Summer Chum Salmon Conservation Initiative

An Implementation Plan To Recover Summer Chum Salmon in the Hood Canal and Strait of Juan de Fuca Region

Supplemental Report No. 7

Five-Year Review of the Summer Chum Salmon Conservation Initiative

Washington Department of Fish and Wildlife
Point No Point Treaty Tribes

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1) INTRODUCTION

BACKGROUND

The Washington Department of Fish and Wildlife and Point No Point Treaty Tribes distributed the Summer Chum Salmon Conservation Initiative (SCSCI) in April 2000 (WDFW and PNPTT 2000). The initiative described a comprehensive plan for the implementation of summer chum salmon recovery in Hood Canal and eastern Strait of Juan de Fuca. The harvest and artificial production components of the SCSCI were subsequently approved by the National Marine Fisheries Service (NMFS) under Limits 6 and 5, respectively, of the Endangered Species Act 4(d) rule (NMFS 2001, 2002a). The SCSCI's harvest and artificial production management provisions were also incorporated into the Summer Chum Recovery Plan prepared by the Hood Canal Coordinating Council (HCCC 2005). This Recovery Plan, which also addressed habitat protection and restoration, was formally adopted by NMFS under rule 4(f) of the Endangered Species Act in March 2007 (NMFS 2007a, 2007b).

The SCSCI specifies preparation of annual reports that describe the results of plan implementation and assess compliance with and effectiveness of the plan provisions (section 3.6.2 of SCSCI). Two biennial supplemental reports have been distributed that provide updated information, data and analyses for the first four years (1999 through 2002) that were not included in the SCSCI (WDFW and PNPTT 2001, 2003). Additionally, memorandum progress reports have been prepared for the years 2003 through 2006 (WDFW and PNPTC 2004, 2005, 2006, 2007). With these progress reports the scheduling has changed from biennial to annual; the reports are relatively brief and focus on providing up to date information on management activities pertaining to stock assessment and harvest, which is needed for preseason harvest management planning.

The present report is characterized as a five-year review, following the provisions under section 3.6.3 of the SCSCI, though the specific range of years covered (through 2004) exceeds five; that is, it includes the six years since the last year (1998) incorporated in the SCSCI. This report provides detailed information for the years 2003 and 2004, consistent with the level of detail provided in the aforementioned biennial reports. It also provides a review of progress through 2004, addressing specific topics for the five year review listed in section 3.6.3 of the SCSCI (p. 331). These topics are addressed in various sections of this report and also are each specifically considered in the below Concluding Remarks & Summary section.

This report is organized to cover, in order, stock assessment, harvest management, artificial production, ecological interactions and habitat; subjects that correspond to the major management areas required to address comprehensive recovery of the summer chum as described in the SCSCI. Additionally, a discussion of progress in meeting SCSCI performance standards and an update on recovery goals are included. Finally, there are concluding remarks and a summary.

UPDATED INFORMATION

This report updates information and data for recent years through 2004. It also provides corrections where applicable, based on new information and found errors. For this reason, the historical information provided in this report takes precedence over that previously reported

2) STOCK ASSESSMENT

As indicated in the above Introduction, this report provides detailed information for the years 2003 and 2004, consistent with what has been done in previous reports covering the years prior to 2003. The below first two subsections of this Stock Assessment section address escapements and runsizes, respectively, and focus primarily on 2003 and 2004 (though brief summaries including prior years are included). The remaining subsections include detailed information for 2003 and 2004 but also incorporate new information and analyses applicable to prior years.

ESCAPEMENT

Spawning ground surveys were conducted throughout the summer chum return period to estimate the abundance of summer chum spawners for all known stocks in the Hood Canal and Strait of Juan de Fuca summer chum region during 2003 and 2004. In addition, the Co-managers conducted escapement surveys that will provide information to determine and monitor the status of Dungeness River summer chum salmon, whose status is currently unknown.

Summer chum escapement estimates based on spawner surveys, weir counts, and broodstock collection from 2003 and 2004 are summarized in Table 2-1, and regional summer chum escapement estimates for the period of 1974 to 2004 are presented in Table 2-2. Figure 2-1 and Figure 2-2 show escapement (and harvest) estimates for Hood Canal and the Strait of Juan de Fuca, respectively. Figure 2-3 shows estimates for the entire ESU. Escapement estimates include fish collected as broodstock for supplementation programs. Spawning escapement estimates by stream for the period 1968 through 2004 are provided for the Hood Canal and the Strait of Juan de Fuca regions in Appendix Tables 1 and 2, respectively. Information on the number of fish taken for broodstock by each supplementation program is also included in those tables. Also, see the below Mark Recovery subsection (Tables 2-10 and 2-12) for escapement estimates partitioned into natural origin and supplementation origin fish for the years 2001 through 2004.

Detailed spawning escapement summaries for each stock during 2003 and 2004 are presented in Appendix Report 1. The methods used to estimate escapements are the same as described in SCSCI Appendix Report 1.1 (WDFW and PNPTT 2000), and the current information is presented in the same format as in the appendices to Supplemental Report No. 1 of the SCSCI (Haymes 2000). Included here are summaries for the Big Beef, Chimacum, and Dungeness stocks that were absent in the SCSCI. Survey data from several small streams (Little Anderson, Seabeck, Stavis, Harding, Thomas, Eagle, Jorsted, Fulton, and Little Lilliwaup) are also presented here. Some of these streams were identified as possibly being part of the historic distribution of summer chum salmon based on evidence of former summer chum occurrence, but insufficient evidence to determine whether each represented a distinct stock (see SCSCI 1.7.2.3, WDFW and PNPTT 2000). These streams were also monitored to determine if summer chum are re-colonizing these streams and/or if summer chum adults returning from supplementation programs may be straying into these watersheds. Brief discussions of the 2003 and 2004 summer chum salmon escapements follow.

Table 2-1. Hood Canal summer chum escapement (including hatchery broodstock) by region and stream, 2003-2004.

Stock/stream	2003	2004
Hood Canal Region		
Big Beef Creek	896	1,916
Anderson Creek	0	1
Dewatto River	9	23
Tahuya River	0	8
Union River	11,916	5,976
Skokomish River	N/A	24
Lilliwaup Creek	353	1,017
Hamma Hamma River	854	2,691
Duckabush River	1,869	8,637
Dosewallips River	7,066	11,549
Big Quilcene River	11,843	35,108
Little Quilcene River	890	3,045
Hood Canal Region Total	**35,696**	**69,995**
Strait of Juan de Fuca Region		
Chimacum Creek	558	1,139
Snow Creek	304	396
Salmon Creek	5,651	6,021
Jimmycomelately Creek	446	1,662
Dungeness River	N/A	123
Strait of Juan de Fuca Total	**6,959**	**9,341**

Table 2-2. Escapement (including hatchery broodstock) for Hood Canal and the Strait of Juan de Fuca summer chum salmon, 1974-2004.

Return year	Hood Canal escapement	St. of Juan de Fuca escapement	HC/SJF ESU
1974	12,281	1,768	14,049
1975	18,248	1,448	19,696
1976	27,715	1,494	29,209
1977	10,711	1,644	12,355
1978	19,709	3,080	22,789
1979	6,554	761	7,315
1980	3,777	5,109	8,886
1981	2,374	884	3,258
1982	2,623	2,751	5,374
1983	899	1,139	2,038
1984	1,414	1,579	2,993
1985	1,109	232	1,341
1986	2,552	1,087	3,639
1987	757	1,991	2,748
1988	2,967	3,690	6,657
1989	598	388	986
1990	429	341	770
1991	747	309	1,056
1992	2,377	1,070	3,447
1993	756	573	1,329
1994	2,429	178	2,607
1995	9,462	839	10,301
1996	20,490	1,084	21,574
1997	8,979	962	9,941
1998	4,001	1,269	5,270
1999	4,114	573	4,687
2000	8,649	983	9,632
2001	12,044	3,955	15,999
2002	11,454	6,955	18,409
2003	35,696	6,959	42,655
2004	69,995	9,341	79,336

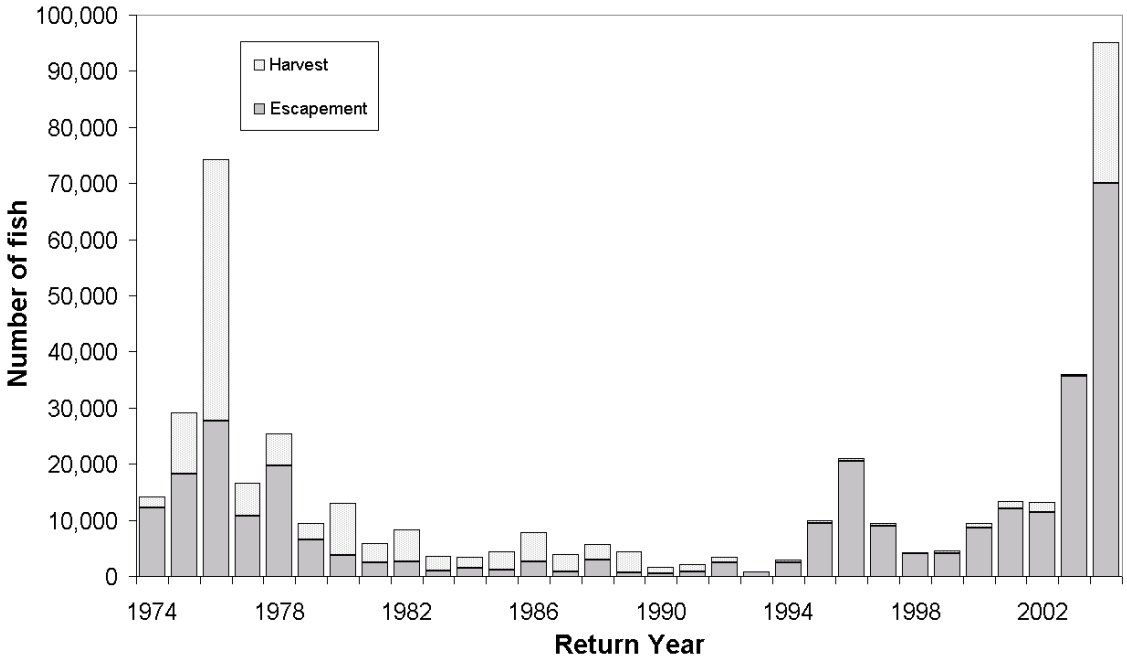

Figure 2-1. Hood Canal summer chum escapement and harvest, 1974-2004.

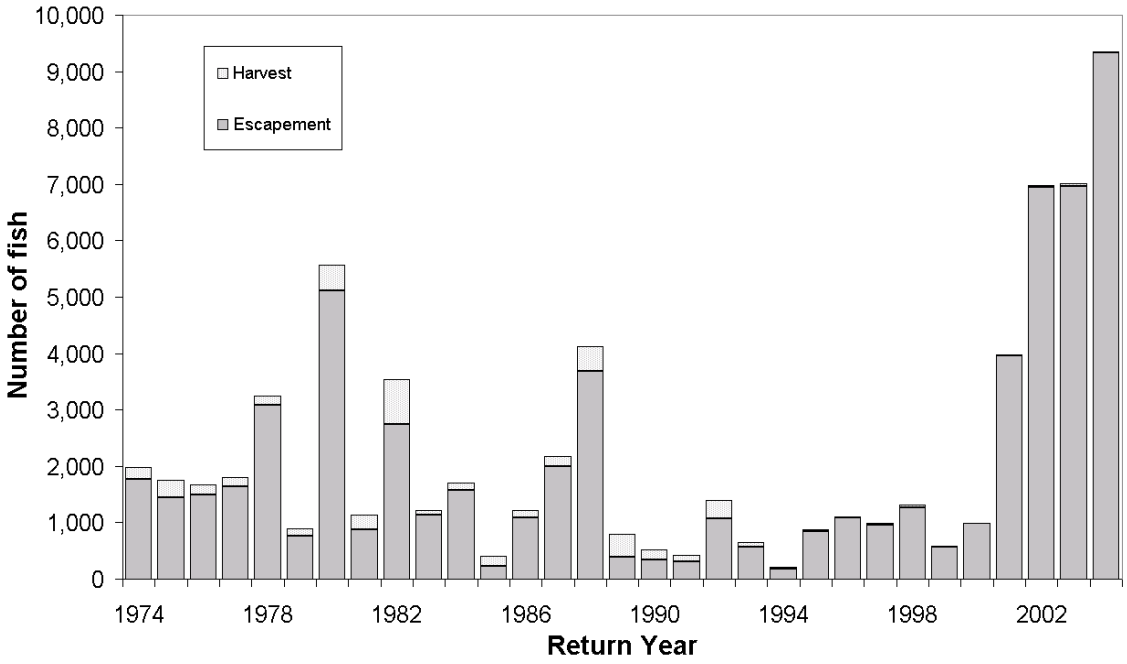

Figure 2-2. Strait of Juan de Fuca summer chum escapement and harvest, 1974-2004.

