Pelagic Fisheries and Coastal Rivers Investigation
Progress Report - Coastal Rivers Section

July 1, 1966 - June 30, 1967

Fish Commission of Oregon
Research Division

July 1970

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GENERAL INFORMATION

Since May 1966, Coastal Rivers activities have been performed under administration of Pelagic Fisheries and Coastal Rivers Investigation of the Research Division. This report encompasses the activities by the Coastal Rivers section of the investigation.

Investigation headquarters is located in Astoria. Other permanent laboratories are located in Charleston, Newport, and Brookings. A field station is maintained in Port Orford to work on fall chinook in the Elk and Sixes rivers.

Activities included spawning ground and physical stream surveys, sampling of shad and striped bass commercial fisheries, population estimates of juvenile coho in selected streams, evaluating releases of adult and fry coho, studying coho in a lake environment, and investigations on the ecology of fall chinook in south coastal streams. Several miscellaneous studies conducted during the report period are also included.

Personnel

Two biologists were added to the staff to fill vacant positions. Delbert Skeesick was hired to fill a position in the Newport Laboratory and Roland Montagne transferred to the Gold Beach office (later shifted to Brookings) from the Fish Passage Research program. Wendell Stauffer was hired as a Biologist Aide to assist in studies on fall chinook ecology. Other temporary or seasonal personnel were employed at various times of the year to assist in some phases of the investigation. Table 1 lists the personnel of Coastal Rivers section as of June 30, 1967.

Table 1. Personnel of Coastal Rivers section, Pelagic Fisheries and Coastal Rivers Investigation, July 1, 1966 to June 30, 1967

Employee	Date started	Date ended	Remarks
Permanent biologists			
Robert Loeffel			Project Leader, Astoria
Alan McGie			Ass't. Project Leader, Charleston
Ed Cummings			Biologist 1S, Charleston
Roland Montagne	July 1, 1966		Biologist 1S, Brookings
Del Skeesick	July 1, 1966		Biologist 1S, Newport
Dennis Isaac			Biologist 1S, Newport
Student trainees			
Paul Reimers			Grad. student, Port Orford
Keith Crenshaw		Sept. 1966	Port Orford
Richard Carleson		Sept. 23, 1966	Charleston
Temporary			
Donald Gillham	Nov. 1, 1966	Dec. 31, 1966	Laborer 1, Newport
Dennis Murry	June 13, 1966	Sept. 16, 1966	E. O. A. 1/, Newport
Wendell Stauffer	Nov. 7, 1966		Bio. Aide, Brookings

1/ Economic Opportunity Act personnel

Reports Prepared

Reports completed during the past year are listed in Table 2.

Table 2. Reports submitted by Coastal Rivers staff, July 1, 1966 to June 30, 1967

Cummings, T. E.
February 1967. Shad and striped bass fisheries in southwestern Oregon rivers, 1965. Fish Comm. Oreg. Proc. Rept. 39 p.

McGie, A. M.
February 1967. Progress report. Natural rearing of 1964-brood coho salmon in Camp Creek Pond.

Reimers, P. E. and C. E. Bond.
1966. Occurrence of the Bidens (sp.) ochene in the snout of chinook salmon and redside shiners. Prog. Fish. Cult., 28(1): 62.

_____ and R. E. Loeffel.
1967. The length of residence of juvenile fall chinook salmon in selected Columbia River tributaries. Fish Comm. Oreg. Res. Briefs 13(1): 5-19.

Table 2. (continued)

Reimers, P. E.
1967. Cessation of chinook spawning during a lunar eclipse. Fish. Comm. Oreg. Res. Briefs 13(1): 125.

Skeesick, D. G.
February 1967. Summary of peak counts of salmon in survey areas of major coastal drainages through the 1966-67 spawning season. Fish. Comm. Oreg. Proc. Rept.

Staff.
October 1969. Coastal Rivers Investigation progress report, July 1, 1965 - June 30, 1966.

COASTAL RIVERS PROGRAMS

Spawning Ground Surveys

Spawning fish counts of salmon are made in several coastal watersheds each fall and winter. The peak counts of salmon in standard areas provide data for computing an index of escapement into coastwide "fish-per-mile" figures for each species. The data give trends in abundance when compared over a period of years. Most of the surveys were established 20 years ago although some new surveys were later added to increase the coverage. Present annual survey distances are 28.5 miles for spring chinook, 37.7 miles for fall chinook, 9.9 miles for chum, and 58.3 miles for coho. Additional surveys were made to check passage over ladders and to check distribution and spawning activity of excess adult coho hauled from hatcheries.

Surveys started on September 20, 1966, and continued through February 24, 1967. During the spawning season, Pelagic Fisheries and Coastal Rivers personnel made 338 surveys over 307 miles.

Coho

The peak count of coho in eight coastal drainages was 30 fish per mile and three less than the 16-year average (Table 3). The jack count of three

fish per mile in 1966 was one fish below average. Counts on the Nehalem, Wilson, Coos, and Coquille rivers were below average while the Nestucca, Yaquina, and Alsea rivers and Beaver Creek were above average. The Coos surveys had the most pronounced decrease with a count of 19 fish per mile compared to the 1950-65 average of 46 coho per mile.

Table 3. Numbers of coho salmon per mile calculated from spawning ground surveys, 1950-66

River	Miles of standard survey	Fish per mile					
		1950-65 average			1966		
		Adults	Jacks	Total	Adults	Jacks	Total
Nehalem	11.5	24	2	26	16	2	18
Wilson	4.0	23	2	25	12	0	12
Nestucca	5.4	24	2	26	27	4	31
Yaquina	8.4	24	3	27	43	1	44
Alsea	8.5	29	3	32	39	6	45
Beaver	2.3	29	4	33	35	3	38
Coos	3.3	34	12	46	16	3	19
Coquille	11.0	42	6	48	24	3	27
Total miles	54.4						
Average number/mile		29	4	33	27	3	30

The Tenmile Lakes system had a peak count of 114 adults and 67 jacks per mile during the 1966-67 spawning season (Table 4). The count was 47 adults and 50 jacks below the 11-year average. All stream systems in both North and South Tenmile Lake shared in the decrease; however, North Tenmile Lake had a smaller decrease (25%) than South Tenmile Lake (41%). The estimated escapement of adults was 13,500, an increase of 1,000 over 1965. The potential egg deposition was 23.1 million based on the sex ratio of dead adults and a fecundity of 3,000 eggs per female.

Fall chinook

In 1966, there were 43 fall chinook per mile in six coastal rivers which was 10 above the 14-year average (Table 5). A jack count of six per

Table 4. Numbers of coho salmon per mile in the Tenmile Lakes system calculated from spawning ground surveys, 1955-66

Lake and stream system	Miles	Fish per mile					
		1955-65 average			1966		
		Adults	Jacks	Total	Adults	Jacks	Total
North Lake							
Big	3.0	263	201	464	219	136	355
Murphy	1.1	199	158	357	156	98	254
Wilkens	1.0	64	40	104	39	24	63
Average		210	160	370	170	106	276
South Lake							
Adams	2.6	126	87	213	33	33	66
Benson	0.9	126	97	223	109	73	182
Johnson	6.0	195	136	331	147	76	223
Shutters	2.5	29	20	49	6	3	9
Average		140	99	239	90	51	141
Total miles	17.1						
Average number/mile		161	117	278	114	67	181

Table 5. Numbers of fall chinook salmon per mile calculated from spawning ground survey counts, 1952-66

River	Miles of standard survey	Fish per mile					
		1952-65 average			1966		
		Adults	Jacks	Total	Adults	Jacks	Total
Nehalem	4.0	32	9	41	40	3	43
Tillamook Bay tribs.	3.5	40	10	50	69	17	86
Nestucca	2.3	72	11	83	111	14	125
Siletz	4.0	26	7	33	28	2	30
Yaquina	7.8	20	6	26	25	5	30
Alsea	10.5	11	4	15	22	5	27
Total miles	32.1						
Average number/mile		26	7	33	37	6	43

mile was one short of the average. Above average counts were obtained in all rivers except the Siletz. Accurate counts in the Siletz and Alsea rivers were severely hampered by large returns of coho to the hatcheries and straying into nearby index streams. Live chinook were difficult to separate from large masses of hatchery coho. The Siletz counts were further influenced by construction of a ladder in Sunshine Creek in 1962. The ladder allows chinook to spawn farther upstream and reduces the number formerly spawning below the falls in the index area.

Both the Nestucca and Tillamook bay tributaries showed the highest increase over average counts. The count in the Nestucca was high for the second successive year and was 42 fish above the 14-year average of 83 chinook per mile.

Spring chinook

Only two spring chinook per mile were recorded in spawning ground surveys in 1966 compared to an average of 10 per mile (Table 6). Counts of spring chinook ranged from zero on the Siletz to five fish per mile on the Nestucca River. Since 1958, there has been a general decline in the counts of spring chinook and these were the lowest since surveys were established in 1953. The extremely low flows during the summer of 1966 may have prevented fish from moving into the survey areas to spawn.

