EVALUATION OF THE CONTRIBUTION OF CHINOOK SALMON REARED AT COLUMBIA RIVER HATCHERIES TO THE PACIFIC SALMON FISHERIES

Annual Report FY 1987

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Project No. 79-2
Contract No. DEAI79-84BP39638

January 1988

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ABSTRACT

In 1979 this study was initiated to determine the distribution, contribution, and value of artificially propagated fall chinook from the Columbia River. Tagging of hatchery fall chinook began in 1979 with the 1978 brood and was completed in 1982 with the 1981 brood of fall chinook at rearing facilities on the Columbia River system. Sampling for recoveries of these tagged fish in the sport and commercial marine fisheries from Alaska through California, Columbia River fisheries, and Columbia River hatcheries and adjacent streams occurred from 1980 through 1986.

Estimated recoveries of thetagged fall chinook are available for 1980 through 1984 for most major salmon fisheries on the Pacific coast. Data for 1985 and 1986 are incomplete at this time. Hatchery return data are complete except for a few possible returns of tagged fish in 1987. Enough data are available to examine contributions to the fisheries and total survivals among broods, hatcheries within broods, and releases within hatcheries for the same brood.

The 1973 brood of fall chinook had the greatest average contribution to the fisheries of 3.9 tagged fish caught for every 1000 tagged fish released. The 1979 brood was followed by the 1978, 1980, and 1981 broods at 2.8, 2.3, and 2.1 tagged fish per 1000 releases respectively. There was considerable variation among rearing facilities within any brood. In the 1979 brood for example, the fishery contribution ranged from 12.7 fish per 1000 releases from Spring Creek Hatchery to 0.3 fish per 1000 releases from Little White Salmon Hatchery. Releases at a rearing facility within any one brood also varied greatly. For example, at Spring Creek Hatchery four different release times for the 1979 brood yielded fishery contributions ranging from 4.3 to 19.2 fish per 1000 releases.

The proportions of the fall chinook contributing to various fisheries also varied among the broods. The largest proportion of the catches for the 1978. 1980, and 1981 occurred in the Canadian fisheries. The catch proportions were .40, .50, and .53 respectively. For the 1979 brood, the largest catch proportion occurred in the Washington fisheries (.37), with the Canadian fisheries taking the second largest proportion (.33). The Columbia River fisheries took the third largest proportion of the catch in all brood years, followed by Oregon, Alaska, and California.

Hatchery returns in general followed the same trend as the fishery contributions. If a release from a particular rearing facility had a larger than average fishery contribution, the hatchery return was also larger than the average.

STUDY GOALS AND OBJECTIVES

In 1979 the Bonneville Power Administration (BPA) began funding an 8-year study to determine the distribution, contribution, and value of fall chinook salmon raised at Columbia River rearing facilities. Information from this tagging study will provide data to determine the effectiveness of hatcheries constructed as mitigation for hydroelectric developments. In addition, these data will aid fishery agencies in planning further measures to protect, mitigate, and enhance salmon runs on the Columbia River. This information is important to regulating bodies, such as the Pacific Fishery Management Council, charged with negotiating, setting, and adjusting fishing seasons, location, and limits. The last comprehensive examination of fishery contributions of fall chinook from Columbia River hatcheries was completed over fifteen years ago (Wahle and Vreeland 1978). After this fin-marking study was completed, it became part of the basis for current fishery regulations. Since completion of that study, new rearing facilities have been built, existing facilities renovated, changes in sport snd commercial fisheries have occurred, and hatchery practices have been altered.

The objectives of the study are to: 1) determine the contribution of fall chinook from Columbia River hatcheries to individual Pacific salmon fisheries by age class of fish, and 2) determine the distribution, contribution, and value of each hatchery's production of fall chinook to Pacific coast salmon fisheries.

The desired goal to achieve objective 1 was to tag a constant percentage of fish at each rearing facility. A goal of tagging at least 150,000 fish at each facility was set to achieve objective 2. We have attempted to meet both goals at each hatchery. This required additional tag codes at some hatcheries because the number of fish tagged for the constant percentage was insufficient to meet the 150,000 goal. This report briefly describes tagging, release, and recovery activities during the eight years of the study and details activities and preliminary results through FY 1987.

STUDY DESCRIPTION

The National Marine Fisheries Service (NMFS) is coordinating the study among three fishery agencies: U.S. Fish and Wildlife Service (USFWS), Oregon Department of Fish and Wildlife (ODFW), and Washington Department of Fisheries (WDF).

Tagging

From 18 to 20 facilities rearing fall chinook on the Columbia River were included in this study each year (Figure 1). Personnel from the participating agencies tagged a portion of the fall chinook production at most Columbia River facilities rearing fall chinook. The fish at each facility received a distinctive mark consisting of an adipose fin clip and insertion of a unique coded wire tag in the snout. From 2.5 to 5 percent of the production at each facility was randomly selected for tagging. Sampling devices developed by WDF and NMFS were used to select the fish for tagging.

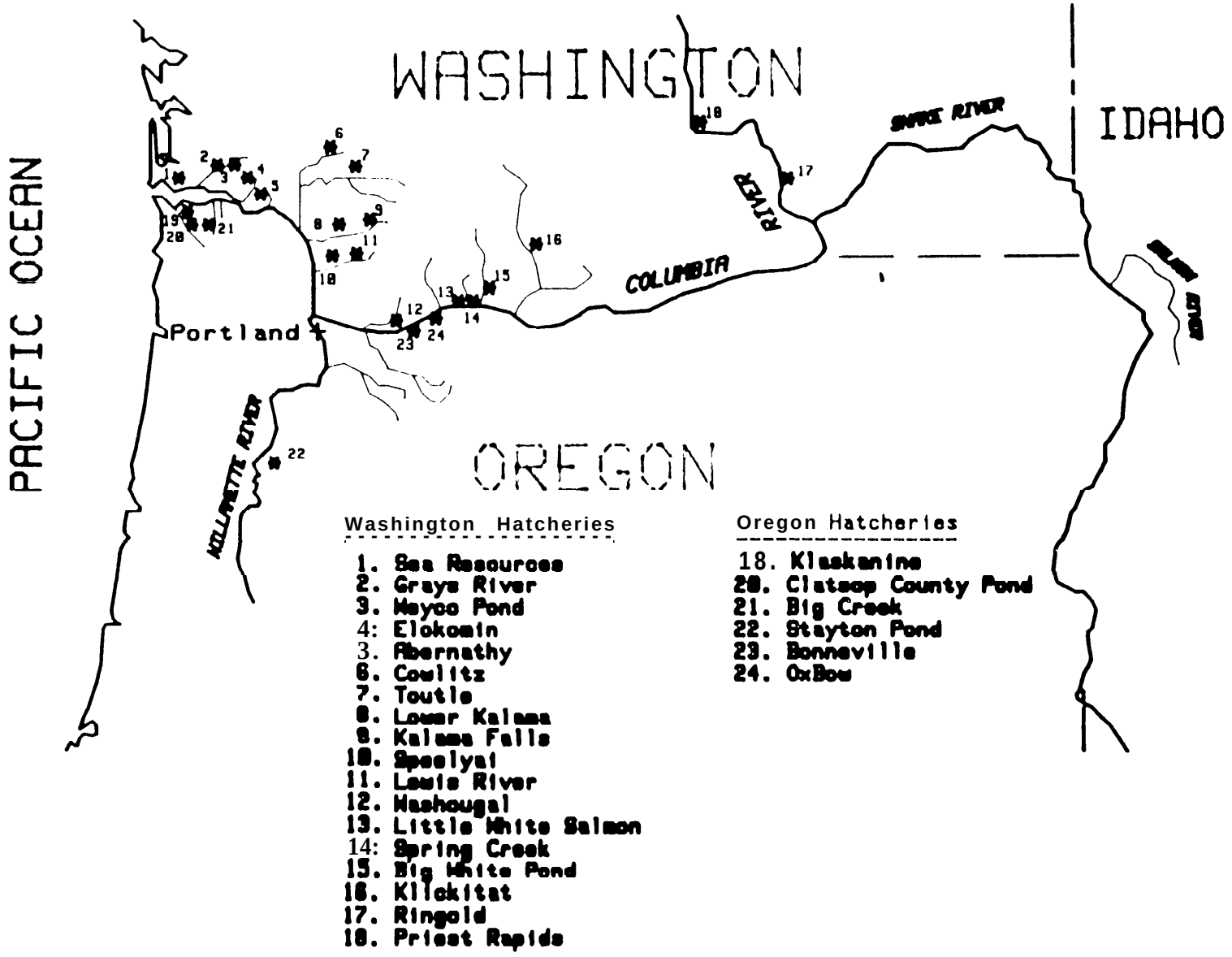


Figure 1. – COLUMBIA RIVER FACILITIES PARTICIPATING IN **THE FALL** CHINOOK **STUDY**

ODFW and USFWS personnel used a mobile tagging unit constructed by NHFS with BPA funds to tag fish a their facilities. WDF used their own tagging equipment. During the four brood years, 1978 through 1981, nearly 15 million fall chinook were tagged. The numbers tagged each year were 4,379,300, 3,009,900, 3,660,500, and 3,651,300. Except for the 1978-brood fall chinook at ODFW and USFWS facilities, tagged fish were returned to the population of untagged fish from which they came.

Prerelease Sampling

During the tagging operation at each facility, tagging supervisors randomly removed a minimum of 2,000 tagged fish. These fish were held separately and were examined at the time of the facility's production release to determine tag retention at release. Just prior to release, fall chinook populations at most participating facilities were sampled to determine the tagged to untagged ratios. In many cases these ratios were used to determine the numbers of tagged and untagged fish released.

Releases

Nearly 14 million tagged fall chinook were released from the participating facilities during the four brood years. Releases were 4,035,100, 2,864,700, 3,465,400, and 3,475,500 for the 1978 through 1981 brood years, respectively. The percentage of the releases tagged each year was 4.4, 3.5, 3.9, and 4.1 for the four broods, respectively. Total releases ranged from 81 million to 92 million fish from the participating facilities (Tables l-4).

Downstream Migration

Research personnel from NHFS, Northwest and Alaska Fisheries Center sampled the Columbia River estuary and marine waters near the mouth of the Columbia during the migration time of the four broods of fall chinook. The purposes of this sampling were to: 1) define migrational characteristics of marked salmonid stocks from release site through the estuary, 2) provide data to assist in evaluating different hatchery production techniques within a release year, and 3) determine juvenile survival to the estuary for selected stocks and compare this survival with fishery contribution and hatchery returns of these stocks. The usefulness of this sampling for evaluating hatchery techniques and determining potential fishery contribution and survival ranges for fall chinook will not be fully evident until the final catch and return data are compiled.

Sport and Commercial Fishery Recoveries

Sport and commercial fisheries from Alaska through California were sampled for wire tagged salmonids (Figure 2). Recoveries of the 1978-brood began in 1980. Fishery recoveries of the 1981 brood were completed in 1986 (Table 5).

TABLE 1 -- Releases of 1978-brood fall chinook salmon from Columbia River facilities in 1979

Rearing Facility	Tagged Fish Released	Tag Code	Ad Only Fish Released	% Tag Retention	Unmarked Fish Released	Total	Fish/lb	Release Dates
ABERNATHY	63,400	05-04-50	15,000	80.2	830,600	909,000	95	4/17 - 5/18
	48,900	05-04-51	11,600	80.2	640,700	701,200	61	4/17 - 5/18
BIG CREEK	224,900	07-18-44	26,400	89.5	4,996,000	5,247,300	81	5/21
BIG WHITE POND	141,400	05-04-43	3,200	97.8	2,884,100	3,028,700	69	5/21
BONNEVILLE	287,900	07-18-42	5,500	98.1	12,262,400	12,555,800	75	5/ 1 - 5/29
	15,100	07-18-43	200	98.7	824,000	839,300	80	5/21
COWLITZ	143,600	63-19-42	2,500	98.3	4,478,800	4,624,900	85	6/27 - 10/16
	11,100	63-19-51	0	100.0	0	11,100	85	6/27 - 10/16
ELOKOMIN	21,100	63-18-56	0	100.0	0	21,100	99	6/15
	117,800	63-19-56	5,800	95.3	2,730,700	2,854,300	99	6/15
GRAYS RIVER	73,900	63-16-46	2,600	100.0	1,220,800	1,297,300	92	6/ 9 - 6/12
	7,600	63-18-33	0	100.0	0	7,600	92	6/ 9 - 6/12
	68,100	63-19-37	0	98.3	0	68,100	92	6/ 9 - 6/12
KALAMA FALLS	214,500	63-19-57	3,300	98.5	3,940,300	4,158,100	177	6/22 - 7/13
KLASKANINE	244,100	07-18-45	28,600	89.5	5,218,100	5,490,800	71	5/29
KLICKITAT	225,400	63-19-49	3,700	98.4	3,366,400	3,595,500	80	5/14 - 6/13
LITTLE WHITE SALMON	177,800	05-04-48	8,900	95.2	5,655,500	5,842,200	111	6/22
	264,800	05-04-49	12,700	95.4	5,291,100	5,568,600	111	6/22
PRIEST RAPIDS	48,100	63-18-21	2,000	96.0	776,400	826,500	74	5/23
	17,500	63-18-57	700	100.0	267,700	285,900	77	6/28
	5,300	63-19-58	0	100.0	0	5,300	77	6/28
	82,200	63-20-17	0	99.2	0	82,200	77	6/28
SEA RESOURCES	24,200	63-19-10	300	98.6	957,500	982,000	112	5/ 1 - 5/31
SPEELYAI	51,700	63-19-20	400	99.2	0	52,100	28	9/ 5
	104,500	63-19-50	3,500	96.0	78,500	186,500	86	7/19
SPRING CREEK	140,900	05-04-33	13,600	91.2	3,568,600	3,723,100	54	5/18
	135,500	05-04-44	19,400	87.5	4,357,400	4,512,300	87	4/20
	55,600	05-04-45	6,300	89.9	1,141,600	1,203,500	19	8/13
	246,000	05-04-46	13,000	95.0	9,861,000	10,120,000	125	3/20
STAYTON POND	283,800	07-18-41	9,400	96.0	4,398,800	4,692,000	67	5/ 7 - 5/21
TOUTLE	12,000	63-18-54	0	100.0	0	12,000	160	6/17
	132,100	63-19-41	6,000	96.0	2,619,500	2,757,600	160	6/17
WASHOUGAL	97,400	63-19-38	8,300	100.0	4,826,800	4,932,500	78	6/14 - 9/ 2
	154,500	63-19-46	0	96.8	0	154,500	78	6/14 - 9/ 2
WEYCO POND	92,400	63-19-39	2,500	97.4	271,600	366,500	58	6/ 5
Total	4,835,100		215,400		87,464,900	91,715,400		

TABLE 2 -- Releases of 1979-brood fall chinook salmon from Columbia River facilities in 1980

Rearing Facility	Tagged Fish Released	Tag Code	Ad Only Fish Released	% Tag Retention	Unmarked Fish Released	Total	Fish/lb	Release Dates
ABERNATHY	35,200	05-06-44	1,100	96.9	466,500	502,800	59	4/ 9 - 5/14
	112,500	05-06-46	2,400	97.9	1,360,000	1,474,900	59	4/ 9 - 5/14
BIG CREEK	143,400	07-21-60	2,200	98.5	6,287,900	6,433,500	78	5/13
BONNEVILLE	121,100	07-21-57	4,400	96.5	4,947,400	5,072,900	74	5/20 - 5/28
COWLITZ	28,700	63-21-37	200	99.7	543,400	564,300	9	3/21 - 4/ 1
	244,300	63-21-54	9,900	96.1	5,671,800	5,926,000	129	6/ 3 - 7/11
	70,500	63-21-59	2,900	96.1	1,566,600	1,640,000	119	6/18 - 7/11
ELOKOMIN	98,400	63-20-05	2,100	97.9	2,310,600	2,411,100	80	6/19
GRAYS RIVER	37,500	63-20-43	1,500	96.2	768,000	807,000	85	6/ 1 - 6/24
KALAMA FALLS	100,400	63-21-05	1,500	98.5	2,299,000	2,400,900	124	6/13 - 6/24
KLASKANINE	66,300	07-21-61	900	98.7	2,170,500	2,237,700	79	6/ 4
KLICKITAT	156,100	63-19-47	1,600	99.0	2,981,700	3,139,400	85	5/27
LEWIS RIVER	103,700	63-21-60	1,000	98.3	321,700	427,200	117	7/15
LITTLE WHITE SALMON	162,600	05-06-43	1,900	98.9	8,611,500	8,776,000	101	6/10
LOWER KALAMA	144,500	63-20-06	5,000	96.2	3,129,500	3,279,000	150	6/10
OXBOW	49,400	07-21-62	900	98.3	1,115,200	1,165,500	100	5/27
	51,900	07-21-63	900	98.3	1,170,100	1,222,900	100	5/27
PRIEST RAPIDS	110,100	63-19-48	700	99.7	2,272,900	2,383,700	69	5/20 - 6/24
RINGOLD POND	37,100	63-19-48	0	100.0	631,700	668,800	88	6/26
SEA RESOURCES	1,900	63-19-47	0	100.0	0	1,900	90	5/20
	18,400	63-20-61	400	98.1	745,400	764,200	90	5/20
SPRING CREEK	125,500	05-06-39	4,700	96.4	7,209,900	7,340,100	123	3/10
	75,200	05-06-40	2,500	96.8	3,836,300	3,914,000	83	4/10
	60,500	05-06-41	1,300	97.9	3,128,900	3,190,700	51	5/ 9
	23,100	05-06-42	500	98.2	1,088,900	1,112,500	19	8/ 7
STAYTON POND	282,000	07-20-55	3,400	98.7	6,063,200	6,348,600	87	4/20 - 5/21
WASHOUGAL	314,600	63-21-53	7,500	97.7	5,771,800	6,093,900	99	6/30
WEYCO POND	97,800	H1-02-03	3,600	96.5	1,850,500	1,951,900	90	6/10
Total	2,864,700		66,600		78,320,900	81,252,200		

TABLE 3. -- Releases of 1980-brood fall chinook salmon from Columbia River facilities in 1981

Rearing Facility	Tagged Fish Released	Tag Code	Ad Only Fish Released	% Tag Retention	Unmarked Fish Released	Total	Fish/lb	Release Dates
ABERNATHY	19,100	05-07-44	3,300	85.4	278,000	300,400	69	4/15 - 5/26
	63,500	05-07-45	10,600	85.7	826,700	900,800	69	4/15 - 5/26
BIG CREEK	50,200	07-23-31	1,500	97.1	1,856,000	1,907,700	77	5/ 7 - 5/18
	51,100	07-23-33	1,600	97.0	1,888,600	1,941,300	77	5/ 7 - 5/18
	46,000	07-23-34	1,400	97.0	1,698,100	1,745,500	77	5/ 7 - 5/18
BONNEVILLE	130,000	07-21-56	4,000	96.5	5,007,400	5,142,200	73	4/24
	75,700	07-23-29	2,700	96.6	3,113,000	3,191,400	68	5/12
CLATSOP COUNTY PONDS	73,200	07-21-58	900	98.8	1,726,800	1,800,900	75	5/15
	48,900	07-21-59	300	99.3	1,308,500	1,357,700	70	5/22
COWLITZ	153,200	63-21-56	7,400	95.4	3,121,300	3,281,900	86	6/27 - 6/28
	121,300	63-22-55	2,200	98.2	2,773,400	2,896,900	77	6/12 - 6/28
ELOKOMIN	156,200	63-22-34	4,000	97.7	2,755,400	2,915,600	102	6/ 1
	9,400	63-23-17	0	100.0	0	9,400	100	6/ 1
GRAYS RIVER	64,100	63-22-63	800	99.0	1,145,700	1,210,600	85	6/ 1 - 6/ 8
	10,200	63-23-40	0	100.0	0	10,200	93	6/ 1
KALAMA FALLS	175,400	63-20-36	3,200	98.2	3,432,800	3,611,400	103	5/22 - 5/28
KLASKANINE	18,900	07-22-27	500	97.5	718,000	737,400	86	5/18
	82,100	07-23-32	2,100	97.5	3,121,800	3,206,000	86	5/18
KLICKITAT	130,000	63-20-08	2,700	98.0	2,346,500	2,479,200	78	6/ 5
LITTLE WHITE SALMON	183,400	05-07-47	4,700	97.5	6,587,300	6,775,400	94	6/ 4 - 6/ 5
	52,400	05-08-49	1,400	97.4	1,883,300	1,937,100	94	6/ 4 - 6/ 5
	13,300	05-08-50	600	95.6	489,200	503,100	94	6/ 4 - 6/ 5
LOWER KALAMA	155,300	63-22-54	6,500	96.0	2,836,900	2,998,700	98	6/ 1 - 6/10
PRIEST RAPIDS	194,600	63-21-55	1,500	99.3	3,793,200	3,989,300	89	6/23 - 6/24
	42,100	63-22-61	100	99.7	787,900	830,100	67	5/18
SEA RESOURCES	43,300	63-22-01	1,100	97.4	786,800	831,200	90	4/16 - 4/29
SPRING CREEK	104,700	05-07-40	400	99.6	4,743,200	4,848,300	90	3/25
	76,700	05-07-41	800	99.0	3,117,800	3,195,300	71	4/15
	63,100	05-07-42	300	99.5	3,141,500	3,204,900	65	5/ 5
	25,700	05-07-43	100	99.5	123,900	149,700	75	4/21 - 4/22
	153,500	05-07-46	800	99.5	722,700	876,800	75	4/21 - 4/22
	28,800	05-07-48	100	99.5	1,345,400	1,374,300	110	3/25
	30,900	05-07-49	300	99.0	1,255,000	1,286,200	71	4/15
	13,700	05-07-50	0	100.0	635,200	648,900	121	3/25
	15,400	05-07-51	100	99.5	748,000	763,500	102	3/25
	7,200	05-07-52	200	97.0	283,600	291,000	15	8/12
STAYTON POND	245,500	07-23-35	7,500	97.0	5,649,700	5,902,700	75	4/27 - 6/15
WASHOUGAL	28,700	63-21-48	300	99.1	483,200	512,200	35	7/ 6 - 9/ 4
	278,800	63-22-51	3,100	98.9	5,228,000	5,509,900	74	6/30 - 9/ 6
WEYCO POND	169,500	H1-03-01	2,700	98.4	3,328,100	3,500,300	90	5/15 - 6/12
	64,300	H1-03-02	600	99.0	1,208,100	1,273,000	90	5/15 - 6/12
Total	3,466,400		83,200		86,298,000	89,847,600		

TABLE 4 Releases of 1981-brood fall chinook salmon from Columbia River facilities in 1982