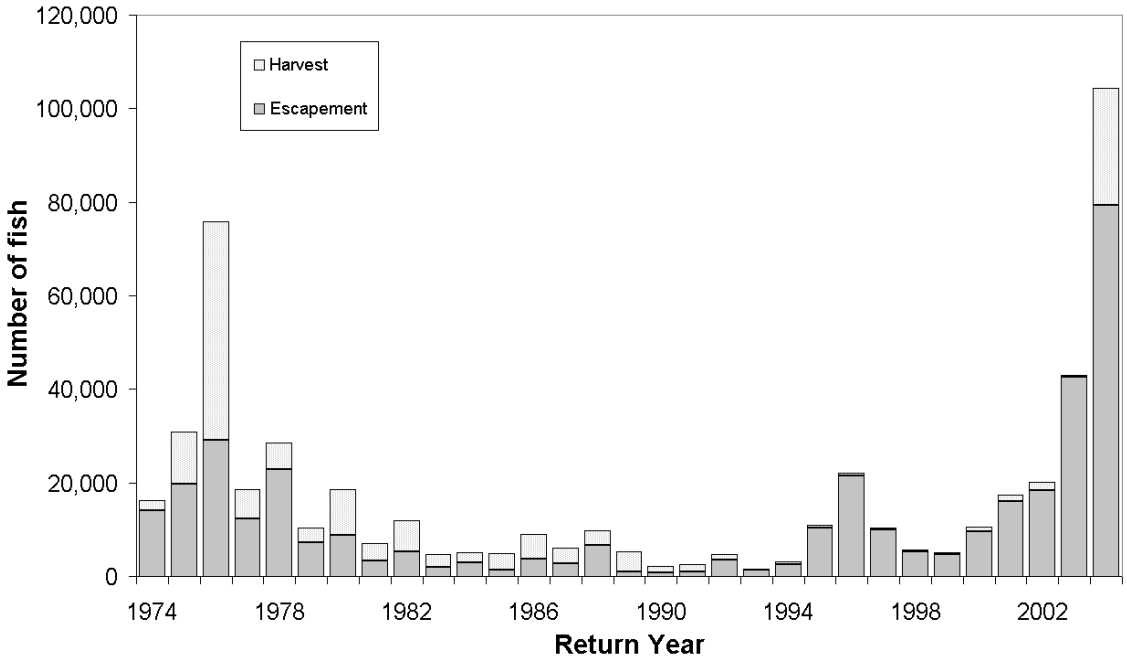

Figure 2-3. Hood Canal summer chum ESU escapement and harvest, 1974-2004.

2003 ESCAPEMENTS

An estimated total of 42,655 summer chum escaped to the region's streams (including fish collected for hatchery broodstock); 35,696 spawners to Hood Canal streams, and 6,959 spawners to Strait of Juan de Fuca streams (Table 2-2). At the time, the 2003 escapements were the highest recorded during the period that total spawner numbers had been estimated (1974-2003), including the years prior to the decline in summer chum abundance. The escapements across the region have been enhanced by the strong returns to the various supplementation and reintroduction programs; however, in 2003 the numbers of natural origin recruits (NORs) far out-numbered hatchery origin recruits. Approximately 74% of the return was estimated to be of natural origin, meaning that the 2003 return was also the largest recorded escapement of natural origin recruits (NORs) to date. For more information on natural and supplementation origin returns, see the subsections below on Mark Recovery, Productivity, and Supplementation Returns/Straying.

The large escapement of summer chum in 2003 was in part due to record-high escapements in Union River (11,916 fish), Big Quilcene River (11,843 fish), Dosewallips River (7,066 fish), and Salmon Creek (5,651 fish). Summer chum escapements to Little Quilcene River, Duckabush River, Big Beef Creek, and Jimmycomelately Creek were all larger than recent previous years. Chimacum Creek continued to show strong returns from an on-going reintroduction program, although the escapement (558 fish) was smaller than the 2001 and 2002 escapements. Hamma Hamma and Lilliwaup escapements were larger than those of the 1990's, but smaller than the 2002 escapements. See Appendix Tables 1 and 2 for spawning escapement estimates by stream for the period 1968 through 2004.

2004 ESCAPEMENTS

The escapements of Hood Canal summer chum in 2004 were exceptional. A total of 79,336 summer chum escaped to the region's streams (including fish collected for hatchery broodstock); 69,995 spawners to Hood Canal streams and 9,341 spawners to eastern Strait of Juan de Fuca streams (Table 2-2). The 2004 escapements were the highest recorded during the period that total spawner numbers have been estimated (1974-2004), exceeding the previous high from 2003. In 2004, the numbers of natural origin recruits (NORs) again far out-numbered hatchery origin recruits. Approximately 83% of the return was estimated to be of natural origin, meaning that the 2004 return was the largest escapement of NORs on record as well. For more information on natural and supplementation origin returns, see the subsections below on Mark Recovery, Productivity, and Supplementation Returns/Straying.

Not surprisingly, escapements for many individual streams in 2004 were the largest on record, including Little Quilcene, Big Quilcene, Big Beef, Dosewallips, Duckabush, Chimacum, Salmon, and Jimmycomelately. Escapements to Hamma Hamma and Lilliwaup were the largest since the 1970's. Significant numbers of summer chum were seen in the Dungeness River for the first time in 2004, with an escapement estimate of 123 fish (all of the fish sampled were natural origin). An estimated 23 fish escaped to the Dewatto, although the majority of those were strays of supplementation origin.

RUNSIZES

To determine the total numbers of salmon returning to specific production areas, fish that are harvested in mixed stock and terminal fisheries must be allocated to the streams from which they originated. This allocation is done through a post-season process called "run re-construction," which splits the harvests in each catch area into the numbers of fish that were likely contributed by the individual stocks or management unit thought to be transiting the area. All estimated harvests for each stock or management unit are added to the escapement for that grouping to derive the estimated total return for each year. Table 2-3 summarizes the estimates of runsizes for Hood Canal and Strait of Juan de Fuca regions for 2003 and 2004, and Table 2-4 shows regional total runsizes from 1974 through 2004. Run reconstruction tables for 2003 and 2004 are included in Appendix Report 2. A discussion of the run re-construction methodology can be found in the SCSCI Appendix Report 1.3. Also, see the Mark Recovery subsection below (Tables 2-11 and 2-13) for runsizes partitioned into natural origin and supplementation origin fish for the years 2001 through 2004.

Table 2-3. Regional summer chum salmon runsizes for the 2003 and 2004 return years.

	2003	2004
Hood Canal Region		
Escapement	35,696	69,995
Terminal runsize	35,729	94,877
Total runsize	**36,024**	**95,077**
Strait of Juan de Fuca Region		
Escapement	6,959	9,341
Terminal runsize	6,959	9,341
Total runsize	**7,016**	**9,360**

2003 RUNSIZES

The estimated 2003 summer chum runsize in Hood Canal was 36,024 fish, with 35,729 fish entering the terminal area (Table 2-3). The Strait of Juan de Fuca runsize was estimated at 7,016 fish, with 6,959 fish entering the terminal area. The combined summer chum runsize for the Hood Canal/Strait of Juan de Fuca region was 43,040 fish in 2003. The 2003 return was the second largest on record, with only 1976 having a larger return of summer chum to the region (Table 2-4).

2004 RUNSIZES

The 2004 return of Hood Canal/Strait of Juan de Fuca summer chum was the largest on record (Table 2-4). The estimated 2004 summer chum runsize in Hood Canal was 95,077 fish, with 94,877 fish entering the terminal area (Table 2-3). The Strait of Juan de Fuca runsize was estimated at 9,360 fish, with 9,341 fish entering the terminal area. The combined summer chum runsize for the Hood Canal/Strait of Juan de Fuca region was 104,437 fish in 2004.

Table 2-4. Total runsizes for Hood Canal and Strait of Juan de Fuca summer chum salmon, 1974-2004.

Return year	Hood Canal Run size	Strait of Juan de Fuca Run size	HC/SJF ESU
1974	14,222	1,985	16,207
1975	29,113	1,747	30,860
1976	74,220	1,673	75,893
1977	16,688	1,810	18,498
1978	25,344	3,240	28,584
1979	9,513	900	10,413
1980	13,026	5,574	18,600
1981	5,875	1,139	7,014
1982	8,331	3,540	11,871
1983	3,545	1,217	4,762
1984	3,372	1,707	5,079
1985	4,424	411	4,835
1986	7,832	1,217	9,049
1987	3,971	2,181	6,152
1988	5,680	4,129	9,809
1989	4,473	795	5,268
1990	1,564	528	2,092
1991	2,199	424	2,623
1992	3,376	1,394	4,770
1993	871	643	1,514
1994	2,959	214	3,173
1995	9,984	882	10,866
1996	21,056	1,106	22,162
1997	9,373	985	10,358
1998	4,274	1,316	5,590
1999	4,527	577	5,104
2000	9,506	987	10,493
2001	13,375	3,982	17,357
2002	13,170	6,981	20,151
2003	36,024	7,016	43,040
2004	95,077	9,360	104,437

GENETIC STOCK IDENTIFICATION (GSI)

The Co-managers continued genetic stock identification allozyme and/or DNA collections of summer chum spawners throughout the region with 1,178 and 874 fish sampled for DNA during 2003 and 2004, repspectively (Table 2-5 and Table 2-6). In addition, many scale samples can be used to increase the number of fish analyzed for DNA. Analysis of the collected data, over time, will allow the comparison of recent and past collections with the goal of monitoring changes in allelic characteristics and of assessing whether the supplementation programs have negatively affected the genetic diversity of natural populations.

New genetic analyses of summer chum allozyme and DNA collections have recently been completed and are presented as appendix reports to SCSCI Supplemental Report No. 4 (WDFW and PNPTT 2003). Kassler and Shaklee (2003) examined recently collected allozyme data for summer chum salmon populations in Hood Canal and Strait of Juan de Fuca and compared the new data with previously collected allozyme data. The results indicated that the eight currently recognized summer chum stocks (2 in Strait of Juan de Fuca and 6 in Hood Canal) generally are significantly different from each other. Small and Young (2003) reported on the genetic analysis of summer and early fall chum salmon populations in Hood Canal, Strait of Juan de Fuca, and South Puget Sound using microsatellite DNA. Summer chum of Hood Canal formed a group distinct but associated with summer chum of the Strait of Juan de Fuca and the study found that individual fish can be assigned to their region of origin. Additional summer chum samples were recently added to improve the DNA baseline (Small et al. 2006) and the baseline was used to assign individual summer chum with "ambiguous" otolith marks to their region and stream of origin and/or to identify potential straying of hatchery-origin summer chum (e.g., see Mark Recovery sub-section, below).

The SCSCI summer chum harvest Base Conservation Regime requires that all chum salmon be released in the Washington Catch Area 7 Reef Net fishery between the dates of August 1 and September 30 (SCSCI Section 3.5.6.1, page 309). This restriction was based on the possibility that summer chum might be present, however, no stock identification studies had been conducted in the area during the specified time period. During the 2002 season, 200 chum salmon samples were collected from the Area 7 Reef Net fishery during two weeks, starting on September 21 and ending September 29, 2002. The WDFW Genetics Lab conducted standard allozyme GSI analyses and the results reported by Kassler (2004) concluded there was no compelling evidence that any chum from the Hood Canal summer chum ESU were harvested in this fishery. During 2003, more samples were collected from the fishery and allozyme results indicate that some (13.9% +/- 7.3%) Hood Canal summer chum were present.

The Puget Sound Technical Recovery Team (TRT) is charged with identifying independent populations within the Hood Canal summer chum ESU that would be the focus of recovery activities under the ESA. Based on analysis of allozyme and microsatellite Based on DNA data, historical and present geographical distribution, straying patterns, and life history variation information provided by the co-managers, the TRT identified two independent populations: one in the Strait of Juan de Fuca, and the other in Hood Canal (PSTRT 2007). The TRT analyses indicated that the extant stocks identified by the co-managers in the SCSCI, as well as spawning aggregations that have disappeared from some streams, were important for viability of the Hood Canal and Strait of Juan de Fuca independent populations. In addition, genetic analyses

suggested that genetic differences observed among some spawning aggregations might be partially explained by increased geographical isolation as a result of local extinctions in southern and eastern Hood Canal and Admiralty Inlet.

Finally, GSI analysis has been used to help resolve questions about program of origin for supplementation fish that could not be definitively identified by otolith techniques. This analysis is discussed below in the Supplementation Returns/Straying section.

BIOLOGICAL DATA (AGE, SIZE, AND SEX DATA)

The genetic, otolith, and scale collections made from summer chum salmon in eastern Strait of Juan de Fuca and Hood Canal streams during 2003 and 2004 are shown in Table 2-5 and Table 2-6. Collection efforts were the largest yet, with over 2,400 fish sampled for otoliths in 2003, and over 3,600 in 2004. Scale sampling numbers were also the largest to date, with over 3,400 fish sampled in 2003, and over 4,100 in 2004. Age composition for each stream as determined from scale collections is presented in Table 2-7 for 2003 and Table 2-8 for 2004. Although sample sizes were generally very good, estimates of age composition likely improved as the proportion of the total escapement sampled increased. In addition, with sample sizes of 200 to 400 fish per stream, for a confidence level of 0.80-0.90, the confidence interval half-width was +/- 5%-10% (Thompson 1987). Scale and otolith information are used as described in the Mark Recovery section of this report for estimating natural productivity and supplementation return rates. In addition to the collection of genetic, otolith, and scale samples taken, sampled fish were measured (fork length in mm) and identified to sex.

A basic analysis of available length data was prepared, comparing the mean size of returning supplementation-origin fish from each program (including fish straying to other watersheds) vs. the mean size of natural-origin fish returning to the program stream, and comparing mean size of fish collected for broodstock in supplementation streams vs. mean size of fish spawning naturally in the same stream. For streams without supplementation programs, the mean lengths of natural-origin fish were compared to the mean lengths of stray supplementation-origin fish recovered in the stream. Means were calculated by sex and age class (data are only presented for age 3 and 4 fish, due to small sample sizes of age 2 and 5 fish). Results are presented graphically in Appendix Report 3. Figures AR3-1 through AR3-9 show the data as means with 95% confidence intervals, and Figures AR3-10 through AR3-17 show the data as length frequency histograms. The means, standard deviations, sample sizes, and confidence intervals are presented in Table AR3-1. Years of collection vary between programs, but all results are from collections occurring between 1998 and 2004.

It appears that summer chum collected for broodstock are representative of the summer chum returns and that supplementation programs have not affected the size of returning adults. Although significance testing on the mean lengths has not been conducted, in general the confidence intervals for each group (within age and sex classifications) tend to overlap. There are some exceptions, some of which were attributable to sample sizes insufficient for meaningful comparisons. The year-to-year comparison for Salmon Creek shows year-to-year variability in size for each age/sex class, but does not appear to show any trend over time. As more data is accumulated, these length analyses will be continued and expanded, to determine whether broodstock collection continues to be representative of returns, and whether supplementation may have any effect on size of returning adults.

Table 2-5. Genetic, otolith, and scale collections made from adult summer chum salmon in Puget Sound fisheries and eastern Strait of Juan de Fuca and Hood Canal streams, 2003.

