Oregon	Mid	Washington	Oregon	Washington
	Percent of catch per unit of effort						
Stickleback	48.2	12.7	0.03	0.01	0.02	26.3	12.7
Shad	20.9	5.2	9.2	1.9	6.7	52.7	3.8
Peamouth	31.5	12.5	4.9	5.2	14.9	11.5	19.8
Perch	47.1	6.8	0.1	0.1	1.3	36.2	8.7
Crappie	80.8	5.0	.4	.4	3.5	8.1	1.9
Starry flounder	62.1	35.0	-	.7	-	2.1	-
Whitefish	37.1	30.7	1.4	-	-	18.5	12.9
Carp	34.7	8.8	8.2	4.1	-	12.9	32.4
Largemouth bass	49.0	8.0	1.0	-	-	33.0	7.0
Sucker	4.9	11.8	2.8	2.8	53.5	16.7	7.6
Brown bullhead	50.0	16.7	-	-	-	-	33.3
Cottidae species	14.4	2.2	-	-	43.3	13.3	26.7
Squawfish	3.4	2.3	-	1.2	81.4	11.6	-
Troutperch	-	-	-	-	100.0	-	-
Sturgeon	40.0	30.0	-	-	30.0	-	-
Smallmouth bass	8.3	75.0	-	-	-	-	16.7
Eulachon	-	41.7	-	-	-	16.6	41.7
Pacific lamprey	-	-	71.4	-	37.5	-	-
Bluegill	50.0	50.0	-	-	-	-	-
Red-sided shiner	50.0	50.0	-	-	-	-	-
Longfin smelt	-	-	-	-	100.0	-	-

Total percentage of non-salmonids captured by site 42.1 10.8 2.3 0.9 3.9 29.2 10.8

The wide variations in fish capture probably reflect migratory movements, but may as well be associated with seasonal changes in river hydraulics. Therefore several consecutive years of sampling in the study area are needed to accurately define the occurrences and locations of fish populations.

SUMMARY

1. Twenty-seven species of fish were captured in sampling areas of the Columbia river between river-mile 70 and river-mile 78 during 1968 and 1969.
2. Juvenile chinook were present in the study area throughout the year, accounting for 85% of the total catch of juvenile salmonids.
3. Most of the young salmonids were captured during May, June, and July.
4. Marked under-yearling chinook released near Bonneville Dam during periods of high river flows peaked 2 days later downstream in the sampling area.
5. Marked spring and fall juvenile chinook released into the Cowlitz River were captured upstream in the Columbia River in the sampling area for approximately 8 months of the year following their release.
6. Juvenile salmonids appeared to favor the Washington half of the river by purse seining (R.M. 73) and the Oregon shore beach seining site (R.M. 70).
7. Species other than salmon and trout accounted for 43 percent of the total catch.

8. Non-salmonid species captured throughout the year were threespined stickleback, Columbia River chub, and starry flounder.

9. Non-salmonid fish of commercial value, captured in the study area, were American shad, white sturgeon, and eulachon.

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Appendix Table A.--Numbers of juvenile salmonids captured at Washington Beach Seine Site
(R.M. 70) during 1968-69 and 1969-70.

		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Chinook	1968	61	51	114	270	330	303	192	216	77	29	2	2	1,647
	1969	125	254	1,190	1,008	540	616	136	56	29	-	No Sets	27	3,981
Coho	1968	-	44	68	4	-	-	-	5	1	1	"	-	123
	1969	-	266	276	3	-	-	-	-	-	-	"	-	545
Sockeye	1968	-	-	-	1	-	-	-	-	-	-	"	-	1
	1969	-	-	-	-	1	-	-	-	-	-	"	-	1
Steelhead	1968	1	2	41	-	-	-	-	-	-	-	"	1	45
	1969	-	4	20	1	2	-	2	3	1	-	"	-	33
Cutthroat	1968	1	-	-	1	-	-	-	3	1	-	"	-	6
	1969	-	1	1	1	-	-	1	1	1	-	"	-	6
Total	1968	63	97	223	276	330	303	192	224	79	30	2	3	1,822
	1969	125	525	1,487	1,013	543	616	139	60	31	0	No Sets	27	4,566

Appendix Table A.--Numbers of juvenile salmonids captured at Oregon Beach Seine Site (R.M. 70) during 1968-69, and 1969-70.--Continued