Rearing Facility	Tagged Fish Released	Tag Code	Ad Only Fish Released	% Tag Retention	Unmarked Fish Released	Total	Fish/lb	Release Dates
ABERNATHY	98,600	05-10-58	7,100	93 0	994,500	1,092,200	51	4/20 - 6/ 1
	29,800	05-10-59	2,900	91 0	331,400	364,100	51	4/20 - 6/ 1
BIG CREEK	131,200	07-24-10	4,300	96.8	4,400,800	4,536,300	75	5/17
BONNE[illegible] LL[illegible]	105,900	07-24-07	700	99 3	1,086,100	1,192,700	80	4/23
	96,800	07-24-08	1,500	98 4	2,095,500	2,193,800	80	5/21 - 6/ 4
	102,400	07-26-63	2,000	98 1	2,724,500	2,828,900	92	4/14 - 4/20
CLATSOP COUNTY PONDS	79,700	07-24-12	1,100	98 6	1,838,100	1,918,900	80	5/20
	33,900	07-24-13	500	98 6	788,000	822,400	80	5/20
COWLITZ	41,300	63-20-32	0	95 4	0	41,300	90	6/24 - 7/ 8
	8,300	63-24-50	100	98 8	151,600	160,000	20	9/29
	199,200	63-24-62	4,500	98 7	6,691,300	6,895,000	90	6/24 - 7/ 8
	47,500	63-26-03	900	98 1	795,600	844,000	30	9/29
ELOKOMIN	52,200	63-22-42	1,000	98 1	1,246,900	1,300,100	80	6/15
	50,600	63-22-60	2,000	96 2	1,247,400	1,300,000	80	6/15
GRAYS RIVER	27,500	63-24-58	1,100	96 2	279,400	308,000	87	6/ 1
	45,400	63 24-59	1,600	96 6	471,400	518,400	87	6/ 1
KALAMA FALLS	177,100	63-24-60	600	99 7	3,375,200	[illegible],552,900	102	6/10 - 7/ 2
KLASKANINE	100,300	07-24-09	1,000	98 8	1,927,000	[illegible],028,300	85	6/ 7
KLICKITAT	204,100	63-21-57	2,000	99 0	3,473,600	[illegible],679,700	83	6/ 4
LITTLE WHITE SALMON	101,300	05-04-35	1,500	98 5	3,933,100	4,035,900	93	6/ 2 - 6/ 3
	98,500	05-04-36	1,800	98 2	3,902,400	4,002,700	93	6/ 2 - 6/ 3
LOWER KALAMA	139,400	63-24-63	1,600	98 3	3,027,000	3,168,000	117	6/13 - 6/25
OXBOW	52,300	07-23-30	700	98 6	2,083,800	2,136,800	78	6/ 4 - 6/25
	52,500	07-24-11	700	98 6	2,092,200	2,145,400	78	6/ 4 - 6/25
PRIEST RAPIDS	262,200	63-22-52	800	99 7	4,360,300	4,623,300	87	5/24 - 6/16
	48,700	63-24-56	900	98 2	836,400	886,000	67	5/18
SEA RESOURCES	45,000	63-24-57	2,500	94 8	783,100	830,600	100	4/ 1 - 5/ 7
SPRING CREEK	500	05 07-53	25	95 0	46,300	46,825	17	7/30
	400	05-07-54	25	95 0	46,300	46,725	17	7/30
	46,700	05-08-51	1,200	97 5	258,400	306,300	79	4/ 8 - 4/13
	151,400	05-10-50	3,600	97 7	7,045,400	7,200,400	110	3/25 - 3/26
	38,900	05-10-51	1,000	97 5	2,130,200	2,170,100	70	4/15
	58,300	05-10-52	5,300	91.6	2,927,700	2,991,300	48	5/20
	102,300	05-10-57	2,600	97 5	567,100	672,000	79	4/ 8 - 4/13
STAYTON POND	265,800	07-26-62	11,300	95 9	6,473,700	6,750,800	88	5/ 3 - 5/21
WASHOUGAL	170,400	63-24-61	4,400	97 5	3,321,100	3,495,900	90	6/30 - 7/ 6
WEYCO POND	217,100	H1-04-06	7,600	96.6	4,270,700	4,495,400	100	6/18
	75		8		8	8 8		

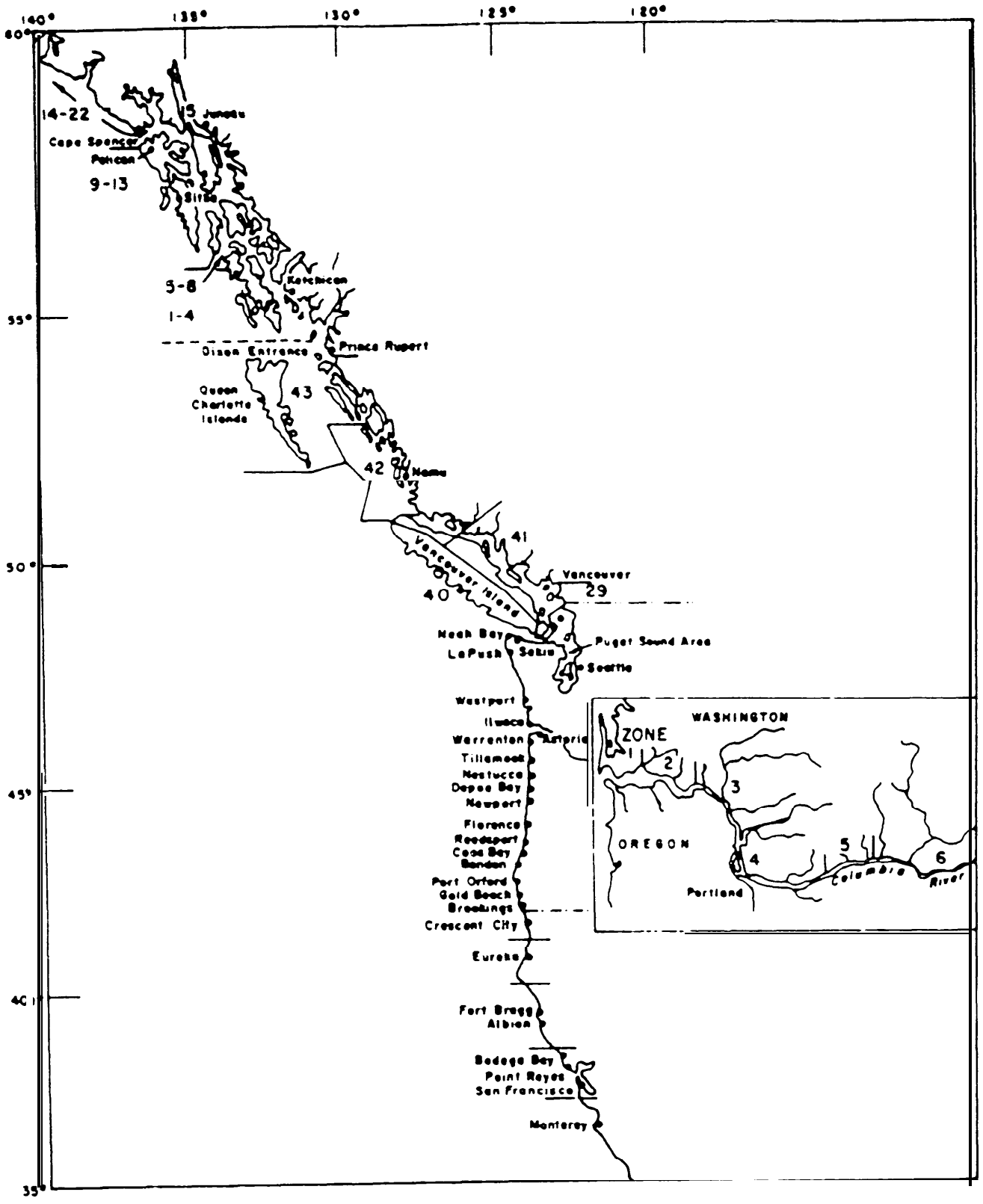


Figure 2. Ports and zones sampled for marked **fall** chinook salmon of Columbia River origin.

Table 5. Recovery years of the 1978– through 1981–brood fall chinook from Columbia River hatcheries.

Brood Year	Calendar Year						
	1980	1981	1982	1983	1984	1985	1986
1978	X	X	X	X			
1979		X	X	X	X		
1980			X	X	X	X	
1981				X	X	X	X

Hatchery Returns

Personnel from WDF, ODFW, and USFWS examined all returning fall chinook at participating facilities for the absence of fins. Biological data were collected from untagged returns at a predetermined systematic sampling rate. Samplers removed the snout of all fish with a missing adipose fin. The biological data will be used to estimate the ages of untagged returning fish. The age structure for tagged and untagged fish will be compared to determine if tagging changes the age distribution of returns.

Data Analysis

The factors to be examined at the completion of the study are summarized in Table 6. Analysis of some factors may be limited to simply noting an occurrence. Many of the factors are intertwined (confounded). This may prevent a direct cause and effect relationship. For example, there are no quantitative measures for disease history. It is not possible to make a comparison between groups of fish where group A is known to be X percent healthier than group B. The most that can be done is to note group A had certain diseases and group B had none. Thus the diseases suffered by group A would be a likely reason for lower survival (assuming there was lower survival). However, the confounding of the factors of disease, rearing environment, time and size of release, stock, hatchery, environmental conditions after release, etc., may prevent determining a direct relationship between survival and any one factor.

RESULTS AND DISCUSSION

Tagging of fall chinook for this project was completed in 1982. Fishery and hatchery sampling was completed in 1987.

Fishery Recoveries

Final estimated recoveries of tagged fall chinook are available for 1980 through 1984 for most major salmon fisheries on the Pacific coast. The fishery recovery data are available from the Pacific Marine Fisheries Commission by direct phone connection to the Mark Recovery Center data base. Final estimated catches of tagged fish are not available yet for 1984 Alaska fisheries. For 1985, finalized data are available for Oregon and Canadian fisheries and preliminary data are available for fisheries in California, Washington, and Alaska.

Catches of tagged fall chinook were expected to be completed in 1983 for the 1978 brood, 1984 for the 1979 brood, 1985 for the 1980 brood, and 1986 for the 1981 brood (Table 5). Estimated recoveries of fall chinook tagged for this project are presented by brood, hatchery, and tag code in Tables 7 through 10.

Hatchery Returns

Returns of tagged fall chinook through 1986 are summarized by brood, rearing facility, and year of return in Tables 11 through 14. Returns by brood were expected to be completed in the same years as catches by

Table 6. Factors to be analyzed for the fall chinook study.

Brood	Hatchery	Disease History 1/	Rearing Environment 2/	Release Time and Size 3/	Release Location 4/	River Flow and Temp. 1/	Smolt Index 5/	Jones Beach Samp. 6/	Catch and Distrib. 1/	Returns 1/	Benefit/ Cost Ratios 1/
Within	within	X	X	X	X	X	X	X	X	X	X
	Between	X	X	X	X	X		X	X	X	X
Between	Within	X	X	X		X	X		X	X	X
	Between								X		X

1/ All facilities all broods

2/ 78-brood: Grays River vs. Weyco Pond, Bonneville vs. Stayton Pond, Spring Creek vs. Big White Pond.
80-brood: Grays River vs. Weyco Pond, Bonneville vs. Stayton Pond vs. Clatsop County Ponds.
81-brood: Bonneville vs. Stayton Pond vs. Klaskanine vs. OxBow

3/ 78-brood: Speelyai, Spring Creek
79-brood: Cowlitz, Spring Creek
80-brood: Spring Creek
81-brood: Spring Creek, Cowlitz

4/ 80-brood: Spring Creek
81-brood: Spring Creek, Bonneville

5/ Measure of degree of smoltification based on ATPase, thyroxine, saltwater challenge tests, etc.
78-brood: Kalama Falls, Toutle, Bonneville, Big White, Elokomin, Washougal
79-brood: Spring Creek, Bonneville, Elokomin, Grays River

6/ All facilities

TABLE 7.-- Estimated recoveries of tagged 1978- brood fall chinook from Columbia River facilities to Pacific coast fisheries by facility, tag code and catch year.

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
BIG CREEK	07-18-44	1980	0	12	19	0	0	0	0	0	31
		1981	0	277	143	27	0	0	0	17	464
		1982	0	65	20	0	0	0	0	69	154
		1983	0	10	0	0	0	0	0	0	10
		Total	0	364	182	27	0	0	0	86	659
BONNEVILLE HATCHERY	07-18-42	1980	0	13	49	0	0	0	2	5	69
		1981	0	275	237	57	0	0	4	18	591
		1982	0	105	6	0	0	0	9	68	188
		1983	0	0	0	0	0	0	0	0	0
		Total	0	393	292	57	0	0	15	91	848
	07-18-43	1980	0	0	0	0	0	0	0	0	0
		1981	0	0	0	0	0	0	0	2	2
		1982	0	0	0	0	4	0	0	0	4
		1983	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	4	0	0	2	6
KLASKANINE HATCHERY	07-18-45	1980	0	11	0	0	0	0	0	0	11
		1981	0	102	32	34	0	0	0	18	186
		1982	0	27	1	0	0	0	0	87	115
		1983	0	0	0	0	0	0	0	0	0
		Total	0	140	33	34	0	0	0	105	312
STAYTON POND	07-18-41	1980	0	35	58	0	0	0	0	0	93
		1981	0	760	520	119	4	0	0	16	1,419
		1982	0	174	47	2	3	2	0	130	358
		1983	0	5	6	0	0	0	0	3	14
		Total	0	974	631	121	7	2	0	149	1,884
SEA RESOURCES HATCH.	63-19-18	1980	0	5	0	12	0	0	0	0	17
		1981	0	0	0	0	0	0	0	2	2
		1982	0	0	3	0	0	0	0	3	6
		1983	0	0	0	0	0	0	0	0	0
		Total	0	5	3	12	0	0	0	5	25

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish.
ABERNATHY HATCHERY	05-04-50	1980	0	9	14	0	0	0	0	0	23
		1981	0	172	60	15	5	0	0	21	273
		1982	0	17	0	0	0	0	0	6	23
		1983	0	0	0	0	0	0	0	0	0
		Total	0	198	74	15	5	0	0	27	319
	05-04-51	1980	0	10	12	0	0	0	0	12	34
		1981	0	64	50	26	0	0	0	18	158
		1982	0	4	4	4	0	0	0	9	21
		1983	0	0	0	0	0	0	0	0	0
		Total	0	78	66	30	0	0	0	39	213
BIG WHITE POND	05-04-43	1980	0	5	17	7	0	0	0	0	29
		1981	0	57	103	14	0	0	19	0	193
		1982	0	17	13	0	0	0	10	12	52
		1983	0	0	0	0	0	0	0	0	0
		Total	0	79	133	21	0	0	29	12	274
LITTLE WHITE HATCH.	05-04-48	1980	0	0	0	0	0	0	0	0	0
		1981	0	11	11	0	0	0	5	0	27
		1982	0	0	0	0	0	0	3	0	3
		1983	0	0	0	0	0	0	0	0	0
		Total	0	11	11	0	0	0	8	0	30
	05-04-49	1980	0	2	0	0	0	0	0	0	2
		1981	0	0	11	5	0	0	0	0	16
		1982	0	10	0	0	0	0	8	0	18
		1983	0	0	0	0	0	0	0	0	0
		Total	0	12	11	5	0	0	8	0	36
SPRING CREEK HATCH.	05-04-33	1980	0	11	80	0	0	0	11	6	108
		1981	0	434	425	115	0	0	200	21	1,195
		1982	0	53	30	7	0	2	64	52	208
		1983	0	0	0	0	0	0	4	0	4
		Total	0	498	535	122	0	2	279	79	1,515

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish.
SPRING CREEK HATCH.	05-04-44	1980	0	34	136	5	0	0	2	21	198
		1981	0	602	709	136	0	0	350	27	1,824
		1982	0	93	45	6	0	0	75	78	297
		1983	0	0	0	0	0	0	0	0	0
		Total	0	729	890	147	0	0	427	126	2,319
	05-04-45	1980	0	0	0	0	0	0	0	0	0
		1981	0	0	2	0	0	0	0	0	2
		1982	0	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0	0
		Total	0	0	2	0	0	0	0	0	2
	05-04-46	1980	0	13	40	13	0	0	14	22	102
		1981	0	324	383	56	0	0	149	17	929
		1982	0	57	16	2	0	0	43	50	168
		1983	0	0	2	0	0	0	2	5	9
		Total	0	394	441	71	0	0	208	94	1,208
COWLITZ HATCHERY	63-19-42	1980	0	0	0	0	0	0	0	2	2
		1981	0	30	32	15	0	0	0	7	84
		1982	6	55	49	25	0	0	0	18	153
		1983	2	4	2	0	0	0	0	0	8
		Total	8	89	83	40	0	0	0	27	247
	63-19-51	1980	0	0	0	0	0	0	0	0	0
		1981	0	5	19	2	0	0	0	0	26
		1982	2	11	13	4	0	0	0	5	35
		1983	1	0	0	0	0	0	0	0	1
		Total	3	16	32	6	0	0	0	5	62
ELOKOMIN HATCHERY	63-18-56	1980	0	0	0	0	0	0	0	0	0
		1981	0	0	0	0	0	0	0	0	0
		1982	0	0	0	0	0	0	0	3	3
		1983	0	3	0	0	0	0	0	0	3
		Total	0	3	0	0	0	0	0	3	6

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
ELOKOMIN HATCHERY	63-19-56	1980	0	3	0	0	0	0	0	0	3
		1981	0	4	3	0	0	0	0	1	8
		1982	0	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0	0
		Total	0	7	3	0	0	0	0	1	11
GRAYS RIVER HATCHERY	63-16-46	1980	0	0	0	0	0	0	0	0	0
		1981	0	0	0	2	0	0	0	4	6
		1982	1	4	0	0	0	0	0	7	12
		1983	5	0	0	0	0	0	0	0	5
		Total	6	4	0	2	0	0	0	11	23
	63-18-33	1980	0	0	0	0	0	0	0	0	0
		1981	0	0	0	0	0	0	0	0	0
		1982	0	4	0	0	0	0	0	0	4
		1983	1	0	0	0	0	0	0	0	1
		Total	1	4	0	0	0	0	0	0	5
	63-19-37	1980	0	0	0	0	0	0	0	0	0
		1981	0	0	7	11	0	0	0	9	27
		1982	1	0	4	0	0	0	0	4	9
		1983	1	0	6	0	0	0	0	0	7
		Total	2	0	17	11	0	0	0	13	43
KALAMA FALLS HATCH.	63-19-57	1980	0	1	0	0	0	0	0	0	1
		1981	0	4	8	3	0	0	0	0	15
		1982	4	42	6	0	0	0	0	18	70
		1983	0	0	0	0	0	0	0	2	2
		1984	0	0	0	0	0	0	0	3	3
		Total	4	47	14	3	0	0	0	23	91
KLICKITAT HATCHERY	63-19-49	1980	0	4	5	0	0	0	0	5	14
		1981	0	59	50	7	0	0	10	3	129
		1982	2	43	22	0	0	0	21	12	100
		1983	0	0	0	0	0	0	0	0	0
		Total	2	106	77	7	0	0	31	20	243

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
PRIEST RAPIDS HATCH.	63-18-21	1980	0	8	0	0	0	0	0	3	11
		1981	0	15	2	3	0	0	2	0	22
		1982	49	33	3	0	0	0	8	4	97
		1983	12	5	0	0	0	0	0	0	17
		Total	61	61	5	3	0	0	10	7	147
	63-18-57	1980	0	0	0	0	0	0	0	0	0
		1981	1	8	0	0	0	0	0	0	9
		1982	3	0	0	0	0	0	0	0	3
		1983	1	0	0	0	0	0	0	0	1
		Total	5	8	0	0	0	0	0	0	13
	63-19-58	1980	0	0	0	0	0	0	0	0	0
		1981	0	0	0	0	4	0	0	0	4
		1982	0	0	0	0	0	0	2	0	2
		1983	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	4	0	2	0	6
	63-20-17	1980	0	0	0	0	0	0	0	0	0
		1981	0	0	0	0	0	0	0	0	0
		1982	7	10	0	0	0	0	4	0	21
		1983	0	3	0	0	0	0	0	1	4
		Total	7	13	0	0	0	0	4	1	25
SPEELYAI HATCHERY	63-19-20	1980	0	7	0	0	0	0	0	3	10
		1981	0	12	30	0	0	0	0	9	51
		1982	8	27	17	11	0	0	0	16	79
		1983	3	0	3	0	0	0	0	4	10
		Total	11	46	50	11	0	0	0	32	150
	63-19-50	1980	0	2	0	0	0	0	0	6	8
		1981	0	20	22	9	0	0	0	2	53
		1982	13	33	25	0	0	0	0	24	95
		1983	1	9	5	0	0	0	0	4	19
		Total	14	64	52	9	0	0	0	36	175

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish.
TOUTLE HATCHERY	63-18-54	1980	0	0	0	0	0	0	0	0	0
		1981	0	5	3	0	0	0	0	0	8
		1982	0	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0	0
		Total	0	5	3	0	0	0	0	0	8
	63-19-41	1980	0	1	0	0	0	0	0	0	1
		1981	1	21	3	0	0	0	0	11	36
		1982	4	47	6	15	0	0	0	18	90
		1983	0	0	0	0	0	0	0	0	0
		Total	5	69	9	15	0	0	0	29	127
WASHOUGAL HATCHERY	63-19-38	1980	0	0	0	0	0	0	0	11	11
		1981	0	36	18	8	0	0	0	6	68
		1982	0	12	8	0	0	0	0	29	49
		1983	0	0	0	0	0	0	0	4	4
		Total	0	48	26	8	0	0	0	50	132
	63-19-46	1980	0	2	0	0	0	0	0	1	3
		1981	0	20	26	10	0	0	0	5	61
		1982	4	42	3	0	0	0	0	29	78
		1983	4	0	0	0	0	0	0	0	4
		Total	8	64	29	10	0	0	0	35	146
WEYCO POND	63-19-39	1980	0	0	0	0	0	0	0	0	0
		1981	0	33	2	0	0	0	0	7	42
		1982	2	4	8	0	0	0	0	9	23
		1983	0	0	0	0	0	0	0	0	0
		Total	2	37	10	0	0	0	0	16	65
	Grand total		139	4,566	3,714	787	20	4	1,021	1,124	11,375

TABLE 8.-- Estimated recoveries of tagged 1979- brood fall chinook from Columbia River facilities to Pacific coast fisheries by facility, tag code and catch year.