Chum

Spawning ground surveys for chum salmon are made in three drainage basins: Tillamook, Nestucca River, and Netarts Bay. A supplemental survey was added in 1960 to the Tillamook Bay counts to strengthen counts obtained in prior standard survey units. The peak count of chum in the three basins was 144 fish per mile and 34 fish below the 13-year average (Table 7). The Nestucca River count was 24 fish per mile above average

Table 6. Numbers of spring chinook per mile calculated from spawning ground survey counts, 1953-66

River	Miles of standard survey	Fish per mile					
		1953-65 average			1966		
		Adults	Jacks	Total	Adults	Jacks	Total
Tillamook Bay tribs.	10.5	9	2	11	2	1	3
Nestucca	1.5	33	4	37	5	1	6
Siletz	2.5	6	1	7	0	0	0
Alsea	11.5	6	1	7	2	0	2
Total miles	26.0						
Average number/mile		8	2	10	2	0	2

Table 7. Numbers of chum salmon per mile calculated from spawning ground survey counts, 1953-66

River	Miles of standard survey	Average number of fish per mile	
		1953-65	1966
Tillamook Bay tribs.	2.3	167	65
	5.4 1/	207	265
Nestucca	1.8	76	100
Netarts Bay	0.4	699	793
Average number/mile 2/		178	144

1/ Supplemental surveys established in 1960—6-year average data.

2/ Excludes the 5.4 mile supplemental survey in Tillamook Bay.

and Whiskey Creek (Netarts Bay) 94 fish per mile above average. In contrast, the Tillamook Bay counts were 102 fish per mile below the 13-year average. However, the auxiliary fish-per-mile count in Tillamook Bay was 265 or 58 above the 6-year average.

Prior to 1962, a commercial gill-net fishery for chum existed in Tillamook Bay. The commercial landings were sampled for sex, age, and size

composition. A severe decline in landings and escapement prompted closure of the fishery after the 1961 season. Since 1961, all information on the status of chum stocks has been obtained in tributaries of the bay.

A total of 152 chum salmon was sampled in Tillamook Bay tributaries in 1966. The fish ranged in size from 24 to 35 inches and the sex ratio was 48% males and 52% females. Age composition consisted of 28.3% 3-year olds (progeny of 288 fish per mile in 1963) and 71.7% 4-year olds (progeny of 408 fish per mile in 1962). Four-year-old chum predominated in the run in 1966 at nearly the same ratio as 1963 (Table 8). The dominance of 4-year fish has occurred three times in the last 4 years, but not at all from 1959-62.

Table 8. Estimated age composition of Tillamook Bay chum salmon, 1947-66

Year	Number sampled	Per cent composition by age group 3	4	5
Commercial fishery samples (gill net)				
1947		32.3	66.2	1.5
1949		4.6	95.4	0.3
1950		77.5	21.1	1.5
1959		51.2	48.0	0.8
1960		68.2	30.8	1.0
1961		83.4	16.0	0.6
Spawning ground samples				
1962		82.1	17.6	0.3
1963		28.0	72.0	0.0
1964		85.5	13.8	0.6
1965		47.1	52.9	0.0
1966		28.3	71.7	0.0

Additional information on spawning ground surveys and status of chum stocks is contained in a report by Delbert Skeesick entitled, "Spawning Fish Surveys in Coastal Watersheds, 1966."

Inventory and Obstruction Stream Surveys

Inventory and obstruction stream surveys are made to assess the physical condition and potential for producing salmon, locate barriers, trace distribution of salmon, and evaluate known obstructions for possible remedial action. Nearly all major streams have been surveyed since 1947 except the Umpqua, Rogue, and some inaccessible streams along the south coast. In 1966-67, 14 stream surveys totaling 37.2 miles were completed in eight coastal drainages (Table 9). Information concerning these and prior surveys is available in the files of this investigation.

Table 9. Inventory surveys and obstruction surveys in coastal streams, July 1, 1966 - June 30, 1967

Watershed	Stream	Miles surveyed	Surveyor
Nehalem	Sager Creek	0.5	Isaac
Siletz	S. F., Schooner Crk.	3.8	Isaac, Murry
	N. F., Big Rock Creek 1/	3.2	Isaac, Skeesick
	N. F., Schooner Creek 1/	3.6	Skeesick, Isaac, Murry
Yaquina	West Olalla Creek	0.5	Isaac, Rousseau 2/
	Mill Creek	2.4	" "
Alsea	Cow Creek #1	1.0	Murry
	Green River	1.2	Murry
Big Creek	Big Creek & tribs.	6.3	Murry, Isaac
Floras Creek	West Fork	2.3	Montagne, Stauffer
Pistol River	Main stem	0.3	" "
	East Fork	5.0	" "
	North Fork	1.4	" "
Winchuck River	East Fork	5.7	" "
Total miles surveyed		37.2 (14 surveys)	

1/ Obstruction resurveys.

2/ Joint survey with Oregon Game Commission personnel.

Shad and Striped Bass

Shad and striped bass were harvested commercially from the Siuslaw, Smith (Umpqua tributary), Umpqua, Coos, and Coquille rivers. Biological

data were collected at buying stations. Logbooks were maintained by cooperating fishermen and landing and license statistics were obtained from Fish Commission files.

Total shad landings from the streams increased from 518,010 pounds in 1965 to 550,083 pounds in 1966 (Figure 1). Bass landings increased from 41,466 to 48,282 pounds in the same period.

Siuslaw River

The 1966 shad landings in the Siuslaw River were 15,321 pounds and 4,856 pounds below those of 1965. Licenses decreased 25% to 16 while the daily average catch per fisherman remained about the same. The proportion of repeat spawners decreased 4% for females and 16% for males.

Striped bass landings were 283 pounds in 1966.

Smith River

Shad landings increased from 58,163 pounds in 1965 to 81,063 pounds in 1966 in Smith River. Gear licenses increased by 19 to 32 in 1966 but daily catch dropped from 49.7 to 32.3 shad per net day. There was a high proportion of repeat spawners but few age 3 males which suggests a somewhat smaller number of age 4 shad in 1967.

Striped bass landings were 1,839 pounds in 1966.

Umpqua River

The shad landings from the Umpqua River in 1966 were 366,778 pounds and 29,782 pounds above the 1965 catch. Licenses decreased 12% to 28 while the average daily catch increased 21% to 90.5 shad per fisherman. Of the females landed in 1966, 63.8% were age 4 compared to 33.5% in 1965. A high incidence of diseased shad may be contributing to the reduced number of repeat spawning females.