		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Chinook	1968	62	168	613	337	414	211	286	451	213	46	6	18	2,825
	1969	113	549	739	877	1,343	513	130	216	65	-	17	27	4,589
Coho	1968	-	844	133	4	-	-	-	32	2	-	-	-	1,015
	1969	27	356	160	3	5	6	-	-	-	-	-	-	557
Sockeye	1968	-	-	-	-	-	-	-	-	1	-	-	-	1
	1969	-	-	1	-	-	-	-	-	-	-	-	-	1
Chum	1968	-	-	-	-	-	-	-	-	-	-	-	-	-
	1969	-	1	-	-	-	-	-	-	-	-	-	-	1
Steelhead	1968	-	12	10	-	-	-	-	-	-	-	-	-	22
	1969	1	5	6	-	1	-	3	3	2	-	-	-	21
Cutthroat	1968	-	3	1	-	-	-	1	1	3	-	-	-	9
	1969	1	5	1	1	1	-	-	-	1	-	-	-	10
Total	1968	62	1,027	757	341	414	211	287	484	219	46	6	18	3,872
	1969	142	916	907	881	1,350	519	133	219	68	-	17	27	5,179

Appendix Table A.--Numbers of juvenile salmonids captured at Purse Seine Site (Area A Oregon side of river) during 1968-1969.--Continued

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Chinook	1968	3	0	9	2	111	1,132	132	48	11	37	1	2	1,488
	1969	No Sets	2	2	5	6	62	32	12	10	-	3	No Sets	134
Coho	1968	-	-	-	-	107	11	-	-	-	1	-	-	119
	1969	-	-	-	6	34	3	-	-	-	-	-	-	43
Sockeye	1968	-	-	-	-	7	4	1	-	-	-	-	-	12
	1969	-	-	-	-	-	-	-	-	-	-	-	-	0
Steelhead	1968	1	-	-	-	64	6	-	-	-	-	-	1	72
	1969	-	-	-	-	2	-	-	-	-	-	-	-	2
Cutthroat	1968	-	-	-	-	3	-	-	-	-	1	-	-	4
	1969	-	-	-	-	-	-	-	-	-	-	-	-	0
Total	1968	4	0	9	2	292	1,153	133	48	11	39	1	3	1,695
	1969	No Sets	2	2	11	42	65	32	12	10	0	3	0	179

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Appendix Table A.--Numbers of juvenile salmonids captured at Purse Seine Site (Area B Center of river) during 1968 1969.--Continued

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Chinook	1968	No Sets	0	2	1	225	1,262	35	20	2	14	7	6	1,574
	1969	"	0	10	42	44	29	8	3	26	3	0	No Sets	165
Coho	1968	No Sets	0	-	1	122	28	-	-	-	-	-	-	151
	1969	"	0	1	17	166	3	-	-	-	-	-	-	187
Sockeye	1968	-	0	-	-	4	12	-	-	-	-	-	-	16
	1969	No Sets	0	-	-	12	-	-	-	-	-	-	-	12
Steelhead	1968	-	0	-	-	44	38	-	2	-	-	-	1	85
	1969	No Sets	0	-	6	17	-	-	-	-	-	-	-	23
Cutthroat	1968	-	0	-	-	-	1	-	-	-	-	-	-	1
	1969	No Sets	0	-	-	26	-	-	-	-	-	-	-	26
Total	1968	No Sets	0	2	2	395	1,341	35	22	2	14	7	7	1,827
	1969	No Sets	0	11	65	265	32	8	3	26	3	0	No Sets	413

Appendix Table A.--Numbers of juvenile salmonids captured at Purse Seine Site (Area C Washington side of river) during 1968 - 1969.--Continued

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Chinook.	1968	-	-	7	10	104	37	19	90	9	55	7	8	346
	1969	-	-	16	68	64	242	75	13	24	2	1	No sets	505
Coho	1968	-	-	-	-	664	3	-	-	-	2	-	-	669
	1969	-	-	6	28	208	1	-	-	-	-	-	-	243
Sockeye	1968	-	-	-	-	6	7	-	-	-	-	-	-	13
	1969	-	-	-	-	1	-	-	-	-	-	-	-	1
Steelhead	1968	-	-	-	-	178	12	-	2	1	2	-	2	197
	1969	-	-	-	-	9	1	-	-	-	-	-	-	10
Cutthroat	1968	-	-	-	-	7	-	-	-	-	4	-	-	11
	1969	-	-	-	-	2	-	-	-	1	-	-	-	3
Total	1968	-	0	7	10	959	59	19	92	10	63	7	10	1,236
	1969	-	-	22	96	284	244	75	13	25	2	1	0	762

Appendix Table A.--Numbers of juvenile salmonids captured at Oregon Beach Seine Site (R.M. 78) during 1969-70.--Continued