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish.
BIG CREEK	07-21-60	1981	0	86	29	4	0	0	0	5	124
		1982	0	435	342	55	8	4	0	108	952
		1983	0	70	13	0	0	0	0	47	130
		1984	0	4	0	0	0	0	0	0	4
		Total	0	595	384	59	8	4	0	160	1,210
BONNEVILLE HATCHERY	07-21-57	1981	0	1	0	0	0	0	0	0	1
		1982	0	51	36	0	0	0	0	24	111
		1983	0	23	2	0	0	0	2	0	27
		Total	0	75	38	0	0	0	2	24	139
KLASKANINE HATCHERY	07-21-61	1981	0	4	4	0	0	0	0	0	8
		1982	0	25	14	1	0	0	0	25	65
		1983	0	5	2	2	0	0	0	11	20
		Total	0	34	20	3	0	0	0	36	93
OXBOW HATCHERY	07-21-62	1981	0	0	0	0	0	0	0	0	0
		1982	0	16	14	2	0	0	0	6	38
		1983	0	13	0	0	0	0	0	3	16
		Total	0	29	14	2	0	0	0	9	54
	07-21-63	1981	0	0	2	0	0	0	0	0	2
		1982	0	40	25	9	0	0	0	10	84
		1983	0	9	7	0	0	0	0	3	19
		Total	0	49	34	9	0	0	0	13	105
STAYTON POND	07-20-55	1981	0	45	187	7	0	0	0	2	241
		1982	0	495	691	109	3	4	0	201	1,503
		1983	0	97	27	0	0	0	0	18	142
		1984	0	4	0	0	0	0	0	0	4
		Total	0	641	905	116	3	4	0	221	1,890
SEA RESOURCES HATCH.	63-20-61	1981	1	8	2	0	0	0	0	0	11

Table 8 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish.
SEA RESOURCES HATCH.	63-20-61	1982	2	6	5	0	0	0	0	11	24
		1983	9	8	0	0	0	0	0	0	17
		Total	12	22	7	0	0	0	0	11	52
ABERNATHY HATCHERY	05-06-44	1981	0	0	26	4	0	0	0	9	39
		1982	0	46	61	4	8	0	0	24	143
		1983	0	5	2	0	0	0	0	1	8
		Total	0	51	89	8	8	0	0	34	190
	05-06-46	1981	0	5	59	9	0	5	0	9	87
		1982	0	135	200	49	0	0	0	32	416
		1983	0	10	0	0	0	0	0	8	18
		1984	0	0	0	0	0	0	0	2	2
		Total	0	150	259	58	0	5	0	51	523
LITTLE WHITE HATCH.	05-06-43	1981	0	0	0	0	0	0	0	0	0
		1982	0	18	20	0	0	0	2	6	46
		1983	0	0	0	0	0	0	0	0	0
		Total	0	18	20	0	0	0	2	6	46
SPRING CREEK HATCH.	05-06-39	1981	0	35	114	23	0	0	41	3	216
		1982	0	213	325	40	10	0	153	142	883
		1983	0	11	5	0	0	0	9	3	28
		Total	0	259	444	63	10	0	203	148	1,127
	05-06-40	1981	0	22	110	11	0	0	52	8	203
		1982	0	229	366	59	0	0	165	168	987
		1983	0	19	3	0	0	0	12	7	41
		Total	0	270	479	70	0	0	229	183	1,231
	05-06-41	1981	0	54	148	5	0	0	59	1	267
		1982	0	138	325	35	8	0	206	159	871
		1983	0	9	0	0	0	0	12	4	25
		Total	0	201	473	40	8	0	277	164	1,163

Table 8 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
SPRING CREEK HATCH.	05-06-42	1981	0	0	0	0	0	0	0	0	0
		1982	0	11	31	6	5	2	9	6	70
		1983	0	21	4	0	0	0	5	0	30
		Total	0	32	35	6	5	2	14	6	100
COWLITZ HATCHERY	63-21-37	1981	0	0	2	0	0	0	0	14	16
		1982	0	4	69	10	0	0	0	10	93
		1983	0	59	89	6	0	0	0	8	162
		Total	0	63	160	16	0	0	0	32	271
	63-21-54	1981	0	8	0	0	0	0	0	8	16
		1982	2	15	74	6	0	0	0	16	113
		1983	22	49	39	0	0	0	0	14	124
		1984	0	11	0	0	0	0	0	0	11
		Total	24	83	113	6	0	0	0	38	264
	63-21-59	1981	0	0	0	0	0	0	0	0	0
		1982	0	12	26	3	0	0	0	3	44
		1983	4	3	18	3	0	0	0	0	28
		Total	4	15	44	6	0	0	0	3	72
ELOKOMIN HATCHERY	63-20-05	1981	0	0	0	0	0	0	0	2	2
		1982	0	7	11	12	0	0	0	3	33
		1983	0	16	4	0	0	2	0	7	29
		Total	0	23	15	12	0	2	0	12	64
GRAYS RIVER HATCHERY	63-20-43	1981	0	0	0	0	0	0	0	0	0
		1982	4	18	9	2	0	0	0	4	37
		1983	3	10	3	0	0	0	0	3	19
		1984	0	9	0	0	0	0	0	0	9
		Total	7	37	12	2	0	0	0	7	65
KALAMA FALLS HATCH.	63-21-05	1981	0	8	0	0	0	0	0	4	12
		1982	1	34	30	6	0	0	0	3	74

Table 8 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
KALAMA FALLS HATCH.	63-21-05	1983	12	57	35	3	0	0	0	10	117
		1984	0	7	0	0	0	0	0	1	8
		Total	13	106	65	9	0	0	0	18	211
KLICKITAT HATCHERY	63-19-47	1981	0	8	4	6	0	0	0	0	18
		1982	1	47	76	7	17	0	4	19	171
		1983	9	32	3	1	0	0	12	0	57
		1984	0	0	0	0	0	0	3	0	3
		Total	10	87	83	14	17	0	19	19	249
LEWIS RIVER HATCHERY	63-21-60	1981	0	25	0	0	0	0	0	0	25
		1982	1	47	43	17	0	0	0	63	171
		1983	20	89	65	20	0	0	0	58	252
		1984	0	7	0	0	0	0	0	0	7
		Total	21	168	108	37	0	0	0	121	455
LOWER KALAMA HATCH.	63-20-06	1981	0	0	3	3	0	0	0	0	6
		1982	2	50	23	5	0	0	0	23	103
		1983	10	25	6	0	0	0	0	14	55
		1984	0	11	0	0	0	0	0	14	25
		Total	12	86	32	8	0	0	0	51	189
PRIEST RAPIDS HATCH.	63-19-48	1981	5	4	0	0	0	0	0	10	19
		1982	21	65	13	8	0	0	4	11	122
		1983	123	56	2	0	0	0	31	13	225
		1984	32	24	5	1	0	0	7	3	72
		Total	181	149	20	9	0	0	42	37	438
WASHOUGAL HATCHERY	63-21-53	1981	0	9	0	0	0	0	0	1	10
		1982	16	144	147	13	10	0	5	55	390
		1983	45	174	97	4	0	0	13	45	378
		1984	2	12	0	0	0	0	0	6	20
		Total	63	339	244	17	10	0	18	107	798

Table 8 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
WEYCO POND	H1-02-03	1981	0	0	0	0	0	0	0	3	3
		1982	1	12	26	2	0	0	0	19	60
		1983	0	8	19	0	0	0	0	1	28
		1984	0	0	0	0	0	0	0	3	3
		Total	1	20	45	2	0	0	0	26	94
	Grand total		348	3,602	4,142	572	69	17	806	1,537	11,093

TABLE 9.-- Estimated recoveries of tagged 1980 brood fall chinook from Columbia River facilities to Pacific coast fisheries by facility, tag code and catch year.

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
CLATSOP COUNTY PONDS	07-21-58	1982	0	3	0	0	0	0	0	0	3
		1983	0	29	11	0	0	0	0	6	46
		1984	0	15	3	0	0	0	0	5	23
		Total	0	47	14	0	0	0	0	11	72
	07-21-59	1982	0	3	20	0	0	0	0	0	23
		1983	0	129	50	3	0	0	0	33	215
		1984	0	12	0	2	0	0	0	25	39
		Total	0	144	70	5	0	0	0	58	277
BIG CREEK	07-23-31	1982	0	1	5	0	0	0	0	0	6
		1983	0	77	26	0	0	0	0	15	118
		1984	0	16	0	0	0	0	0	0	16
		Total	0	94	31	0	0	0	0	15	140
	07-23-33	1982	0	8	4	0	0	0	0	0	12
		1983	0	30	18	7	0	0	0	3	58
		1984	0	8	0	0	0	0	0	6	14
		Total	0	46	22	7	0	0	0	9	84
	07-23-34	1982	0	0	0	0	0	0	0	0	0
		1983	0	38	28	2	0	0	0	12	80
		Total	0	38	28	2	0	0	0	12	80
BONNEVILLE HATCHERY	07-21-56	1982	0	5	24	3	0	0	2	0	34
		1983	0	99	54	5	0	0	2	12	172
		1984	0	24	0	0	0	0	0	8	32
		Total	0	128	78	8	0	0	4	20	238
	07-23-29	1982	0	0	3	2	0	0	0	0	5
		1983	0	90	21	4	0	0	2	5	122
		1984	0	15	0	0	0	0	3	5	23
		Total	0	105	24	6	0	0	5	10	150

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
KLASKANINE HATCHERY	07-22-27	1982	0	0	0	0	0	0	0	1	1
		1983	0	0	0	0	0	0	0	3	3
		1984	0	0	0	0	0	0	0	2	2
		Total	0	0	0	0	0	0	0	6	6
	07-23-32	1982	0	0	0	0	0	0	0	2	2
		1983	0	31	8	0	0	0	0	21	60
		Total	0	31	8	0	0	0	0	23	62
STAYTON POND	07-23-35	1982	0	14	76	0	3	2	0	0	95
		1983	0	284	200	13	0	0	0	34	531
		1984	0	48	4	0	0	0	0	10	62
		Total	0	346	280	13	3	2	0	44	688
SEA RESOURCES HATCH	63-22-01	1982	0	0	0	0	0	0	0	2	2
		1983	0	22	15	0	0	0	0	15	52
		1984	0	0	0	0	0	0	0	2	2
		Total	0	22	15	0	0	0	0	19	56
ABERNATHY HATCHERY	05-07-44	1982	0	7	22	0	0	0	0	3	32
		1983	0	90	30	2	0	0	2	6	130
		1984	2	3	0	0	0	0	0	2	7
		Total	2	100	52	2	0	0	2	11	169
	05-07-45	1982	0	37	70	4	0	0	0	12	123
		1983	0	156	143	8	0	0	2	17	326
		1984	0	15	0	0	0	0	0	8	23
		Total	0	208	213	12	0	0	2	37	472
LITTLE WHITE HATCH	05-07-47	1982	0	0	0	0	0	0	0	0	0
		1983	0	20	17	0	0	0	0	5	42
		1984	0	4	0	0	0	0	8	0	12
		Total	0	24	17	0	0	0	8	5	54

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
LITTLE WHITE HATCH.	05-08-49	1982	0	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0
	05-08-50	1982	0	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	2	0	2
		Total	0	0	0	0	0	0	2	0	2
SPRING CREEK HATCH.	05-07-40	1982	0	1	0	0	0	0	0	0	1
		1983	0	31	26	2	0	0	18	11	88
		1984	0	18	0	0	0	0	3	2	23
		1985	0	0	0	0	0	0	5	0	5
		Total	0	50	26	2	0	0	26	13	117
	05-07-41	1982	0	6	11	0	0	0	0	0	17
		1983	0	38	44	0	0	0	6	5	93
		1984	0	10	0	0	0	0	3	0	13
		Total	0	54	55	0	0	0	9	5	123
	05-07-42	1982	0	0	5	0	0	0	0	0	5
		1983	0	70	27	0	0	0	11	8	116
		1984	0	7	0	0	0	0	8	0	15
		Total	0	77	32	0	0	0	19	8	136
	05-07-43	1982	0	0	22	0	0	0	2	0	24
		1983	0	95	48	3	0	0	23	3	172
		1984	0	11	0	0	0	0	11	7	29
		Total	0	106	70	3	0	0	36	10	225
	05-07-46	1982	0	13	58	2	0	2	9	1	85
		1983	0	479	248	30	0	2	190	43	992
		1984	0	64	6	3	0	0	97	23	193
		1985	0	5	0	0	0	0	4	0	9
		Total	0	561	312	35	0	4	300	67	1,279

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
SPRING CREEK HATCH.	05-07-48	1982	0	6	4	0	0	0	0	0	10
		1983	0	6	0	4	0	0	2	3	15
		1984	0	0	0	0	0	0	3	0	3
		Total	0	12	4	4	0	0	5	3	28
	05-07-49	1982	0	0	0	0	0	0	0	3	3
		1983	0	40	16	0	0	0	2	0	58
		1984	0	5	0	0	0	0	7	0	12
		Total	0	45	16	0	0	0	9	3	73
	05-07-50	1982	0	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0
	05-07-51	1982	0	0	0	0	0	0	2	0	2
		1983	0	5	2	0	0	0	2	3	12
		Total	0	5	2	0	0	0	4	3	14
	05-07-52	1982	0	0	0	0	0	0	0	0	0
		1983	0	5	4	0	0	0	0	0	9
		1984	0	3	0	0	0	0	3	0	6
		Total	0	8	4	0	0	0	3	0	15
COWLITZ HATCHERY	63-21-56	1982	0	5	0	0	0	0	0	4	9
		1983	2	73	91	18	0	0	0	16	200
		1984	19	194	15	13	4	0	0	73	318
		1985	3	16	2	0	0	0	0	0	21
		Total	24	288	108	31	4	0	0	93	548
	63-22-55	1982	0	2	0	0	0	0	0	3	5
		1983	1	48	13	2	0	0	0	5	69
		1984	15	58	1	4	0	0	0	31	109
		1985	0	2	0	0	0	0	0	8	10
		Total	16	110	14	6	0	0	0	47	193

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
ELOKOMIN HATCHERY	63-22-34	1982	0	0	0	0	0	0	0	0	0
		1983	0	55	17	4	0	0	0	1	77
		1984	9	21	0	3	0	0	0	29	62
		1985	0	0	0	0	0	0	0	4	4
		1986	0	0	0	0	0	0	0	4	4
		Total	9	76	17	7	0	0	0	38	147
	63-23-17	1982	0	0	0	0	0	0	0	0	0
		1983	0	0	5	4	0	0	0	0	9
		1984	1	24	0	0	0	0	0	16	41
		1985	2	6	0	0	0	0	0	0	8
		1986	0	5	0	0	0	0	0	0	5
		Total	3	35	5	4	0	0	0	16	63
GRAYS RIVER HATCHERY	63-22-63	1982	0	4	0	0	0	0	0	0	4
		1983	0	7	10	2	0	0	0	0	19
		1984	9	42	1	0	0	0	0	24	76
		1985	2	6	0	0	0	0	0	4	12
		Total	11	59	11	2	0	0	0	28	111
	63-23-40	1982	0	0	0	0	0	0	0	0	0
		1983	0	8	0	0	0	0	0	0	8
		1984	0	19	0	0	0	0	0	2	21
		Total	0	27	0	0	0	0	0	2	29
KALAMA FALLS HATCH.	63-20-36	1982	0	4	0	0	0	0	0	0	4
		1983	4	44	22	0	0	0	0	3	73
		1984	18	66	8	1	0	0	0	22	115
		1985	4	0	0	0	0	0	0	0	4
		Total	26	114	30	1	0	0	0	25	196
KLICKITAT HATCHERY	63-20-08	1982	0	4	0	0	0	0	0	0	4
		1983	0	9	0	0	0	0	0	0	9
		1984	0	15	1	1	0	0	8	0	25
		1985	2	0	0	0	0	0	3	0	5
		Total	2	28	1	1	0	0	11	0	43

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
LOWER KALAMA HATCH.	63-22-54	1982	2	20	6	0	0	0	0	17	45
		1983	0	133	35	7	0	0	0	3	178
		1984	47	161	12	3	0	0	0	96	319
		1985	27	16	0	0	0	0	0	42	85
		Total	76	330	53	10	0	0	0	158	627
PRIEST RAPIDS HATCH.	63-21-55	1982	2	12	0	0	0	0	0	0	14
		1983	9	72	0	0	0	0	15	4	100
		1984	144	180	8	0	0	0	62	13	407
		1985	41	61	5	8	0	2	36	21	174
		1986	0	6	0	0	0	0	5	0	11
		Total	196	331	13	8	0	2	118	38	706
	63-22-61	1982	0	4	0	0	0	0	2	0	6
		1983	5	35	2	0	0	0	2	0	44
		1984	70	89	0	1	0	0	21	5	186
		1985	23	32	0	0	0	0	11	13	79
		Total	98	160	2	1	0	0	36	18	315
WASHOUGAL HATCHERY	63-21-48	1982	0	3	0	0	0	0	0	0	3
		1983	0	6	15	0	0	0	0	0	21
		1984	5	37	0	1	0	0	0	9	52
		1985	2	5	0	0	0	0	0	0	7
		Total	7	51	15	1	0	0	0	9	83
	63-22-51	1982	1	10	0	0	0	0	0	4	15
		1983	5	37	25	2	3	0	0	5	77
		1984	46	108	16	3	0	0	5	76	254
		1985	4	3	0	0	0	0	0	10	17
		Total	56	158	41	5	3	0	5	95	363
WEYCO POND	H1-03-01	1982	0	0	0	0	0	0	0	0	0
		1983	0	0	5	0	0	0	0	0	5
		1984	0	0	0	0	0	0	0	0	0
		Total	0	0	5	0	0	0	0	0	5

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
WEYCO POND	H1-03-02	1982	0	0	0	0	0	0	0	0	0
		1983	0	6	6	0	0	0	0	0	12
		1984	2	11	9	0	0	0	0	2	24
		Total	2	17	15	0	0	0	0	2	36
	Grand total		528	4,035	1,703	176	10	8	604	961	8,025

TABLE 10.-- Estimated recoveries of tagged 1981- brood fall chinook from Columbia River facilities to Pacific coast fisheries by facility, tag code and catch year.

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
CLATSOP COUNTY PONDS	07-24-12	1983	0	4	0	0	0	0	0	0	4
		1984	0	24	0	3	0	0	0	7	34
		1985	0	4	0	0	0	0	0	11	15
		1986	0	4	0	0	0	0	0	6	10
		Total	0	36	0	3	0	0	0	24	63
	07-24-13	1983	0	4	0	0	0	0	0	0	4
		1984	0	0	0	0	0	0	0	2	2
		1985	0	14	0	0	0	0	0	0	14
		Total	0	18	0	0	0	0	0	2	20
BIG CREEK	07-24-10	1983	0	11	2	0	0	2	0	0	15
		1984	0	305	29	15	5	5	0	53	412
		1985	0	33	10	0	0	0	0	21	64
		1986	0	0	0	0	0	0	0	6	6
		Total	0	349	41	15	5	7	0	80	497
BONNEVILLE HATCHERY	07-24-07	1983	0	8	19	0	5	0	2	0	34
		1984	0	140	20	19	0	0	32	24	235
		1985	0	25	0	0	0	0	0	0	25
		Total	0	173	39	19	5	0	34	24	294
	07-24-08	1983	0	2	0	0	0	0	0	0	2
		1984	0	46	6	0	0	0	0	5	57
		1985	0	4	0	0	0	0	0	0	4
		1986	0	0	0	0	0	0	0	3	3
		Total	0	52	6	0	0	0	0	8	66
	07-26-63	1983	0	13	21	0	0	0	2	0	36
		1984	0	173	36	15	0	0	113	29	366
		1985	0	4	2	2	0	0	52	0	60
		1986	0	0	0	0	2	0	0	0	2
		Total	0	190	59	17	2	0	167	29	464

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
KLASKANINE HATCHERY	07-24-09	1983	0	0	0	0	0	0	0	0	0
		1984	0	26	1	2	0	0	0	4	33
		1985	0	7	2	3	0	0	0	0	12
		Total	0	33	3	5	0	0	0	4	45
OXBOW HATCHERY	07-23-30	1983	0	8	0	0	0	0	0	0	8
		1984	0	16	0	0	0	0	0	2	18
		1985	0	1	0	0	0	0	0	0	1
		Total	0	25	0	0	0	0	0	2	27
	07-24-11	1983	0	0	0	0	0	0	0	0	0
		1984	0	4	0	0	0	0	0	5	9
		Total	0	4	0	0	0	0	0	5	9
STAYTON POND	07-26-62	1983	0	37	27	0	0	2	0	0	66
		1984	0	636	57	24	0	0	0	63	780
		1985	0	61	15	3	0	0	0	0	79
		1986	0	0	0	3	0	0	0	0	3
		Total	0	734	99	30	0	2	0	63	928
SEA RESOURCES HATCH.	63-24-57	1983	0	1	4	0	0	0	0	3	8
		1984	0	125	9	13	0	0	0	43	190
		1985	0	9	0	0	0	0	0	49	58
		1986	0	7	0	0	0	0	0	6	13
		Total	0	142	13	13	0	0	0	101	269
ABERNATHY HATCHERY	05-10-58	1983	0	2	13	0	0	0	0	3	18
		1984	0	78	9	1	0	0	0	20	108
		1985	0	17	0	0	0	0	0	0	17
		Total	0	97	22	1	0	0	0	23	143
	05-10-59	1983	0	0	2	0	0	0	0	0	2
		1984	0	18	3	0	0	0	0	15	36
		1985	0	0	0	0	0	0	0	4	4
		Total	0	18	5	0	0	0	0	19	42

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
LITTLE WHITE HATCH.	05-04-35	1983	0	0	0	0	0	0	0	0	0
		1984	0	10	0	0	0	0	3	5	18
		1985	0	11	2	0	0	0	0	0	13
		Total	0	21	2	0	0	0	3	5	31
	05-04-36	1983	0	0	0	0	0	0	0	0	0
		1984	0	3	0	0	0	0	0	0	3
		Total	0	3	0	0	0	0	0	0	3
SPRING CREEK HATCH.	05-07-53	1983	0	0	0	0	0	0	0	0	0
		1984	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0
	05-07-54	1983	0	0	0	0	0	0	0	0	0
		1984	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0
	05-08-51	1983	0	0	7	2	0	0	10	0	19
		1984	0	90	13	10	0	0	48	24	185
		1985	0	4	0	0	0	0	16	0	20
		Total	0	94	20	12	0	0	74	24	224
	05-10-50	1983	0	2	15	2	0	0	15	3	37
		1984	0	109	27	14	13	0	52	40	255
		1985	0	12	0	0	0	0	9	0	21
		Total	0	123	42	16	13	0	76	43	313
	05-10-51	1983	0	0	2	5	0	2	0	0	9
		1984	0	16	5	3	0	0	11	7	42
		1985	0	8	2	0	0	0	0	0	10
		Total	0	24	9	8	0	2	11	7	61
	05-10-52	1983	0	5	10	6	0	0	5	1	27

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
SPRING CREEK HATCH.	05-10-52	1984	0	167	16	10	0	0	58	44	295
		1985	0	12	0	0	0	0	17	0	29
		Total	0	184	26	16	0	0	80	45	351
	05-10-57	1983	0	11	34	0	0	0	8	0	53
		1984	0	218	56	28	0	2	162	21	487
		1985	0	4	6	0	0	0	39	2	51
		1986	0	0	0	0	0	0	5	0	5
		Total	0	233	96	28	0	2	214	23	596
COWLITZ HATCHERY	63-20-32	1983	0	0	0	0	0	0	0	0	0
		1984	0	9	0	0	0	0	0	0	9
		1985	0	0	0	0	0	0	0	4	4
		Total	0	9	0	0	0	0	0	4	13
	63-24-50	1983	1	3	0	0	0	0	0	0	4
		1984	0	0	0	0	0	0	0	3	3
		1985	0	0	0	0	0	0	0	0	0
		1986	2	0	0	2	0	0	0	0	4
		Total	3	3	0	2	0	0	0	3	11
	63-24-62	1983	0	2	0	0	0	0	0	6	8
		1984	0	31	5	4	0	0	0	14	54
		1985	10	105	10	7	0	0	0	13	145
		1986	0	12	0	0	0	0	0	13	25
		Total	10	150	15	11	0	0	0	46	232
	63-26-03	1983	0	3	0	0	0	0	0	0	3
		1984	0	6	0	0	0	0	0	11	17
		1985	0	26	16	10	0	0	0	15	67
		1986	0	0	0	0	0	0	0	3	3
		Total	0	35	16	10	0	0	0	29	90
ELOKOMIN HATCHERY	63-22-42	1983	0	0	0	0	0	0	0	0	0

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish
ELOKOMIN HATCHERY	63-22-42	1984	0	7	0	0	0	0	0	0	7
		1985	0	7	0	0	0	0	0	0	7
		Total	0	14	0	0	0	0	0	0	14
	63-22-60	1983	0	0	0	0	0	0	0	0	0
		1984	0	8	0	1	0	0	0	0	9
		1985	0	3	0	0	0	0	0	0	3
		Total	0	11	0	1	0	0	0	0	12
GRAYS RIVER HATCHERY	63-24-58	1983	0	0	0	0	0	0	0	0	0
		1984	0	3	3	0	0	0	0	0	6
		Total	0	3	3	0	0	0	0	0	6
	63-24-59	1983	0	2	0	0	0	0	0	0	2
		1984	0	3	2	0	0	0	0	6	11
		1985	0	1	0	0	0	0	0	0	1
		Total	0	6	2	0	0	0	0	6	14
KALAMA FALLS HATCH.	63-24-60	1983	1	8	0	0	0	0	0	0	9
		1984	0	41	0	0	0	0	0	14	55
		1985	17	89	5	2	0	0	0	1	114
		1986	0	21	1	0	0	0	0	7	29
		Total	18	159	6	2	0	0	0	22	207
KLICKITAT HATCHERY	63-21-57	1983	0	0	4	0	0	0	0	0	4
		1984	0	35	15	1	0	0	11	12	74
		1985	0	6	2	0	0	0	16	0	24
		Total	0	41	21	1	0	0	27	12	102
LOWER KALAMA HATCH.	63-24-63	1983	2	10	0	0	0	0	0	0	12
		1984	0	55	6	0	0	0	0	13	74
		1985	20	71	8	0	0	0	0	29	128
		1986	2	8	0	2	0	0	0	9	21
		Total	24	144	14	2	0	0	0	51	235