Stream	WRIA	GSI code	Sample size				Collection method
			Allozyme	DNA	Otolith	Scales	
Catch Area 7/7A	--	--	203[1]	203[1]	203[1]	203[1]	Reef net
Dungeness River	18.0018	--	0	0	0	0	Spawner survey
Jimmycomelately[2]	17.0285	03FB	0	97	199	189	Trap, foot survey
Salmon Cr.[2]	17.0245	03FC	0	130	361	361	Trap, foot survey
Snow Cr.	17.0219	03FD	0	0	72	77	Foot survey
Chimacum Cr.[2]	17.0203	--	0	0	122	126	Foot survey
Thorndyke Cr.	17.0170	--	0	0	0	0	Foot survey
Little Quilcene R.	17.0076	03FE	0	0	86	139	Foot survey
Big Quilcene R.[2]	17.0012	--	0	0	0	396	Foot survey, seine (Quil Bay)
Dosewallips R.	16.0442	03FF	0	171	238	493	Foot survey
Duckabush R.	16.0351	03FG	0	80	170	309	Foot survey
Fulton Cr.	16.0332	--	0	0	0	0	Foot survey
Hamma Hamma R.[2]	16.0251	03FH	0	107	164	223	Seine, foot survey
Lilliwaup R.[2]	16.0230	03FI	0	141	244	247	Trap, foot survey
Little Lilliwaup	16.0228	--	0	0	0	0	Foot survey
Union R.[2]	15.0503	03FJ	0	177	405	476	Trap, foot survey
Stavis Cr.	15.0404	--	0	0	0	0	Foot survey
Dewatto R.	15.0420	03FL	0	0	2	3	Foot survey
Big Beef Cr.[2]	15.0389	03FM	0	72	163	222	Trap, foot survey
Little Anderson	15.0377	--	0	0	0	0	Foot survey
Totals			**203**	**1,178**	**2,429**	**3,464**	

[1] Allozyme results indicate 13.9% (+/- 7.3%) of chum sampled in Area 7/7A reef net fishery were from Hood Canal summer chum ESU.
[2] Stream has supplementation or reintroduction program.

Table 2-6. Genetic, otolith, and scale collections made from adult summer chum salmon in Hood Canal and eastern Strait of Juan de Fuca streams, 2004.

Stream	WRIA	GSI code	Sample size				Collection method
			Allozyme	DNA	Otolith	Scales	
Dungeness River	18.0018	04GR	0	4	8	8	Foot survey
Jimmycomelately Cr.[1]	17.0285	04GS	0	61	299	283	Trap, foot survey
Salmon Cr.[1]	17.0245	04GT	0	46	400	400	Trap, foot survey
Snow Cr.	17.0219	04GU	0	11	100	97	Foot survey
Chimacum Cr.[1]	17.0203	04HM	0	0	228	229	Foot survey
Thorndyke Cr.	17.017	--	0	0	0	0	Foot survey
Little Quilcene R.	17.0076	04GV	0	47	157	298	Foot survey
Big Quilcene R.[1]	17.0012	--	0	123	77	357	Foot survey, seine (Quil. Bay)
Dosewallips R.	16.0442	04GW	0	0	487	550	Foot survey
Duckabush R.	16.0351	04GX	0	0	556	625	Foot survey
Fulton Cr.	16.0332	--	0	0	0	0	Foot survey
Hamma Hamma R.[1]	16.0251	04GY	0	64	409	445	Seine, foot survey
Lilliwaup R.[1]	16.023	04GZ	0	95	321	305	Trap, foot survey
Little Lilliwaup	16.0228	--	0	0	0	0	Foot survey
Union R.[1]	15.0503	04HA	0	359	336	341	Trap, foot survey
Stavis Cr.	15.0404	--	0	0	0	0	Foot survey
Dewatto R.	15.0420	--	0	0	8	8	Foot survey
Big Beef Cr.[1]	15.0389	04HD	0	64	230	233	Trap, foot survey
Little Anderson	15.0377	--	0	0	0	0	Foot survey
Totals			**0**	**874**	**3,616**	**4,179**	

[1] Stream has supplementation or reintroduction program.

Table 2-7. Age composition for summer chum salmon sampled from eastern Strait of Juan de Fuca and Hood Canal streams, 2003.

Stream	WRIA	Number sampled	Age 2 No.	Age 2 %	Age 3 No.	Age 3 %	Age 4 No.	Age 4 %	Age 5 No.	Age 5 %	Total No. aged
Jimmycomelately[1]	17.0285	189	10	5.3%	116	61.4%	63	33.3%	0	0.0%	189
Salmon Cr.[1]	17.0245	361	2	0.6%	259	72.3%	94	26.3%	3	0.8%	358
Snow Cr.	17.0219	77	0	0.0%	57	74.0%	20	26.0%	0	0.0%	77
Chimacum Cr.[1]	17.0203	126	2	1.6%	68	55.3%	52	42.3%	1	0.8%	123
Little Quilcene	17.0076	139	1	0.7%	87	63.0%	50	36.2%	0	0.0%	139
Big Quilcene R.[1]	17.0012	396	0	0.0%	282	71.2%	112	28.3%	2	0.5%	396
Dosewallips R.	16.0442	493	4	0.8%	356	74.5%	117	24.5%	1	0.2%	478
Duckabush R.	16.0351	309	0	0.0%	208	68.4%	96	31.6%	0	0.0%	304
Hamma Hamma R.[1]	16.0251	223	2	1.0%	91	43.5%	115	55.0%	1	0.5%	209
Lilliwaup R.[1]	16.0230	247	7	2.9%	179	74.6%	54	22.5%	0	0.0%	240
Union R.[1]	15.0503	476	1	0.2%	416	94.3%	23	5.2%	1	0.2%	441
Dewatto R.	15.0420	3	0	0.0%	1	100%	0	0.0%	0	0.0%	1
Big Beef Cr.[1]	15.0389	222	4	1.8%	189	87.1%	24	11.1%	0	0.0%	217

[1] Stream has supplementation or reintroduction program.

Table 2-8. Age composition for summer chum salmon sampled from eastern Strait of Juan de Fuca and Hood Canal streams, 2004.

Stream	WRIA	Number sampled	Age 2 No.	Age 2 %	Age 3 No.	Age 3 %	Age 4 No.	Age 4 %	Age 5 No.	Age 5 %	Total No. aged
Dungeness River	18.0018	7	0	0.0%	1	14.3%	5	71.4%	1	14.3%	7
Jimmycomelately[1]	17.0285	286	0	0.0%	243	85.9%	40	14.1%	0	0.0%	283
Salmon Cr.[1]	17.0245	400	1	0.3%	143	35.8%	250	62.5%	6	1.5%	400
Snow Cr.	17.0219	100	0	0.0%	32	33.0%	64	66.0%	1	1.0%	97
Chimacum Cr.[1]	17.0203	232[2]	0	0.0%	140	61.1%	88	38.4%	1	0.4%	229
Little Quilcene	17.0076	303	0	0.0%	13	4.4%	284	95.3%	1	0.3%	298
Big Quilcene R.[1]	17.0012	?	0	0.0%	82	23.0%	273	76.5%	2	0.6%	357
Dosewallips R.	16.0442	558	0	0.0%	40	7.3%	508	92.4%	2	0.4%	550
Duckabush R.	16.0351	629	0	0.0%	51	8.2%	574	91.8%	0	0.0%	625
Hamma Hamma R.[1]	16.0251	447	0	0.0%	95	21.3%	350	78.7%	0	0.0%	445
Lilliwaup R.[1]	16.0230	321	0	0.0%	230	75.4%	75	24.6%	0	0.0%	305
Union R.[1]	15.0503	359	1	0.3%	138	40.5%	201	58.9%	1	0.3%	341
Dewatto R.	15.0420	8	0	0.0%	5	62.5%	3	37.5%	0	0.0%	8
Big Beef Cr.[1]	15.0389	234	0	0.0%	174	74.7%	58	24.9%	1	0.4%	233

[1] Stream has supplementation or reintroduction program.

[2] Includes samples from Kala Point Lagoon

MARK RECOVERY

Summer chum fry from all supplementation and reintroduction programs are marked to allow for differentiation from natural-origin fish upon return as adults in fisheries, at broodstock traps, and on the spawning grounds. For the supplementation program on Big Quilcene River, all fry have been adipose-fin-clipped beginning with brood year 1997. The summer chum released from all other supplementation programs have their otoliths thermally mass-marked at the embryo stage; each program receives unique otolith marks. Due to the low rate of interception in fisheries, mark recovery has concentrated on spawning ground rather than fishery recoveries. Examination of otoliths recovered from spawned adults and checking adults for presence/ absence of adipose fins provides a method to separate the number of supplementation (hatchery) fish from the number of naturally spawning fish and assists in determining the contribution of the supplementation program to the summer chum population. In addition, adipose-fin-clipping and otolith-marking make it possible to determine the level of straying of supplementation program-origin fish to other drainages. This means that all adults sampled can be classified as natural or supplementation origin, and supplementation-origin fish can be identified to their stock of origin, allowing estimation of total returns for each group.

Marked summer chum adults produced by the supplementation or reintroduction programs began returning to streams mostly during 2000, 2001, and 2002; the exceptions are Salmon Creek and Union River which had marked adult returns beginning in 1996 and 2003, respectively, and Tahuya River which did not have program returns until 2006 (Table 2-9). The numbers of summer chum salmon sampled for fin-clips or otoliths during 2003 and 2004 in eastern Strait of Juan de Fuca and Hood Canal streams are shown in Tables 2-5 and 2-6.

Table 2-9. Brood years that summer chum salmon supplementation or reintroduction programs and mass marking of fry releases (otolith marking or adipose clipping) were initiated and terminated in Hood Canal and eastern Strait of Juan de Fuca streams; and the first year marked adults from the program were/are expected to return.

Supplementation/reintroduction program	Brood year program initiated	Brood year mass marking initiated	First year marked adults to return[1]	Brood year program terminated
Salmon Creek	1992	1993	1996	2003
Big Quilcene River[2]	1992	1997	2000	2003
Lilliwaup Creek[3]	1998	1997	2000	
Chimacum Creek (reintroduction)	1996	1999	2002	2003
Big Beef Creek (reintroduction)	1996	1998	2001	
Hamma Hamma River	1997	1997	2000	
Jimmycomelately Creek	1999	1999	2002	
Union River	2000	2000	2003	2003
Tahuya River (reintroduction)	2003	2003	2006	

1. First year of returning age 3 fish is shown. Most adults return at age 3 and 4, with a few returns at ages 2 and 5.
2. Mass marked with adipose clip. All other programs use otolith marking.
3. Attempts to initate supplementation at Lilliwaup began in 1992, but broodstock collection efforts were largely unsuccessful until the 1998 brood, when a functional trap was first installed on the creek.

Otoliths were collected from adult summer chum salmon returning to spawn in Hood Canal and eastern Strait of Juan de Fuca streams and the fish were examined for adipose fin clips by WDFW, USFWS and tribal staffs, and staff or volunteers from Hood Canal Salmon Enhancement Group (HCSEG), Long Live The Kings (LLTK), North Olympic Salmon Coalition (NOSC) and Wild Olympic Salmon (WOS). Adult summer chum were sampled after spawning on the spawning grounds or after being spawned as broodstock for the supplementation/ reintroduction programs. Otolith analyses were conducted by WDFW's Fish Program Otolith Laboratory staff.

Both the number of fish and the number of streams sampled increased from 2000 through 2004 as marked adults were expected to return from more supplementation programs, more streams without supplementation programs were sampled, and escapements increased. The actual numbers of otolith-marked or adipose marked (AD-clipped) adults sampled were expanded based on the percentage of the total spawner escapement sampled for otolith marks or AD-clips in each stream. The expanded estimates probably improve as the proportion of the total escapement sampled increases.

DATA ANALYSIS

The analysis of mark recovery data was done in successive steps, but only the expanded results are presented and discussed in this report. The mark recovery analysis presented in WDFW and PNPTT (2003) for the years 2000-2002 is similar, but expansions from the number of sampled fish to total escapements were simply based on total numbers of fish sampled. The analysis in this report calculates expansions based on age-specific otolith mark and AD-clip data and yields slightly different results, since age composition of otolith and AD-clip sampled fish varied slightly from total stock age composition in most cases. The mark recovery data and results presented here should take precedence over those in previous reports.

Through a series of calculations and expansions, the total escapements of adipose-clipped fish, otolith marked fish, and unmarked fish (i.e., without adipose or otolith marks) were estimated for each stream. Using these numbers, it is possible to calculate total natural-origin returns and productivity, supplementation return rates, and to determine numbers of supplementation-origin fish straying to sampled streams other than their stream of origin. For productivity and supplementation return rate calculations, these escapement numbers were expanded to represent total runsize (using proportional escapement assumptions similar to those used by the run reconstruction model).

Interpretation of the mark recovery data is sound, but is complicated by several caveats. First, mass marking was not under way for all supplementation programs until brood year 1997. This means that not all supplementation-origin fish returning prior to 2002 were marked; the last unmarked supplementation-origin fish returned as 5-year olds in 2001. In addition, not all streams were sampled for otoliths every year although coverage was generally very good. For example, the Dosewallips and Duckabush were sampled for adipose clips, but were not sampled for otoliths in 2000 and 2001. This means that the actual number of natural-origin recruits (NORs) was likely smaller than the number calculated, and the actual number of supplementation-origin strays was likely higher in the Dosewallips and Duckabush in 2000 and 2001. For reintroduction programs at Big Beef and Chimacum creeks, supplementation fish

were not marked for the first brood, as all returns were assumed to be of supplementation origin until natural-origin returns became a possibility. This means that any of these returning reintroduction-origin fish straying to other streams would have been classified as NORs, and that stray NORs from other streams entering these reintroduction streams would have been classified as supplementation-origin recruits (SORs).