		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Chinook	1969	22	58	Dredge	2,261	1,246	430	123	75	94	0	No Sets	28	4,337
Coho	1969	-	15	"	2	-	-	-	1	5	-	"	-	23
Sockeye	1969	-	-	"	1	-	-	-	-	-	-	"	-	1
Steelhead	1969	-	4	"	-	-	1	2	-	-	-	"	-	7
Cutthroat	1969	-	1	"	-	-	-	-	-	-	-	"	-	1
Total	1969	22	78	Dredge	2,264	1,246	431	125	76	99	0	No Sets	28	4,369

Catch per unit of effort of juvenile salmonids at Oregon Beach Seine Site (R.M. 78) during 1969-70

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		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Chinook	1969	11	6	Dredge	323	138	53	17	15	47	-	No Sets	7	80
Coho	1969	-	1	"	X	-	-	-	X	2	-	"	-	X
Sockeye	1969	-	-	"	X	-	-	-	-	-	-	"	-	X
Steelhead	1969	-	X	"	-	-	X	X	-	-	-	"	-	X
Cutthroat	1969	-	X	"	-	-	-	-	-	-	-	"	-	X
Total CPUE	1969	11	8	Dredge	323	138	53	17	15	49	0	No Sets	7	81
Total Net Sets		2	9	0	7	9	8	7	5	2	1		4	54

X = Less than one per net set.

Appendix Table A.--Numbers of juvenile salmonids captured at Washington Beach Seine Site
(R.M. 78) during 1969-70--Continued

		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Chinook	1969	36	1,048	2,832	711	Dredge	31	200	47	13	4	No Sets	19	4,941
Coho	1969	-	262	338	-	"	-	-	-	-	-	"	-	600
Sockeye	1969	-	1	-	-	"	-	-	-	-	-	"	1	2
Steelhead	1969	-	3	4	-	"	-	-	-	-	-	"	-	7
Cutthroat	1969	-	3	2	1	"	-	-	1	-	-	"	1	8
Total	1969	36	1,317	3,176	712	Dredge	31	200	48	13	4	No Sets	21	5,558

Catch per unit of effort of juvenile salmonids at Washington Beach Seine Site
(R.M. 78) during 1969-70

		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Chinook	1969	18	105	314	101	Dredge	6	28	9	6	4	No Sets	5	95
Coho	1969	-	26	37	-	"	-	-	-	-	-	"	-	11
Sockeye	1969	-	X	-	-	"	-	-	-	-	-	"	X	X
Steelhead	1969	-	X	X	-	"	-	-	-	-	-	"	-	X
Cutthroat	1969	-	X	X	X	"	-	-	X	-	-	"	X	X
Total CPUE	1969	18	132	353	101	Dredge	6	28	10	6	4	No Sets	5	107
Total Net Sets		2	10	9	7	0	5	7	5	2	1	0	4	52

X = Less than one per net set.

Appendix Table B.--Catch per unit of effort of juvenile salmonids at Oregon Beach Seine Site (R.M. 70) during 1968-69, and 1969-70

		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Chinook	1968	32	56	68	37	51	30	27	56	26	7	1	3	35
	1969	16	34	67	97	134	64	21	27	21	-	17	9	55
Coho	1968	-	281	14	X	-	-	-	4	X	-	-	-	12
	1969	3	22	14	X	X	X	-	-	-	-	-	-	6
Sockeye	1968	-	-	-	-	-	-	-	-	X	-	-	-	X
	1969	-	X	X	-	-	-	-	-	-	-	-	-	-
Chum	1968	-	-	-	-	-	-	-	-	-	-	-	-	-
	1969	-	X	-	-	-	-	-	-	-	-	-	-	X
Steelhead	1968	-	4	1	-	-	-	-	-	-	-	-	-	X
	1969	X	X	X	-	X	-	X	X	X	-	-	-	X
Cutthroat	1968	-	1	X	-	-	-	X	X	X	-	-	-	X
	1969	X	X	X	X	X	-	-	-	X	-	-	-	-
Total	1968	32	342	84	38	51	30	27	60	27	7	1	3	48
C.P.U.E.	1969	20	57	82	97	135	64	22	27	22	-	17	9	62
Total net sets	1968	2	3	9	9	8	7	10	8	8	6	5	6	81
	1969	7	16	11	9	10	8	6	8	3	1	1	3	83

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X = Less than one per net set.