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Foreign	Columbia River: Indian	Non-Indian	Total: All fish.
PRIEST RAPIDS HATCH.	63-22-52	1983	3	20	0	0	0	0	2	0	25
		1984	6	138	5	1	0	5	71	61	287
		1985	155	192	8	2	4	0	207	87	655
		1986	25	27	0	0	0	0	62	16	130
		Total	189	377	13	3	4	5	342	164	1,097
	63-24-56	1983	1	13	0	0	0	0	0	0	14
		1984	10	35	0	0	0	0	19	22	86
		1985	42	71	0	0	0	3	72	14	202
		1986	18	10	0	0	0	0	21	0	49
		Total	71	129	0	0	0	3	112	36	351
WASHOUGAL HATCHERY	63-24-61	1983	0	10	0	0	0	0	0	4	14
		1984	1	26	0	0	0	0	5	15	47
		1985	15	55	13	3	0	0	3	30	119
		1986	2	19	0	0	0	0	0	36	57
		Total	18	110	13	3	0	0	8	85	237
WEYCO POND	H1 °4 °6	1983	0	2	0	0	0	0	0	0	2
		1984	0	10	3	1	0	0	0	3	17
		1985	11	31	0	0	0	0	0	9	51
		1986	0	0	0	0	0	0	0	6	6
		Total	11	43	3	1	0	0	0	18	76
		Grand total	344	3,787	588	219	29	21	1,148	1,007	7,143

Table 11.-- Tag returns of 1978-brood fall chinook by rearing facilities, tag code and return year (estimated returns in brackets)

Rearing Facility	Tag Code	Return Year 1980	1981	1982	1983	Total Estimated
Abernathy	S-4-50	3[8]	35[48]	13(24)	0	80
	s-4-51	1	24[29]	16[24]	0	54
Big White	s-4-43	6	28	24[73]	1	108
Little White Salmon	S-4-48	1	6[9]	2	1	13
	s-4-49	0	4	5	1	10
Spring Creek	5-4-46	18	122	50	1	191
	s-4-44	34	242	84	3	363
	s-4-33	26	175[180]	42	0	248
	s-4-45	1	0	0	0	1
Big Creek	7-18-44	3	52[62]	125[130]	10	205
Bonneville	7-18-42	12	197	95	3	307
	7-18-43	0	3	1	0	4
Klaskanine	7-18-45	0	4	9	1	14
Stayton Pond	7-18-41	1	93	156	4	254
Cowlitz	63-19-42	5[19]	25[26]	59[66]	7	118
	63-19-51	0	8	14[16]	2	26
Elokomin	63-18-56	0	0	0	1	1
	63-19-56	0	0	1	0	1
Grays River	63-16-46	1	3	4[51	2	11
	63-18-33	0	0	2	0	2
	63-19-37	0	5	3	0	8
Kalama Falls	63-19-57	1	2	17[47]	15	65
Klickitat	63-19-49	0	0	0	0	0
Priest Rapids	63-18-21	3[16]	15[52]	27[97]	4	169
	63-18-57	0	0	2[11]	0	11
	63-20-17	0	5[8]	9	1	18
	63-19-58	0	1	0	0	1
Sea Resources	63-19-18	0	0	0	0	0

Table 11. (Continued)

Rearing Facility	Tag Code	Return Year 1980	1981	1982	1983	Total Estimated
Speelyai	63-19-20	0	31111	12[27]	2	40
	63-19-50	4[16]]	3	19[48]	4	71
Toutle	63-18-54	0	0	3	0	3
	63-19-41	2[5]	5	28[36]	3	49
Washougal	63-19-38	0	2	17[20]	4	26
	63-19-46	0	12[34]	26[36]	2	72
Weyco Pond	63-19-39	0	0	9	0	9

Table 12.-- Tag returns of 1979-brood fall chinook by rearing facilities, tag code and return year (estimated returns in brackets)

Rearing Facility	Tag Code	Return Year 1981	1982	1983	1984	Total Estimated
Abernathy	S-6-44	9[14]	20[28]	3	0	4s
	5-6-46	26[34]	71[118]	17	0	169
Little White Salmon	S-6-43	0	1	1	0	2
Spring Creek	5-6-39	45	134[144]	18	0	207
	S-6-40	46	109[129]	25	0	200
	5-6-41	32	83(85]	20	0	137
	S-6-42	0	8	7	0	1s
Big Creek	7-21-60	8	171[181]	99	1	289
Bonneville	7-21-57	3	17	11	0	31
Klaskanine	7-21-61	0	2	0	0	2
OxBow	7-21-62	2	1	5	0	8
	7-21-63	1	7	6	0	14
Stayton Pond	7-20-55	0	159	28	0	187
Cowlitz	63-21-37	9	20	33	2	64
	63-21-54	2	22[27]	36	2	67
	63-21-59	0	6[11]	13	2	26
Elokomin	63-20-S	0	4	8	1	13
Grays River	63-20-43	0	5	5	0	10
Kalama Falls	63-21-5	0	9[13]	67	9	89
Klickitat	63-19-47	1	6	3	0	10
Lewis River	63-21-60	1[9]	10[29]	23	7	68
Lower Kalama	63-20-6	0	4[6]	34	10	so
Priest Rapids	63-19-48	22[39]	65[114]	60	19	232
Sea Resources	63-20-61	3	15[16]	3	1	23
Washougal	63-21-53	5	84[91]	157	9	262
Weyco Pond	H 1-2-3	0	23[25[	6	1	32

Table 13.-- Tag returns of 1980-brood fall chinook by rearing facilities, tag code and return year (estimated returns in brackets)

Rearing Facility	Tag Code	Return Year 1982	1983	1984	1985	1986	Total Estimated
Abernathy	5-7-44	17[23]	21	1	0	0	4s
	s-7-45	44[56]	99	3	0	0	158
Little White Salmon	s-7-47	0	3	6	0	0	9
	5-8-49	1[1]	1	2	0	0	4
	S-B-SO	0	0	0	0	0	0
Spring Creek	S-7-40	1	14	8	0	0	23
	5-7-41	4	22	11	0	0	37
	S-7-42	0	17	S	0	0	22
	s-7-43	0	1	0	0	0	1
	5-7-46	1[5]	6	0	0	0	11
	5-7-48	0	1	0	0	0	1
	5-7-49	0	10	4	0	0	14
	5-7-s-	0	3	0	0	0	3
	5-7-51	0	0	0	0	0	0
	5-7-52	1	2	2	0	0	5
Big Creek	7-23-31	2[4]	16	S	1	0	26
	7-23-33	4	21	12	0	0	37
	7-23-34	0	14	10	0	0	24
Bonneville	7-21-56	12	81	8	0	0	101
	7-23-29	6	47	5	0	0	58
Clatsop County Ponds	7-21-58	0	4	3	0	0	7
	7-21-59	1	2	6	0	0	9
Klaskanine	7-22-27	0	2	1	0	0	3
	7-23-32	0	3	1	0	0	4
Stayton Pond	7-23-35	4	56	28[60]	0	0	120
Cowlitz	63-21-56	26[27]	97	128	2s	2	279
	63-22-55	4	16	60	14	0	94
Elokomin	63-22-34	1	7	16	4	0	28
	63-23-17	0	2	5	0	0	7
Grays River	63-22-63	1	2	13	4	0	20
	63-23-40	0	0	0	1	0	1

[1] Fish returned in 1981

Table 13. (continued)

Rearing Facility	Tag Code	Return Year 1982	1983	1984	1985	1986	Total Estimated
Kalama Falls	63-20-36	0	21	so	11	0	82
Kl ickitat	63-20-8	1	0	0	0	0	
Lower Kalama	63-22-54	0	34	126	30		191
Priest Rapids	63-21-55	9	36	75	36	3	159
	63-22-61	3[130]	17	43	25	1	216
Sea Resources	63-22-l	0	3	2	0	0	S
Washougal	63-21-48	1	20	28	8	1	58
	63-22-51	2[4]	4s	76[77]	15	0	141
Weyco Pond	H l-3-1	1	2	2	0	0	S
	H l-3-2	0		S	1	0	7

Table 14. -- **Tag returns of 1981-brood fall chinook by raring faciliteis, tag code and return year (estimated returns in brackets)**

Rearing Facility	Tag code	Return Year 1983	1984	1985	1986	Total Estimated
Abernathy	5-10-58	S	26	14	0	45
	5-10-59	3	10	3	0	16
Little White Salmon	s-4-3s	0	1	2	1	4
	S-4-36	0	0	0	0	0
Spring Creek	s-7-53	0	0	0	0	0
	s-7-54	0	0	0	0	0
	5-8-51	0	0	0	0	0
	5-10-50	12	44	4	0	60
	s-10-51	2	18	S	1	26
	5-10-52	7 1/	44	19	0	70
	5-10-57	0	1	0	1	2
Big Creek	7-24-10	2	86	117	3	208
Bonneville	7-24-7	3	71	27	1	102
	7-24-8	0	7	9	3	19
	7-26-63	0	1	1	0	2
Clatsop County Ponds	7-24-12	0	2	4	0	6
	7-24-13	0	1	3	0	4
Klaskanine	7-24-9	0	1	2	0	3
OXBOW	7-23-30	0	1	7	0	8
	7-24-11	0	1	1	0	2
S tayton Pond	7-26-62	0	169[360]	103[172]	1[2]	534
Cowlitz	63-20-32	0	0	8	1	9
	63-24-50	0	0	S	2	7
	63-24-62	4	24	81	19	128
	63-26-03	0	0	23	5	28
Elokomin	63-22-42	0	0	3	0	3
	63-22-60	0	1	3	1	S
Grays River	63-24-58	0	0	0	0	0
	63-24-59	0	1	6	0	7

1/ one fish returned in 1982

Table 14 (Con t inued)

Rearing Facility	Tag code	Return Year 1983	1984	1985	1986	Total Estimated
Kalams Falls	63-24-60	0	5	77	22	104
Klickitat	63-24-63	0	0	0	1	1
Lower Kalama	63-24-63	1	7	57	11	76
Priest Rapids	63-22-52	4	64	114	30	212
	63-24-56	2	25	44	6	77
Sea Resource	63-24-57	1	36	7	0	44
Washouga 1	63-24-61	1	7	60	14	82
Weyco Pond	Hl-4-6	0	3	2	1	6

brood. Appendix Tables 1 through 17 present the returns of tagged fish in more detail by brood, year of return, rearing facility, and the site of return of the tagged fish. The total returns for 1980 through 1986 are listed in Table 15 by return facility. Appendix Tables 18 through 24 present the returns by return year, facility, and sex of fish.

During the seven years when 1978 through 1981 broods of fall chinook returned to Columbia River hatcheries, total returns fluctuated greatly at most hatcheries. At Spring Creek Hatchery, there was nearly a ten fold steady decrease in returns going from over 30,000 in 1981 to 3,600 in 1986. At Cowlitz Hatchery the trend was the reverse going from 2200 fish in 1980 to 12,700 in 1986. Returns to Priest Rapids Hatchery went from 3,900 in 1981 to nearly 31,000 in 1985. Returns fluctuated from under 3,000 to over 10,000 at Big Creek Hatchery. Washougal Hatchery experienced a fairly steady increase in returns going from 1,800 in 1980 to nearly 11,000 in 1986. There are no clear trends. While the return trend at one hatchery is downward, the trend at another hatchery is upward. During any one year, one hatchery can have its lowest return numbers while another hatchery can have its best return.

Comparisons of individual hatchery returns over the seven years is complicated by several factors. The effects of openings and closings of commercial gillnet and sport seasons in the Columbia River have differing influences on different hatcheries in the Columbia Basin. Returns to hatcheries on smaller streams (Abernathy, Big Creek, Klaskanine, Elokomin, Grays River, Washougal and Lower Kalama) are influenced by the date and quantity of the first fall rains. In general the earlier the beginning of the rains the larger the return to these facilities. Also some hatcheries are not efficient at capturing returning jack salmon, particularly those where salmon are trapped in the stream below the hatchery (Elokomin and Kalama Falls). Some of the jack salmon can swim through the bars of the traps.

Observations

Fall chinook from the Columbia River contribute predominately to British Columbia marine troll, Washington and Oregon marine sport and troll, and Columbia River gillnet fisheries. While catch data are not complete for all broods, sufficient data are available to make preliminary contribution comparisons among broods. Releases, catches, and returns by rearing facility and tag code are compared among broods in Tables 16 through 19. The percent survival values in these tables were calculated by summing the catches and returns and dividing by the number of fish released. The catch per 1,000 releases and percent survival values are minimal for the 1980 and 1981 broods due to incomplete fishery recovery data.

Catches of wire tagged fish from this study have occurred in all Pacific coast fisheries from California through Alaska. The fractions of fish caught by fishery are displayed by brood in Figure 3. The largest proportion of the 1978 brood was recovered in the British Columbia fisheries, and the largest proportion of the 1979 brood was recovered in the Washington fisheries. For the 1980 and 1981 broods, 50 percent or greater of the tagged fall chinook were recovered in the British Columbia fisheries. The catch fractions in Figure 3 are

Table 15.--Total fall chinook returns to Columbia River facilities participating in the BPA funded fall chinook evaluation project, 1980-1985

Hatchery	Return Year	Adults	Jacks	Total
Abernathy	1980	610	130	740
	1981	1,282	743	2,025
	1982	2,065	1,016	3,081
	1983	1,950	192	2,142
	1984	557	185	742
	1985	2,010	207	2,217
	1986	449	1,819	2,268
Little White Salmon	1980	1,559	114	1,673
	1981	1,241	256	1,497
	1982	2,047	101	2,148
	1983	1,139	53	1,192
	1984	560	17	577
	1985	201	43	244
	1986[1/]	2,191	366	2,557
Spring Creek	1980	24,610	2,822	27,432
	1981	23,862	6,662	30,524
	1982	26,708	739	27,447
	1983	9,403	1,005	10,408
	1984	8,697	799	9,496
	1985	5,428	53	5,481
	1986[2/]	3,453	165	3,618
Big Creek	1980	2,791	70	2,861
	1981	3,791	526	4,317
	1982	10,245	400	10,645
	1983	3,912	7s	3,987
	1984	6,168	368	6,536
	1985	10,276	274	10,550
	1986	6,288	3,554	9,842
Bonneville	1980	19,159	2,202	21,361
	1981	29,103	5,162	34,265
	1982	21,081	2,199	23,280
	1983	12,816	585	13,401
	1984	5,234	244	5,478
	1985	9,179	102	9,281
	1986	6,354	6,907	13,261

1/ Includes 1,541 adult and 286 jack upper river bright stock.
2/ Returns collected at three sites: Spring Creek Hattachery, Bonneville Dam, and Big White Salmon River

Table 15 (Continued)

Hatchery	Return Year	Adults	Jacks	Total
Cascade	1980	1,753	104	1,857
	1981	234	15	249
	1982	814	76	890
	1983[3/]	1,727	108	1,835
	1984	157	4	161
	1985	96	81	177
	1986	154	23	177
Clatsop County Ponds	1980	0	0	0
	1981	0	0	0
	1982	0	0	0
	1983	5	0	S
	1984	0	62	62
	1985	10	2	12
	1986	2	9	11
Klaskanine	1980	114	1	115
	1981	60	3	63
	1982	94	3	97
	1983	47	1	48
	1984	41	0	41
	1985	12	0	12
	1986	31	8	39
Cowlitz	1980	1,968	221	2,189
	1981	4,697	976	5,673
	1982	4,767	1,023	5,790
	1983	6,300	147	6,447
	1984	5,840	169	6,009
	1985	6,848	2,926	9,774
	1986	10,985	1,695	12,680
Elokomin	1980[4/]	1,074	0	1,074
	1981	633	1	634
	1982	2,056	6	2,062
	1983	2,690	1	2,691
	1984	1,704	10	1,714
	1985	1,810	22	1,832
	1986	1,499	155	1,654
Grays River	1980	91	6	97
	1981	59	26	85
	1982	678	23	701
	1983	273	1	274
	1984	169	68	237
	1985	245	112	357
	1986[5/]	1,735	248	1,983

3/ Includes 1,268 adult and 87 jack upper river bright stock
4/ Includes 619 adults transported from Kalama Falls Hatchery
5/ Includes SO7 adults and 8 jacks trapped in Skamokawa Creek

Table 15 (Continued)

Hatchery	Return Year	Adults	Jacks	Total
Kalama Falls	1980	4,532	167	4,699
	1981	4,220	74	4,294
	1982	806	86	892
	1983	3,866	9	3,875
	1984	3,894	13	3,907
	1985	3,423	276	3,699
	1986	3,738	107	3,845
Kalama Falls[6/]	1980	80	175	255
	1981	546	24	570
	1982	329	19	348
	1983	842	30	872
	1984	484	0	484
	1985	954	0	954
	1986	576	0	576
Klickitat	1980	99	115	214
	1981	282	0	282
	1982	314	23	337
	1983	147	13	160
	1984	138	2	140
	1985	8	7	15
	1986	194	53	247
Lewis River	1980	647	46	693
	1981	630	116	746
	1982	219	147	366
	1983[7/]	515	80	595
	1984	159	195	354
	1985	514	283	797
	1986	115	89	204
Lower Kalama	1980	2,420	359	2,779
	1981	1,375	161	1,536
	1982	736	84	820
	1983	685	6	691
	1984	1,348	30	1,378
	1985	1,348	339	1,687
	1986	2,746	188	2,664
Lower Kalama[6/]	1980			
	1981			
	1982	472	271	743
	1983	457	89	546
	1984	1	0	1
	1985	0	0	0
	1986	0	0	0

6/ Bright fall chinook
7/ Includes 35 adult and 4 jack upper river bright stock

Table 15 (Continued)

Hatchery	Return Year	Adults	Jacks	Total
Priest Rapids	1980	2,192	2,564	4,756
	1981	2,380	1,523	3,903
	1982	3,531	4,201	7,732
	1983	4,810	1,214	6,024
	1984	7,653	5,581	13,234
	1985	13,491	17,266	30,757
	1986	13,408	7,637	21,045
Ringold	1980	-		
	1981			
	1982	177	14	191
	1983	176	28	204
	1984	0	0	0
	1985	0	0	0
	1986	2,012	128	2,140
Sea Resources	1980	123	3	126
	1981	197	32	229
	1982	424	4	428
	1983	253	24	277
	1984	847	10	a57
	1985	323	2	325
	1986	108	177	285
Washougal	1980	1,717	121	1,838
	1981	3,656	104	3,760
	1982	2,548	260	2,808
	1983	4,032	26	4,058
	1984	2,077	39	2,116
	1985	3,303	4,628	7,931
	1986	10,541	447	10,988
Willamette Falls	1980	7,760	625	0,305
	1981	16,799	1,127	17,926
	1982	25,760	1,123	26,003
	1983	13,205	528	13,733
	1984	20,086	1,084	21,170
	1985	29,089	1,490	30,579
	1986	14,037	810	14,847
All Facilities	1980	73,299	9,845	83,144
	1981	95,047	17,531	112,578
	1982	105,871	11,818	117,689
	1983	69,250	4,215	73,465
	1984	65,814	8,880	74,694
	1985	88,568	28,113	116,681
	1986	80,346	24,585	104,931

Table 16.--Release, catch and return statistics for 1978-brood fall chinook by facility and tag code

Rearing Facility	Tag Code	Number Released	Catch	Return	Catch/ 1,000 Releases	Percent Surv[1/]
Big Creek	7-18-44	224,900	659	205	2.9	.4
Bonneville	7-18-42	287,900	848	307	2.9	.4
	7-18-43	15,100	6	4	.3	.1
Klaskanine	7-18-45	244,100	312	14	1.4	.1
Stayton Pond	7-18-41	283,800	1,884	254	6.6	.7
Sea Resources	63-19-18	24,200	25	0	1.0	.1
Abernathy	S-4-50	63,400	319	80	5.0	.6
	S-4-51	48,900	213	54	4.4	.5
Big White Pond	s-4-43	141,400	274	108	1.9	.3
Little White Salmon	S-4-48	177,800	30	13	.2	.0
	s-4-49	264,800	36	10	.1	.0
Spring Creek	s-4-33	140,900	1,515	248	10.8	1.2
	5-4-44	135,500	2,319	363	17.1	1.9
	s-4-45	55,600	2	1	.0	.0
	S-4-46	246,000	1,208	191	4.9	.6
Cowlitz	63-19-42	143,600	247	118	1.7	.3
	63-19-51	11,100	62	26	5.4	.8
Elokomin	63-18-56	21,100	6	1	.3	.0
	63-19-56	117,800	11	1	.1	.0
Grays River	63-16-46	73,900	23	11	.3	.0
	63-18-33	7,600	5	2	.7	.1
	63-19-37	68,100	43	8	.6	.1
Kalama Falls	63-19-57	214,500	91	65	.4	.0
Klickitat	63-19-49	225,400	243	0	1.1	.1
Priest Rapids	63-18-21	48,100	147	168	3.1	.7
	63-18-57	17,500	13	11	.7	.1
	63-19-58	5,300	6	1	1.1	.1
	63-20-17	82,200	25	18	.3	.0

Table 16. (continued)

Rearing Faci li ty	Tag Code	Nunber Released	Catch	Return	Catch/ 1,000 Releases	Percent Surv[1/]
Speelyai	63-19-20	51,700	150	40	2.9	.4
	63-l 9-50	104,500	175	71	1.7	.3
Toutle	63-18-54	12,000	8	3	.9	.l
	63-19-41	132,100	127	49	1.0	.l
Washougal	63-19-38	97,400	132	26	1.4	.2
	63-l 9-46	154,500	146	72	.9	.1
Weyco Pond	63-19-39	92,400	65	9	.7	.1
TOTAL		4,035,100	11,375	2,552	2.8	.3

1/ Survivals listed as .O percent are less than .05 percent.

Table 17.--Release, catch and return statistics for 1979-brood fall chinook by facility and tag code

Rearing Facility	Tag Code	Number Released	Catch	Return	Catch/ 1,000 Releases	Perce Surr[75]
Bfg Creek	7-21-60	143,400	1,210	289	8.4	1.1
Bonneville	7-21-57	121,100	139	31	1.1	.1
Klaskanine	7-21-61	66,300	93	2	1.4	.2
OxBow	7-21-62	49,400	54	8	1.1	.1
	7-21-63	51,900	105	14	2.0	.2
Stayton Pond	7-20-55	282,000	1,890	187	6.7	.7
Sea Resources	63-20-61	18,400	52	23	2.6	.3
Abernathy	5-6-44	35,200	190	45	5.4	.7
	6-6-46	112,500	523	169	4.6	.6
Little White Salmon	5-6-43	162,600	46	2	.3	.0
Spring Creek	5-6-39	125,500	1,127	207	9.0	1.1
	S-6-40	75,200	1,231	200	16.4	1.9
	5-6-41	60,500	1,163	137	19.2	2.2
	5-6-42	23,100	100	15	4.3	.5
Cowlitz	63-21-37	20,700	271	64	13.1	1.6
	63-21-54	244,300	264	67	1.1	.1
	63-21-59	70,500	72	26	1.0	.1
Elokomin	63-20-S	98,400	64	13	.6	.1
Grays River	63-20-43	37,500	65	10	1.7	.2
Kalama Falls	63-21-5	100,400	211	89	2.1	.3
Klickitat	63-19-47	156,100	249	10	1.6	.2
Lewis River	63-21-60	103,700	455	68	4.4	.5
Lower Kalama	63-20-6	144,500	189	50	1.3	.2
Priest Rapids	63-19-48	147,200	438	232	3.0	.4
Washougal	63-21-53	314,600	798	262	2.5	.3
Weyco Pond	Hl-2-3	97,800	94	32	1.0	.1
TOTAL		2,864,700	11,093	2,252	3.9	.5

1/ Survivals listed as .O percent are less than .05 percent.