The lack of reference collections for some mark groups, and ambiguous otolith marks placed on some groups (e.g., due to not strictly following the assigned otolith marking schedule at the hatchery) made assignment of some returning adults to a specific program impossible (although they were distinguishable as supplementation origin, and often could be narrowed to two or three likely programs of origin). This problem was substantial with the 2003 and 2004 returns. In an attempt to assign these fish to a particular program, DNA analysis was conducted on a portion of the samples with ambiguous otoliths, and the results of that analysis were used to assign program of origin to fish with the same combination of possible marks. If DNA and/or otolith analysis did not provide a conclusive result or if DNA analysis was not done due to lack of sufficient funding, the fish were assigned to the category 'marked, origin indefinite.' In some cases, this could represent a fish that was returning to its stream of origin, but whose release group was missing a reference collection, making assignment to the appropriate program impossible. Scale age was also used to resolve ambiguous marks whenever possible. Many of the data tables included in this section and in Appendix Tables 3 through 17 have footnotes explaining some, but not all of the issues discussed here. Finally, no attempt was made to put confidence intervals on these estimates, due to the difficulties that task would present.

TOTAL NATURAL-ORIGIN VS. SUPPLEMENTATION-ORIGIN RETURNS

At the broadest level, this mark-recovery analysis yields estimates of total numbers of natural-origin and supplementation-origin summer chum returning each year. The natural-origin estimates are of particular interest for evaluation of the productivity of summer chum at a broad scale. The year 2001 was the first where the vast majority of returning summer chum of supplementation origin was marked. The exceptions in 2001 were age-5 fish returning from the Quilcene and Lilliwaup programs, and portions of the returns to the Big Beef and Chimacum reintroduction program, all of which were assumed to be of supplementation origin in 2001. Table 2-10 shows the total estimates of natural-origin recruits (NORs) and supplementation-origin recruits (SORs) escaping from 2001 through 2004, in Hood Canal and the Strait of Juan de Fuca. Table 2-11 shows similar estimates, expanded to total runsize. For the ESU, natural origin fish accounted for 54% to 83% of total escapement, and from 54% to 86% of total runsize between 2001 and 2004. Table 2-12 shows NOR and SOR escapement estimates at the Management Unit and stream levels, and Table 2-13 shows NOR and SOR runsize estimates at the Management Unit level.

Table 2-10. Estimates of total **escapement** of natural and supplementation origin fish returning to streams in Hood Canal and Strait of Juan de Fuca, 2001-2004.

		2001		2002		2003		2004	
Region	Origin	No.	%	No.	%	No.	%	No.	%
Hood Canal	Natural origin	7,170	59.5%	6,853	59.8%	27,319	76.5%	60,296	86.1%
	Supp. origin	4,839	40.2%	4,591	40.1%	8,377	23.5%	9,666	13.8%
	Undetermined origin*	35	0.3%	10	0.1%	0	0.0%	33	0.0%
	Total	12,044		11,454		35,696		69,995	
Strait of Juan de Fuca	Natural origin	1,473	37.2%	4,215	60.6%	4,282	61.5%	5,597	59.9%
	Supp. origin	2,482	62.8%	2,740	39.4%	2,677	38.5%	3,621	38.8%
	Undetermined origin*	0	0.0%	0	0.0%	0	0.0%	123	1.3%
	Total	3,955		6,955		6,958		9,341	
Hood Canal ESU	Natural origin	8,643	54.0%	11,068	60.1%	31,601	74.1%	65,893	83.1%
	Supp. origin	7,321	45.8%	7,331	39.8%	11,054	25.9%	13,287	16.7%
	Undetermined origin*	35	0.2%	10	0.1%	0	0.0%	156	0.2%
	Total	15,999		18,424		42,654		79,336	

* Undetermined origin represents fish escaping to streams where no carcasses were sampled for marks
Estimates may vary slightly from total estimates presented earlier due to rounding error.

Table 2-11. Estimates of total **runsizes** of natural and supplementation origin fish returning to streams in Hood Canal and Strait of Juan de Fuca, 2001-2004.

		2001		2002		2003		2004	
Region	Origin	No.	%	No.	%	No.	%	No.	%
Hood Canal	Natural origin	7,831	58.5%	8,047	61.1%	27,494	76.3%	83,845	88.2%
	Supp. origin	5,509	41.1%	5,103	38.8%	8,429	23.4%	11,199	11.8%
	Undetermined origin*	47	0.4%	20	0.1%	101	0.3%	33	0.0%
	Total	13,375		13,170		36,024		95,077	
Strait of Juan de Fuca	Natural origin	1,483	37.3%	4,231	60.6%	4,317	61.5%	5,608	59.9%
	Supp. origin	2,499	62.7%	2,750	39.4%	2,699	38.5%	3,628	38.8%
	Undetermined origin*	0	0.0%	0	0.0%	0	0.0%	123	1.3%
	Total	3,982		6,981		7,016		9,360	
Hood Canal ESU	Natural origin	9,308	53.6%	12,277	61.0%	31,811	74.0%	89,453	85.7%
	Supp. origin	8,003	46.1%	7,854	39.0%	11,128	25.8%	14,827	14.2%
	Undetermined origin*	47	0.3%	20	0.0%	101	0.2%	156	0.1%
	Total	17,358		20,151		43,040		104,437	

* Undetermined origin represents fish escaping to streams where no carcasses were sampled for marks
Estimates may vary slightly from total estimates presented earlier due to rounding error.

Table 2-12. Estimates of natural-origin and supplementation-origin **escapement** for Hood Canal and Strait of Juan de Fuca summer chum management units and streams from 2001 through 2004.

Management Unit (MU)	Stream	Origin	Return year			
			2001	2002	2003	2004
Sequim Bay	**Jimmycomelately**	Nat. origin	251	2	68	613
		Supp. origin	9	55	378	1,049
Discovery Bay	**Salmon**	Nat. origin	1,168	3,745	3,785	4,103
		Supp. origin	1,470	1,772	1,866	1,918
	Snow	Nat. origin	54	340	203	289
		Supp. origin	100	192	101	107
	MU total	Nat. origin	1,222	4,085	3,988	4,392
		Supp. origin	1,570	1,964	1,967	2,025
Port Townsend	**Chimacum**	Nat. origin	0	128	227	592
		Supp. origin	903	736	331	547
Quilcene/Dabob Bays	**Big Quilcene**	Nat. origin	2,905	2,818	9,960	32,867
		Supp. origin	3,269	1,199	1,883	2,241
	Little Quilcene	Nat. origin	143	393	780	2,971
		Supp. origin	56	77	110	74
	MU total	Nat. origin	3,048	3,211	10,740	35,838
		Supp. origin	3,325	1,276	1,993	2,315
Mainstem Hood Canal	**Dosewallips**	Nat. origin	757	1,313	6,510	10,284
		Supp. origin	233	314	556	1,265
	Duckabush	Nat. origin	662	355	1,600	7,850
		Supp. origin	280	175	269	787
	Hamma	Nat. origin	1,155	1,050	536	2,409
		Supp. origin	72	1,278	318	282
	Lilliwaup	Nat. origin	41	36	27	136
		Supp. origin	51	822	326	881
	Dewatto	Nat. origin	N/A**	N/A**	0	6
		Supp. origin	N/A**	N/A**	9	17
	Big Beef	Nat. origin	16	15	0	174
		Supp. origin	878	727	896	1,742
	MU total	Nat. origin	2,631	2,770	8,673	20,859
		Supp. origin	1,514	3,315	2,374	4,974
SE Hood Canal	**Union**	Nat. origin	1,491	872	7,906	3,598
		Supp. origin	0	0	4,010	2,378 *

Dosewallips and Duckabush were sampled for adipose clips but not for otoliths marks in 2001.

** Escapements to Dewatto of 32 fish in 2001 and 10 fish in 2002 were sampled for adipose clips, but not for otolith marks.

Table 2-13. Estimates of natural-origin and supplementation-origin **runsize** for Hood Canal and Strait of Juan de Fuca summer chum management units from 2001 through 2004.

Management Unit (MU)	Origin	Return year 2001	2002	2003	2004
Sequim Bay	Nat. origin	253	2	69	614
	Supp. origin	9	55	381	1,051
Discovery Bay	Nat. origin	1,230	4,100	4,021	4,402
	Supp. origin	1,581	1,972	1,983	2,028
Port Townsend	Nat. origin	0	129	229	593
	Supp. origin	909	738	334	548
Quilcene/Dabob Bays	Nat. origin	3,632	4,330	10,850	59,333
	Supp. origin	3,964	1,720	2,013	3,833
Mainstem Hood Canal	Nat. origin	2,676	2,827	8,748	20,905
	Supp. origin	1,540	3,383	2,394	4,984
SE Hood Canal	Nat. origin	1,517	890	7,974	3,606
	Supp. origin	0	0	4,045	2,383

PRODUCTIVITY

Productivity is a measurement of the number of adult salmon that are ultimately produced by each year's spawning escapement. Since the summer chum salmon from a given year's spawner population (brood year) return as 2-, 3-, 4-, and 5-year old fish, it is necessary to have reliable age composition data for each annual return, so that fish can be assigned to individual brood years. The compiled total return for each brood year is divided by the number of parent spawners to arrive at the brood year productivity, typically expressed as recruits per spawner (R/S). The SCSCI performance standards included a minimum value for mean R/S rates that would contribute to stability and recovery of summer chum, and the SCSCI interim recovery goals (PNPTT and WDFW 2003) include R/S threshold criteria that represent recovery.

Although previous reports in the SCSCI series recognized the importance of R/S rates as an indicator of stock performance, attempts to address brood productivity were not made, as age composition data were insufficient for estimating recruits by brood year. Increased scale and otolith data collection in recent years have made it possible to begin estimating productivity for a limited number of broods. When interpreting the productivity estimates, it is necessary to keep in mind the limitations of the mark recovery expansions discussed earlier. These estimates assume that all natural-origin recruits return to their home stream. Any exchanges (or straying) of natural origin recruits are not detectable, but are included in the stream-by-stream productivity estimates.

Productivity estimates of natural spawners are presented for the Hood Canal and Strait of Juan de Fuca regions, and for the Hood Canal summer chum ESU, in Table 2-14. Productivity estimates are not available prior to the 1996 brood in either region due to insufficient age data collected prior to the 1999 return year. An estimate is not available for the 1996 brood in Hood Canal because supplementation origin fish released prior to the 1997 brood were not marked.

Total natural-origin R/S estimates for each management unit and stock are shown in Table 2-15 for each brood year with available data. Rates are highly variable from stock to stock and from year to year, although trends are visible for across stocks between years. Productivity was lowest for all stocks for the 1996 brood year and highest for almost all stocks for the 2000 brood year. Because brood returns are incomplete for the 2001 and 2002 broods, estimates are not presented here. Tables detailing the recruit/spawner estimates for each stock are included in Appendix Table 3 through Appendix Table 12. Data for the partially complete broods are included in those tables.

Table 2-14. Hood Canal summer chum brood-year based wild escapement, natural-origin brood return, and natural-origin recruit per spawner (R/S) estimates for the 1996 through 2000 broods by region, and for the whole ESU.

		Brood year				
Region		1996*	1997	1998	1999	2000*
Hood Canal Region	Brood wild escapement	19,707	8,412	3,404	3,882	7,987
	Total NOR brood return	N/A**	7,057	3,762	12,073	87,509
	R/S	N/A**	**0.84**	**1.11**	**3.11**	**10.96**
Strait of Juan de Fuca Region	Brood wild escapement	975	852	1,148	502	801
	Total NOR brood return	171	1,132	1,296	5,053	6,590
	R/S	**0.18**	**1.33**	**1.13**	**10.07**	**8.23**
Hood Canal ESU	Brood wild escapement	20,682	9,264	4,552	4,384	8,788
	Total NOR brood return	N/A**	8,189	5,059	17,126	94,099
	R/S	N/A**	**0.88**	**1.11**	**3.91**	**10.71**

Estimates for early broods subject to caveats listed in text and appendix tables on mark recovery

* Partial brood returns - 1996 - does not include age 2 returns for most streams
2000 - does not include age 5 returns (to occur in 2005)
2001 - only age 3 return data available, included in Appendix Tables 3 to12

** Because 1996 brood Quilcene and Lilliwaup supplementation releases were not marked, natural-origin returns cannot be separated from supplementation-origin returns.

Table 2-15. Productivity estimates (natural-origin recruits/spawner) for Hood Canal and Strait of Juan de Fuca summer chum management units and stocks, brood years 1996 through 2000.

Management Unit (MU)	Stock	Brood year				
		1996 [1]	1997	1998	1999	2000 [1]
Sequim Bay	**Jimmycomelately**	0.03	1.39	2.26	8.78	16.68
Discovery Bay	**Salmon/Snow**	0.18	1.32	1.02	10.48	8.13
Port Townsend	**Chimacum**	N/A[2]	N/A[2]	N/A[2]	4.54	6.50
Quilcene/Dabob Bays	**Big/Little Quilcene**	N/A[3]	0.44	0.57	2.27	9.62
Mainstem Hood Canal	**Dosewallips**	0.22	9.74	2.83	6.26	11.63
	Duckabush	0.17	0.99	1.37	7.81	18.05
	Hamma	0.58	8.13	6.35	4.40	12.78
	Lilliwaup	N/A[3]	3.01	10.76	N/A[4]	45.87[4]
	Big Beef	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
	MU total	0.23	2.83	2.91	5.92	13.34
SE Hood Canal	**Union**	0.19	4.86	1.80	7.79	15.06

Estimates for early broods subject to caveats listed in text and Appendix Tables 3-12.

1. Partial brood returns - 1996 - does not include age 2 returns for most streams
2000 - does not include age 5 returns (to occur in 2005)
2001 - only age 3 return data available, included in Appendix Tables 3-12

2. There were no wild spawners in Chimacum and Big Beef prior to reintroduction programs, meaning there was no natural productivity.

3. Big Quilcene and Lilliwaup supplementation-origin fish were not marked, so estimation of natural-origin return is not possible.

4. Although 1999 brood year NOR's did return to Lilliwaup Creek, the 1999 natural spawning escapement estimate was zero, meaning that either natural spawners were present but not seen during surveys, or that the returning NOR's strayed from another system. A similar scenario arose with the 2000 brood, where a parent escapement of only 2 fish led to returns of 91 NOR's.