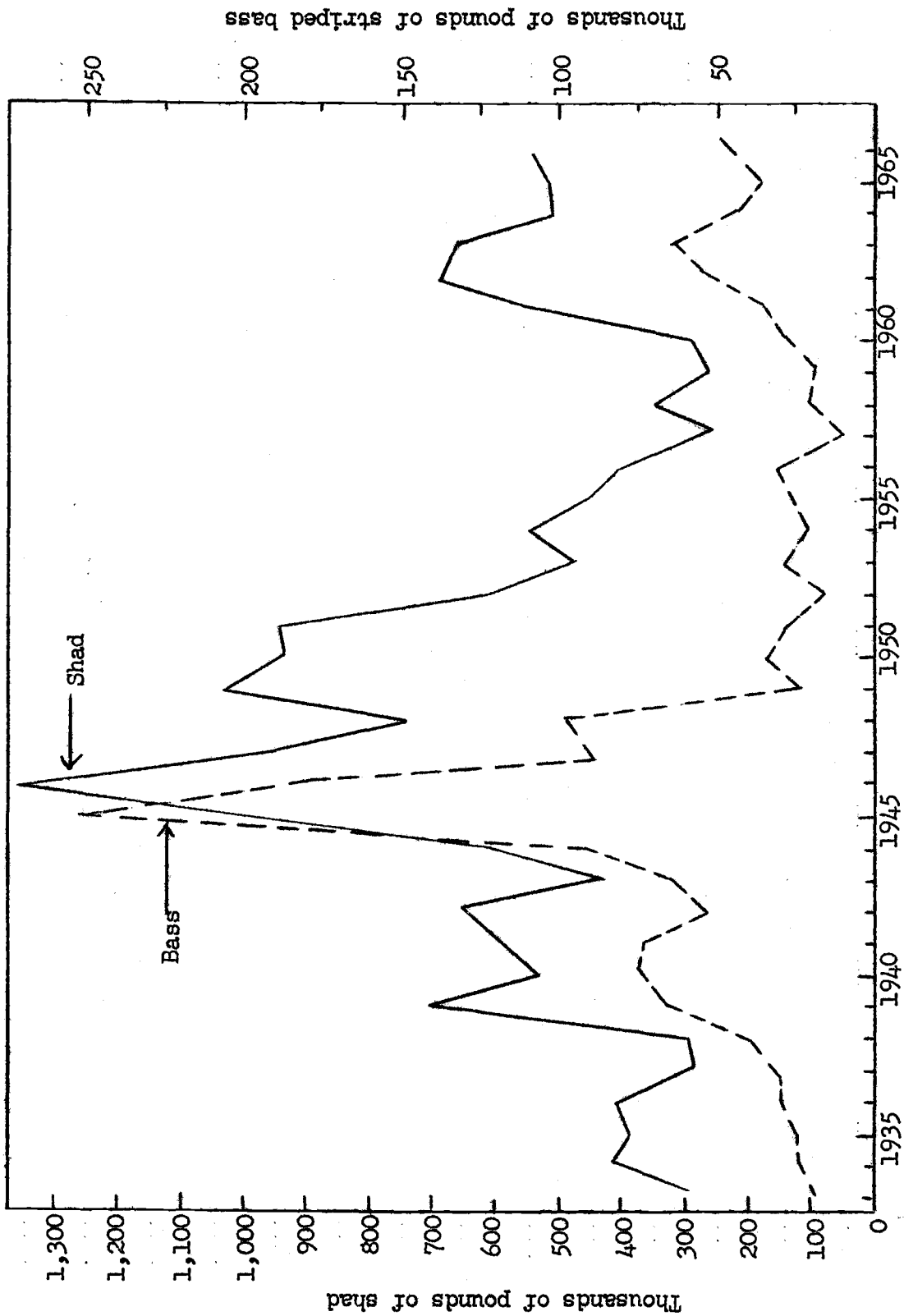

Figure 1. Pounds of shad and striped bass landed from Oregon streams south of the Columbia River, 1933-65

Striped bass landings increased from 10,390 pounds in 1965 to 13,564 pounds in 1966.

Coos River

Shad landings in Coos River declined 26,802 pounds to 72,521 pounds in 1966. Gear licenses dropped from 88 in 1965 to 69 in 1966. Daily catch declined about three fish per set net and 14 shad per fisherman day. About one half of the females caught in 1966 were age 4 and spawning for the first time. The proportion of shad first spawning at age 3 was the lowest since aging started in 1960.

Striped bass landings increased from 29,352 pounds in 1965 to 31,938 pounds in 1966. The 1958 year class continued to dominate the landings and was composed of 31% females and 46% males. No large year classes have entered the fishery since the 1958 year class and landings will probably decrease until another good year class enters the fishery.

Coquille River

Several new fishermen began setting nets in the Coquille River in 1966. The pieces of licensed gear rose from six in 1965 to 23 in 1966. Shad landings increased from 2,351 pounds to 14,395 pounds in 1966. The catch rate was 70 shad per day or 19 per set-net day. A high proportion of old, repeat spawning shad was noted in 1966.

The Coquille River commercial fishery landed 640 pounds of striped bass in 1966. No biological information was taken from the bass landed.

Lake Rearing Studies

Studies designed to provide information on the potential of coastal lakes as supplemental rearing areas have been under way since 1960. The program has centered on a series of lakes forming an interconnected chain

above Eel Lake in the Tenmile Lake system (Figure 2). Releases of coho fry were made in Hall and Schuttpelz lakes in the first 3 years (1960-62). In the 4th year (1963), coho fry were stocked in all lakes (Clear, Edna, Teal, and Hall) except Schuttpelz Lake. Since 1963, the study was confined to Hall Lake and fingerling rather than fry coho were stocked in the lake.

The rearing program has provided data on the size and rate of planting for optimum yield, survival, growth, and number of returning adults. Supplemental information was obtained on limnological features and plankton populations.

Downstream migrants

In the spring of 1967, 668 yearlings (1965 brood) were counted in the downstream-migrant trap at the outlet of Hall Lake. The survival rate was 3.3% of the 20,000 originally stocked in Hall Lake (Table 10). The migrants had a mean length of 127.6 mm and the calculated average weight was 20.0 grams.

Hall Lake was not restocked with juvenile coho in 1967 and no further work is planned on the lake.

Adult returns

Mature coho returning from those released at Hall Lake and natural stocks in Clear Creek were trapped 1/2 mile downstream from Hall Lake. A total of 106 coho entered the trap between December 5, 1966, and February 10, 1967. The total captured consisted of 102 unmarked fish (47 adults and 55 jacks) and 4 adults from the 1963 brood marked left ventral. The count of jacks (age 2_2) was a minimal number since some fish escaped upstream between the pickets and were not counted. The marked coho were age 3_2 (1 year fresh water and 2 years ocean). The adult return from the 1963 brood represents 0.5% of the 850 juveniles released below Hall Lake (Table 11). No jacks from the 1963 brood were found in the trap.

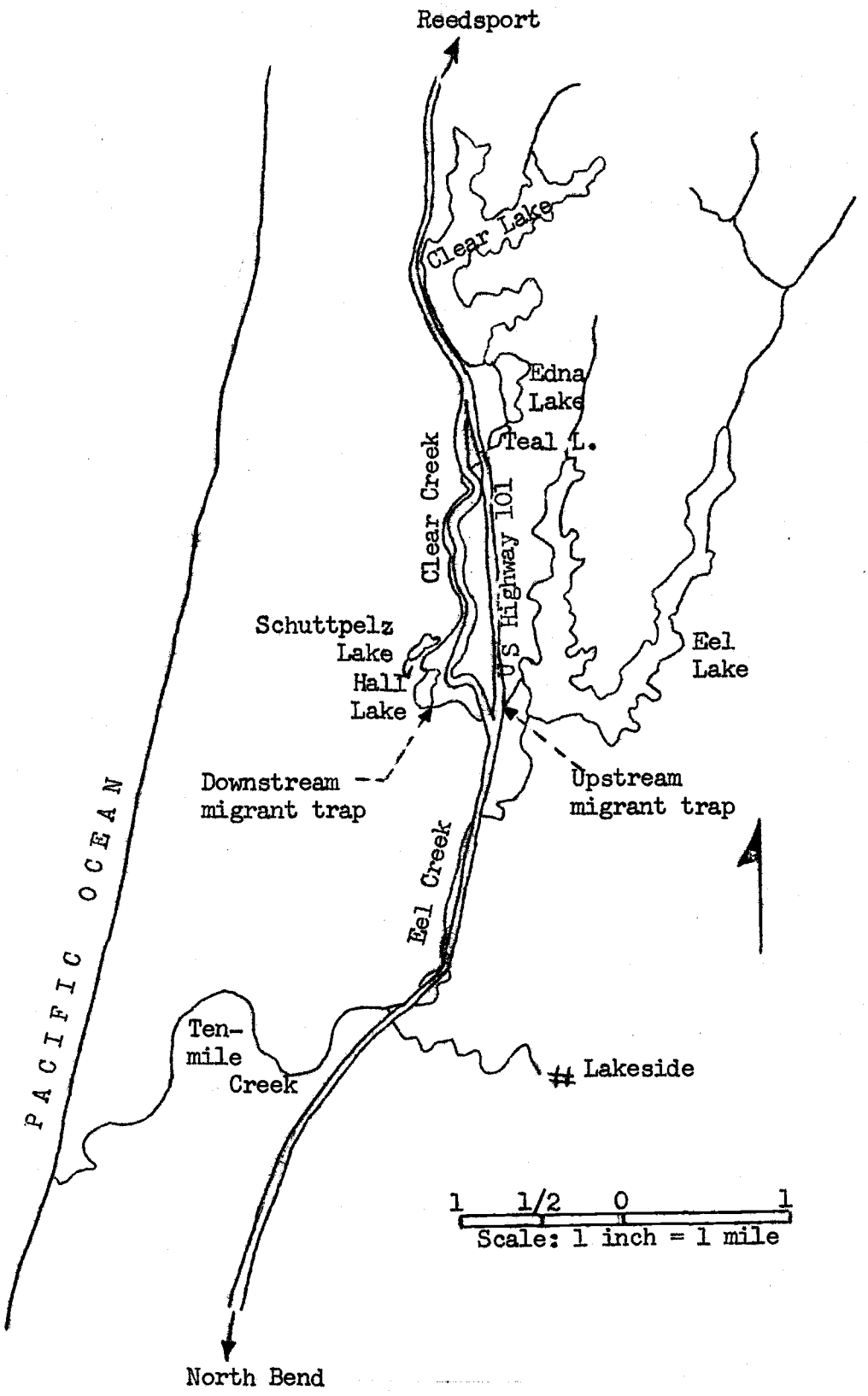

Figure 2. Location and drainage system of Clear, Edna, Teal, Schuttpelz, and Hall lakes

Table 10. Summary of juvenile coho broods stocked in coastal lakes and recovered in traps as downstream migrants, 1960-67

Lake	Brood	Number planted	Date	Count at traps 1961	1962	1963	1964	1965	1966	1967	Total	Per cent
Schuttpelz	1959	26,600	3/11/60	3,563	70						3,633	13.7
	1960	25,300	3/18/61		1,517	20					1,537	6.1
	1961	29,100	5/23/62			473	103				576	2.0
Hall	1959	72,800	3/11 & 25/60	852	4						856	1.2
	1960	107,000 1/	3/17/61		2,323	0					2,323	2.3
	1961	75,000	5/28 & 6/1/62			474	45				519	0.7
	1963	12,012	5/6/64					861	0		861	7.2
	1964	28,222	5/18/65						1,221	0	1,221	4.3
	1965	20,000	5/20/66							668	668	3.3
Hall	1959	3,305 2/	Spring 1961	2,476	210						2,686	81.3
	1960	1,396 2/	" 1962		656	11					667	47.8
	1961	457 2/	" 1963			420	16				436	95.4
All lakes 3/	1962	1,787,600	3/7-4/4/63				3,004	107			3,111	0.2

1/ Approximately 7,000 fish killed on outlet screen or escaped downstream soon after planting. Per cent survival is computed on the basis of 100,000 fry.