Table 18.--Release, catch and return statistics for 1980-brood fall chinook by facility and tag code

Rearing Facility	Tag Code	Number Released	Catch	Return	Catch/ 1,000 Releases	Perce Surr[75]
Abernathy	5-7-44	19,100	169	45	8.8	1.1
	5-7-45	63,500	472	158	7.4	1.0
Big Creek	7-23-31	50,200	140	26	2.8	.3
	7-23-33	51,100	84	37	1.6	.2
	7-23-34	46,000	80	24	1.7	.2
Bonneville	7-21-56	130,000	238	101	1.8	.3
	7-23-29	75,700	150	58	2.0	.3
Clatsop County Ponds	7-21-58	73,200	72	7	1.0	.1
	7-21-59	48,900	277	9	5.7	.6
Klaskanine	7-22-27	18,900	6	3	.3	.0
	7-23-32	82,100	62	4	.8	.1
Stayton Pond	7-23-35	245,500	688	120	2.8	.3
Sea Resources	63-22-1	43,300	56	5	1.3	.1
Little White Salmon	5-7-47	183,400	54	9	0.3	.0
	5-8-49	52,400	0	4	.0	.0
	S-8-50	13,300	2	0	.2	.0
Spring Creek	S-7-40	104,700	117	23	1.1	.1
	5-7-41	76,700	123	37	1.6	.2
	5-7-42	63,100	136	22	2.2	.3
	5-7-43	25,700	225	1	8.8	.9
	5-7-46	150,500	1,279	11	8.5	.9
	5-7-48	28,800	28	1	1.0	.1
	5-7-49	30,900	73	14	2.4	.3
	S-7-50	13,700	0	3	.0	.0
	5-7-51	15,400	14	0	.9	.1
	5-7-52	7,200	15	5	2.1	.3
Cowlitz	63-21-56	153,200	548	279	3.6	.5
	63-22-55	121,300	193	94	1.6	.2
Elokomin	63-22-34	156,200	147	28	.9	.1
	63-23-17	9,400	63	7	6.7	.6
Grays River	63-22-63	64,100	111	20	1.7	.2
	63-23-40	10,200	29	1	2.8	.3

Table 18 (continued)

Rearing Facility	Tag Code	Number Released	Catch	Return	Catch/ 1,000 Releases	Percent Surv[1/]
Kalama Falls	63-20-36	175,400	196	82	1.1	.2
Klickitat	63-20-8	130,000	43	1	.3	.0
Lower Kalama	63-22-54	155,300	627	191	4.0	.5
Priest Rapids	63-21-55	194,600	706	159	3.6	.4
	63-22-61	42,100	315	216	7.5	1.3
Washougal	63-21-48	28,700	83	58	2.9	.5
	63-22-51	278,800	363	141	1.3	.2
Weyco Pond	H1-3-1	169,500	5	5	.0	.0
	H1-3-2	64,300	36	7	.6	.1
TOTAL		3,466,400	8,025	2,016	2.3	.3

1/ Survivals listed as .0 percent are less than .05 percent.

Table 19. --Release, catch and return statistics for 1981-brood fall chinook by facility and tag code

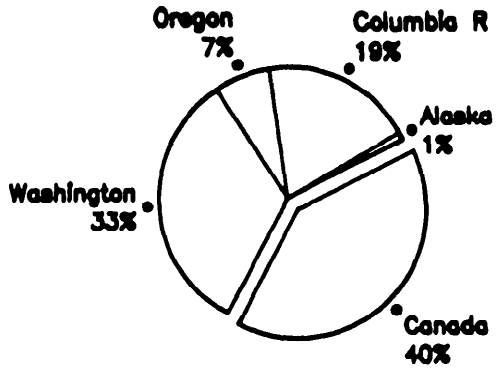
Rearing Facility	Tag Code	Number Released	Catch	Return	Catch/ 1,000 Releases	Percent Surv[1/]
Abernathy	S-lo-58	90,600	143	45	1.6	.2
	S-10-59	29,800	42	16	1.4	.2
Big Creek	7-24-10	131,200	497	208	3.8	.5
Bonneville	7-24-7	105,900	294	102	2.8	.4
	7-24-8	96,800	66	19	.7	.1
	7-26-63	102,400	464	2	4.5	.5
Clatsop County Ponds	7-24-12	79,700	63	6	.8	.1
	7-24-13	33,900	20	4	.6	.1
Klaskanine	7-24-9	100,300	45	3	.5	.0
OXBOW	7-23-30	52,300	27	8	.5	.1
	7-24-11	52,500	9	2	.2	.0
Stayton Pond	7-26-62	265,800	928	534	3.4	.6
Sea Resources	63-24-57	45,000	269	44	6.0	.7
Little White Salmon	5-4-35	101,300	31	4	.3	.0
	5-4-36	98,500	3	0	.0	.0
Spring Creek	5-7-53	500	0	0	.0	.0
	5-7-54	400	0	0	.0	.0
	5-8-51	46,700	224	0	4.8	.5
	S-10-50	151,400	313	60	2.1	.2
	S-10-51	38,900	61	26	1.6	.2
	S-lo-52	58,300	351	70	6.0	.7
	5-10-57	102,800	596	2	5.8	.6
Cowlitt	63-20-32	41,300	13	9	.3	.1
	63-24-50	8,300	11	7	1.2	.2
	63-24-62	199,200	232	128	1.2	.2
	63-26-3	47,500	90	28	1.7	.2
Elokomin	63-22-42	52,200	14	3	.3	.0
	63-22-60	50,600	12	5	.2	.0
Grays River	63-24-58	27,500	6	0	.2	.0
	63-24-59	45,400	14	7	.3	.0

Table 19 (continued)

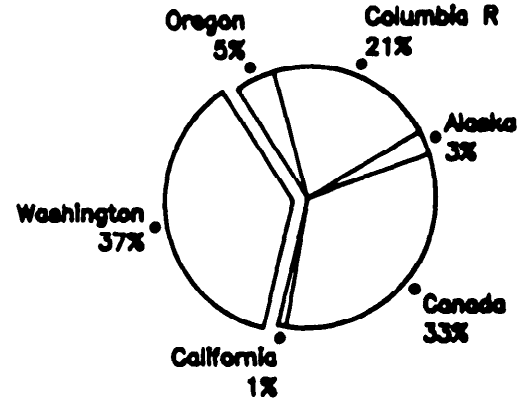
Rearing Facility	Tag Code	Number Released	Catch	Return	Catch/ 1,000 Releases	Percent Surv[1/]
Kalama Fal ls	63-24-60	177,100	207	104	1.1	.2
Klickitat	63-21-57	204,100	102	1	.5	.1
Lower Kalama	63-24-63	139,400	235	76	1.7	.2
Priest Rapids	63-22-52	262,200	1,097	212	4.2	.5
	63-24-56	48,700	351	77	7.2	.9
Washougal	63-24-61	170,400	237	82	1.4	.2
Weyco Pond	Hl-4-6	217,100	76	6	.3	.0
TOTAL		3,475,500	7,143	1,900	2.1	.3

1/ Survivals listed as .0 percent are less than .05 percent.

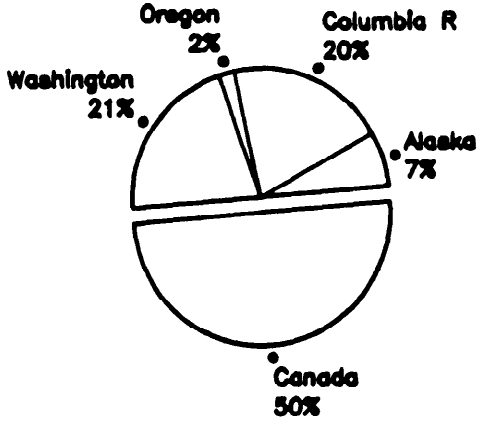
Figure 3.-- Catch percentages by fishery by brood



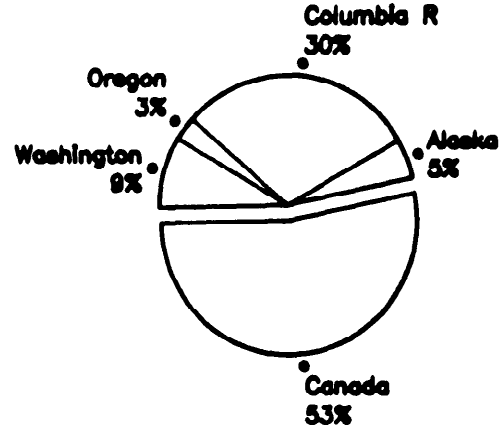
1978 Brood



1979 Brood



1980 Brood



1981 Brood

influenced somewhat by the numbers of fish tagged at a facility and the contribution of that facility to the fisheries. For example, for the 1979 brood only 6 facilities (Stayton Pond, Abernathy, Little White Salmon, Spring Creek, Cowlitz, and Weyco Pond) out of 19 have a greater fraction of the catch in Washington fisheries than in Britiah Columbia. The contribution of the other 13 facilities was greater to the British Columbia fisheries. However, since Stayton Pond and Spring Creek tagged fish accounted for 50 percent of the recoveries, the catch fraction for Washington is greater than British Columbia when all 19 facilities are combined. The larger catch fraction of the catch in the British Columbia fisheries for the 1980 and 1981 broods is not influenced by facility. For the 1980 brood, all facilities except Weyco Pond had the largest catch fraction in the British Columbia fisheries. For the 1981 brood, British Columbia had the largest catch fraction for all facilities.

There appears to be a more northerly distribution of the fall chinook tagged for this study for the 1980 and 1981 broods. The contributions to the Alaska fisheries come almost exclusively from the WDF facilities, with the largest catch fraction coming from Priest Rapids Hatchery. The fractions of the catch of tagged fish from Priest Rapids occurring in the Alaska fisheries are 38, 41, 29, and 18 percent for the 1978 through 1981 broods respectively; a decreasing trend. However, the Alaska catch fractions for all WDF facilities combined show an increasing trend; 8, 10, 15, and 10 percent respectively for the same brood years.

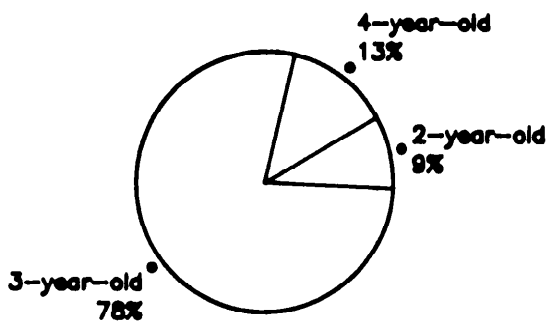
Fall chinook salmon from Spring Creek Hatchery have typically contributed most heavily to the Washington fisheries (Wahle and Vreeland 1978). This was also the case for the 1978 and 1979 broods (37 and 40 percent respectively). For the 1980 and 1981 broods, the fall chinook from Spring Creek contributed most heavily to the British Columbia fisheries (46 and 43 percent respectively).

The more northerly distribution may be the result of the 1982 · 1983 El Nino (unusually warm sea surface temperatures in the northeast Pacific Ocean). The El Nino would have effected the 1980-brood fall chinook in their second and third years of life and the 1981 brood in their first and second years (Hayes and Henry 1985).

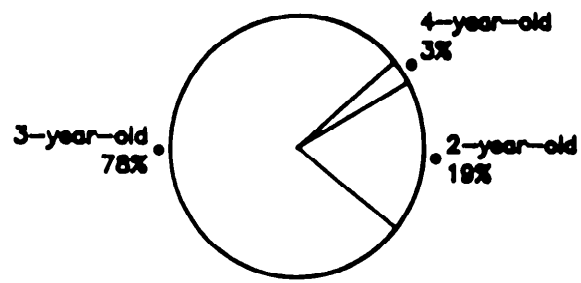
The proportions of the ages of chinook caught differ among rearing facilities, but there are general trends by agency (Figures 4-6). Catches of three year old chinook predominate for USFWS and ODFW facilities. Three-year-old fish account for from 70 to 80 percent of the catch of all age groups. For WDF facilities, the four-year-old catches predominate. From 46 to 56 percent of the catches of all age groups are four-year-old fish.

Hatchery returns show a trend similar to the catches with the three-year-old returns predominant for all brood years at USFWS facilities and three of four brood years at ODFW facilities (Figures 7 and 8). Three-year-old returns accounted for from 46 to 70 percent of the total return for all broods at USFWS and ODFW facilities. For the 1978 brood at ODFW facilities, the proportion of the return made up of four-year-old fish (.50) is considerably larger than the four-year-old proportion

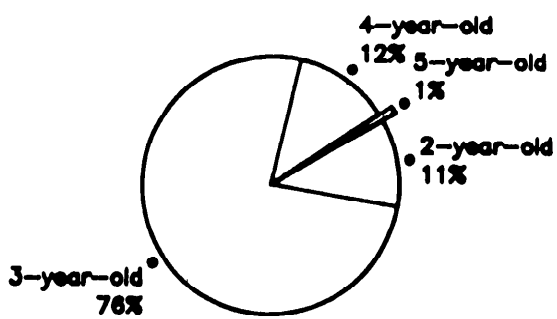
Figure 4.-- Age proportions of catches of tagged fish from USFWS hatcheries



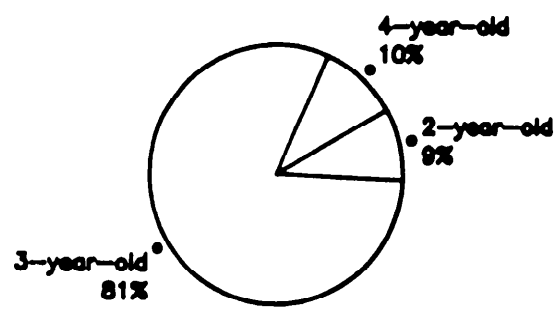
1978 Brood



1979 Brood

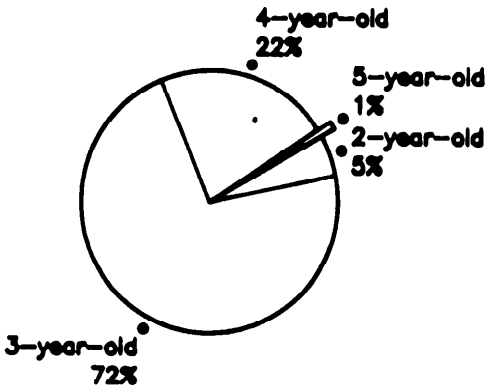


1980 Brood

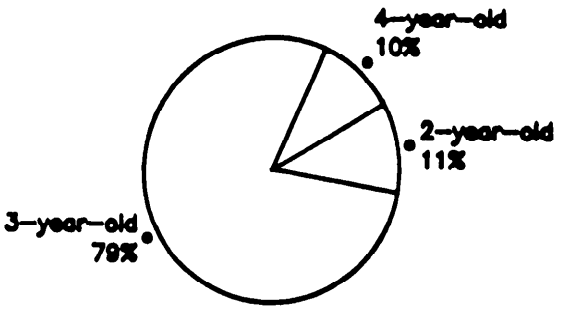


1981 Brood

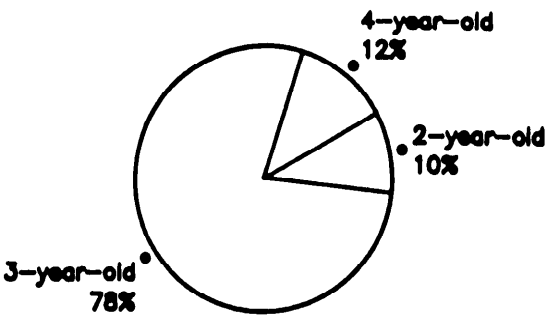
Figure 5.-- Age proportions of catches of tagged fish from ODFW hatcheries



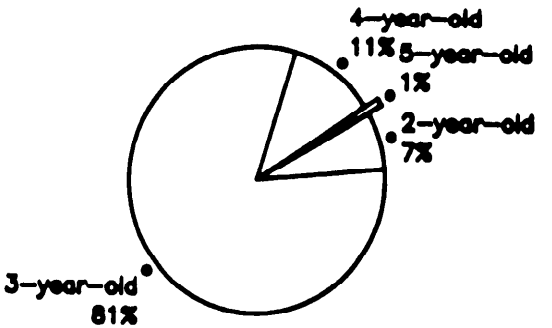
1978 Brood



1979 Brood

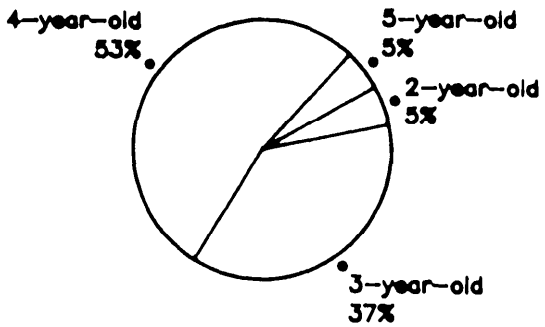


1980 Brood

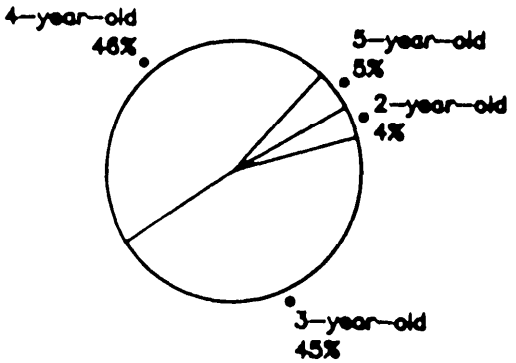


1981 Brood

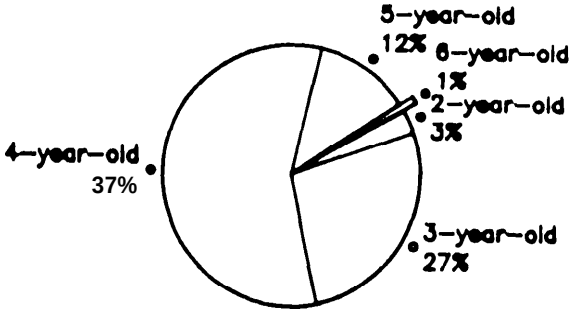
Figure 6.-- Age proportions of catches of tagged fish from WDF hatcheries



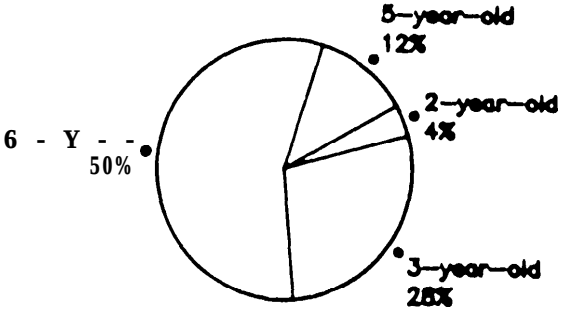
1978 Brood



1979 Brood

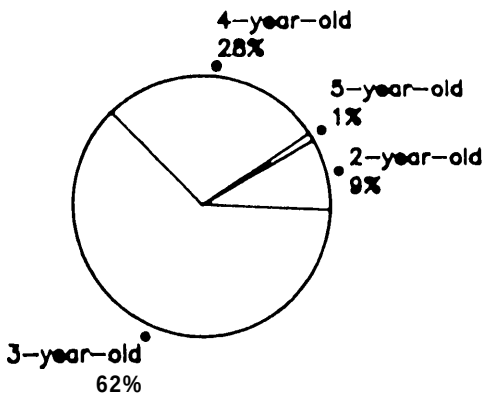


1980 Brood

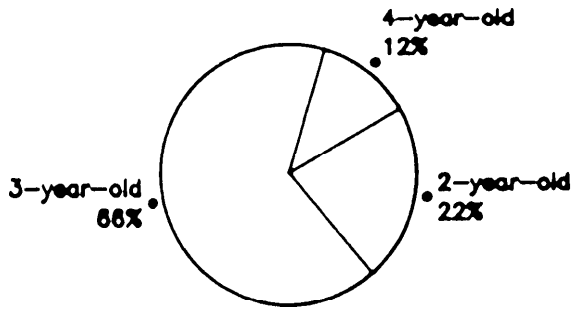


1981 Brood

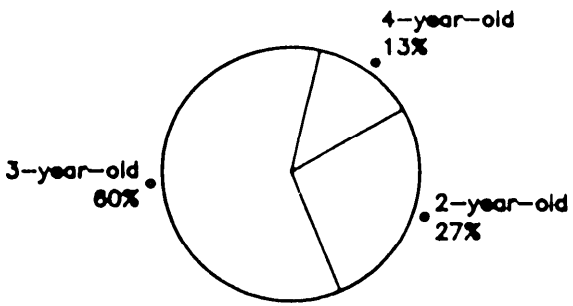
Figure 7.-- Age proportions of returns of tagged fish to USFWS hatcheries



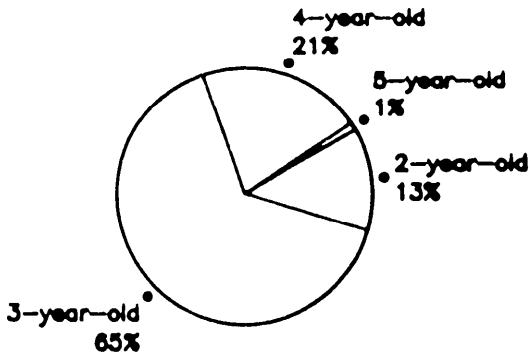
1978 Brood



1979 Brood

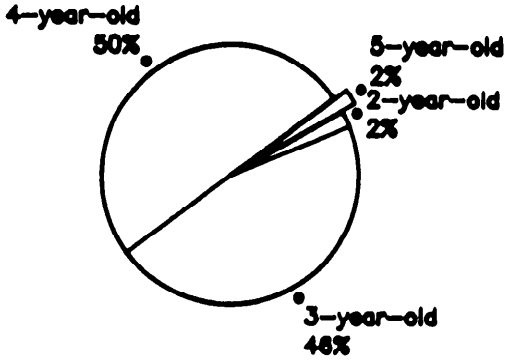


1980 Brood

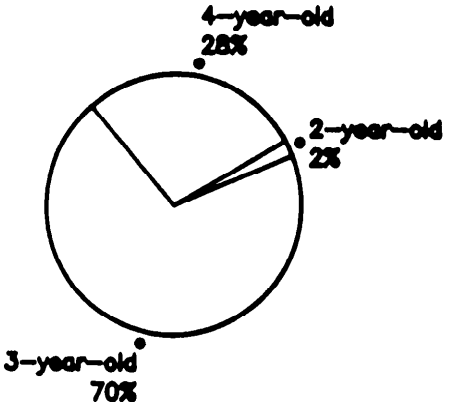


1981 Brood

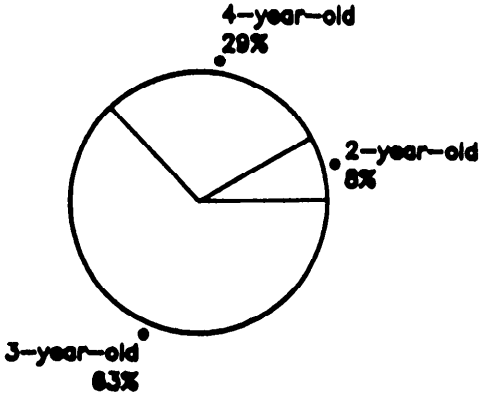
Figure 8.-- Age proportions of returns of tagged fish to ODFW hatcheries



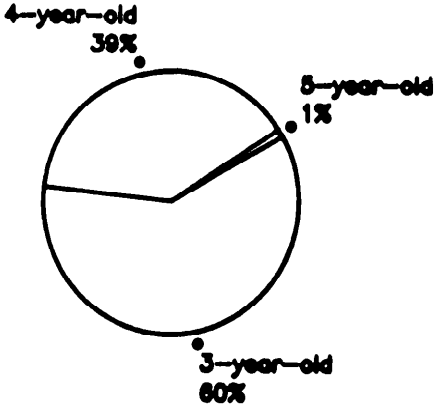
1978 Brood



1979 Brood



1980 Brood



1981 Brood

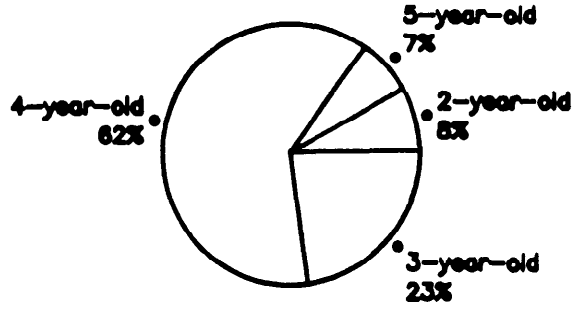
of the catch (.22) (Figures 8 and 5). At USFWS and ODFW facilities, for ail but one brood year (1980 brood at USFWS) the proportion of four-year-old fall chinook in the return is at least twice the proportion in the catch (Figures 5, 6, 7, and 8). At WDF facilities the four-year-old returns are predominant, accounting for 47 to 62 percent of the returns for each brood (Figure 9).