SUPPLEMENTATION RETURNS/STRAYING

Most supplementation program adults have been recovered in their stock's own watersheds, however, some of the program adults have also been recovered in other streams each year. Most exchange (or straying) of supplementation-origin fish occurred between neighboring streams within the region of origin. The natural exchange (or stray) rate for Hood Canal and eastern Strait of Juan de Fuca summer chum stocks or populations is not known.

Return rates for supplementation programs, and brief discussion of straying of supplementation fish to other streams, are discussed in detail in section 4 (artificial production) under the individual project discussions. For year-by-year estimates of stray supplementation returns by program of origin and stream of recovery, see Appendix Table 13 through Appendix Table 17. The issue of straying of supplementation fish is difficult to interpret completely for some programs, due partially to the problems with definite assignment of some marked otoliths to programs.

Several references have been made to ambiguous otolith marks, not assignable to a single program. This problem is primarily only seen with the 2003 and 2004 returns. To give some idea of the magnitude of the problem, in 2004 nearly 1,175 marked otoliths were recovered. Of those, 428 could not be attached to a specific supplementation program, even after using DNA analysis to assign many of the ambiguous otoliths (note: not all ambiguous otoliths were analyzed with DNA so more assignments may be possible). This large number of ambiguous marks expands to an escapement estimate of 3,097 supplementation fish not attributable to a specific program. However, DNA analysis was used and able to assign supplementation fish to the region of origin (i.e., either Hood Canal or Strait of Juan de Fuca) with a high level of confidence. The presence of ambiguous otolith marks must, however, be considered when interpreting supplementation return rate and straying data within each region.

As mentioned earlier, summer chum stocks from the Strait of Juan de Fuca and Hood Canal regions have been identified as independent populations within the ESU. While some straying of supplementation (and natural) origin fish between streams within each population's geographic region is expected, straying between regions should be much less common. In fact, recoveries of supplementation-origin fish in streams outside their region have been rare. No such recoveries occurred in 2000. In 2001, 2002, 2003, and 2004, there were 1, 2, 4, and 10 actual recoveries of supplementation-origin fish outside their region of origin. These recoveries expand to estimates of 3, 17, 16, and 61 supplementation-origin fish straying between regions (Table 2-16, see Appendix Tables 13 through 17 for details by program and stream). In addition, of those 17 total recoveries (97 expanded estimate), 9 were either released from or recovered in Chimacum Creek (38 expanded estimate), which is located near the boundary used to distinguish the Strait of Juan de Fuca and Hood Canal populations, and might be expected to act as a stepping-stone for gene flow between the two.

Table 2-16. Total escapement, escapement of supplementation fish straying between regions, and percentage of total escapement represented by inter-region strays for Hood Canal and Strait of Juan de Fuca summer chum, 2001-2004.

	2001	2002	2003	2004
Hood Canal				
Total escapement	12,044	11,454	35,696	69,995
Estimated strays from SJF supplementation programs	0	12	12	31
% of total escapement straying from SJF supp. programs	0.00%	0.10%	0.03%	0.04%
Strait of Juan de Fuca				
Total escapement	3,955	6,955	6,958	9,341
Estimated strays from HC supplementation programs	3	5	4	30
% of total escapement straying from HC supp. programs	0.08%	0.07%	0.06%	0.32%
Hood Canal/SJFuca ESU				
Total escapement	15,999	18,409	42,654	79,336
Estimated strays from supplementation programs	3	17	16	61
% of total escapement straying from out-of-region supp. programs	0.02%	0.09%	0.04%	0.08%

EXTINCTION RISK UPDATE

The extinction risk faced by individual summer chum stocks is assessed periodically based on the methodology proposed by Allendorf et al. (1997), and discussed in section 1.7.4 of SCSCI. The Allendorf et al. (1997) methodology consists of a set of procedures for rating extinction risk and for providing estimation of the possible consequences of extinction for Pacific salmon stocks. The methods for estimating extinction risk use either population viability analysis (PVA) or a set of surrogate measures that include current population size parameters and population trends.

The methods used to assess extinction risk result in the ranking of individual stocks into one of four categories: very high, high, moderate, and special concern (see SCSCI Table 1.11). For the purposes of assessment, a "low" category was added for defining stocks that did not fit any of the above categories and are not at risk of extinction. Hood Canal and Strait of Juan de Fuca summer chum stocks were first rated for extinction risk in the SCSCI (see SCSCI table 1.12). The original risk assessment was subsequently updated in the SCSCI Supplemental Report Nos. 3 and 4 (WDFW and PNPTT 2001, WDFW and PNPTT 2003).

Abundances of summer chum in Hood Canal declined from the late 1970's through the early 1990's (Figure 2-1). All stocks of summer chum in Hood Canal except the Union River suffered declines in abundance during this period, with several stocks becoming extinct, and several others being classified at high risk of extinction based on methods of Allendorf et al. (1997). In the Strait of Juan de Fuca, the decline started approximately 10 years later, with a noticeable and lasting drop of abundance in 1989 (Figure 2-2). By 1992, six of the twelve summer chum stocks

known to have inhabited Hood Canal were extinct, and six were rated at moderate or high risk of extinction; one of the four Strait of Juan de Fuca stocks was extinct, two were rated at high risk of extinction, and one was of unknown status.

Populations rebounded to higher levels quickly in the mid-1990's, after the initiation of harvest reductions and several supplementation programs. Larger escapements were seen from 1995-1997 for the major streams entering the west side of Hood Canal, including a new record escapement for Big Quilcene in 1996, although a significant portion of the Quilcene return was thought to be of supplementation origin (see Artificial Production section for details on supplementation programs and their evaluation). Abundances were down again in 1998 and 1999 (although still five times higher than abundances just prior to recovery efforts), but began to increase in 2000. The 2003 and 2004 escapements were the largest on record, with a total of over 79,000 fish escaping to the ESU in 2004. However, 2004 was the peak return year in a strong 4-year production cycle and production was expected to decline in 2005 as the run cycled down from the high year. Mark data show that about 74% and 83% of the fish returning in 2003 and 2004, respectively, were of natural origin, indicating that success has not been limited to supplementation-origin fish.

Extinction risks for all stocks have decreased since the onset of recovery activities, with increases in population sizes, and effective population sizes per generation greater than 500 for all but two stocks. Table 2-17 summarizes extinction risk criteria based on escapement data from the four years (one generation) before onset of recovery activities, and from the most recent four years. The extinction risk for all extant stocks has decreased. In addition, three stocks have been reintroduced into watersheds where the indigenous stock was extinct, further reducing the extinction risk for the donor stocks and reinitiating natural summer chum production in these streams. Short discussions for each stock follow.

UNION RIVER

Estimated escapements to the Union River show no declining trend over the period of record and, in fact, have increased somewhat since the 1970s, with a larger increase occurring since the onset of supplementation returns. Escapements from 2001-2004 ranged from 872 to 11,916, averaging 5,064 spawners. This stock has shown a recent increasing escapement trend, and its risk of extinction is rated as low.

LILLIWAUP CREEK

Estimated escapements to Lilliwaup Creek range from 92 to 1,017 from 2001-2004, averaging 580 spawners. The effective population size *(N_e)* equals 418 fish for the 2001-04 return years, and total population size *(N)* is 2,088 for the same years. Although previously rated as a high risk of extinction, the increasing population trend leads to a ranking of moderate risk for the Lilliwaup Creek population.

Table 2-17. Mean escapement, effective population size, total population size, population trend, and extinction risk rating for Hood Canal and Strait of Juan de Fuca summer chum stocks for the 4-years preceding onset of recovery actions, and the most recent 4 years. Extinction risk calculations are based on the methodology proposed by Allendorf et al. (1997).

Stock	Escapement (4-year mean)	Effective Population Size (Ne)	Total Population Size (N)	Population Trend	Risk Rating
Union					
1988-1991	391	281	1,406	Stable	Moderate
2001-2004	5,064	3,646	18,230	Increasing	Low
Lilliwaup					
1988-1991	88	63	315	Chronic decline/depression	High
2001-2004	580	418	2,088	Increasing	Moderate
Hamma Hamma					
1988-1991	154	111	555	Chronic decline/depression	High
2001-2004	1,775	1,278	6,390	Increasing	Low
Duckabush					
1988-1991	175	126	631	Chronic decline/depression	High
2001-2004	2,995	2,156	10,780	Increasing	Low
Dosewallips					
1988-1991	234	168	842	Chronic decline/depression	High
2001-2004	5,308	3,822	19,109	Increasing	Low
Big/Little Quilcene					
1988-1991	89	64	319	Chronic decline/depression	High
2001-2004	15,437	11,115	55,572	Stable/increasing	Low
Snow/Salmon					
1989-1992*	283	204	1,018	Precipitous decline	High
2001-2004	5,303	3,818	19,091	Increasing	Low
Jimmycomelately					
1989-1992*	244	176	879	Precipitous decline	High
2001-2004	603	439	2,196	Increasing	Moderate
Dungeness	No data	N/A	N/A	N/A	Special concern

*1989-1992 escapement values used due to later onset of decline of Strait of Juan de Fuca stocks.

HAMMA HAMMA RIVER

The annual average estimated Hamma Hamma system escapement from 2001-04 is 1,775 summer chum, ranging from 854 to 2691 spawners. The effective population size *(N_e)* equals 1,278 fish for the 2001-04 return years, and total population size *(N)* is 6,390 for the same years. Because the population exceeds the high risk abundance criterion (population size, $N_e < 500$ or $N < 2,500$) and is currently increasing relative to the low years from 1987-1993, the risk of extinction is judged to be low.

DUCKABUSH RIVER

The estimated escapement to the Duckabush River ranges from 530 to 8,637 summer chum from 2001-04, averaging 2,995 spawners. The effective population size *(N_e)* equals 2,156 fish for those return years, and total population size *(N)* is 10,780 for the same years. Previously rated as moderate risk of extinction, the increasing population size for this stock exceed the risk abundance criterion *($N_e < 500$ or $N < 2,500$)*, indicating that the risk of extinction for Duckabush summer chum is low.

DOSEWALLIPS RIVER

The 2001 through 2004 annual average escapement of summer chum salmon to the Dosewallips River was 5,308 spawners, ranging from 990 to 11,549 fish. The effective population size *(N_e)* equals 3,822 fish for the 2001-04 return years, and total population size *(N)* is 19,109 for the same years. Escapements have increased substantially over the lows experienced in the 1980s and the recent population size for this stock exceeds the risk abundance criterion *($N_e < 500$ or $N < 2,500$)*, indicating that the current risk of extinction for Dosewallips summer chum is low.

BIG/LITTLE QUILCENE RIVERS

Escapement estimates averaged 15,437 summer chum spawners (range of 4,487 to 38,153) for the Big/Little Quilcene summer chum stock for the 2001 through 2004 return years. The combined (including broodstock removals) total effective population size *(N_e)* equals 11,115 fish for the 2001-2004 return years, and the total population size *(N)* is 55,572 for the same years. These recent returns likely were affected by the existing supplementation project begun in 1992. Based on a stable escapement trend and the large recent escapements, the current extinction risk for this stock is low.

SNOW/SALMON CREEKS

From 2001 through 2004, escapement estimates averaged 5,303 spawners (range of 2,792 to 6,417) for the Snow/Salmon stock. The effective population size *(N_e)* equals 3,818 fish for the 2001-04 return years, and total population size *(N)* is 19,091 for the same years. The recent return estimates were affected by returns to the existing supplementation project begun on Salmon Creek in 1992. Since the stock (with two streams combined) has experienced increasing overall escapements in recent years and average escapement exceeds the population size risk criteria, the current risk of extinction is judged to be low.

JIMMYCOMELATELY CREEK

Escapements for Jimmycomelately Creek for the 2001 to 2004 averaged 603 spawners (range of 42 to 1,662). The effective population size *(N_e)* equals 439 fish for the 2001-04 return years, and total population size *(N)* is 2,196 for the same years. Although the trend for this population is increasing, population sizes meet the high risk criteria (N_e < 500 or N < 2,500), leading to an extinction risk rating of moderate.

DUNGENESS RIVER

Summer chum spawner information comes from observations made in the course of collecting data on Chinook and pink salmon as part of ongoing stock assessment and recovery efforts for these two species. More detailed information is needed before extinction risk can be evaluated and, in the interim, the Dungeness River stock risk is rated to be of special concern.

STOCK ASSESSMENT INFORMATION NEEDS

As noted in section 3.5.12 of the SCSCI, success of the implementation plan is dependent on application of the best current data and data analysis to the management of the summer chum salmon resource. Several stock assessment information needs identified in the SCSCI section 3.5.12 have been addressed by the Co-managers since completion of the SCSCI, including the following:

- The frequency of escapement surveys continues to be excellent with surveys conducted on a weekly basis. This survey coverage provides very good escapement estimates.
- Age composition information is being collected for each management unit from summer chum carcasses on the spawning grounds and/or from broodstock used in the supplementation program. These data are being used to develop estimates of age-specific returns and productivity estimates for each management unit. No biological data were collected from the fisheries because of the general scarcity of summer chum catch and the impracticality of setting up sampling programs for expected very small numbers of fish. It may, however, be possible to sample catch in the Quilcene Bay fishery with some additional planning and effort.
- Contributions of supplementation-origin adults to natural spawning escapement and recovery of program adults in streams other than their streams of release are being determined through marking of all supplementation releases, and sampling for marks on all streams with returning adults.

The level of effort placed in escapement surveys and age/mark sampling must be continued, if the progress of summer chum towards recovery is to be evaluated. As supplementation programs are terminated, mark sampling needs will be affected. Funding will be required for analysis of otolith samples collected in the future, and for analysis of past and future genetic collections.

3) HARVEST MANAGEMENT

INTRODUCTION

The SCSCI established an annual fishing regime (referred to as the Base Conservation Regime or BCR) designed to minimize incidental impacts to summer chum salmon beginning in 2000 for Canadian, Washington pre-terminal, and Washington terminal area fisheries. The intent of the BCR is to initiate rebuilding of the summer chum runs, from the critical or near critical levels of the late 1990s, by establishing ceiling exploitation rates, to provide incremental increases in escapements over time while allowing a limited opportunity to harvest other species. The BCR was constructed using a conservative approach that would pass through to spawning escapement, on average, in excess of 95% of the Hood Canal-Strait of Juan de Fuca summer chum recruitment entering U.S. waters, and nearly 90% of the total recruitment of the run of each management unit.