Appendix Table B.--Catch per unit of effort of juvenile salmonids at Washington Beach Seine Site (R.M. 70) during 1968-69, and 1969-70--Continued

		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Chinook	1968	13	12	19	33	41	37	19	30	9	5	X	X	21
	1969	17	13	132	126	60	77	22	9	9	-	-	9	50
Coho	1968	-	11	11	X	-	-	-	X	X	X	-	-	1
	1969	-	14	30	X	-	-	-	-	-	-	-	-	7
Sockeye	1968	-	-	-	X	-	-	-	-	-	-	-	-	X
	1969	-	-	-	X	-	-	-	-	-	-	-	-	X
Steelhead	1968	X	X	6	-	-	-	-	-	-	-	-	X	X
	1969	-	X	2	X	X	-	X	X	X	-	-	-	-
Cutthroat	1968	X	-	-	X	-	-	-	X	X	-	-	-	X
	1969	-	X	X	X	-	-	X	X	X	-	-	-	X
Total CPUE	1968	14	24	37	34	41	37	19	32	9	6	X	X	23
	1969	17	27	165	126	60	77	23	10	10	-	No Sets	9	57
Total net sets	1968	4.5	4	6	8	8	8	10	7	8	5	3	6	77.5
	1969	7	19	9	8	9	8	6	6	3	1	0	3	79

X = Less than one per net set.

Appendix Table B.--Catch per unit of effort of juvenile salmonids by Purse Seine (Area A, Oregon side) during 1968-69

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Chinook	1968	X	-	3	2	22	125	44	9	3	7	X	X	33
	1969	No Sets	X	1	X	X	10	10	4	3	-	3	No Sets	4
Coho	1968	-	-	-	-	21	1	-	-	-	X	-	-	2
	1969	-	-	-	X	11	X	-	-	-	-	-	-	1
Sockeye	1968	-	-	-	-	1	X	X	-	-	-	-	-	X
	1969	-	-	-	-	-	-	-	-	-	-	-	-	0
Steelhead	1968	X	-	-	-	12	X	-	-	-	-	-	-	1
	1969	-	-	-	-	X	-	-	-	-	-	-	-	X
Cutthroat	1968	-	-	-	-	X	-	-	-	X	-	-	X	X
	1969	-	-	-	-	-	-	-	-	-	-	-	-	0
Total CPUE	1968	1	0	3	2	58	128	44	9	3	7	X	1	37
	1969	No Sets	X	1	3	14	10	10	4	3	0	3	No Sets	6
Total net sets	1968	4	2	3	1	5	9	3	5	3	5	2	3	45
	1969	0	3	2	3	3	6	3	3	3	1	1	0	28

Appendix Table B.--Catch per unit of effort of juvenile salmonids by Purse Seine (Area B Center of the river) during 1968-69--Continued

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Chinook	1968	No Sets	0	2	1	45	126	11	4	2	3	3	3	44
	1969	"	0	5	14	14	5	2	1	9	3	0	No Sets	6
Coho	1968	-	-	-	1	-	3	-	-	-	-	-	-	4
	1969	-	-	X	6	55	X	-	-	-	-	-	-	7
Sockeye	1968	-	-	-	-	-	1	-	-	-	-	-	-	X
	1969	-	-	-	-	4	-	-	-	-	-	-	-	X
Steelhead	1968	-	-	-	-	8	4	-	X	-	-	-	X	2
	1969	-	-	-	2	6	-	-	-	-	-	-	-	X
Cutthroat	1968	-	-	-	-	-	X	-	X	-	-	-	-	X
	1969	-	-	-	-	9	-	-	-	-	-	-	-	X
Total CPUE	1968	No Sets	0	2	2	79	134	11	4	2	3	3	3	50
	1969	"	0	5	21	88	5	2	1	9	3	0	No Sets	14
Total net sets	1968	0	2	1	1	5	10	3	5	1	4	2	2	36
	1969	0	3	2	3	3	6	3	3	3	1	1	0	28

X = Less than one per net set

Appendix Table B.--Catch per unit of effort of juvenile salmonids by Purse Seine (Area C Washington side of river) during 1968-69.

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Chinook	1968	No Sets	0	7	10	17	18	6	22	4	11	3	3	11
	1969	"	0	8	17	21	40	25	4	8	2	1	No sets	17
Coho	1968	-	-	-	-	111	1	-	-	-	X	-	-	21
	1969	-	-	3	7	69	-	-	-	-	-	-	-	8
Sockeye	1968	-	-	-	-	1	3	-	-	-	-	-	-	X
	1969	-	-	-	-	X	-	-	-	-	-	-	-	X
Steelhead	1968	-	-	-	-	29	6	-	X	X	X	-	-	6
	1969	-	-	-	-	3	X	-	-	-	-	-	-	X
Cutthroat	1968	-	-	-	-	1	-	-	-	-	X	-	-	X
	1969	-	-	-	-	X	-	-	-	X	-	-	-	X
Total CPUE	1968	No Sets	0	7	10	160	29	6	23	5	12	3	3	40
	1969	"	0	11	24	95	40	25	4	8	2	1	No sets	26
Total net sets	1968	N 0	2	1	1	6	2	3	4	2	5	2	3	31
	1969	0	3	2	4	3	6	3	3	3	1	1	0	29

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