An interesting trend through the four brood years is the difference in catch fractions for two hatcheries, Spring Creek and Priest Rapids. The catch fractions are influenced somewhat by the numbers of tagged fish released. For the 1978 brood, tagged fish from Spring Creek Hatchery represented 14 percent of the fish released (Table 1). The catch of these same fish is 44 percent of the total catch of tagged fish for the 1987 brood (Table 7). For the 1979 brood, the portion of the tagged fish released from Spring Creek Hatchery declined to 10 percent of the total (Table 2). The catch of these same fish is 33 percent of the total catch of 1979 brood fish (Table 8). This is despite the fact that the total survival and contribution of Spring Creek fish increased from the 1978 to the 1979 broods (Tables 16 and 17). The drop in survival and contribution of Spring Creek fish for the 1980 and 1981 broods (Tables 18 and 19) is reflected in the portion of the total catch represented by these fish. The Spring Creek tagged fish make up 15 and 12 percent of the total tagged fish released for the 1980 and 1981 broods respectively (Tables 3 and 4). The catch proportions of these same fish are 25 and 22 percent for the same broods respectively (Tables 9 and 10). Thus the proportions of the catch of tagged fish from Spring Creek Hatchery dropped from nearly 45 percent to just over 20 percent over the four brood years, while the proportion of tagged fish in the releases ranged from 10 to 15 percent.

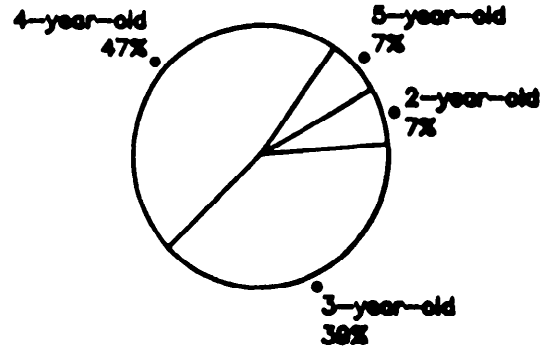
The proportion of the catch of tagged fish from Priest Rapids and all WDF hatcheries combined increased over the four brood years. The proportion of the total catch from Priest Rapids was 2 percent for the 1978 brood (Table 7) and then increased to 4, 13, and 20 percent for the 1979 through 1981 broods respectively (Tables 8 through 10). The proportion of the tagged fish released from Priest Rapids increased from 2 percent (Table 1) to 4, 7, and 9 percent (Tables 2 through 4) for the 1978 through 1981 broods respectively. All WDF rearing facilities combined showed this same trend of increase in proportion of total catch of tagged fish from tagged releases. For the 1978 brood tagged fish from WDF facilities represented 42 percent of the total releases (Table 1). The percentage of total releases from WDF facilities increased to 54 percent for the 1979 brood (Table 2) and then dropped slightly to 52 and 50 percent for the 1980 and 1981 broods respectively (Tables 3 and 4). The proportion of the catch of tagged fish from WDF facilities was only 15 percent for the 1978 brood (Table 7) and increased to 19, 44, and 42 percent for the 1979 through 1981 broods respectively (Tables 8 through 10).

Comparisons of hatchery contributions and survivals among hatcheries for the 1978 and 1979 broods of fall chinook are similar to those previously reported (Vreeland 1985). Data available for the 1980 and 1981 broods of fall chinook indicate the contribution and survival will be lower than the 1978 brood.

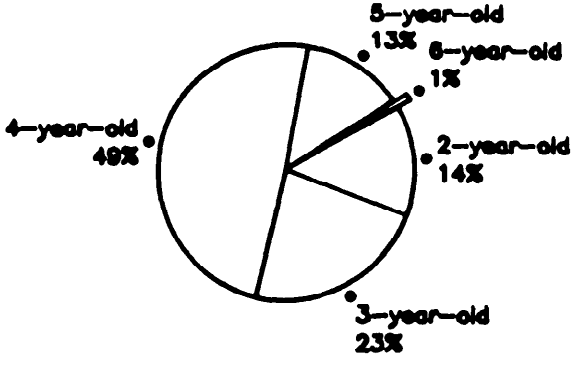
Figure 9.-- Age proportions of returns of tagged fish to WDF hatcheries



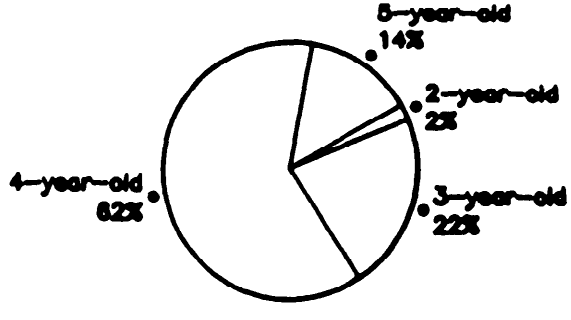
1978 Brood



1979 Brood



1980 Brood



1981 Brood

At this point it appears the overall contributions for the 1980 and 1981 broods of fall chinook will be nearly equal (Tables 18 and 19). The facility with the greatest contribution and survival for the 1981 brood (all release groups combined for each facility) is Sea Resources at 6 fish caught for every 1000 fish released and 0.6 percent survival (Table 19). Sea Resources is a cooperative facility on the Chinook River in Washington near the mouth of the Columbia River. The fish were released at an average of 100 fish per pound (162 · 79 fish/lb.), from April 1 to May 7, 1982. The source of fish for these releases came from a combination of eggs from Spring Creek Hatchery and eggs from returns to the Chinook River. The next greatest contribution came from Priest Rapids Hatchery (4.7 fish per 1000 releases), followed by Big Creek (3.8), Spring Creek (3.7), Stayton Pond (3.4), and Bonneville (2.7). Abernathy, which had the greatest contribution of all facilities for the 1980 brood (7.8), had a contribution of 1.5 fish caught per 1000 releases.

At the same rearing facility, different tag codes representing different rearing environments, release times, or release locations show very different contributions and survivals for the 1981 brood. At Spring Creek Hatchery, the seven different tag codes represent four different release times and sizes and two different release locations. March and April releases from the hatchery showed low contributions to the fisheries (2.1 and 1.6 fish per 1000 releases respectively). The May release had a contribution and survival nearly three times greater (6.0 fish per 1000 releases and 0.7 percent total survival) than the earlier releases (Table 19). The two tag codes with no recoveries or returns represent an emergency July release caused by a power failure during the night and a subsequent loss of flow in the rearing ponds. The fish were released immediately upon discovery of the problem, but an undetermined high mortality was observed. The remaining two tag codes represent releases of fish in the Umatilla River. These fish were transported to the Umatilla and released in April. The contributions of these fish to the fisheries are two to three times greater than the April release at the hatchery. This is despite the fact that the Umatilla released fish had to pass three dams (John Day, The Dalles, and Bonneville) and the hatchery release only went past Bonneville Dam. This same increase in survival of fish released in Rock Creek (above John Day Dam) over the hatchery release occurred for the 1980 brood fish.

At Bonneville Hatchery, the'three tag codes represented two different rearing conditions and two release locations. The fall chinook at Bonneville are reared in two different water supplies; constant temperature well water and variable temperature creek water. The fish reared in well water grew faster and were released earlier than the fish in creek water. Both groups of fish were released at 80 fish per pound. The fish reared in well water were released in April and contributed 2.8 fish to the fisheries per 1000 releases. The fish reared in creek water were released in late May through early June. These fish contributed 0.7 fish per 1000 releases. A group of fall chinook was also transported from Bonneville Hatchery to the Umatilla River and released in April. The fishery contribution of the transported fish was 4.5 fish per 1000 releases. Thus at both Spring Creek and Bonneville hatcheries, the Umatilla releases had a greater

fishery contribution than the comparable hatchery releases.

At Priest Rapids Hatchery, the two different tag codes represented different rearing environments and release times and sizes. The largest release group was reared in spawning channel sections converted to large raceways. This group was released on two dates, May 24 and June 16, 1982 at 90 and 77 fish per pound respectively. The contribution to the fisheries of this tagged group was 4.2 fish per 1000 releases. The other release group was transferred from vinyl raceways to adult holding ponds on March 15, 1982. The fish were released on May 18, 1982 at a size of 67 fish per pound. This group contributed 7.2 fish to the fisheries per 1000 fish released.

The experimental phase of transportation of salmonids from McNary Dam began in 1978. In 1979 and 1980 when the 1978 and 1979 broods of fall chinook were released from Priest Rapids Hatchery, about 100,000 fall chinook each year were transported from McNary Dam (the first dam downstream from Priest Rapids Hatchery) to below Bonneville Dam (Park 1985). In 1981 transportation became an operational program at McNary Dam (Athearn 1985), when research results indicated a positive survival benefit for transported salmonids, particularly fall chinook (Park 1985). In 1981 and 1982 (during the down stream migration of the 1980 and 1981 broods of fall chinook) 2.1 and 1.7 million fall chinook respectively were transported. One could assume that transport had a positive influence on the contribution and survival of the 1980 and 1981 broods from Priest Rapids Hatchery. The extent of this influence is unclear because of the confounding factors of size and time of release and spill at McNary Dam.

The reasons for these differences in contribution to the fisheries and total survival among release groups are unclear at this time. There is some indication at Spring Creek Hatchery suggesting development of smoltification may play a part in improved survival. The quantity of an enzyme in the gills of the fish (ATPase) increases as salmonids near the time of migration and entry into sea water (Zaugg and McClain 1970). Measurements of the quantity of ATPase where made during the rearing period of the fall chinook at Spring Creek Hatchery throughout this study. ATPase had begun to develop for the 1978 and 1979 broods of fall chinook prior to any of the releases (Prentice et al. 1980 and 1981). The enzyme level never did develop in the 1980 brood fish and did not increase in the 1981 brood until just before the May release (Zaugg pers. comm. 1987)[1]. The 1981 brood release in May had the greatest fishery contribution rate and survival of any hatchery release fish for the 1980 or 1981 broods.

The recovery patterns of hatchery and above John Day Dam releases at Jones Beach show a protracted recovery of above John Day release fish over hatchery release. Dr. Zaugg and I speculate that the April releases of 1980- and 1981-brood fall chinook upstream of John Day Dam, allowed the fish a greater time and distance to develop smolt characteristics. Thus the above John Day releases were more able to

[1] Zaugg, W. S. National Marine Fisheries Service, Willard, Wash. Personal communication, Dec. 22, 1987.

characteristics. Thus the above John Day releases were more able to make the transition from fresh to salt water than the hatchery releases as the groups reached the Columbia River estuary. Development of the smolt characteristics during the longer downstream migration resulted in greater contribution and survival for the above John Day Dam releases. This hypothesis is purely speculative since there are no data from Jones Beach to compare ATPase levels of the groups as they entered the estuary.

The fishery contribution and survival of tagged fall chinook from Big Creek Hatchery fluctuated greatly for the four brood years. The catches per 1000 releases went from 2.9 up to 8.4, then down to 2.1, and back up to 3.8 for the 1978 through 1981 broods respectively. Survivals were 0.4, 1.1, 0.3, and 0.5 for the brood years respectively. All broods were released in mid May at 75 to 81 fish per pound. From 4.5 to 6 million fish were released each year, and minimal disease treatment was recorded for all broods. Smoltification measurements were not made on any of the broods. Thus it is not know if the status of smoltification at release played a part in the contribution and survival differences. Big Creek Hatchery is below the Jones Beach recovery site where most downstream migrants were recovered. A few recoveries of migrating smolts from the 1978 and 1979 broods of tagged fall chinook were made with purse seines in the Columbia River estuary and in the ocean off of the mouth of the Columbia River. About all that can be said is the fish were in the capture areas in sufficient numbers to result in some recoveries.

The 1980-brood release at Big Creek consisted of three tag code groups of approximately equal size (50,000). One would expect near equal fishery recoveries and returns for each group. This was not the case. Nearly half (46%) of the estimated fishery recoveries came from one group (tag code 7-23-31) with 28% and 26% coming from the other two groups (tag codes 7-23-33 and 7-23-34 respectively) (Table 18). However 43% of the returning tagged fish came from tag code group 7-23-33. The other two groups (7-23-31 and 7-23-34) contributed 30 and 28% respectively. There are two possible contributing factors for the differences among groups. The first is that the three tag groups represent different groups of ponds. There could be different survivals among groups due to pond differences. The second factor is the variability due to the sampling of the fisheries and expansion of the observed catch to the estimated catch. There is no way of knowing how much each of these factors contribute to the variability of the catch and return of the three groups.

Stayton Pond contributions and survivals remained stable for the first two brood years (6.6 and 6.7 fish caught per 1000 releases and 0.7 percent total survival) and then dropped for the last two broods (2.8 and 3.4 fish per 1000 releases and 0.3 and 0.6 percent survival for the 1980 and 1981 broods respectively) (Tables 16, 17, 18, and 19). Nothing in the rearing and release data provide a clue as to the reason for the differences in contribution and survival. Stayton Pond is 'located on the Willamette River system. Fish are not released directly from the pond. They are collected and transported by truck to various Willamette River tributaries. The releases took from two to six weeks with average release sizes in the 70 to 90 fish per pound range for the

no diseases were noted. Measurements of the status of smoltification were not made at Stayton Pond. Recoveries of migrating tagged fish were made at Jones Beach for all four broods. Numbers of recoveries at Jones Beach do not imply the differences in survival are do to freshwater conditions. The protracted release periods eliminate the possibility of examining migration rate to Jones Beach as an indication of smoltification status.

In Vreeland (1985), it was reported that in general for the 1978 and 1979 broods, the hatcheries which released fish prior to June at a size larger than 100 fish per pound had the highest survivals. This trend is not clear for the 1980- or 1981-brood fish. For the 1980 brood there appeared to be a possible trend of the larger the fish at release the better the survival (Vreeland 1986). The size/survival relationship was not clear for the 1981 brood. The ability to determine the reasons for the differences in fishery contributions and survivals among broods, rearing facilities within broods, or releases within rearing facilities is limited in this study. The study was not designed to determine the reasons for differences, but to determine if differences did in fact exist and give an indication of how great they might be. Survival influencing factors likely include time of release, size of release, health of fish, status of smoltification at release, release location, and ocean conditions. Because of the confounding nature of these potential influences on survival, isolating one or more of them as key factors is impossible given the rearing, release, and recovery data available. It seems likely the 1982 - 1983 El Nino would have a profound influence on the survival of salmonids in the northeast Pacific during this time. The reduced overall contributions and survivals of the 1980 and 1981 broods of fall chinook when compared to the 1978 and 1979 broods are likely an indication of the influence of the El Nino. However, rearing facilities and releases within the 1980 and 1981 broods were not equally effected. This indicates factors affecting the fish prior to ocean entry also play an important part in the subsequent contribution and total survival.

Summary of Expenditures

Expenditures for this project in FY87 were approximately $5,100. They are itemized in Table 20.

Table 20.-- Summary of Cost Estimates - FY87

Contractual Services:	
University of Washington	$ 1,000.00
Maintenance Contract on HP9845 Computer	4,100.00
Total Direct Costs	$ 5,100.00
Department of Comnence Support (.5%)	1/
Tot a 1	$ 5,100.00 2/

1/ Less than $100.00.

2/ Total costs may prove less when final vouchers are received.

LITERATURE CITED

ATHEARN, J. B.
1985. A review of juvenile salmonid transportation operations from 1981 to 1984, p. 3-l · 3-108. *In* U.S. Army Corps of Engineers [ed.] Comprehensive report of juvenile salmonid transportation. Unpubl. manuscr., 240 p., North Pac. Div., P.O. Box 2870, Portland, OR 97208

BASHAM, L. R., M. R. DEIARM, J. B. ATHEARN, AND S. W. PETTIT.
1982. Fish transportation oversight team annual report-FY 1981 transport operations on the Snake and Columbia rivers. NOAA Tech. Memor. NMFS F/NWR-2, 74 p.

BASHAM, L. R., M. R. DEIARM, S. W. PETTIT, J. B. ATHEARN, AND J. V. BARKER.
1983. Fish transportation oversight team annual report-FY 1982 transport operations on the Snake and Columbia rivers. NOAA Tech. Memor. NMFS F/W-R-5, 103 p.

HAYES, M. L. AND K. A. HENRY.
1985. Salmon management in response to the 1982-83 El Nino event, p. 226-236. *In* Wooster, W. S. and D. L. Fluharty (ed.] El Nino north Nino effects in the eastern subarctic Pacific Ocean. Wash. Sea Grant, Univ. Wash.

PARK, D. L.
1985. A review of smolt transportation to bypass dams on the Snake and Columbia rivers, p. 2-l · 2-65. *In* U.S. Army Corps of Engineers [ed.] Comprehensive report of juvenile salmonid transportation. Unpubl. manuscr., 240 P., North Pac. Div., P.O. Box 287, Portland, OR 97208

PRENTICE, E. F., C. MAHNKEN, K. GORES, W. WAKNITZ, W. ZAUGG, L. FOLMAR, R. KING, J. MIGHELL, W. DICKHOFF, T. FLAGG, L. HARRELL, A. NOVOTNY, D. DAMKAER, E. WOLD, AND R. VREEIAND.
1980. A study to assess status of smoltification and fitness for ocean survival of chinook and coho salmon and steelhead. Unpubl. manuscr., 393 P., Nat. Mar. Fish. Serv., NW Alaska Fish. Cent., 2725 Montlake Blvd. E., Seattle, WA 98112.

PRENTICE, E. F., C. V. W. MAHNKEN, W. S. ZAUGG, L. C. FOLMAR, W. W. DICKHOFF, F. W. WAKNITZ, K. X. GORES, L. W. HARRELL, A. L. NOVOTNY, T. A. FWGG, C. G. SAFSTEN, AND J. L. MIGHELL.
1981. Assessment of smoltification and fitness for ocean survival (quality) of chinook and coho salmon and steelhead in the Columbia River and Puget Sound hatcheries. Unpubl. manuscr., 150 P., Nat. Mar. Fish. Serv., NW Alaska Fish. Cent., 2725 Montlake Blvd. E., Seattle, WA 98112.

VREELANGD R. R.
1985. Evaluation of the contribution of chinook salmon reared at Columbia River hatcheries to the Pacific salmon fisheries. Unpubl. manuscr., 91 p., Nat. Mar. Fish. Serv., 847 N.E. 19th Ave., Suite 350, Portland, OR 97232.

VREEIAND, R. R.
1986. Evaluation of the contribution of chinook salmon reared at Columbia River hatcheries to the Pacific salmon fisheries. Unpubl. manuscr., 103 p., Nat. Mar. Fish. Serv., 847 N.E. 19th *Ave.,* Suite 350, Portland, OR 97232.

WAHLE, R. J. AND R. R. VREELAND
1978. Bioeconomic contribution of Columbia River hatchery fall chinook salmon, 1961 through 1964 broods, to the Pacific salmon fisheries. Fish. Bull., U.S. 76:179-208.

ZAUGG, W. S. AND L. R. MCCLAIN.
1970. Adenosine triphosphatase activity in gills of salmonids: seasonal variations and saltwater influence in coho salmon, *Oncorhynchus kisutch.* Comp. Biochem. Physiol. 35:587-596.