The SCSCI requires annual post-season abundance assessments for each management unit (MU). Where management units may contain more than one stock (Mainstem Hood Canal), it requires assessment of the abundance distribution among component populations. Critical abundance thresholds are defined for each MU, for both total run size and spawning escapement, and minimum escapement as well as escapement distribution "flags" are further defined for individual stocks within the Mainstem MU. An MU is considered to be in critical status when its run size or escapement in the most recent past return year is lower, or its forecast run size for the coming return year is projected to be lower, than the appropriate threshold value. Minimum escapement and escapement distribution flags are useful planning benchmarks to check for unbalanced performance of individual stocks of the Mainstem MU in years when the overall MU abundance exceeds the critical abundance threshold (see SCSCI Section 1.7.3).

This section summarizes the harvest management actions, and results of those actions, relative to summer chum salmon, in the years 2000 through 2004. The results from these five years, under the Base Conservation Regime, can be generally described as very good.

PRESEASON FORECASTS AND POST SEASON ESTIMATES

Preseason forecasts were calculated as the mean of the preceding five years' recruitment, as estimated by the current post-season run reconstruction. The forecasts include summer chum which are expected to return to a number of streams from supplementation and reintroduction projects. Insufficient age-specific information is currently available to attempt forecasts based on age-specific or cohort returns. Forecasts were made annually for each management unit and these were summed into regional and ESU totals (Table 3-1). Forecasts for the Chimacum unit were made starting in 2002, once sufficient information from past returns was available. Details of the data and methods used in each year have been presented in the co-managers' Hood Canal and Strait of Juan de Fuca Framework Management Plans (PNPTC et al. 2000, 2001, 2002, 2003, and 2004).

An overview of pre-season forecasts (Table 3-1) and postseason results (Table 3-2) compared to abundance thresholds that triggered the various management responses are provided for the entire ESU, and for the Strait of Juan de Fuca and Hood Canal. Table 3-3 shows estimated annual harvest of summer chum salmon by management unit and fishery.

Table 3-1. Abundance thresholds and pre-season forecasts for Hood Canal and Strait of Juan de Fuca summer chum, 2000-2004.

	Abundance Thresholds		Forecasts				
Unit	**Critical**	**Recovery**	**2000**	**2001**	**2002**	**2003**	**2004**
H. Canal - SJFuca ESU	5,590	22,760	7,780	7,812	9,827	13,260	21,116
Strait of Juan de Fuca[1]	1,010	2,080	792	941	1,981	**3,132**	**4,739**
Sequim	220	520	82	56	112	92	202
Discovery	790	1,560	710	885	1,536	**2,573**	**3,939**
Chimacum	na	na	na	na	333	467	598
Hood Canal[1]	4,580	20,680	6,988	6,871	7,846	10,128	16,377
Quilcene	1,260	4,570	3,945	**5,396**	**5,230**	**5,974**	**8,396**
Mainstem Hood Canal	2,980	15,560	2,601	1,057	1,941	3,320	5,907
SE Hood Canal	340	550	442	418	**675**	**834**	**2,074**

Note: Boxed entries indicate abundance below critical threshold. Bolded entries indicate abundance above recovery threshold.
[1] Dungeness and Skokomish rivers not included in pre-season forecasts.

Table 3-2. Abundance thresholds and post-season runsize estimates for Hood Canal and Strait of Juan de Fuca summer chum, 2000-2004.

	Abundance Thresholds		Post Season Estimates				
Unit	**Critical**	**Recovery**	**2000**	**2001**	**2002**	**2003**	**2004**
H. Canal - SJFuca ESU	5,590	22,760	10,483	17,342	20,141	**43,040**	**104,289**
Strait of Juan de Fuca	1,010	2,080	987	**3,982**	**6,981**	**7,016**	**9,236**
Sequim	220	520	55	262	42	450	**1,665**
Discovery	790	1,560	879	**2,811**	**6,072**	**6,004**	**6,430**
Chimacum	na	na	52	909	867	563	1,141
Hood Canal	4,580	20,680	9,496	13,360	13,160	**36,024**	**95,053**
Quilcene	1,260	4,570	6,704	**7,595**	**6,050**	**12,863**	**63,167**
Mainstem Hood Canal	2,980	15,560	2,035	4,248	6,220	11,142	**25,889**
SE Hood Canal	340	550	757	**1,516**	**890**	**12,019**	**5,997**

Note: Boxed entries indicate abundance below critical threshold. Bolded entries indicate abundance above recovery threshold.

Table 3-3. Distribution of harvest of Hood Canal and Strait of Juan de Fuca summer chum by management unit and fishery, 2000-2004.

Management Unit	Fishery	2000	2001	2002	2003	2004
Sequim	Canada	0	1	0	1	1
	U.S. Preterm.	0	1	0	3	2
	Terminal	0	0	0	0	0
Discovery	Canada	2	10	12	4	4
	U.S. Preterm.	1	9	11	45	9
	Terminal	0	0	0	0	0
Chimacum	Canada	0	3	1	1	0
	U.S. Preterm.	0	3	2	4	2
	Terminal	0	0	0	0	0
Quilcene	Canada	17	28	12	10	46
	U.S. Preterm.	9	29	11	95	87
	Terminal	780	1,165	1,540	25	24,881
Mainstem Hood Canal	Canada	5	16	13	8	19
	U.S. Preterm.	3	16	11	83	36
	Terminal	22	39	101	4	1
Southeast Hood Canal	Canada	2	5	2	9	4
	U.S. Preterm.	1	6	2	90	9
	Terminal	8	14	14	4	0

In nearly all cases, the forecasts underestimated the annual recruit abundance (compare Table 3-1 and Table 3-2 entries). Exceptions were the Mainstem Hood Canal unit, in 2000, and the Sequim unit, in 2000 and 2002. A significant reason for the underestimates is the forecasting method. Moving averages will generally result in underestimates, when the abundance trend is moving upwards. While in this case the forecasts were conservative, relative to the underlying abundance, the forecasting method could result in overestimates, should the abundance trend downwards for any significant period of years.

As shown in Table 3-1, the preseason forecasts for the Strait of Juan de Fuca indicated that at least one unit (Sequim) would be below the critical threshold in all years. Additionally, the Discovery unit was expected to be below its critical threshold in 2000. In Hood Canal, the Mainstem unit was forecast to be below the critical threshold in 2000, 2001 and 2002.[1]

[1]In this context, the term "critical" is used to indicate a specific threshold, not a population status. The use of "critical" in this application is not intended to mean that the population is at a biologically critical level. See description of the derivation

As part of preseason assessments, individual unit forecasts were compared to each unit's critical abundance threshold (Table 3-1) and when the abundance was lower, consideration was given to the need for additional harvest control measures. However, given the performance of the BCR, no specific additional measures were implemented. Also, in the case of the Mainstem Hood Canal unit, the preceding year's escapement distribution was reviewed, to see whether particular stocks of the unit merited special consideration. In 2000, since the entire unit's escapement was below its critical threshold (Table 3-4), all four of its component stocks were of concern. The other four years (2001 – 2004) showed the Mainstem unit escapement exceeding the critical threshold, so the component stocks' escapement flag thresholds were reviewed. In 2001, Lilliwaup was below both its minimum escapement flag (MEF) and escapement distribution flag (EDF) thresholds (Table 3-5). In 2002, Duckabush was below its MEF and EDF thresholds. Finally, in 2003, Hamma Hamma was below its MEF and EDF thresholds. Lilliwaup in 2003 and Hamma Hamma in 2004 failed the EDF but not the MEF test, meaning that while the overall escapement may not have been distributed according to the SCSCI targets, escapement volumes were not critically low. In all cases, given the performance of the BCR and the lack of readily available additional means to address escapement balances, no additional protective steps were taken. A summary of the Mainstem MU flags' application, relative to escapement assessment, is provided in Table 3-5.

In all cases, the co-managers used the provisions of the Base Conservation Regime (BCR) during the preseason planning process to formulate the season's plans. The BCR exploitation rate limits, for specific fisheries and fishery aggregates is outlined in Table 3-6 along with the post season estimated results of its application to each fishery for the years 2001 through 2004. Detailed descriptions of the co-managers' adopted measures can be found in each year's State/Tribal Agreed-to Fisheries Document (recent years available at wdfw.wa.gov/fish/tribal/index.htm) and in the annual co-manager's Framework Management Plan for each region (available at www.pnptc.org).

In the first five years of the BCR application, the resulting exploitation rates, as assessed after each season, were well below the BCR targets, for the Canadian fisheries, the U.S. preterminal fisheries, and the Hood Canal terminal area fisheries (Table 3-6). In Canadian fisheries, the lower than predicted level of exploitation has been the result of the absence of Canadian commercial fisheries for sockeye and pink salmon in most years. The same management considerations have also acted to reduce the U.S. preterminal exploitation to lower than anticipated levels. Terminal area interceptions are normally expected in the Hood Canal fisheries (Strait of Juan de Fuca has no applicable terminal fishing areas). However, again because of other factors, such as fishery restrictions to protect Chinook salmon, and a reduction in fishing effort for coho salmon, exploitation rates were lower than expected. Finally, in the Quilcene area there is an extreme terminal fishery, for hatchery coho salmon, which are commingled with returning summer chum. In that case, per the SCSCI, fisheries are controlled as to retention and gear types, to limit exploitation to 5%, unless inseason information indicates that the escapement of summer chum salmon will exceed pre-set levels. In that case, gear and effort limitations can be relaxed a bit. During 2000 through 2004, in-season information indicated that the escapement to the Quilcene unit would exceed 2,500 summer chum (see SCSCI Table 3.33) each year, and additional days per week of gillnet fishing for coho could be

and intended use of critical thresholds in Part One Appendix Report 1.5, p. A1.167, of the SCSCI.

scheduled. As a result, extreme terminal area exploitation ranged from 0.2% to 39.4% (17.7% average) for Quilcene unit summer chum (Table 3-6).

Table 3-4. Escapement thresholds and actual escapements for Hood Canal and Strait of Juan de Fuca summer chum, 2000-2004.

Unit	Escapement Thresholds		Escapement				
	Critical	Recovery	2000	2001	2002	2003	2004
H. Canal - SJFuca ESU	4,990	14,240	9,632	15,996	18,409	42,655	79,189
Strait of Juan de Fuca	920	1,300	983	**3,955**	**6,955**	**6,959**	**9,218**
Sequim	200	330	55	260	42	**446**	**1,662**
Discovery	720	970	876	**2,792**	**6,049**	**5,955**	**6,417**
Chimacum	na	na	52	903	864	558	1,139
Hood Canal	4,070	12,940	8,649	12,041	11,454	35,696	69,971
Quilcene	1,110	2,860	**5,898**	**6,373**	**4,487**	**12,733**	**38,153**
Mainstem Hood Canal	2,660	9,740	2,005	4,177	6,095	**11,047**	**25,834**
SE Hood Canal	300	340	**746**	**1,491**	**872**	**11,916**	**5,984**

Note: Boxed entries indicate abundance below critical threshold. Bolded entries indicate abundance above recovery threshold.

Table 3-5. Mainstem Hood Canal summer chum escapement flags and actual escapement, 2000-2004.

	Flag Check Values		Escapements									
	MEF	EDF	2000		2001		2002		2003		2004	
MU Escapement			**2,005**		4,177		6,095		11,047		25,834	
Dosewallips	736	14.7%	1,260	63.8%	990	30.5%	1,627	30.5%	7,066	69.7%	11,549	48.3%
Duckabush	700	18.0%	464	23.5%	942	29.0%	**530**	**9.9%**	1,869	18.4%	8,637	36.1%
Hamma Hamma	1,042	19.3%	229	11.6%	1,227	37.7%	2,328	43.6%	**854**	**8.4%**	2,691	**11.3%**
Lilliwaup	182	4.3%	22	1.1%	**92**	**2.8%**	858	16.1%	353	*3.5%*	1,017	4.3%

Note: Entries in bold indicate values below the threshold. Boxed entries highlight the cases where both MEF and EDF flags were triggered, for critical response, or when the entire MU required critical level response.

Table 3-6. Base Conservation Regime exploitation rate limits and actual exploitation rates, 2000-2004.

Fishery	BCR target (range)	2000	2001	2002	2003	2004	Average
Canada	6.3% (2.3% - 8.3%)	0.2%	0.4%	0.2%	0.1%	0.1%	0.2%
U.S. Preterminal							
Strait of Juan de Fuca	2.5%	0.1%	0.4%	0.2%	0.7%	0.1%	0.3%
Hood Canal	2.5% (0.5% - 3.5%)	0.1%	0.4%	0.2%	0.7%	0.1%	0.3%
Hood Canal Mixed Terminal	2.1% (0.5% - 3.5%)	1.1%	0.9%	1.6%	0.0%	0.0%	0.7%
Quilcene Extr. Term. (min)	5.0%	10.5%	14.4%	23.8%	0.2%	39.4%	17.7%
Quilcene Escapement (Range)	(2,500 - 3,500)	5,898	6,373	4,487	12,733	38,153	

Performance assessments for the entire ESU and the Strait of Juan de Fuca and Hood Canal regions are outlined in Table 3-7, Table 3-8, and Table 3-9; also see Figure 2-1 through Figure 2-3 for display of annual abundance (escapement + harvest). Similarly, performance assessments for the individual management units are provided in Appendix Report 4 Tables AR4-1 through AR4-6; also see Figures AR4-1 through AR4-5 for display of annual abundance (escapement + harvest).