2/ Fish reared in Schuttpelz Lake and released into Hall Lake as yearlings to continue migration.

3/ Includes Clear, Edna, Teal, and Hall lakes.

Table 11. Numbers of marked juvenile coho released from the trap at Hall Lake and subsequent adult and jack returns, 1959-63 brood years

Brood year	Number juveniles released			Classification of total returns							
				2_2		3_2		3_3			
	Yearlings	2-year olds	Total	M	F	M	F	M	F	Total	Per cent survival
1959	3,216	239	3,455	2	0	33	44	1	0	80	2.3
1960	2,960	29	2,989	0	0	22	29	3	3	57	1.9
1961	886	126	1,012	0	0	5	3	3	2	13	1.3
1962	2,950	107	3,057	3	0	14	11	1	1	30	1.0
1963	850	0	850	0	0	3	1	0	0	4	0.5
1964	1,173	0	1,173	0	0	—	—	—	—	—	—

NOTE: Broods from 1959 through 1961 were reared in Hall and Schuttpelz lakes. The 1962 brood was reared in Clear, Edna, Teal, and Hall lakes.

Additional details can be found in a progress report by Alan M. McGie on "Natural Rearing of 1963- and 1964-Brood Coho Salmon in Hall Lake" (in preparation).

Population Estimates of Coho Fingerlings

The study of juvenile coho populations in six streams in tributaries of the Nehalem, Wilson, and Yaquina rivers continued in FY 1967, using the format established in 1963. The program was designed to measure annual fluctuations in the abundance of juvenile coho and relationships with the number of parents or environmental conditions. The studies are conducted in standard index areas measuring 2,500 feet.

In August 1966 the number of juveniles in the index sections varied between 1,313 in Humbug Creek (Nehalem River) and 6,627 in the upper Yaquina River (Table 12). Larger than usual populations occurred in Cedar Creek tributary, North Fork of Wolf Creek, and the upper Yaquina River sections even though stream flows were lower than usual in these streams.

Table 12. Juvenile coho abundance, standing crop, and stream flow in six coastal streams, 1963-66

River index stream	Year	Estimated population	95% confidence limits	Standing crop (lbs)	Stream flow (cfs)
Wilson River					
Cedar Creek tributary	1963	1,045	1,003-1,098	8.4	2.2
	1964	335	297-384	3.8	2.8
	1965	1,482	1,401-1,574	13.1	2.4
	1966	2,029	1,904-2,174	20.5	1.0
Devil's Lake Fork	1963	2,551	2,404-2,773	14.7	3.2
	1964	2,363	2,154-2,710	19.2	2.6
	1965	3,206	2,952-3,496	19.1	2.3
	1966	3,144	2,954-3,398	16.9	1.5
Nehalem River					
North Fork Wolf Creek	1963	980	928-1,022	6.8	2.5
	1964	1,473	1,391-1,559	3.8	1.6
	1965	1,467	1,404-1,537	7.7	0.8
	1966	2,416	2,233-2,608	16.5	0.9
Humbug Creek	1963	2,351	2,196-2,579	18.3	3.6
	1964	1,813	1,694-1,957	16.5	9.7
	1965	1,712	1,627-1,809	11.2	1.4
	1966	1,313	1,242-1,389	10.7	1.7
Yaquina River					
Grant Creek	1963	5,247	4,936-5,514	29.0	3.6
	1964	5,458	5,292-5,635	42.9	--
	1965	4,856	4,645-5,084	25.0	2.7
	1966	4,061	3,808-4,342	28.3	2.3
Upper Yaquina River	1963	3,418	3,218-3,626	18.7	3.1
	1964	3,179	2,845-3,556	22.8	--
	1965	2,122	2,013-2,244	12.4	2.4
	1966	6,627	6,337-6,913	25.9	2.1

To determine factors regulating the abundance of coho populations, the numbers and standing crops were compared to the following factors: (1) low summer flows, (2) indices of the adult runs that produced them, and (3) indices of their returns as adults.

Analysis of covariance and regression analysis indicated no significant relationship between stream flow and abundance either as numbers or standing crops using the 4 years of data. No significant relationships were found between the indices of abundance of spawning adults and the numbers or standing crops of the progeny. The relationship between 1962-brood fish as juveniles in 1963 and adults in 1965 was not significant, but there was a significant relationship between 1963-brood fish as juveniles in 1964 and adults in 1966.

More detailed information will be available in the report on the 1965-66 juvenile coho study in preparation.

Fall Chinook Ecology

Sixes River

Studies on the ecology of juvenile fall chinook salmon in Sixes River continued during the early part of the fiscal year. Work was interrupted in the fall when the graduate student on the project returned to school. Major emphasis during the summer of 1966 was in the estuary.

Juvenile growth. Beginning during the spring months, a program was undertaken to measure large numbers of juveniles at regular intervals in the estuary. Most observations were in the lower portion of the estuary where the fish were concentrated. During the spring and early summer, the instantaneous growth rate in length was good, $g_l = 0.0107$ (Figure 3). From mid-June until the end of July there was a period of essentially no growth in length ($g_l = 0.0007$) followed by another period of good growth rate, $g_l = 0.0095$. During the period of reduced growth, average size was about 8.0 cm fork length. Subsequently, the average size increased to about 12.5 cm.