Appendix Table 1.--Returns in 1980 to Columbia River facilities and adjacent streams of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing facility	Tag code	Number of returns	Return site
Spring Creek	S-4-46	16	Spring Creek Eatchery
	"	2	Bonneville Eatchery
	5-4-44	32	Spring Creek Eatchery
	"	2	Bonneville Hatchery
	5-4-33	25	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-4-45	1	Bonneville Hatchery
Big White Pond	5-4-43	5	Spring Creek Hatchery
	"	1	Bonneville Hatchery
Abernathy	5-G-50	2	Abernathy Hatchery
	"	1[6]	Abernathy Creek
	5-4-5 1	1	Abernathy Eatchery
Little White Salmon	5-4-48	1	Bonneville Hatchery
Bonneville	7-18-42	12	Bonneville Hatchery
*Big Creek	7- 18-44	3	Big Creek Hatchery
Stayton Pond	7-18-41	1	Willamette River
Grays River	63-16-46	1	Grays River Hatchery
Toutle	63-19-4 1	2[5]	Kalama Falls
Cowlitz	63-19-42	2[5]	Kalama Falls
	"	3[14]	North Fork Lewis R.
Kalama Falls	63-19-57	1	Kalama Falls
Speelyai	63-19-50	1[2]	Kalama Falls
	"	3[14]	N. Fork Lewis R.
Priest Rapids	63-18-21	2[15]	Priest Rapids
	"	1	Wells Dam

Appendix Table 2.—Returns in 1981 to Columbia River facilities and adjacent streams of 1978-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing Facility	Tag code	Number of returns	Return site
Abernathy	5-4-50	25	Abernathy Hatchery
	"	2	Kalama Falls Hatchery
	"	1	Lower Kalama Hatchery
	"	2[8]	Kalama River
	"	5[12]	Abernathy Creek
	5-4-51	17	Abernathy Hatchery
	"	1	Lower Kalama Hatchery
	"	1	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	4[9]	Abernathy Creek
Little White Salmon	5-4-48	3	Little White Salmon Hatchery
	"	2	Bonneville Hatchery
	"	1[4]	Big White Salmon River
	5-4-49	3	Little White Salmon Hatchery
	"	1	Spring Creek Hatchery
Spring Creek	5-4-46	87	Spring Creek Hatchery
	"	1	Abernathy Hatchery
	"	1	Little White Salmon Hatchery
	"	33	Bonneville Hatchery
	5-4-44	190	Spring Creek Hatchery
	"	52	Bonneville Hatchery
	5-4-33	137	Spring Creek Hatchery
	"	36	Bonneville Hatchery
	"	2[7]	Big White Salmon River
Big White Pond	5-4-43	12	Spring Creek Hatchery
	"	6	Little White Salmon Hatchery
	"	10	Bonneville Hatchery
Big Creek	7-18-44	41	Big Creek Hatchery
	"	2	Abernathy Hatchery
	"	3	Elokomin Hatchery
	"	1	Kalama Falls Hatchery
	"	2[5]	Abernathy Creek
	"	2[9]	Skamokowa Creek
	"	1	Gnat Creek

Appendix Table 2 (Continued)

Rearing Facility	Tag code	Number of return8	Return bite
Bonneville	7-18-42	196	Bonneville Hatchery
	"	1	Spring Creek Hatchey
	7-18-43	3	Bonneville Hatchery
Klaskanine	7-18-45	3	Big Creek Hatchery
	"	1	Lewis 6r Clark River
Stayton Pond	7-10-41	75	Willamette Falls fish ladder
	II	18	Willamette River & tributar.
Grays River	63-16-46	1	Grays River Hatchery
	"	2	Big Creek Hatchery
	63-19-37	4	Grays River Hatchery
	"	1	Big Creek Hatchery
Cowlitz	63-19-42	24[25]	Coulitz Hatchery
	"	1	Speelyai Hatchery
	63-19-51	8	Cowlitz Hatchery
Toutle	63-19-41	4	Coulitz Hatchery
	"	1	Kalama Falls Hatchery
Kalama Falls	63-19-57	2	Kalama Falls Hatchery
Speelyai	63-19-20	1	Lower Kalama Eatchery
	"	1	Kalama Falls Hatchery
	"	1[9]	Lewis River
	63-19-50	2	Cowlitz Hatchery
	"	1	Kalama Falls Hatchery
Washougal	63-19-38	1	Washougal Hatchery
	II	1	Bonneville Hatchery
	63-19-46	7[8]	Washougal Hatchery
	"	1	Kalama Falls Hatchery
	"	3[16]	Washougal River
	"	1[9]	Lewis River

Appendix Table 2 (Continued)

Rearing Facility	Tag code	Number of returns	Return site
Priest Rapids	63-18-21	11[14]	Priest Rapids Hatchery
	"	2	Wells Dam
	"	2[36]	Priest Rapida area
	63-19-58	1	Priest Rapids Hatchery
	63-20-17	5[8]	Priest Rapids Hatchery

Appendix Table 3.--Returns in 1982 to Columbia River facilities and adjacent streams of 1978-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing Facility	Tag code	Number of returns	Return site
Abernathy	5-4-50	7	Abernathy Hatchery
	"	5[15]	Abernathy Creek
	"	1[2]	Germany Creek
	5-4-51	10	Abernathy Hatchery
	"	1	Lower Kalama Hatchery
	"	3[9]	Abernathy Creek
	"	2[4]	Germany Creek
Big White Pond	5-4-43	9	Spring Creek Hatchery
	"	6	Little White Salmon Hatchery
	"	4	Bonneville Hatchery
	"	5[54]	Big White Salmon River
Little White Salmon	5-4-48	1	Little White Salmon Hatchery
	"	1	Bonneville Hatchery
	5-4-49	5	Little White Salmon Hatchery
Spring Creek	5-4-33	37	Spring Creek Hatchery
	"	5	Bonneville Hatchery
	5-4-44	78	Spring Creek Hatchery
	"	6	Bonneville Hatchery
	5-4-46	47	Spring Creek Hatchery
	"	2	Bonneville Hatchery
	"	1	Cascade Hatchery
Big Creek	7-18-44	68	Big Creek Hatchery
	"	1	Abernathy Hatchery
	"	17	Elokomin Hatchery
	"	1	Gnat Creek
	"	14	Big Creek
	"	21	Plympton Creek
	"	1[3]	Abernathy Creek
	"	2[5]	Skamokowa Creek
Bonneville	7-18-42	91	Bonneville Hatchery
	"	4	Cascade Hatchery
	7-18-43	1	Cascade Hatchery

Appendix Table 3 (continued)

Rearing Facility	Tag code	Number of returns	Return site
Klaskanine	7-18-45	3	Klaskanine Hatchery
	"	3	Big Creek Hatchery
	"	3	Lewis & Clark River
Stayton Pond	7-18-41	137	Willamette Falls ladder
	"	1	Bonneville Eatchery
	"	18	Wlllamette River system
Covlltz	63-19-42	57	Cowlitz Eatchery
	"	1[6]	Cowlitz River
	"	1[3]	Lewis River
	63-19-51	13	Cowlitz Hatchery
	"	1[3]	Levis River
Elokomin	63-19-56	1	Elokomin Hatchery
Grays River	63-16-46	2	Grays River Hatchery
	"	1	Big Creek Hatchery
	"	1[2]	Skamokava Creek
	63-18-33	2	Grays River Hatchery
	63-19-37	2	Grays River Hatchery
	"	1	Elokomin Hatchery
Kalama Falls	63-19-57	2	Kalama Falls Hatchery
	"	3	Lower Kalama Hatchery
	"	1	Lewis River Hatchery
	"	9[28]	Kalama River
	"	1[3]	Levis River
	"	1[10]	Upper Columbia River
Priest Rapids	63-18-21	18[19]	Priest Rapids Eatchery
	"	1	Bonneville Hatchery
	"	8[77]	Priest Rapids area
	"		
	63-18-57	1	Priest Rapids Hatchery
	"	1[10]	Priest Rapids Area
	63-20-17	9	Priest Rapids Hatchery

Appendix Table 3 (Continued)

Rearing Facility	Tag code	Number of returns	Return Site
Speelyai	63-19-20	1	Cowlitz Hatchery
	"	2	Lower Kalama Hatchery
	"	1	Kalama Falls Hatchery
	"	1	Lewis River Hatchery
	"	7[22]	Lewis River
	63-19-50	2	Cowlitz Hatchery
	"	3	Lower Kalama Hatchery
	"	1	Lewis River Hatchery
	"	13[42]	Lewis River
Toutle	63-18-54	3	Cowlitz Hatchery
	63-19-41	12	Cowlitz Hatchery
	"	2	Lower Kalama Hatchery
	"	9	Kalama Falls Hatchery
	"	1	Lewis River Hatchery
	"	4[12]	Kalama River
Washougal	63-19-38	14	Washougal Hatchery
	"	2	Bonneville Hatchery
	"	1[4]	Lewis River
	63-19-46	22	Washougal Hatchery
	"	1	Lower Kalama Hatchery
	"	2[6]	Kalama River
	"	1[7]	Washougal River
Weyco Pond	63-19-39	2	Grays River Hatchery
	"	3	Big Creek Hatchery
	"	3	Elokomin Hatchery
	"	1	Clatskanie River

Appendix --Returns in 1983 to Columbia River facilities and adjacent stream of 1978-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Numbers of returns	Return site
Big White Pond	5-G-43	1	Little White Salmon Eatchery
Little White Salmon	5-4-48	1	Little White Salmon Hatchery
	5-4-49	1	Little White Saloon Hatchery
Spring Creek	5-4-44	3	Spring Creek Hatchery
	5-4-46	1	Spring Creek Hatchery
Big Creek	7-18-44	4	Big Creek Hatchery
	"	5	Big Creek
	"	1	Skamokowa Creek
Bonneville	7-18-42	3	Bonneville Hatchery
Klaskanine	7-18-45	1	Bear Creek
Stayton Pond	7-18-41	4	Willamette Falls
Cowlltz	63-19-42	7	Cowlitz Hatchery
	63-19-51	2	Cowlitz Hatchery
Elokomin	63-18-56	1	Abernathy Hatchery
Grays River	63-16-46	1	Grays River Hatchery
	"	1	Elokomin Hatchery
Kalama Falls	63-19-57	13	Kalama Falls Eatchery
	"	2	Levis River
Priest Rapids	63-18-21	1	Priest Rapids Eatchery
	"	1	Wells Hatchery
	"	2	Mid Columbia River
	63-20-17	1	Priest Rapids Hatchery
Speelyai	63-19-20	2	Levis River
	63-19-50	3	Lewis River
	"	1	Cowlltt River
Toutle	63-19-41	3	Covlitz Hatchery
Washougal	63-19-38	3	Uashougal Hatchery
		1	**Washougal River**
	63-19-46	2	Washougal Eatchery

Appendix Table 5.--Returns in 1981 to Columbia River facilities and adjacent streams of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-6-44	4	Abernathy Hatchery
	"	4[9]	Abernathy Creek
	"	1	Big Creek
	5-6-46	19	Abernathy Hatchery
	"	1	Spring Creek Hatchery
	"	6[14]	Abernathy Creek
Spring Creek	5-6-39	27	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	17	Bonneville Hatchery
	5-6-40	40	Spring Creek Hatchery
	"	6	Bonneville Hatchery
	5-6-41	28	Spring Creek Hatchery
	"	4	Bonneville Hatchery
Bonneville	7-21-57	3	Bonneville Hatchery
Big Creek	7-21-60	8	Big Creek Hatchery
OxBow	7-21-62	2	Bonneville Hatchery
	7-21-63	1	Bonneville Hatchery
Cowlitz	63-21-54	2	Grays River Hatchery
	63-21-37	9	Cowlitz Hatchery
Klickitat	63-19-47	1	Little White Salmon Hatchery
Lewis River	63-21-60	1[9]	Lewis River
Priest Rapids	63-19-48	22[39]	Priest Rapids Hatchery
Sea Resources	63-20-61	3	Sea Resources Hatchery
Washougal	63-21-53	5	Washougal Hatchery

Appendix Table 6.--Returns in 1982 to Columbia River facilities and adjacent stream of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-6-44	13	Abernathy Hatchery
	"	3	Lover Kalama Hatchry
	"	4[12]	Abernathy Creek
	5-6-46	41	Abernathy Hatchery
	"	2	Spring Creek Eatchery
	"	1	Big Creek Hatchery
	"	1	Bonneville Hatchery
	"	1	Lower Kalama hatchery
	"	22[64]	Abernathy Creek
	"	2[6]	Ka lama River
	"	1[2]	Germany Creek
Little White Salmon	5-6-43	1	Little White Salmon Hatchery
Spring Creek	5-6-39	109	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	21	Bonneville Hatchery
	"	1	Cascade Hatchery
	"	1	Plympton Creek
		1[11]	Big White Salmon River
	5-6-40	95	Spring Creek Hatchery
	"	2	Little White Salmon Hatchery
	"	9	Bonneville Hatchery
	"	1	Cascade Hatchery
	"	2[22]	Big white Salmon River
	5-6-4 1	77	Spring Creek Hatchery
	"	3	Bonneville Hatchery
	"	2	Cascade Hatchery
	"	1[3]	Kalama River
	5-6-42	8	Spring Creek Hatchery
Big Creek	7-21-60	100	Big Creek Hatchery
	"	6	Abernathy Hatchery
	"	1	Bonneville Hatchery
	"	1	Willamette Falls
	"	18	Elokomln Hatchery
	"	19	Big Creek
	"	19	Plympton Creek
	"	4[9]	Skamokowa Creek
	"	2[6]	Abernathy Creek
	"	1[2]	Germany Creek

Appendix Table 6 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Bonneville	7-21-57	17	Bonneville Hatchery
Klaskanine	7-21-61	1	Elokomin Hatchery
	"	1	Big Creek
OxBow	7-21-62	1	Bonneville Hatchery
	7-21-63	6	Bonneville Hatchery
	"	1	Cascade Hatchery
Stayton Pond	7-20-55	155	Willamette Falls
	"	4	Willamette River
Cowlitz	63-21-37	20	Cowlitz Hatchery
	63-21-54	19	Cowlitz Hatchery
	"	1	Grays River Hatchery
	"	1[6]	Cowlitz River
	"	1[1]	Kalama River
	63-21-59	4	Cowlitz Hatchery
	"	1	Elokomin Hatchery
	"	1[6]	Cowlitz River
Elokomin	63-20-5	3	Elokomin Hatchery
	"	1	Big Creek Hatchery
Grays River	63-20-43	2	Grays River Hatchery
	"	3	Big Creek Hatchery
Kalama Falls	63-21-5	4	Kalama Falls Hatchery
	"	2	Lower Kalama Hatchery
	"	1	Cowlitz Hatchery
	"	2[6]	Kalama River
Klickitat	63-19-47	5	Klickitat Hatchery
	-	1	Sea Resources Hatchery
Lewis River	63-21-60	1	Lewis River Hatchery
	"	1	Lower Kalama Hatchery
	"	1[3]	Kalama River
	"	7[24]	Lewis River
Lower Kalama	63-20-6	3	Lower Kalama Hatchery
	"	1[3]	Kalama River

Appendix Table 6 (Continued)

Rearing Facility	Tag Code	Number of returns	Return ● itc
Priest Rapids	63-19-48	54[56]	Priest Rapids Hatchery
	"	1	Ringold Pond
	"	5[16]	Walls Dam
	ll	1[3]	Levis River
	"	4[38]	Priest Rapids area
Sea Resources	63-20-61	15[16]	Sea Resources Hatchery
Washougal	63-21-53	68[69]	Washougal Hatchery
	"	1	Bonneville Hatchery
	"	4	Cascade Hatchery
	"	4	Lower Kalama Hatchery
	"	1[3]	Lewis River
	"	2[6]	Kalama River
	"	4	Kalama Falls Hatchery
Ueyco Pond	H1-2-3	12[13]	Grays River Hatchery
	"	7	Big Creek Hatchery
	"	3	Elokomin Hatchery
	"	1[2]	Skamokowa Creek

Appendix Table7--Returns in 1983 to Columbia River facilities and adjacent stream of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of return8	Return site
Abernathy	5-6-44	2	Abernathy Hatchery
	"	1	Abernathy Creek
	5-6-46	6	Abernathy Hatchery
	"	1	Spring Creek Hatchery
	"	3	Kalama Falls Hatchery
	"	6	Abernathy Creek
	"	1	Germany Creek
Little White Salmon	S-6-43	1	Little White Salmon Hatchery
Spring Creek	S-6-39	15	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	2	Bonneville Hatchery
	S-6-40	24	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-6-4 1	18	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	1	Bonneville Hatchery
	S-6-42	7	Spring Creek Hatchery
Big Creek	7-2 1-60	36	Big Creek Hatchery
	"	2	Willamette Falls
	"	5	Bear Creek
	"	10	Big Creek
	"	10	Plympton Creek
	"	3	Abernathy Hatchery
	"	21	Elokomin Hatchery
	"	1	Lewis River
	"	2	Elochoman River
	"	7	Skamokcwa Creek
	"	2	Abernathy Creek
Bonneville	7-21-57	10	Bonneville Hatchery
	"	1	Cascade Hatchery
OxBow	7-21-62	4	Bonneville Hatchery
	"	1	Cascade Hatchery

Appendix Table 7 (Continued)

Rearing Facility	Tag Code	Number of return8	Return site
OxBow	7-2 1-63	6	Bonneville Hatchery
Stayton Pond	7-20-55	28	Willame tta Falls
Covlitz	63-21-37	33	Cowlitz Hatchery
	63-21-54	17	Cowlitz Elatchery
	"	9	Elokomin Hatchery
	"	1	Lover Kalama Hatchery
	"	2	Kalama Falls Hatchery
	"	1	Levis River Hatchery
	"	3	Cowlitz River
	"	3	Levis River
	63-21-59	4	Cowlitz Hatchery
	"	3	Elokomin Hatchery
	"	2	Lover Kalama Hatchery
	"	3	Kalama Falls Hatchery
	"	1	Levis River Hatchery
Elokomin	63-20-5	7	Elokomin Hatchery
	"	1	Elochoman River
Grays River	63-20-43	3	Grays River Hatchery
	"	1	Grays River
	"	1	Plympton Creek
Kalama Falls	63-21-S	58	Kalama Falls Hatchery
	"	7	Lover Kalama Hatchery
	"	1	Covlitz River
	"	1	Kalama River
Klickitat	63-19-47	3	Klickitat Hatchery
Lewis River	63-21-60	3	Lewis River Hatchery
	"	2	Elokomin Hatchery
	"	2	Cowlitt Hatchery
	"	4	Kalama Falls Hatchery
	"	12	Levis River
Lower Kalama	63-20-6	1	Lower Kalama Hatchery
	"	31	Kalama Falls Hatchery
	"	1	Coulitz Hatchery
	"	1	Kalama River

Appendix Tabel 7 (Continued)

Rearing Facility	Tag Code	Number of returns	Return rite
Priest Rapids	63-19-48	s2	Priest Rapids Hatchery
	"	1	Ringold Pond
	"	1	Wells Hatchery
	"	6	Hid Columbia River
Sea Resources	63-20-61	3	Sea Resources Hatchery
Washougal	63-21-53	129	Washougal Hatchery
		1	Lover Kalama Hatchery
		10	Kalama Falls Hatchery
		1	Levis River Hatchery
		14	Washougal River
		2	Levis River
Weyco Pond	Hl-2-3	4	Big Creek Hatchery
		1 ?	Elokomin Hatchery
		1	Skamokowa Creek

Appendix Table 8.--return in 1984 to Columbia River facilities and adjacent streams of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing Facility	Tag Code	Number of returns	Return sit0
Big Creek	7-21-60	1	Plympton Creek
Cowlitz	63-21-37	2	Cowlitz Hatchery
	63-21-54	1 1/	Cowlitz Hatchery
	"	1	Kalama Falls Hatchery
	"	1	Cowlitz River
	63-21-59	2	Cowlitz Hatchery
Elokomin	63-20-S	1	Elokomin Hatchery
Kalama Falls	63-21-5	5	Kalama Falls Hatchery
	"	1	Lower Kalama Hatchery
	"	3	Kalama River
Lewis River	63-21-60	1	Cowlitz Hatchery
	"	6	Lewis River
Lower Kalama	63-20-6	9	Kalama Falls Hatchery
	"	1	Kalama River
Priest Rapids	63-19-48	7 1/	Priest Rapids Hatchery
	"	1	Bonneville Hatchery
	"	9	Bonneville Darn
	"	3	Mid-Columbia River
Sea Resources	63-20-61	1	Sea Resources Hatchery
Washougal	63-21-53	4	Washougal Hatchery
	"	3	Kalama Falls Hatchery
	"	2	Lower Kalama Hatchery
Weyco Pond	H1-2-3	1 ?[2]	Skamokowa Creek

1/ One fish returned in 1985

Appendix Table9.--Returns in 1982 to Columbia River facilities and adjacent streams of 1980-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns brackets)

Rearing Facility	Tag Code	Number of returns	Return site
Aberoa thy	5-7-44	14	Abernathy Hatchery
	"	3[9]	Abernathy Creek
	5-7-4s	33	Abernathy Hatchery
	"	S	Lover Kalama Eatchery
	II	6[18]	Abernathy Creek
Little White Salmon 1/	5-8-49	1	Spring Creek Hatchery
Spring Creek	5-7-40	1	Spring Creek Hatchery
	5-7-41	4	Spring Creek Hatchery
	5-7-46	1[5]	Columbia River
	5-7-52	1	Spring Creek Hatchery
Bonneville	7-2 l-56	12	Bonneville Eatchery
	7-23-29	6	Bonneville Hatchery
Big Creek	7-23-31	1	Big Creek Hatchery
	II	1[3]	Elochoman River
	7-23-33	4	Big Creek Hatchery
Clatsop County Ponds	7-21-59	1	Big Creek Hatchery
Stayton Pond	7-23-35	4	Wlllamette Falls
Cowlitz	63-21-56	25[26]	Cowlitz Hatchery
	"	1	Lewis River Hatchery
	63-22-55	4	Cowlitz Hatchery
Elokomin	63-22-34	1	Lower Kalama Hatchery
Grays River	63-22-63	1	Big Creek Hatchery
Klickitat	63-20-8	1	Klickitat Hatchery
Priest Rapids	63-21-55	9	Priest Rapids Hatchery

1/ Fish returned in 1981.

Appendix Table 9 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Priest Rapids	63-22-6 1	1	Priest Rapids Hatchery
	"	2 [129)	Priest Rapids area
Washougal	63-2 1-48	1	Washougal Hatchery
	63-22-5 1	1	Bonneville Hatchery
	"	1 [3]	Ka lama River
Weyco Pond	H1-3-1	1	Grays River Hatchery

Appendix Table 10.--Returns in 1983 to Columbia River facilities andadjacent streams of 1980-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-7-44	13	Abernathy Hatchery
	"	1	Elokomin Eatchery
	II	2	Kalama Falls Hatchery
	"	5	Abernathy Creek
	5-7-45	63	Abernathy Hatchery
	"	1	Big Creek Hatchery
	"	2	Elokoain Hatchery
	"	1	Lower Kalama Hatchery
	"	10	Kalama Falls Eiatchery
	"	1	Washougal Hatchery
	"	1	Big Creek
	"	1	Ka Lama River
	"	1	Elochomao River
	"	3	Skamokova Creek
	"	15	Abernathy Creek
Little White Salmon	5-7-47	2	Little White Salmon Hatchery
	"	1	Bonneville Eatchery
	5-8-49	1	Little White Salmon Hatchery
Spring Creek	5-7-40	13	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-7-4 1	22	Spring Creek Eatchery
	5-7-42	16	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-7-43	1	Spring Creek Eiatchery
	5-7-46	5	Spring Creek Hatchery
	II	1	Icicle Creek
	5-7-48	1	Spring Creek Hatchery
	5-7-49	9	Spring Creek Eatchery
	"	1	Bonneville Hatchery
	5-7-50	3	Spring Creek Eatchery
	5-7-52	2	Spring Creek Hatchery

Appendix **Table 10 (Continued)**

Rearing Facility	Tag Coda	Number of returns	Return site
Big Creek	**7-23-31**	6	Big Creek Hatchery
	"	7	Elokomin Hatchery
	"	1	Big Creek
	"	1	Bear Creek
	"	1	Shamokowa Creek
	7-23-33	4	Big Creek Harchery
	"	1	Abernathy Hatchery
	"	7	Elokomin Hatchery
	"	3	Bear Creek
	"	4	Big Creek
	"	1	Plympton Creek
	"	1	Abernathy Creek
	7-23-34	8	Big Creek Hatchery
	"	1	Elokonin Hatchery
	"	1	Bear Creek
	"	1	Elochoman River
	"	3	Skamokowa Creek
Bonneville	**7-21-56**	79	Bonneville Hatchery
	"	1	Cascade Hatchery
	"	1	Wasbougal Eatchery
	7-23-29	46	Bonneville Hatchery
	"	1	Spring Creek Hatchery
Clatsop County Pond	**7-2 1-58**	1	Grays River Hatchery
	"	3	levis & Clark River
	7-2 l-59	1	Big Creek
	"	1	Levis 6 Clark River
Klaskanine	**7-22-27**	2	Levis & Clark River
	7-23-32	2	Levis 6 Clark River
	"	1	Bear Creek
Stayton Pond	**7-23-35**	56	Willamette Falls
Covlitz	**63-21-56**	90	Covlitz Hatchery
		1	Levis River Hatchery
		4	Willamette Falls
		2	Covlitr River

Appendix Table 10 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Cowlitz	63-22-55	15	Cowlitz Hatchery
	"	1	Covlitz River
Elokomin	63-22-34	5	Elokomin Hatchery
	"	1	Big Creek Hatchery
	"	1	Abernathy Hatchery
	63-23-17	2	Hatchery
Grays River	63-22-63	2	Grays River Hatchery
Kalama Falls	63-20-36	16	Kalama Falls Hatchery
	"	1	Covlitz Hatchery
	"	2	Lover Kalama Hatchery
	"	2	Kalama River
Lover Kalama	63-22-54	17	Lover Kalama Hatchery
	"	16	Kalama Falls Hatchery
	"	1	Covlitz Hatchery
Priest Rapids	63-2 1-55	36	Priest Rapids Hatchery
	63-22-6 1	17	Priest Rapids Eatchery
Sea Resources	63-22-1	3	Sea Resources Hatchery
Washougal	63-21-48	19	Washougal Hatchery
	"	1	Washougal River
	63-22-5 1	39	Washougal Hatchery
	"	1	Bonneville Eatchery
	"	2	Lover Kalama Eatchery
	"	1	Kalama Falls Hatchery
	"	1	Kalama River
	"	1	Washougal River
Weyco Pond	H1-3-1	1	Big Creek Hatchery
	"	1	Grays River Hatchery
	H1-3-2	1	Elokomin Hatchery