Table 3-7. Pre-season abundance forecasts, post-season estimates of abundance, and forecast error for the Hood Canal/Strait of Juan de Fuca summer chum ESU, 2000-2004. (1)

	2000	2001	2002	2003	2004
Preseason Abundance Forecast	7,780	7,812	9,647	13,260	21,116
Post Season Estimate of Abundance	10,431	16,433	20,141	43,040	104,289
Forecast Error (Percent over / under observed)	-25.4%	-52.5%	-52.1%	-69.2%	-79.8%
Preseason Escapement Rate Target (2)	89.3%	89.4%	89.5%	89.6%	89.6%
Post Season Escapement Rate (3)	91.8%	91.8%	91.4%	98.6%	80.9%
Preseason Expected Escapement	6,949	6,980	8,633	11,880	18,914
Post Season Escapement Estimate	9,580	15,093	18,412	42,660	79,192
Expected Preterminal & Terminal Exploitation	10.9%	10.9%	10.9%	10.9%	10.9%
Expected Additional Extreme Terminal Exploitation (4)	5.0%	5.0%	5.0%	5.0%	5.0%
Estimated Preterminal and Terminal Exploitation	1.5%	1.6%	1.5%	0.8%	0.2%

(1): Chimacum was not included in the 2000 and 2001 calculations
(2): Includes base level (5%) extreme terminal exploitation at Quilcene
(3): Minimum and expanded net opportunity at Quilcene
(4): Minimum Quilcene Area harvest of Quilcene run only

Table 3-8. Pre-season abundance forecasts, post-season estimates of abundance, and forecast error for Hood Canal summer chum, 2000-2004.

	2000	2001	2002	2003	2004
Preseason Abundance Forecast (1)	6,988	6,871	7,846	10,128	16,377
Post Season Estimate of Abundance	9,496	13,360	13,160	36,024	95,053
Forecast Error (Percent over / under observed)	-26.4%	-48.6%	-40.4%	-71.9%	-82.8%
Preseason Escapement Rate Target (2)	86.3%	85.2%	85.8%	86.2%	86.5%
Post Season Escapement Rate (3)	91.1%	90.1%	87.0%	98.5%	79.0%
Preseason Expected Escapement	5,361	4,941	5,842	7,711	12,731
Post Season Escapement Estimate	8,649	12,041	11,454	35,696	69,971
Expected Preterminal & Terminal Exploitation	10.9%	10.9%	10.9%	10.9%	10.9%
Expected Additional Extreme Terminal Exploitation (4)	5.0%	5.0%	5.0%	5.0%	5.0%
Estimated Preterminal and Terminal Exploitation	1.6%	1.8%	2.1%	1.1%	0.2%
Estimated Additional Extreme Terminal Exploitation (3)(4)	10.5%	14.4%	23.8%	1.8%	39.4%

(1): Skokomish River not included in pre-season forecast.
(2): Includes base level (5%) extreme terminal exploitation at Quilcene
(3): Minimum and expanded net opportunity at Quilcene only
(4): Minimum Quilcene Area harvest of Quilcene run only

Table 3-9. Pre-season abundance forecasts, post-season estimates of abundance, and forecast error for Strait of Juan de Fuca summer chum, 2000-2004. (1)

	2000	2001	2002	2003	2004
Preseason Abundance Forecast	792	941	1,801	3,132	4,739
Post Season Estimate of Abundance	935	3,073	6,981	7,016	9,236
Forecast Error (Percent over / under observed)	-15.3%	-69.4%	-74.2%	-55.4%	-48.7%
Preseason Escapement Rate Target	91.2%	91.2%	91.2%	91.2%	91.2%
Post Season Escapement Rate	99.6%	99.3%	99.7%	99.3%	99.8%
Preseason Expected Escapement	722	858	1,643	2,856	4,322
Post Season Escapement Estimate	931	3,052	6,958	6,964	9,221
Expected Preterminal & Terminal Exploitation	8.8%	8.8%	8.8%	8.8%	8.8%
Expected Add'l Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%
Estimated Preterminal and Terminal Exploitation	0.4%	0.7%	0.3%	0.7%	0.2%
Estimated Add'l Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%

(1): Chimacum was not included in the 2000 and 2001 calculations

IN-SEASON ACTIONS AND ESTIMATES

During each season, the co-managers followed the preseason agreements regarding the application of the BCR to the various affected fisheries. With the exception of the Quilcene extreme terminal area fishery, no inseason actions were taken, except for the monitoring of bycatch numbers, as they became available, through established inseason reporting databases (soft data) and, for Canadian areas, the test fishery reports of the Pacific Salmon Commission.

In the Quilcene area, weekly spawner surveys were used to assess escapements throughout each season. This information was also used to assess whether fisheries for other commingled species, in Quilcene Bay and the Quilcene River, could safely be liberalized, without adverse impact to summer chum escapement targets. In all years, by mid-September, it was determined that fisheries could be liberalized and additional days per week of gillnet fishing for coho could be scheduled.

In an effort to limit the bycatch mortality of summer chum salmon, in the Quilcene area, the co-managers prohibited the use of beach seines, along the western shore of the Bay, in 2003. The reduction in bycatch mortality was substantial (See Table 3-3) because fisheries at this location may exhibit high mortality when summer chum are "rolled" in a seine with large numbers of coho salmon. However, this approach was not continued in 2004, partly because it had resulted in significant loss of coho fishing opportunity, in the previous year.

Since the co-managers did not undertake any measures that differed from the BCR, there was no significant in-season consultation with NMFS once the initial fishery design had been proposed and adopted through the Pacific Fishery Management Council/North of Falcon annual preseason planning process.

Overall, during this period, there were no significant, or persistent, compliance or enforcement problems. Individual fishery events, which caused the co-managers to assess their enforcement emphasis, included some targeted harvest of summer chum in beach seines in Quilcene Bay, some recreational fishery induced mortality in the Big Quilcene River, and some nearshore interceptions by beach seine fisheries, in the vicinity of Big Beef Creek. These appear to have been relatively minor in nature and the issuing of citations and some shifting of enforcement efforts, along with efforts at fisher education, appear to have been effective.

In addition to catch record data, pre-terminal and terminal area commercial catches were sampled at buying stations, as part of CWT recovery efforts, and any chum salmon were recorded. In recreational fisheries, sampling was used primarily in Areas 5 and 12C to estimate encounters.

No biological data were collected in fisheries, primarily because of the scarcity of summer chum catch and the difficulties involved in setting up biological sampling programs for very small numbers of fish. In 2004, given the very large volume of returns, there was significant catch of summer chum in the Quilcene Bay fishery. However, no sampling of that catch was made, due mostly to fact that the co-managers had not been prepared for such a large return. Discussions are currently underway to investigate different approaches that could secure samples from future fisheries.

BASE CONSERVATION REGIME EVALUATION

The Base Conservation Regime (BCR) was formulated along with the rest of the SCSCI, using all available stock information, including timing and abundance profiles, and information regarding the conduct of fisheries directed at other species during times when summer chum salmon were likely to be intercepted. Fishing gear characteristics and effort intensity were also taken into consideration when designing appropriate closed periods and areas, as well as specific gear restrictions, to provide for summer chum protection, while maintaining a stable fishery regime to provide sufficient levels of opportunity directed at other species.

After the first five years of application, it has become apparent that the BCR has been well chosen for its function and has resulted in the reduction of fishery related impacts to summer chum salmon to nearly insignificant levels.

The only location where additional inseason measures became part of the BCR was the Quilcene extreme terminal area fishery. Major emphasis there was placed on beach seines for the harvest of coho salmon. Gillnets, because of their high level of mortality impact to summer chum salmon were severely restricted. However, as was apparent during the 2003 season, beach seines may also be causing significant mortality, because of their catch volume and injury rate, when fished at certain locations. Such details were not available to the co-managers during the design of the BCR. It is recommended that the co-managers adaptively manage and improve implementation of the BCR provisions for this fishery.

After five years of application, it appears that the BCR has indeed accomplished its major goal of controlling and reducing bycatch impacts to summer chum salmon. In fact, its performance far exceeded the co-managers' expectations. The BCR was designed to be particularly conservative, during its formulation, because a number of unknowns existed. These included the survival and recruitment rate of summer chum, the recovery potential or recovery goals for summer chum, the prospects for other species' fisheries, and the relative fishing effort levels, just to name a few.

Given the current performance of the BCR, we recommend that it be retained as the primary harvest regulation tool toward recovery. It is particularly well suited to address fishery risk when the summer chum populations are at low levels, as they had been, in the vicinity of their critical abundance thresholds. On the other hand, since a "recovered" regime may not be formulated, or warranted, for at least the next five years (the time of the next major review), it has become apparent that the co-managers should develop, as soon as possible, the basic provisions and criteria for a "Recovering" regime. This new regime could be used when the status of summer chum, while not recovered, is sufficient to warrant departure from the strict application of the BCR in order to relieve some of the restrictions on fisheries for other stocks and species.

4) ARTIFICIAL PRODUCTION

Artificial production (hatchery) techniques may be used to supplement currently depressed wild summer chum populations or to reintroduce summer chum into streams where the original population no longer exists. When properly implemented, supplementation and reintroduction can be powerful tools which, in combination with harvest and habitat management actions, can contribute to the recovery or restoration of naturally-producing populations (Ames and Adicks, 2003; Johnson and Weller, 2003; Adicks et al. 2005). As described in section 3.2 of the SCSCI, the intent of supplementation of summer chum in the Hood Canal Region is to reduce the short term extinction risk to summer chum populations and to increase the likelihood of their recovery.

This section of the annual report is organized to provide background information for six supplementation and three reintroduction projects, including a brief history, an overview of the implementation of supplementation standards presented in the SCSCI, an overview of project monitoring and evaluation, and a perspective on the Hatchery and Genetic Management Plans prepared for each project. Individual reports are also provided for each project that include more detailed information on annual production and monitoring and evaluation, as well as a general program assessment.

BACKGROUND

HISTORY OF PROJECTS

Consistent with the SCSCI, supplementation has been applied as a strategy to help recover summer chum populations in Hood Canal and the eastern Strait of Juan de Fuca since 1992.

Included in the SCSCI are rigorous standards that determine when and how hatchery supplementation will be applied as a recovery action. Based on the best scientific data and the collective salmon management experience of the plan authors, these standards were developed with the goal of using artificial propagation to preserve and expeditiously recover extant summer chum salmon populations, and re-establish returns where stocks have been extirpated, while minimizing the risk of deleterious genetic, ecological, and demographic effects to supplemented and un-supplemented stocks.

An over-riding understanding is that supplementation will be applied while other factors causing decreased summer chum abundances are addressed. This approach recognizes that supplementation measures alone will not lead to self-sustainability, or to the recovery of the ESA-listed summer chum populations. Commensurate, timely improvements in the condition of habitat critical for summer chum salmon survival, and implementation of protective harvest management measures, are also necessary to recover the listed populations to healthy levels.

Active supplementation of selected Hood Canal and Strait of Juan de Fuca summer chum stocks began in 1992, operating concurrently with the development of the principles contained in the SCSCI. From an initial start in 1992 with seven stocks at high risk of extinction,

supplementation efforts have now contributed to increased returns to six of the eight extant stocks, and reintroduction projects have returned fish to three streams where summer chum salmon had become extinct (**Figure 4-1**). Programs initiated in 1992 include the Big Quilcene River, Lilliwaup Creek, and Salmon Creek supplementation projects. Re-introduction of summer chum into Chimacum and Big Beef creeks began in 1996; summer chum adults have returned to these streams since 1999. Supplementation programs were also initiated on Hamma Hamma River in 1997, on Jimmycomelately Creek in 1999, and on Union River in 2000. A reintroduction program was initiated on Tahuya River in 2003 and summer chum adults returned beginning in fall 2006.

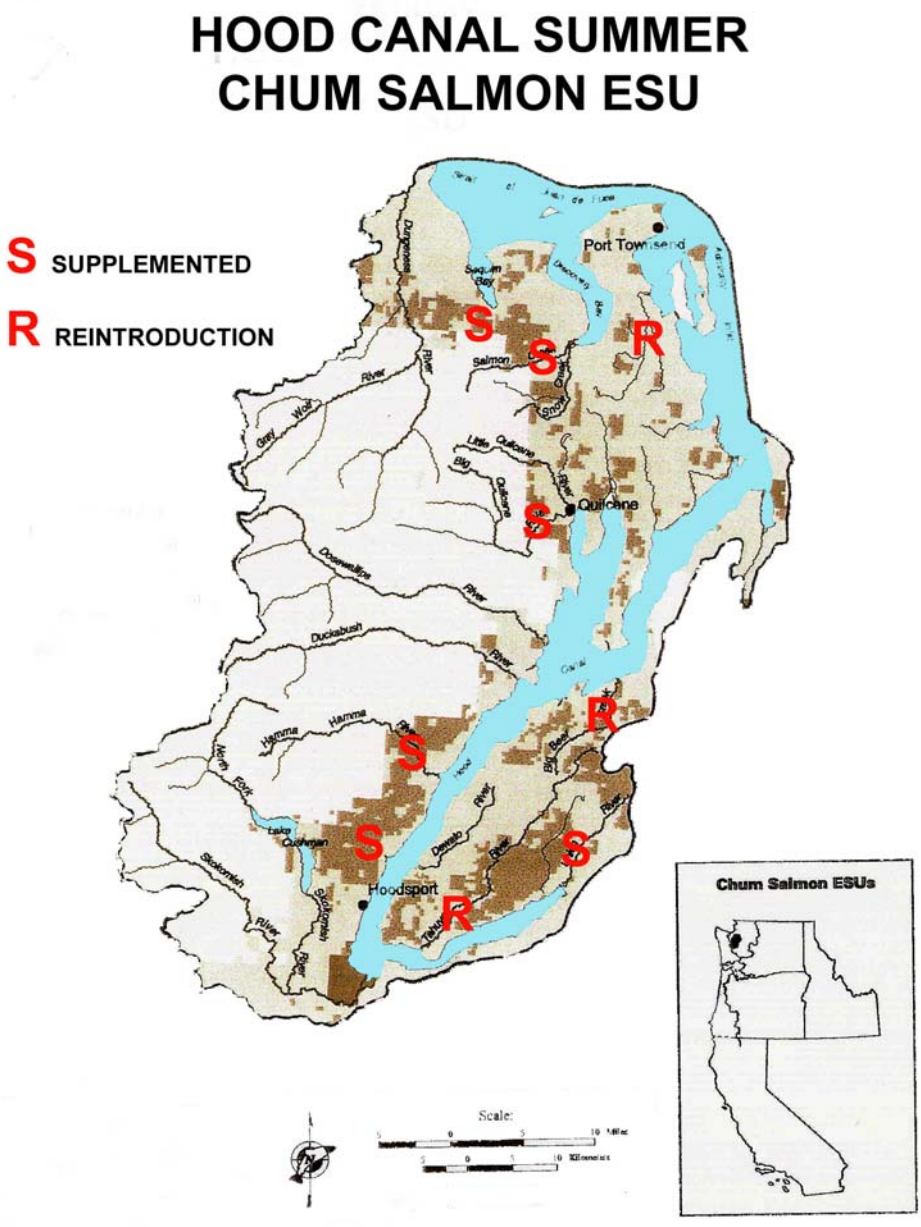

Figure 4-1. Map of Hood Canal summer chum Evolutionarily Significant Unit (ESU). Locations of supplementation programs indicated by "S", and locations of reintroduction programs by "R".