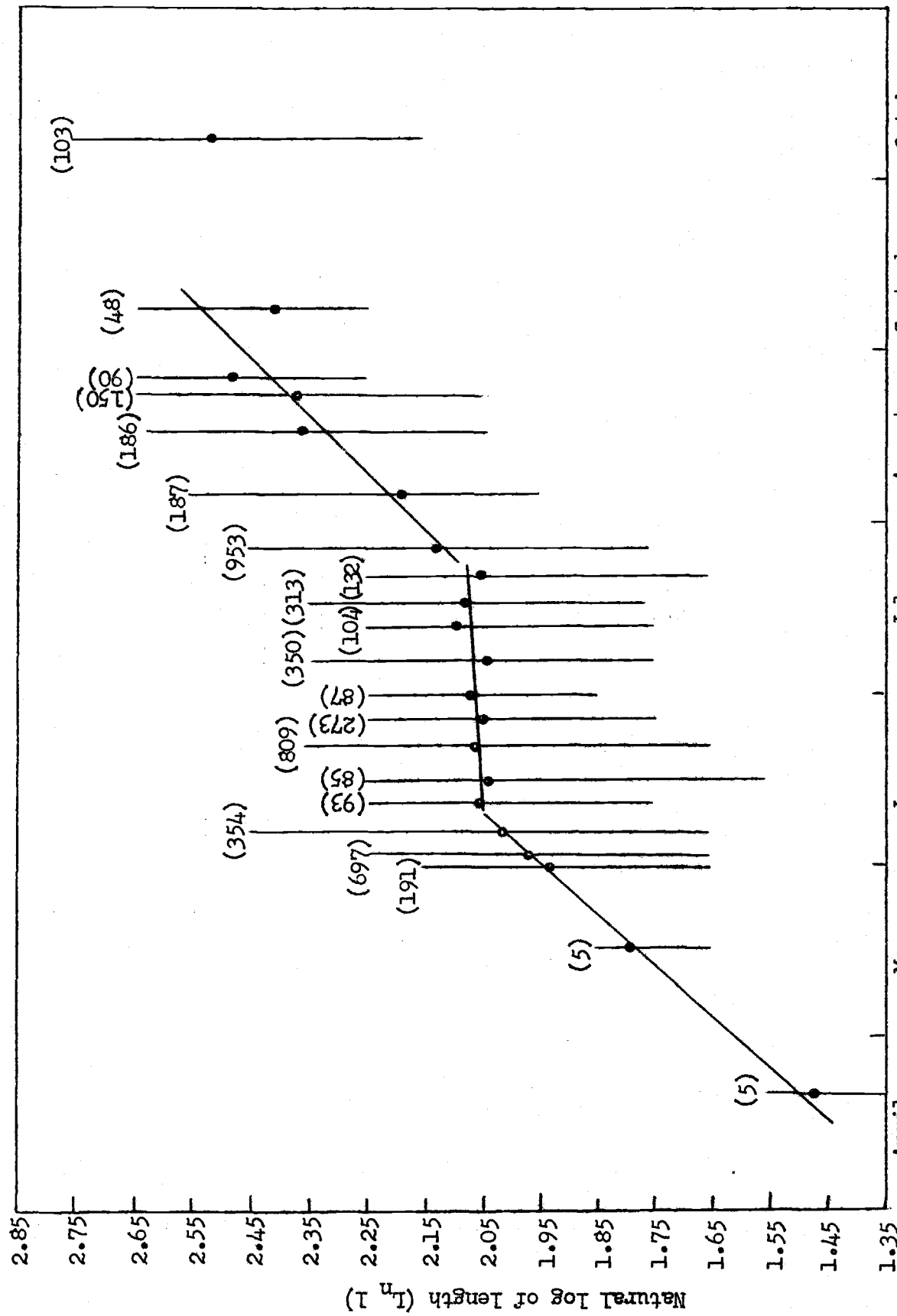

Figure 3. Growth of juvenile fall chinook at the mouth of Sixes River estuary, 1966

A reduction in growth rate was unexpected based on the general concept of the richness of estuaries and raised several important questions: (1) Could the population of juveniles in Sixes Bay have increased to a density that overtaxed the food supply? (2) Was there a natural cycle in the important food organisms? (3) Could growth reduction have been in response to physiological processes associated with the adaptation to salt water? (4) Was there simply an apparent period of no growth because small fish were being recruited from upstream and large fish were leaving for the ocean? The latter question was explored further using comparative size data from a trapping program above the estuary and seining in the ocean surf.

Trapping in the lower river. A trap was operated just above the estuary during the early part of June 1966. About one half of the stream was trapped, but the catches were thought to be representative, since the stream divided evenly around a gravel island. The average sizes of the trapped fish in relation to sizes of fish in the lower estuary are shown in Figure 4. These data suggest that smaller fish were moving downstream and could have been contributing to the apparent reduced growth rate measured in the estuary. Also, sampling from the trap site to the mouth of the estuary suggested a size increase progressing downstream.

Sampling in the ocean surf. Concurrent to sampling in the estuary, a series of seine hauls was taken in the estuary outlet and in the ocean surf. Fish size in samples from various locations at high and low tide was comparable and was combined for a particular day in Figure 4. Based on the sampling program, there was no indication that larger fish were leaving the estuary.

Tagging of juveniles. During the summer about 2,500 small, vinyl pennant tags were applied to juveniles. Each fish was tagged with a unique number. The growth of recovered fish is plotted in Figure 5. Only those

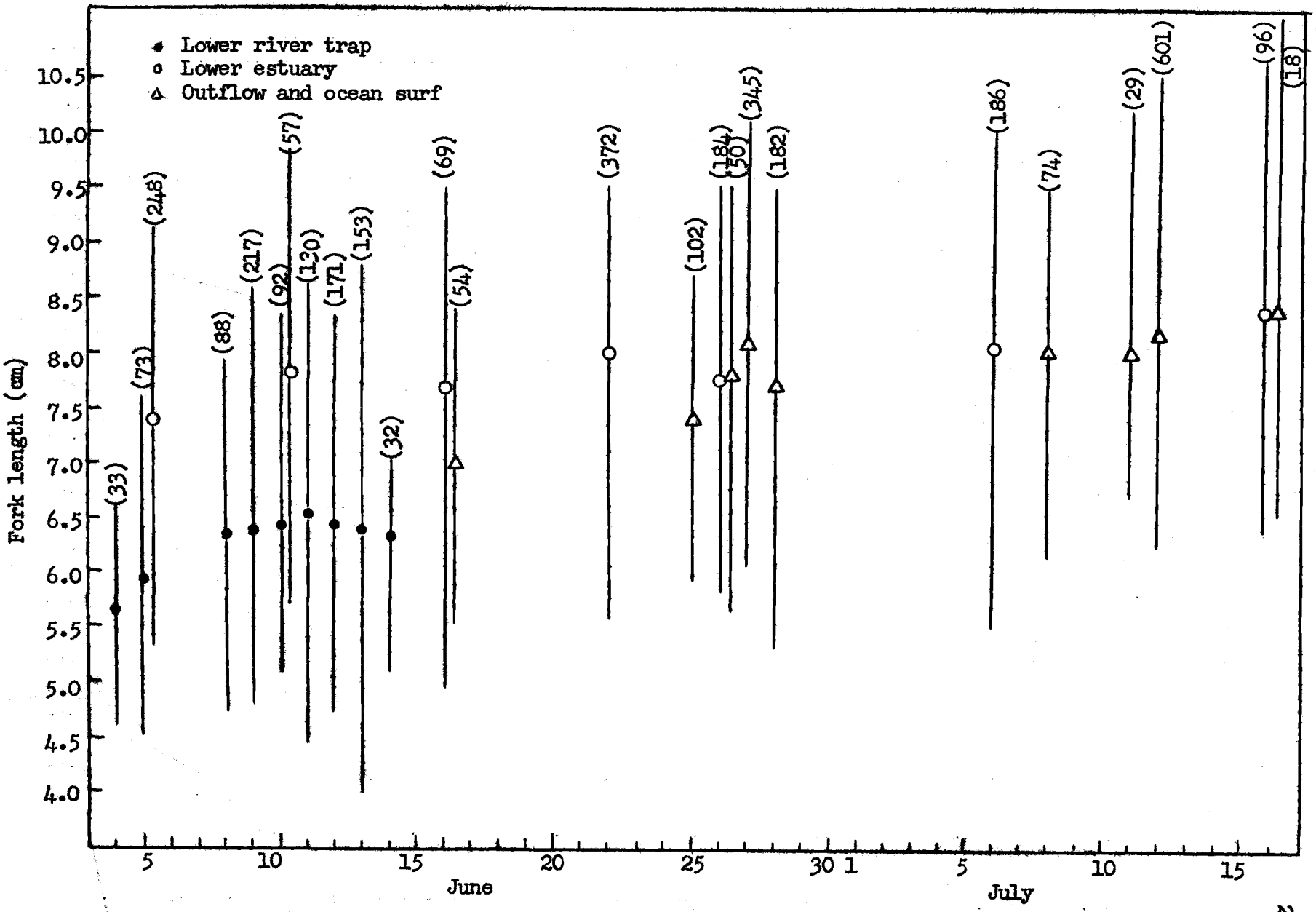

Figure 4. Average size of juvenile fall chinook captured in the lower river, estuary, and ocean surf during June and early July 1966