Appendix Tabel 11.--Returns in 1984 to Columbia River facilities and adjacent streams of 1980-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated return in brackets)

Rearing Site	Tag Code	Number of return8	Return Site
Abernathy	5-7-44	1	Abernathy Creek
	5-7-45	2	Abernathy Eatchery
	"	1	Elokomin Hatchery
Little White **Salmon**	5-7-47	5	Little White Salmon Eatchery
	"	1	Spring Creek Hatchery
	5-a-49	2	Little White Salmon Hatchery
Spring Creek	5-7-40	a	Spring Creek Hatchery
	5-7-41	11	Spring Creek Hatchery
	5-7-42	5	Spring Creek Hatchery
	5-7-49	3	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-7-52	2	Spring Creek Hatchery
Bonneville	7-21-56	8	Bonneville Hatchery
	7-23-29	5	Bonneville Hatchery
Big Creek	7-23-31	1	Big Creek Hatchery
	"	1	Elokomln Hatchery
	"	3	Big Creek
	7-23-33	5	Big Creek Hatchery
	"	3	Elokomln Hatchery
	"	1	Bear Creek
	"	1	Big Creek
	"	2	Plympton Creek
	7-23-34	6	Big Creek Hatchery
	"	1	Elokomin Hatchery
	"	2	Bear Creek
	"	1	Big Creek
Clatsop County Pond	7-21-58	1	Elokomin Hatchery
	"	1	Levis & Clark River
	"	1	Covlitz River
	7-21-59	1	Big Creek Hatchery
	"	2	Big Creek

Appendix Table 11 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Clatsop Pond	7-2 l-59	1	Klaskanine River
	"	2	Lewis & Clark River
Klaskanne	7-22-27	1	Klaskanine River
	7-23-32	1	Big Creek Hatchery
Stayton Pond	7-23-35	28[60]	Willamette Falls Fishway
Cowlitz Hatchery	63-2 1-56	116	Cowlitz Hatchery
	"	1	Abernathy Hatchery
	"	11	Cowlitz River
Cowlitt	63-22-55	49	Covlitz Hatchery
	"	11	Cowlitz River
Elokomin	63-22-34	8	Elokomin Hatchery
	"	1	Kalama Falls Hatchery
	"	2	Abernathy Hatchery
	"	4	Big Creek Hatchery
	"	1	Skamokowa Creek
	63-23-l 7	5	Elokomin Hatchery
Grays River	63-22-63	10	Grays River Hatchery
	"	2	Elokomin Hatchery
	"	1	Big Creek Hatchery
Kalama Falls	63-20-36	35	Kalama Falls Hatchery
	"	10	Lower Kalama Hatchery
	ll	1	Covlitz Hatchery
	"	4	Cowlitt River
	"	4	Kalama River
Lower Kalama	63-22-54	35	Lover Kalama Hatchery
	"	76	Kalama Falls Hatchery
	"	4	Covlitz Hatchery
	"	11	Kalama River
Priest Rapids	63-21-55	64	Priest Rapids Hatchery
	"	6	Bonneville Dam
	"	2	Wells Dam
	"	3	Hid-Columbia River
	63-22-61	35	Priest Rapids Hatchery
	"	5	Bonneville Dam
	"	3	Hid-Columbia River

Appendix Table 11 (Contiued)

Rearing Facility	Tag cod8	Number of returns	Return site
Sea Resources	63-22-1	2	Sea Resources Hatchery
Washougal	63-21-48	26	Washougal Hatchery
	"	2	Kalama Palls Hatchery
	63-22-5 1	44	Washougal Hatchery
	"	13	Kalama Falls Hatchery
	"	7	Lower Kalama Hatchery
	"	7	Washougal River
	"	3	Kalama River
	"	1[2]	Willamette Falls Fishway
	"	1	Sandy River
Weyco Pond	81-3-l	1	Big Creek Hatchery
	"	1	Big Creek
	H1-3-2	3	Elokomln Hatchery
	"	2	Skamokova Creek

Appendix Table 12. --Roturns in 1985 to Columbia River facilities and adjacent streams of 1980-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing facility	Tag code	Number of returns	Return slte
Big Creek	7-23-31	1	Skamokawa Creek
Cowlitz	63-21-56	22	Covlitz Hatchery
		3	Cowlltz River
	63-22-55	9	Cowlitz Hatchery
		5	Cowlitz River
Elokomin	63-22-34	2	Kalama Falls Hatchery
		1	Big Creek
		1	Cowlitz River
Grays River	63-22-63	2	Grays River Hatchery
		1	Big Creek
		1	Skamokawa Creek
	63-23-40	1	Elokomin Hatchery
Kalama Falls	63-20-36	8	Kalama Falls Hatchery
		2	Lower Kalama Hatchery
		1	Cowlitz Hatchery
Lower Kalama	63-22-54	4	Lower Kalama Hatchery
		24	Kalama Falls Hatchery
		1	Cowlitz Hatchery
		1	Kalama River
Priest Rapids	63-21-55	34	Priest Rapids Hatchery
		1	Wells Dam
		1	Columbia River
	63-22-61	25	Priest Rapids Hatchery
Washougal	63-21-48	7	Washougal Hatchery
		1	Kalama Falls Hatchery
	63-22-51	10	Washougal Hatchery
		5	Kalama Falls Hatchery
Weyco Pond	H1-3-2	1	Big Creek Hatchery

Appendix Tab18 13. --Returns in 1986 to Columbiia River facilities and adjacent stsreams of 19800-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing facility	Tag code	Number of returns	Return site
Cowlitz	63-21-56	1	Cowlitz Hatchery
		1	Cowlitz River
Lower Kalama	63-22-54	1	Kalama Falls Hatchery
Washougal	63-21-48	1	Uashougal Hatchery
Priest Rapids	63-21-55	3	Priest Rapids Hatchery
	63-22-61	1	Wells Dam

Appendix Table 14.--Returns in 1983 to Columbia River facilities and adjacent streams of 1981-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	S-10-58	2	Abernathy Hatchery
	"	3	Abernathy Creek
	S-10-59	2	Abernathy Hatchery
	"	1	Abernathy Creek
Spring Creek	5-10-50	9	Spring Creek Hatchery
	"	3	Bonneville Hatchery
	s-10-51	1	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	S-10-52	7[1/]	Spring Creek Hatchery
Big Creek	7-24-10	1	Big Creek Hatchery
		1	Skamokowa Creek
Bonneville	7-24-7	3	Bonneville Hatchery
Cowlitz	63-24-62	4	Cowlitz Hatchery
Lower Kalama	63-24-63	1	Lower Kalama Hatchery
Priest Rapids	63-22-52	4	Priest Rapids Hatchery
	63-24-56	2	Priest Rapids Hatchery
Sea Resources	63-24-57	1	Sea Resources Hatchery
Washougal	63-24-61	1	Washougal Hatchery

1/ One fish returned in 1982.

Appendix Table 15.--Returns in 1984 to Columbia River facilities and adjacent streams of 1981-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated return in brackets)

Rearing Facility	Tag Code	Number of returns	Return Site
Abernathy	S-10-58	18	Abernathy Hatchery
	"	1	Elokomin Hatchery
	"	2	Lower Kalama Hatchery
	"	2	Kalama Falls Hatchery
	"	1	Kalama River
	"	2	Abernathy Creek
	S-10-59	5	Abernathy Hatchery
	"	1	Big Creek Hatchery
	"	4	Abernathy Creek
Little White Salmon	5-4-35	1	Bonneville Hatchery
Spring Creek	5-10-50	34	Spring Creek Hatchery
	"	10	Bonneville Hatchery
	S-10-51	15	Spring Creek Hatchery
	"	3	Bonneville Hatchery
	S-lo-52	41	Spring Creek Hatchery
	"	2	Bonneville Hatchery
	"	1	Cascade Hatchery
	S-10-57	1	Spring Creek Hatchery
Bonneville	7-24-7	69	Bonneville Hatchery
	"	1	Spring Creek Hatchery
	"	1	Cascade Hatchery
	7-24-0	7	Bonneville Hatchery
	7-26-63	1	Spring Creek Hatchery
Big Creek	7-24-10	56	Big Creek Hatchery
	"	1	Abernathy Hatchery.
	"	11	Elokomin Hatchery
	"	4	Bear Creek
	"	9	Big Creek
	"	1	Plympton Creek
	"	4	Skamokowa Creek
Clatsop County Pond	7-24-12	2	Big Creek Hatchery
	7-24-13	1	Lewis & Clark River

Appendix Table 15 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Klaskanine	7-24-9	1	Bear Creek
OxBow	7-23-30	1	Bonneville Hatchery
	7-24-11	1	Abernathy Hatchery
Stayton Pond	7-26-62	169[360]	Willamette Falls Fishway
Cowlitz	63-24-62	16	Cowlitz Hatchery
	"	8	Cowlitz River
Elokomin	63-22-60	1	Big Creek Hatchery
Grays River Hatchery	63-24-59	1	Big Creek Hatchery
Kalama Falls	63-24-60	3	Kalama Falls Hatchery
	"	1	Lower Kalama Hatchery
	"	1	Kalama River
Lower Kalama	63-24-63	5	Lower Kalama Hatchery
	"	2	Kalama Falls Hatchery
Priest Rapids	63-22-52	62	Priest Rapids Hatchery
	"	2	Mid-Columbia River
	63-24-56	24	Priest Rapids Hatchery
	"	1	Mid-Columbia River
Sea Resources	63-24-57	36	Sea Resources Hatchery
Washougal	63-24-61	7	Washougal Hatchery
Weyco Pond	Hl-4-6	2	Big Creek Hatchery
	"	1	Skamokowa Creek

Appendix Table 16. --Returns in 1985 to Columbia River facilities and adjacent stream of 1981-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing facility	Tag code	Number of returns	Return site
Clatsop County	7-24-12	2	Big Creek Hatchery
		1	Bear Creek
		1	S. F. Klaskanine River
	7-24-13	1	Big Creek Hatchery
		2	Willamette Falls
Big Creek	7-24-10	48	Big Creek Hatchery
		10	Elokomin Hatchery
		2	Kalama Falls Hatchery
		1	Grays River Hatchery
		4	Abernathy Hatchery
		16	Big Creek
		16	Skamokawa Creek
		9	Plympton Creek
		2	Abernathy Creek
		6	Bear Creek
		3	Willamette Falls
Bonneville	7-24-7	27	Bonneville Hatchery
	7-24-8	9	Bonneville Hatchery
	7-26-63	1	Bonneville Hatchery
Klaskanine	7-24-9	1	Big Creek Hatchery
		1	Big Creek
OXBOW	7-23-30	7	Bonneville Hatchery
	7-24-11	1	Bonneville Hatchery
Stayton Pond	7-26-62	103(171)	Willamette Falls
		1	Elokomin Hatchery
Sea Resources	63-24-57	7	Sea Resources Hatchery
Abernathy	S-10-58	12	Abernathy Hatchery
		1	Kalama Falls Hatchery
		1	Skamokawa Creek
Abernathy	5-10-59	2	Abernathy Hatchery
		1	Abernathy Creek

Appendix Table 16 (cont.)

Rearing facility	Tag code	Number of returns	Return site
Little White	s-4-35	1	Little White Hatchery
		1	Bonneville Hatchery
Spring Creek	S-10-50	2	Spring Creek Hatchery
		2	Bonneville Hatchery
	S-10-51	4	Spring Creek Hatchery
		1	Little White Salmon
	S-lo-52	18	Spring Creek Hatchery
		1	Bonneville Hatchery
Cowlitz	63-20-32	8	Cowlitz Hatchery
	63-24-50	5	Cowlitz Hatchery
	63-24-62	63	Cowlitz Hatchery
		1	hwer Kalama Hatchery
		16	Cowlitz River
		1	Lewis River
	63-26-3	22	Cowlitz Hatchery
		1	Cowlitz River
Elokomin	63-22-42	2	Elokomin Hatchery
		1	Abernathy Creek
	63-22-60	2	Elokomin Hatchery
		1	Skamokawa Creek
Grays River	63-24-59	6	Skamokawa Creek
Kalama Falls	63-24-60	51	Kalama Falls Hatchery
		17	Lower Kalama Hatchery
		3	Cowlitz Hatchery
		1	Lewis River Hatchery
		2	Washougal Hatchery
		2	Lewis River
		1	Coweeman River
Lower Kalama	63-24-63	10	Lower Kalama Hatchery
		41	Kalama Falls Hatchery
		2	Cowlitz Hatchery
		3	Lewis River Hatchery
		1	Lewis River

Appendix Table 16 (cont.)

Rearing facility	Tag code	Number of returns	Return site
Priest Rapids	63-22-52	109	Priest Rapids Hatchery
		4	Wells Dam
		1	Columbia River
	63-24-56	44	Priest Rapids Hatchery
Washougal	63-24-61	48	Washougal Hatchery
		6	Kalama Falls Hatchery
		1	Lower Kalama Hatchery
		2	Lewis River
		3	Washougal River
Weyco Pond	H1-4-6	1	Elokomin Hatchery
		1	Big Creek Hatchery

Appendix Table 17. --Returns in 1986 to Columbia River facilities and adjacent streams of 1981-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing facility	Tag code	Number of returns	Return site
Big Creek	7-24-10	3	Big Creek Hatchery
		1	Grays River Hatchery
Bonneville	7-24-7	1	Bonneville Hatchery
	7-24-8	3	Bonneville Hatchery
Stayton Pond	7-26-62	1(2)	Willamette Falls
Little White	5-4-35	1	Bonneville Dam Trap
Spring Creek	S-10-51	1	Bonneville Dam Trap
	S-10-57	1	Bonneville Dam Trap
Cowl itz	63-20-32	1	Cowlitz Hatchery
	63-24-50	2	Cowlitz Hatchery
	63-24-62	14	Cowlitz Hatchery
		4	Cowlitz River
		1	Lewis River
	63-26-03	5	Cowlitz Hatchery
Elokomin	63-22-60	1	Abernathy Hatchery
Kalama Falls	63-24-60	15	Kalama Falls Hatchery
		1	Cowlitz Hatchery
		5	Lower Kalama Hatchery
		1	Lewis River
Lower Kalama	63-24-63	7	Lower Kalama Hatchery
		4	Kalama Falls Hatchery
Klickitat	63-21-57	1	Lyons Ferry Hatchery
Priest Rapids	63-22-52	26	Priest Rapids Hatchery
		2	Wells Dam
		2	Columbia River
	63-24-56	3	Priest Rapids Hatchery
		3	Wells Dam

Appendix Table 17 (Continued)

Rearing facility	Tag code	Number of returns	Return Sits
Washougal	63-24-61	8	Washougal Hatchery
		1	Lower Kalama Hatchery
		1	Little White Salmon Hatchery
		1	Bonneville Hatchery
		1	Kalama River
		2	Lewis River
Weyco Pond	Hl-4-6	1	Big Creek Hatchery

Appendix Table 18.--Returns of fall chinook to Columbia River facilities in 1980

Facility	Returns Female	Male	Jack	Total
Abernathy	336	274	130	740
Little White Salmon	1,126	433	114	1,673
Spring Creek	15,116	9,494	2,022	27,432
Big Creek	1,304	1,407	70	2,861
Bonneville	10,109	9,050	2,202	21,361
Cascade	1,010	743	104	1,857
Klaskanine	66	48	1	115
Willamette Falls 1/			625	8,385
Cowlitz	1,046	922	221	2,189
Elokomin 2/	645	429	0	1,074
Grays River	48	43	6	97
Kalama Falls 3/	2,566	1,966	167	4,699
Kalama Falls 4/			175	255
Klickitat	32	67	115	214
Lewis River	341	306	46	693
Lower Kalama	1,157	1,263	359	2,779
Priest Rapids	1,409	783	2,564	4,756
Sea Resources	59	64	3	126
Washougal	589	1,128	121	1,038
TOTAL	36,959	28,500	9,845	83,144

1/ Adults not sexed
2/ Includes 619 adults transported from Kalama Falls Hatchery
3/ Lower river production stock
4/ Upper river bright stock, adults not sexed

Appendix Table 19.--Returns of fall chinook to Columbia River facilities in 1981.

Facility	Returns Female	Male	Jack	Total
Abernathy	454	820	743	2,025
Big Creek	1,923	1,868	526	4,317
Bonneville	14,147	14,956	5,162	34,265
Cascade	131	103	15	249
Cowlitz	2,750	1,947	976	5,673
Elokomin	349	284	1	634
Grays River	22	37	26	85
Kalama Falls-1/	2,419	1,801	74	4,294
Kalama Falls-2/	311	235	24	570
Klaskanine	48	12	3	63
Klickitat	107	175	0	282
Lewis River	450	180	116	746
Little White Salmon	767	474	256	1,497
Lower Kalama	794	581	161	1,536
Priest Rapids	972	1,408	1,523	3,903
Sea Resources	130	67	32	229
Spring Creek	13,607	10,175	6,662	30,524
Washougal	2,036	1,620	104	3,760
Willamette Falls	6,695	10,104	1,127	17,926
TOTAL	48,192	46,855	17,531	112,578

1/ Lower river stock
2/ Upper river bright stock

Appendix Table 20.--Returns of fall chinook to Columbia River facilities in 1982.

Facility	Returns Female	Male	Jack	Total
Abernathy	1,032	1,033	1,016	3,081
Big Creek	4,425	5,820	400	10,645
Bonneville	11,672	9,409	2,199	23,280
Cascade	450	364	76	890
Cowlitz	2,618	2,149	1,023	5,790
Elokomin	889	1,167	6	2,062
Grays River	284	394	23	701
Kalama Falls[1/]	357	449	86	892
Kalama Falls[2/]	61	268	19	348
Klaskanine	68	26	3	97
Klickitat	136	178	23	337
Lewis River	127	92	147	366
Little White Salmon	1,337	710	101	2,148
Lower Kalama[1/]	242	494	84	820
Lower Kalama[2/]	3	469	271	743
Priest Rapids	1,132	2,399	4,201	7,732
Ringold	65	112	14	191
Sea Resources[3/]			4	428
Spring Creek	17,210	9,498	739	27,447
Washougal	1,271	1,277	260	2,808
Willamette Falls	12,041	13,858	984	26,883
TOTAL	55,420	50,166	11,679	117,689

1/ Lover river stock
2/ Upper river bright stock
3/ Adults not sexed

Appendix Table 21.--Returns of fall chinook to Columbia River facilities in 1983.

Facility	Returns Female	Male	Jack	Total
Abernathy	1,096	854	192	2,142
Big Creek	2,158	1,754	7s	3,987
Bonneville	6,319	6,497	585	13,401
Cascade[1/]	272	187	21	480
Cascade[2/]	736	532	87	1,355
Clatsop County Ponds			0	5[3/]
Cowlitz	2,646	3,654	147	6,447
Elokomin	1,419	1,271	1	2,691
Grays River	123	150	1	274
Kalama Falls-1/	2,122	1,744	9	3,875
Kalama Falls- 2/	468	374	30	872
Klaskanine	30	17	1	48
Klickitat	57	90	13	160
Lewis River[1/]	185	29s	76	556
Lewis River[2/]	10	25	4	39
Little White Salmon	664	47s	53	1,192
Lower Kalama-[1/]	182	so3	6	691
Lower Kalama[2/]	85	372	89	546
Priest Rapids	1,530	3,280	1,214	6,024

1/ Lower river stock
2/ Upper river bright stock
3/ Adults not sexed

Appendix Table 21 (continued)

Facility	Female	Returns Male	Jack	Total
Ringold	89	87	28	204
Sea Resources	156	97	24	277
Spring Creek	5,889	3,514	1,005	10,408
Washougal	1,775	2,257	26	4,058
Willamette Falls	7,049	6,156	528	13,733
TOTAL	35,060	34,185	4,215	73,465

Appendix Table 22.--Returns of fall chinook to Columbia River facilities in 1984.

Hatchery	Returns			
	Female	Male	Jack	Total
Abernathy	297	260	185	742
Big Creek	2,458	3,710	368	6,536
Bonneville	2,280	2,954	244	5,478
Cascade	102	55	4	161
Clatsop County Ponds			62	62
Cowlitz	2,942	2,898	169	6,009
Elokomin	722	932	10	1,714
Grays River	102	67	68	237
Kalama Falls	2,106 268	1,788 216	13	3,907 484 1/
Klaskanine	26	15		41
Klickitat	46	92	2	140
Lewis River 2/	78	81	19s	354
Little White Salmon	407	153	17	577
Lower Kalama	705	643 1	30	1,378 1 1/
Priest Rapids	3,130	4,523	5,581	13,234
Sea Resources	413	434	10	857
Spring Creek	5,273	3,424	799	9,496
Washougal	1,028	1,049	39	2,116
Willamette Falls	7,946	12,140	1,084	21,170
TOTAL	30,379	35,435	8,880	74,694

1/ Upriver bright fall chinook
2/ Includes Speelyai Hatchery

Appendix Table 23.-- Returns of fall chinook to Columbia River facilities in 1985

Hatchery	Returns			
	Female	Hale	Jack	Total
Abernathy	941	1069	207	2217
Big Creek	4306	5970	274	10550
Bonneville	3576	5603	102	9281
Cascade	39	57	81	177
Clatsop County Ponds	9	1	2	12
Cowlitz	3055	3793	2926	9774
Elokomin	803	1007	22	1832
Grays River	78	167	112	357
Kalama Falls	1902	1521	276	3699
Kalama Falls Brights	421	533	0	954
Klaskanine	8	4	0	12
Klickitat	0	8	7	15
Lewis River 6 Speelyai	199	315	283	797
Little White Salmon	96	105	43	244
Lower Kalama	472	876	339	1687
Priest Rapids	4597	8894	17266	30757
Sea Resources	200	123	2	325
Spring Creek	3258	2170	53	5481
Washougal	909	2394	4628	7931
Willamette Falls	13091	15998	1490	30579
Total	37960	50608	28113	116681

Appendix Table 24. --Returns of fall chinook toColumbia River facilities in 1986

Hatchery	Returns			
	Female	Hale	Jack	Total
Abernathy	276	173	1,819	2,268
Big Creek	3,356	2,932	3,554	9,842
Bonneville	2,768	3,586	6,907	13,261
Cascade	65	89	23	177
Clatsop County Ponds	1	1	9	11
Cowlitz	4,316	6,669	1,695	12,680
Elokomin	730	796	155	1,654
Grays River	472	756	240	1,468
(Trapped Skamokawa Creek)	233	274	8	515
Kalama Falls	1,563	2,175	107	3,845
(Upriver bright falls)	576			576
Klaskanine	24	7	8	39
Klickitat	29	165	53	247
Lewis River	115		89	204
Little White Salmon	303	347	80	730
(Upriver bright falls)	868	673	286	1,827
Lower Kalama	755	1,721	188	2,664
Priest Rapids	6,169	7,239	7,637	21,045
Sea Resources	56	52	177	285
Spring Creek (Hatch. returns)	763	291	90	1,144
(Trapped Bonneville Dam)	1,496	749		2,245
(Big White Pond Return)	92	62	75	229
Washougal	2,944	7,597	447	10,988
Willamette Falls	14,037		810	14,847
	78,334		24,457	102,791