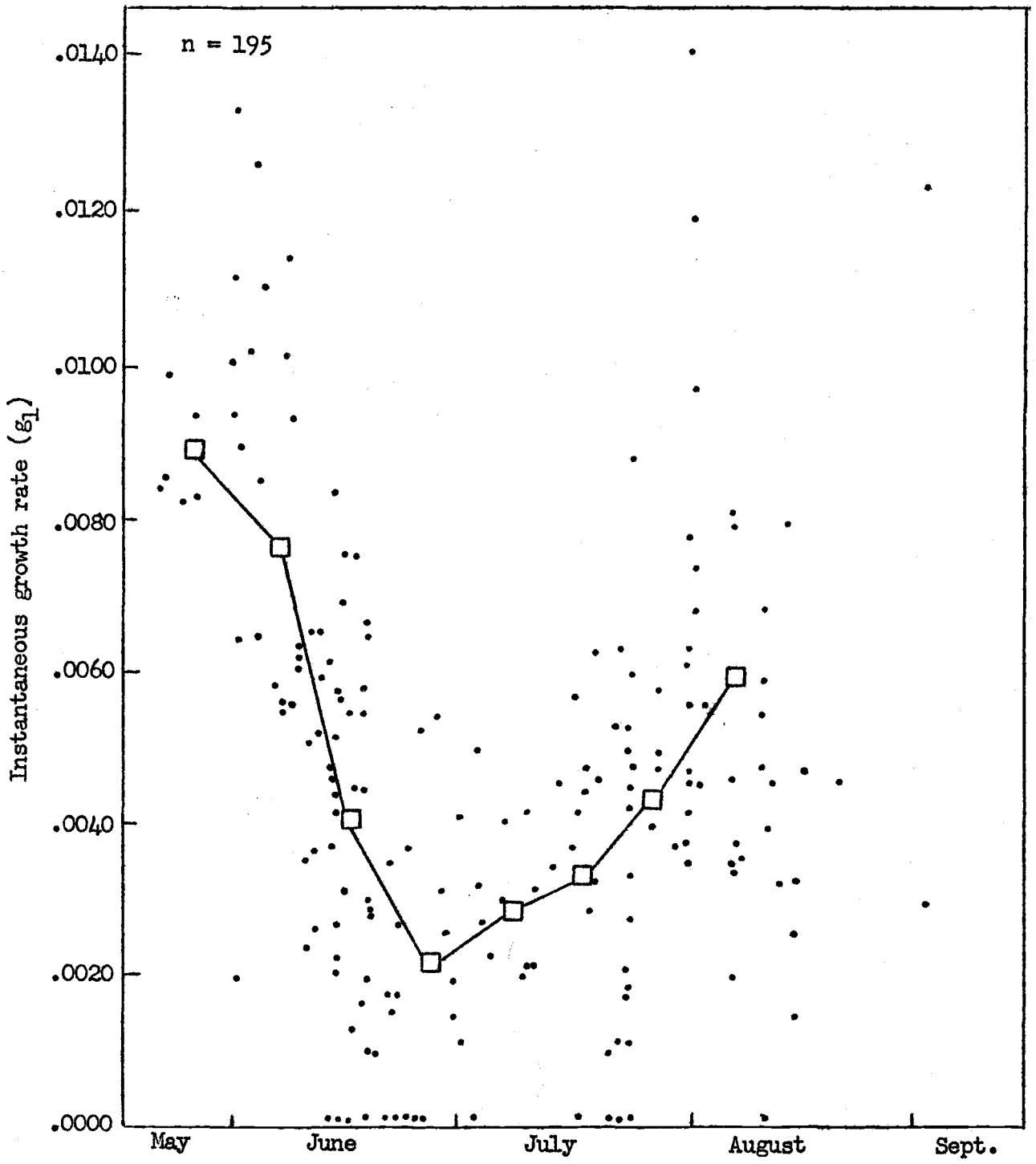

Figure 5. Instantaneous growth rate in length of juvenile fall chinook tagged and recovered in Sixes River estuary, 1966

fish that were out more than 5 days, but less than 25 days were used. This was done to reduce handling effects shortly after tagging and to avoid long periods where a fish might experience good and poor growth. The growth of tagged fish was averaged by 10-day periods. During the initial period in late May and early June, the instantaneous growth rate in length was high, $g_1 = 0.0080$. However, the growth rate fell to a low level in late June, $g_1 = 0.0020$. After late June, the growth rate again increased. These data suggest that even though small fish from upstream may have contributed to some of the reduced growth, those fish residing in the estuary independently experienced a period of reduced growth.

Pistol and Winchuck river estuaries

In May 1967 preliminary studies were initiated on the Pistol and Winchuck river estuaries to measure environmental parameters and incidence of juvenile fall chinook. These estuaries are typical closed systems common in south coastal rivers during the summer months when sand bars form across the river mouths. The studies were designed to complement work on the Sixes River estuary.

Juvenile fall chinook were sampled in the Pistol River and estuary in May 1967 and in the Winchuck River and estuary in May and June 1967. In Pistol River, the stream fish ranged from 37 to 48 mm on May 19 compared to a length range of 39 to 55 mm in the estuary on May 26 (Figure 6). Means for the samples were stream fish 42 mm and estuary fish 44 mm. Juvenile chinook sampled in the Winchuck River on May 15 ranged between 37 and 47 mm with a mean of 42 mm (Figure 7). Chinook sampled in the estuary 25 days later had a mean of 53 mm and major modes at 48 and 53 mm.

Adult population estimates in Jack Creek, Chetco River

Jack Creek, a tributary of the lower Chetco River, was chosen as a study stream to enumerate the abundance of spawning chinook by tagging

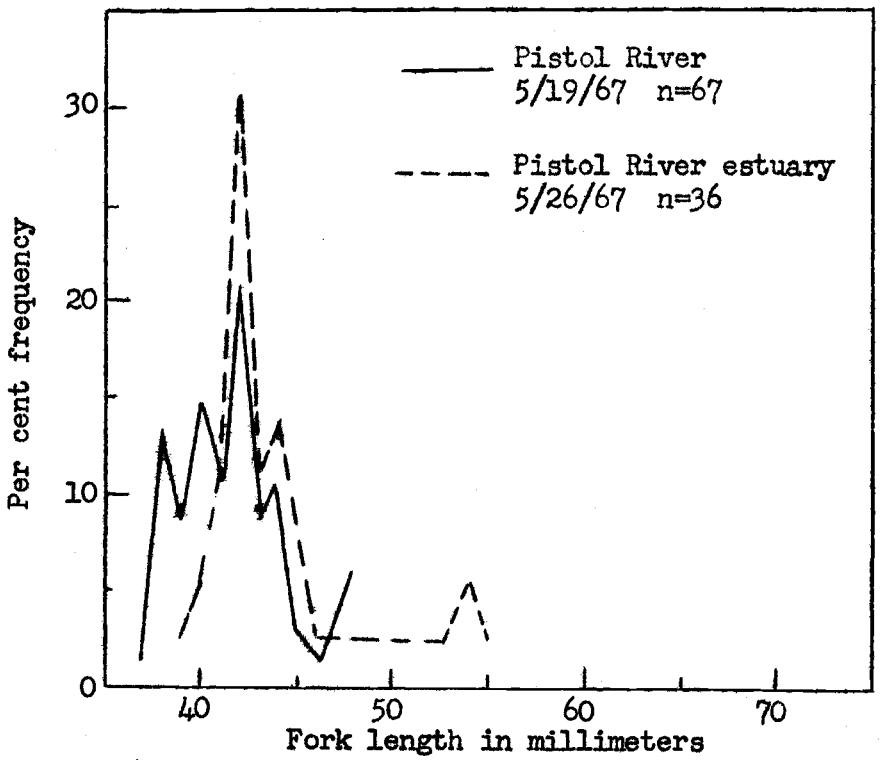

Figure 6. Length frequency of juvenile fall chinook in the Pistol River, May 1967

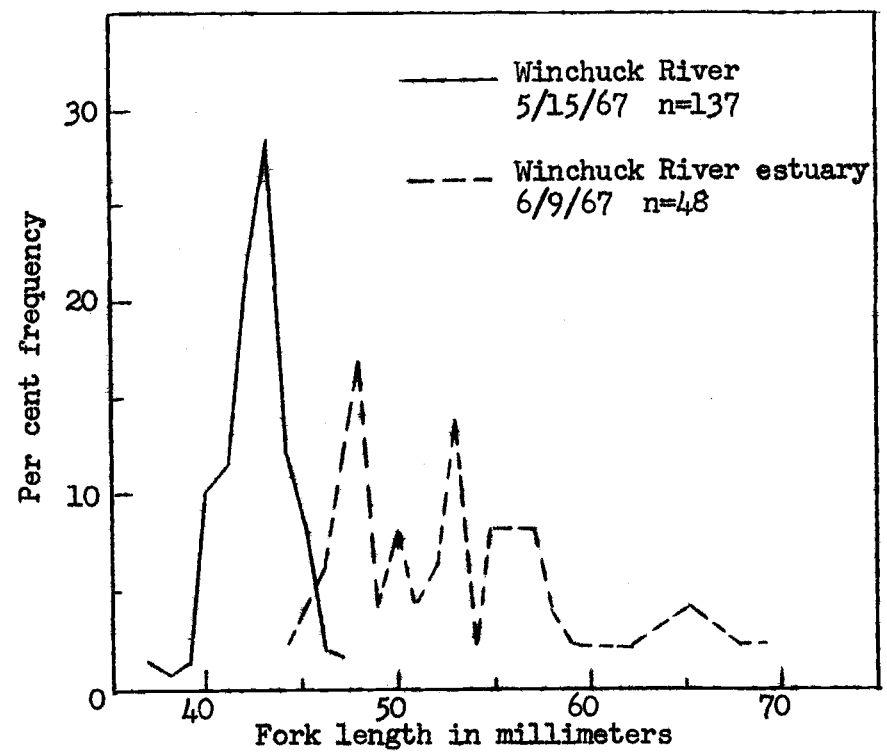

Figure 7. Length frequency of juvenile fall chinook in the Winchuck River, May-June 1967

carcasses. Additional information on time of entry, age composition, sex ratios, and feasibility in using tagged carcasses was obtained from the study.

Two spawning peaks occur in Jack Creek. The first wave appears in mid-November and the second in late December or early January. The early segment in Jack Creek was not sampled and the population estimate applies only to the second spawning escapement.

The study area extended from the mouth upstream 3 miles to a cascade. Field work began on December 20, 1966, and continued until January 20, 1967, when all fish were dead. No carcasses were found in the stream during a preliminary survey prior to December 20.

The carcasses were tagged using two different types of wire. The wire was inserted around the jaw, twisted tight, and bent inside the mouth to prevent snagging on brush. Salmon were tagged every 3 to 4 days during the spawning period. Recovery of tagged carcasses varied between 68% and 100%, averaging 80%. A total of 154 carcasses was tagged in the study area, giving a population estimate of 182 chinook when computed by a formula developed by the BCF Biometrics Unit (Table 13).

Table 13. Summary of tag and recovery data of chinook carcasses in Jack Creek, Chetco River, 1966-67

Tagging period	Date	Carcasses tagged	Recovery period 2	3	4	5	6	7	8	Total	Per cent recovered
1	12/20	56	42	2	--	1	--	--	--	45	80
2	12/23	35		27	2	--	--	--	--	29	83
3	12/27	28			22	2	--	--	--	24	85
4	12/30	18				12	--	--	--	12	68
5	1/3	13					9	1	--	10	77
6	1/6	3						3	--	3	100
7	1/10	1							1	1	100
Totals		154	42	29	24	15	9	4	1	124	80

Estimated population = 182 chinook

Length and sex data were taken from 123 salmon. The sex composition was 52% male and 48% female. Males dominated the smaller size groups and the majority of the larger fish were females.

Age composition of the run based on scale samples from 90 fish was as follows: 2-year olds, 27%; 3-year olds, 18%; 4-year olds, 21%; 5-year olds, 33%; and 6-year olds, 1%. Length-frequency data did not indicate length differences by sex within the age groups. Apparent differences did occur in the sex composition by age group. Males dominated ages 2 and 3, while females dominated age groups 4 and 5 (Figure 8).

Physical and chemical characteristics of South Coast streams

A study was designed to measure environmental limits in Curry County streams by monitoring the general spectrum of flows, temperatures, water chemistry, and weather. The information collected included (1) flows in important river systems; (2) weekly air and water temperature; (3) weekly turbidity measurements; (4) correlation of stream data with U. S. Weather Bureau data from south coastal stations; and (5) description of climatological, geological, and botanical characteristics in Curry County. The stream systems monitored from north to south were Sixes River, Elk River, Brush Creek, Euchre Creek, Hunter Creek, Myers Creek, Pistol River, Chetco River, and Winchuck River.

Data collected during the fiscal year are on file in the Brookings Laboratory and will be summarized in succeeding reports.

Hatchery Site Evaluation

The recent success of the coho hatcheries has stimulated an interest in finding new locations for hatcheries on coastal rivers. The acceptance of pumping water to the hatchery also allowed us to investigate coastal lakes as potential hatchery water sources.

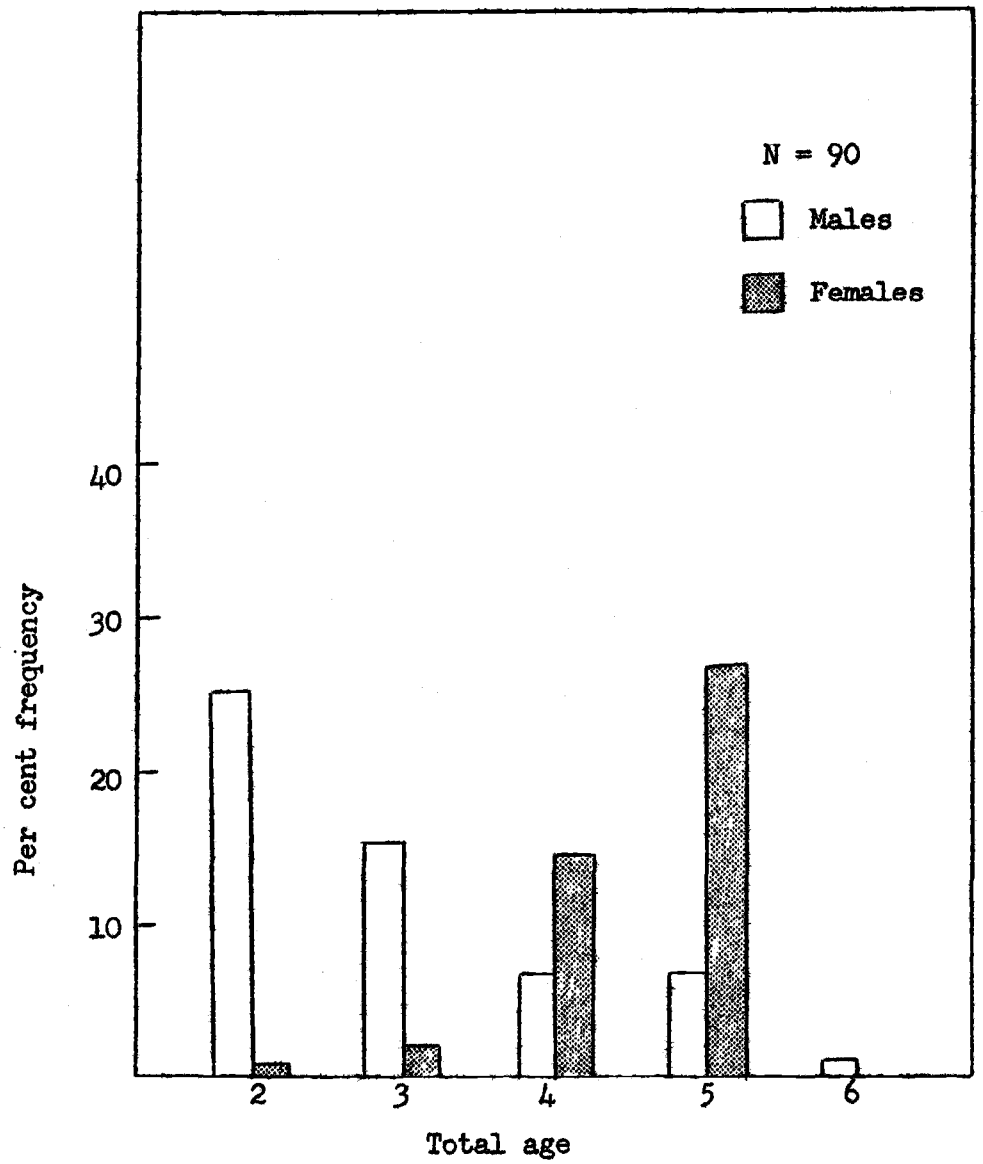

Figure 8. Age and sex composition of fall chinook in Jack Creek, Chetco River, 1966-67

Criteria used to judge potential hatchery water supplies included (1) a minimum stream flow of 17 cfs, (2) a maximum water temperature of 65 F, (3) a minimum of 3 acres of land, (4) road and electric power available, (5) passage for juveniles and adults, and (6) potential disease problems. Existing Fish Commission, Game Commission, and U. S. Geological Survey records were searched to locate streams having the necessary flow and temperature regimes. Similar sources were used for data on the limnology of coastal lakes.

A list was developed including 17 streams and five lakes appearing to have promise. The minimum flows and maximum temperatures observed in 16 of the streams are listed in Table 14. Based upon the available physical data, the South Fork Trask River, Kilchis, Yachats, and Nestucca rivers were judged as the most promising water sources.

Information compiled on the five lakes became the subject of an unpublished report, "Coastal Lakes as Possible Water Sources for a Coho Hatchery," by D. G. Skeesick. The conclusions were that among the five lakes there were varying degrees of potential (Table 15). However, Munsel Lake satisfied more requirements compared to the other lakes analyzed.

As a result of the investigation, a more detailed study on hydrography and limnology of coastal streams and lakes was started under the auspices of the Anadromous Fish Act (PL 89-304) at the close of the fiscal year.

Surplus Coho Liberations

The advent of surplus adult coho at our coastal hatcheries led to the practice of hauling live adults to other streams. The selection of the areas stocked and transporting the fish is a joint effort with the Oregon Game Commission. The fish are usually released above barriers in locations lacking natural runs of salmon. The fish are loaded on trucks at an equal sex ratio and contain approximately 200 fish per load. In 1966, we released

Table 14. Minimum stream flows and maximum temperatures recorded in coastal streams

River system	Tributary	Location	Date	Min. flow cfs	Max. obs. temp.	Source of data	Years of data
Necanicum		1.0 mi. above Williamson Cr.		13.4	65 F	OGC	2
Nehalem	North Fork	Just above Gods Valley Cr.		15.8	68	OGC	2
	Salmonberry	0.1 mi. above mouth		25.0	70	OGC	2
Miami		1/4 mi. above Moss Cr.		16.5	63	OGC	3
Kilchis		1/4 mi. below Mapes Cr.		26.7	61	OGC	3
Wilson		6-1/4 mi. east of Tillamook	10/15/52	45.0	64	USGS	33
Trask		Just above Gold Cr.	10/15/52	42.0	68	USGS	27
	South Fork	At mouth		30.0	65	OGC	1
	East Fork of South Fork	0.2 mi. above mouth		15.0	65	OGC	2
Nestucca		Camp 101 (3 mi. above Hebo)		20	62	OGC	2
	Three Rivers	At mouth (Hebo)		17.6	63	OGC	2
Little Nestucca		At Fall Cr.		15.9	61	OGC	2
Salmon		1/4 mi. abv. Hwy. 101 bridge	7/9/58	70	61	OFC	1
		Just below Slick Rock Cr.	9/9/63	22.6	69	OGC	3
Yachats		Just below Reedy Cr.	9/12/63	20	65	OGC	2
Siuslaw	Indian	Confluence of West Fork	8/13/64	14	61	OGC	1
		0.7 mi. above the mouth	9/15/64	21	69 1/	OGC	2
Elk		Just above Anvil Cr.	1964	32.9	71	OFC	3

1/ Recorded on July 6, 1964, when the flow was 45 cfs.

NOTE: Stream flows in Elk River and those by the Game Commission (OGC) were measured with a Gurley current meter. Other Fish Commission measurements are estimates. The USGS measurements were recorded at permanent gauging stations.

Table 15. Summary of factors considered in locating a coho hatchery on five western Oregon lakes

Lake	Water of adequate temp.	Hatchery location	Road access to hatchery site	Power access	Turbidity	Release of smolts	Development of adult handling	Disease problems
Clear	Marginal	Good	No	Close	Very low	Some hauling desirable	Easy	Unknown
Munsel	Sufficient	Excellent	Yes	Yes	Very low	Very easy	Easy	Unknown
Floras	Excess	Poor	Yes	Yes	Moderate	Easy	Difficult	Unknown
Triangle	Excess	Good	Close	Close	High	Some hauling desirable	Difficult	Probable
Loon	Excess	Poor	No	No	Moderate	Unknown	Difficult	Unknown

11,573 adults into 13 coastal watersheds (Table 16). Assuming an equal sex ratio and 3,000 eggs per female, the potential egg deposition was 17,361,000. An additional 2,202,100 fry were stocked into various other lakes and streams in the spring of 1967.

Table 16. Number of adult 1966 brood hatchery coho liberated into coastal streams

Stream system	Number liberated	Stream system	Number liberated
Miami	212	Siletz	2,404
Kilchis	400	Yaquina	305
Wilson	350	Alsea	1,262
Trask	400	Siuslaw	2,915
Nestucca	600	Umpqua	1,575
Salmon	400	Coquille	350
		Rogue	400
		Total	11,573

Because the practice of hauling adults and releasing them in barren streams was new, it was necessary to evaluate its success. The most pressing questions were (1) Did the adults move from the planting site? and (2) Did they reproduce successfully?

To evaluate the movement patterns, surveys were made on Bear, Euchre, North Fork Schooner, Eckman, and Lobster creeks to see what became of the fish. Twenty-four hours after release, we were able to observe 64, 68, and 71% of the releases in Euchre, Bear, and North Fork Schooner creeks, respectively. The releases into Eckman and Lobster creeks could not be followed as closely for a variety of reasons.

Fish movement was definitely related to flow conditions (Table 17). When the fish were released during moderate to high flows, they spread throughout the available stream area. Fish that were released during low flows moved much shorter distances. Downstream movement appeared to be just

to the nearest unoccupied spawning riffle. Nearly all of the effective movement occurred in the first 24 hours after release. Fifty-three per cent of the females released in Bear Creek and 60% of those in North Fork Schooner Creek were observed digging redds the day after release. Since one of the benefits of hauling adults is to use all available stream areas above the release sites, we concluded it is very important to release the adults during periods of moderate to high flow.

Table 17. Movement of transplanted adult coho in coastal streams, 1966 brood

Stream	Flow	Fish movement in miles		
		Maximum downstream	Maximum upstream	Average upstream
Eckman	Low	0.1	0.3	0.04
Euchre				
Lower	Low-Mod.	0.2	0.3	0.09
Upper	Low-Mod.	0.0	0.4 & 0.9 1/	0.16 & 0.17
N. Fk. Schooner	Mod.-High	0.0	1.85	0.91
Bear	Mod.-High	0.0	1.30	0.74

1/ Two release sites separated by a barrier.

Detailed sampling of the progeny from transported adults was carried on in Bear Creek, a tributary of Yaquina River. The first fry were observed February 13, 1967, and had a mean length of 37.7 mm. By June 30, they had attained a mean length of 63.4 mm which was larger than wild juveniles in two of three nearby streams.

Two population estimates covering 400 ft. and 500 ft. of stream were made in August 1967. At that time, there was approximately one juvenile per linear foot of stream. Since there was 11,600 feet of stream between the barrier and the upper limit of spawning, we can assume that 98 females produced 11,600 juveniles.

The excellent growth and only moderate numbers of juveniles indicate that Bear Creek probably did not receive an adequate complement of adults.

Miscellaneous Activities

Herring fisheries

Commercial herring bait fisheries exist in several bays along the coast. The most important fishery is located in Salmon Harbor (Winchester Bay) on the Umpqua River. Other minor fisheries exist in the Yaquina and Alsea bays. The seine fishery in Salmon Harbor has developed during the past 5-6 years and provides bait for sport and charter boats fishing out of the Umpqua River. Herring are also exported to other coastal ports.

In past years, the herring ordinarily moved into Salmon Harbor in March or April and spawned on the rocky shores and piling in the basin. The fish were generally present until about October according to local fishermen. During the spring of 1967, the herring did not enter the bay which created a hardship on the bait dealers and other sport fishing interests. The Fish Commission and other agencies were asked to investigate the situation and take remedial action if necessary. A variety of reasons were offered by local interests; however, the difference in behavior appeared to be associated with environmental factors in the Umpqua estuary. Large numbers of herring were located by fishermen in the lower river and they were possibly prevented from moving upstream and into Salmon Harbor by fresh water or low river temperature. A thermograph was installed to monitor temperature in Salmon Harbor and a program was initiated to take periodic salinities. When first sampled on June 28, 1967, salinity in the bay was 25.5 o/oo and the temperature 59 F. Similar data will be collected during the remainder of the summer.

Umpqua River smelt fishery

Two drift gill nets were fished for smelt (Thaleichthys pacificus) in the Umpqua River from late December 1966 to mid-March 1967. Approximately 4,000-5,000 pounds of smelt were landed by the two commercial fishermen during 31 days of fishing. Smelt were generally more abundant during high tides at slack water. The fishing area extended from the Highway 101 bridge at Reedsport upstream about 4 miles. Both white and green sturgeon were a problem while netting in the lower river. Smelt were taken in the sport fishery up to Scottsburg at the head of tidewater.

Oxbow Burn, Siuslaw and Smith rivers

On August 20, 1966, a fire started on Oxbow Creek, a tributary of the Siuslaw River. The fire burned out of control the next several days, spreading over the ridge in a southwesterly direction into the Smith River drainage. The fire burned a roughly circular area encompassing about 46,000 acres owned by BLM and International Paper Company. On the main stem of Smith River, the major damage was sustained between Twin Sisters Guard Station and Damewoods Place, a distance of 10 miles. Watersheds of Scare, Beaver, South Sister, Devil's Club, and Marsh creeks were completely burned. Streams partially burned included Vincent, North Sister, Big, Blind, and Yellow creeks. On the Siuslaw, portions of Oxbow, Bear, Esmond, and Haight creeks were burned.

Representatives of industry, BLM, OGC, Bureau of Sport Fisheries and Wildlife, and the Fish Commission met on several occasions to discuss remedial measures for safeguarding the fisheries resource. International Paper Company and BLM decided to reseed portions of the burn with Endrin-coated Douglas fir seed. Since previous studies had shown that Endrin is extremely toxic to aquatic organisms, it was decided to monitor the reseeding operation. Under sponsorship of the Bureau of Sport Fisheries

and Wildlife. Staff personnel from the Charleston Research Laboratory participated in planning the study and carried out portions of the field work.

On December 22, 1966, liveboxes containing juvenile coho from the Alsea River Hatchery were placed in Smith River a short distance above the West Fork and in South Sister Creek. These liveboxes were periodically sampled in conjunction with other liveboxes stationed in the drainage by cooperating agencies. The livebox in South Sister Creek was lost part way through the program but the livebox in Smith River was successfully held until the program terminated in January. Samples of coho salmon were periodically removed from the liveboxes and transferred to the Bureau of Sport Fisheries and Wildlife for bioassay. Analysis of these and other salmonids held in other parts of the drainage showed traces of DDT and DDE in their tissues, but no Endrin (Morton, 1967). However, Endrin was detected in one sample of redsided shiners collected from Big Creek and from five dead crayfish picked up in Big Creek.

LITERATURE CITED

Morton, William M. 1967. Effects of aerial distribution of Endrin-coated Douglas-fir seeds on the aquatic life of an Oregon coastal stream. Special Report, Bur. of Sport Fish. & Wildl., Portland, Oreg., 13 pp.