Cooperators who have participated in the projects with WDFW and the PNPT Tribes include Hood Canal Salmon Enhancement Group (HCSEG), Long Live the Kings (LLTK), North Olympic Salmon Coalition (NOSC), Wild Olympic Salmon (WOS), and the U.S. Fish and Wildlife Service (USFWS). Programs have been operated using WDFW and USFWS hatcheries, a private hatchery owned by LLTK, and remote site facilities operated by the cooperators. WDFW oversees operation of the cooperators' programs.

HATCHERY AND GENETIC MANAGEMENT PLANS

Hatchery and Genetic Management Plans (HGMPs) have been prepared by WDFW and the U.S. Fish and Wildlife Service (USFWS) and submitted to NMFS for each of the summer chum supplementation and reintroduction programs in the eastern Strait of Juan de Fuca and Hood Canal areas. Supported by information provided in the SCSCI, each HGMP provides a thorough description of each hatchery operation including the facilities used, methods employed to propagate and release fish, measures of performance, status of ESA-listed stocks that may be affected by the program, anticipated listed fish "take" levels, and descriptions of risk minimization measures applied to safeguard listed fish. Much of the information in the HGMPs was derived from the SCSCI. NMFS determined through ESA review that the hatchery programs were adequately conservative to prevent harm to the summer chum populations, and were likely to be beneficial to their recovery. The HGMPs were approved by NMFS in 2002 under Limit 5 of the ESA 4(d) Rule for a 12-year period (NMFS 2002, 2004). The summer chum programs have operated under the approved HGMPs since that time.

A copy of each HGMP is available on NMFS Northwest Region web site (http://www.nwr.noaa.gov/Salmon-Harvest-Hatcheries/Hatcheries/HGMPs-Current.cfm).

SCSCI STANDARDS AND PRINCIPLES GUIDING ARTIFICIAL PRODUCTION

In developing the hatchery component of the SCSCI, the co-managers identified objectives and the rationale for supplementation programs and reviewed their benefits and risks (see sections 3.2.2.2 and 3.2.2.3 of the SCSCI and Tynan et al. (2003)). Standards in the SCSCI defined when to modify or stop a supplementation or reintroduction program and how to supplement summer chum salmon populations to meet stock recovery, restoration, and ESA-listed wild stock protection objectives. We present or synopsize these SCSCI standards here and describe how these standards were applied to summer chum supplementation and reintroduction programs.

When to modify or stop a supplementation or reintroduction program

By definition, supplementation and reintroduction were proposed to be used as much as possible as short term means to preserve, rebuild, or restore a naturally producing summer chum salmon population through the use of artificial propagation. One intent is to limit the duration of the programs to minimize the risk that adverse effects on the natural-origin population would result from the use of artificial propagation. This intent is balanced by the need to allow the program to progress for a sufficient period of time to allow the target population for rebuilding or reintroduction to be sufficiently recovered or established. Also, as the program progresses there should be an allowance for adequate evaluation of whether the program is effective, and for

adaptive management of the program as a result of evaluation findings.

The following six standards were developed and included in the SCSCI to determine when a supplementation or reintroduction program should be terminated or modified (see section 3.2.2.2 of the SCSCI).

1) The maximum duration of regional summer chum salmon supplementation programs will be based on criteria that minimize the likelihood that potentially deleterious genetic changes occur in the wild population.

This objective is met by applying a three generation maximum duration (12 years) for all summer chum salmon supplementation programs. Geneticists working with the co-managers advised that a three generation maximum duration limits the risk of adverse within and among population diversity reduction effects that could harm the target or conspecific wild populatios (S. Phelps, WDFW, pers. comm., April 1998). This limit also provides two generations (eight years) of adult returns to assess the program, prior to cessation of egg takes. An exception to this duration limit, leading to an increase in the duration of a program, may be acceptable if there have been catastrophic declines in habitat condition, or if other uncontrollable factors affecting summer chum survival emerge during the course of a supplementation effort, making sustainable natural production unlikely. In such a situation, the risk of continuing the project would be reevaluated and measured against jeopardy to the status of the target stock that is likely if the program were terminated. Extension of a project longer than three generations necessitates compliance with more rigorous genetic hazard reduction criteria included in the SCSCI.

All summer chum supplementation programs are scheduled with a maximum duration of three generations (12 years).

Two supplementation programs (Quilcene River and Salmon Creek) met the 12 year operation limit with brood year 2003 and have been terminated.

The supplementation program on Lilliwaup also reached the 12 year limit with brood year 2003, but production targets (e.g., broodstock collections and release numbers) were not met for the Lilliwaup program through 1997. It was decided that the program should continue since the Lilliwaup summer chum stock remained at high risk of extinction and would be in jeopardy without a supplementation program. The co-managers provided increased involvement and oversight beginning in 1998 and program management and returns of summer chum have improved since then.

No other supplementation programs have reached the 12 year limit.

2) If adult return targets are met before the three generation maximum limit is reached, then the program may be reconsidered, and may be reduced or terminated.

Adult return targets defined specifically for each project were based on the magnitude of total adult escapements to consider program reductions, and on escapement of only natural origin recruits resulting from supplementation program and wild-origin fish to consider program termination. Program reduction or cessation determinations may therefore be made as follows:

• When the total summer chum salmon adult escapement meets or exceeds 1974-78 average escapement for the stock for four consecutive years, the desired number of juvenile hatchery-origin fish produced for the program will be reduced, after considering circumstances bearing on the sustainability of the population.
• When the total number of natural origin recruits (NORs) escaping to the production stream resulting from the supplementation program and wild-origin fish meets or exceeds 1974-78 average escapement for the stock for four consecutive brood years, the supplementation program may be terminated.
• When the adult return target used to indicate when a supplementation program should be reduced or terminated is based on another number that will assume precedence over 1974-78-derived goals.

The Union River supplementation program was terminated in brood year 2004 after 4 years (one generation) of operation since adult return targets were met; e.g., the average escapement of 3,472 NORs during 2001-2004 exceeded the mean escapement of 82 NORs during 1974-1978 and 340 NORs during 1974-2000. In addition, supplementation program releases into Union River during 2000 through 2004 are expected to continue to contribute to Union River escapement through 2008 and boost the population. Union River broodstock continued as the source of eggs during brood years 2003 and 2004 to support the reintroduction program for Tahuya River summer chum; and, summer chum returns to Tahuya beginning in 2006 will be considered a range extension of Union River summer chum and further reduce its extinction risk.

The Chimacum Creek reintroduction program was terminated in brood year 2004 after 8 years (two generations) of operation. Good fry-to-adult return rates from program releases and favorable productivity (NOR recruits per spawner) from the first natural spawners in 1999 and 2000 led the co-managers to conclude that the stock would not be in jeopardy if the program was terminated. In addition, program releases of summer chum fry into Chimacum Creek through brood year 2003 are expected to continue to contribute to summer chum escapement through 2007 and boost the population. Chimacum Creek summer chum are considered a range extension of Snow/Salmon Creek summer chum and further reduce its extinction risk.

3) Supplementation and reintroduction programs may be terminated if they are no longer believed to be necessary for timely recovery, for reasons other than the success of supplementation or reintroduction, including improvements in ocean survival or habitat condition.
4) Supplementation programs will be modified or terminated if appreciable genetic or ecological differences between hatchery and wild fish have emerged during the recovery programs.
5) Supplementation programs will be modified or terminated if there is evidence that the programs are impeding recovery.
6) Supplementation or reintroduction programs will be modified or terminated if there is evidence that the programs are negatively impacting a non-target ESA-listed salmonid population.

There is no evidence that Standards 3) through 6), above, currently apply to any summer chum supplementation or reintroduction program.

How to supplement or reintroduce

In the SCSCI, general and specific guiding principles describe how supplementation and reintroduction programs will be conducted. These principles were applied to help address risks to natural origin fish, and to ensure the effectiveness of supplementation and reintroduction programs selected for implementation. A presentation of specific criteria, expanding on these general guidelines, is included in Appendix Report 3.1 of the SCSCI. Also, more recently a set of protocols for summer chum supplementation recovery projects has been developed (Schroeder and Ames 2005). General standards guiding how to supplement or reintroduce (see section 3.2.2.3 of the SCSCI) include

- *Phased implementation of individual programs and distribution of programs in the region rather than commencing selected programs at maximum levels at the same time*

Supplementation and reintroduction programs were phased in between 1992 and 2003 in the Hood Canal region and between 1992 and 1999 in the eastern Strait of Juan de Fuca region. The numbers of broodstock collected and fry released were often also phased in for each program (see Individual Project Reports, below), but with the overall intent to produce fish at consistent levels, at or near goals each year. By 2004, maximum fry release numbers set as goals in the SCSCI have not been achieved for Hamma Hamma, Lilliwaup, or Tahuya river programs due to limited remote hatchery rearing space and/or rearing flows in these watersheds.

- *Selection and maintenance of non-supplemented wild summer chum populations that comprise a representative spectrum of existing diversity*

Summer chum stocks in the Dosewallips and Duckabush rivers are being maintained in a natural state without assistance of supplementation to act as reference populations for tracking effects and benefits of supplementation programs implemented in adjacent watersheds. These unsupplemented wild populations may still be used as donor stocks (subject to risk assessments applied for all candidate programs) to reintroduce summer chum into watersheds where the original population has been extirpated to help maintain population diversity in the region.

- *Managing individual hatchery hazards and development of risk aversion and minimization methods addressing each hazard category, including*
  - *partial/total hatchery failure (e.g., propogation at more than one location (including reintroductions), hatchery siting guidelines, emergency response strategies, and back-up hatchery equipment)*
  - *predation and competition (e.g., determined to be low risk to wild summer chum due to size and number of program fish and time of release)*
  - *disease (e.g., application of Pacific Northwest and co-manager disease control policies and inspection/certification by co-manager fish pathologists prior to release)*
  - *loss of genetic variability between populations (e.g., diversity-based management measures are implemented to minimize likelihood for outbreeding depression and potential negative effects on wild stock fitness); key standards are*
    - *propagate and release only the indigenous population;*
    - *limit transfers of each donor stock for reintroduction to only one target watershed outside of the range of the donor stock*

- *supplemented and reintroduced populations will be acclimated to the watershed desired for outplanting*
- *for reintroduced populations, where feasible, local adaptation should be fostered by using returning spawners rather than the original donor population as broodstock*
- *all summer chum produced in hatchery programs will be marked to allow for monitoring and evaluation of adult returns.*
- *loss of genetic variability within populations ((e.g., diversity-based management measures are implemented to reduce the risk that within population genetic variability would be lost as a result of inbreeding depression, genetic drift, or domestication selection; key standards included*
- *limit duration of all supplementation programs to a maximum of three chum salmon generations (12 years);*
- *collect broodstock so that they represent an unbiased sample of the naturally spawning donor population with respect to run timing, size, age, sex ratio, and any other traits identified as important for long term fitness;*
- *use returning adults produced by a supplementation program, with natural origin fish, as broodstock over the duration of the program as a measure to increase the effective breeding population size;*
- *apply spawning protocols to ensure that hatchery broodstocks are*
- *representative of wild stock diversity (e.g., spawning of broodstock proportionately across the breadth of the natural return, randomizing matings with respect to size and phenotypic traits, application of factorial, or at least 1 : 1 male-female mating schemes, and avoidance of intentional selection for any life history or morphological trait.*
- *apply numerical broodstock collection objectives to help retain genetic diversity (e.g., minimize loss of some alleles and fixation of others; allow for at least 50% of escaping fish to spawn naturally each year);*
- *mimic the natural environment with hatchery incubation and rearing measures (e.g., limit hatchery rearing to a maximum of 75 days post swim-up to minimize the level of intervention into the natural chum life cycle; reduce domestication selection effects); and,*
- *mark all summer chum produced in hatchery programs to allow for monitoring and evaluation of adult returns.*

These key standards from the SCSCI and the specific criteria in Appendix Report 3.1 of the SCSCI are implemented for each supplementation or reintroduction program.

There have been hatchery failures in some years at some facilities that caused summer chum mortalities (see Individual Project Reports, below), but any problems have subsequently been assessed and remedied.

Although no specific studies have been conducted, there is no evidence of effects on wild summer chum by hatchery summer chum due to predation, competition, or disease.

There is no evidence of loss between or within population genetic variability for the summer

chum populations. All genetically based management measures described above continue to be implemented. Analyses of GSI allozyme collections made pre- and post-supplementation indicate that supplemented natural summer chum populations have remained significantly different from each other (Kassler and Shaklee 2003; see Appendix Report 3 of WDFW and PNPTT (2003)). In addition, the co-managers continue to collect DNA samples from summer chum spawners throughout the ESU and plan to analyze DNA samples to monitor changes in allelic characteristics and assess whether the supplementation programs have negatively affected the genetic diversity of natural populations. A DNA baseline for Hood Canal and Strait of Juan de Fuca summer chum has been developed and is being refined and will be useful in this assessment.

- *The SCSCI provides standards for setting the scale of allowable fish release levels for each program, the disposition of excess individuals, and the maintenance of ecological and genetic characteristics of the natural population (e.g. broodstock collection, spawning, incubation, juvenile rearing, and smolt release procedures; see section 3.2.2.3 of the SCSCI.*

The release levels established for each program were generally not exceeded, but not all targets were met. Program releases for the Big Quilcene and Big Beef Creek programs exceeded the targets in some years (e.g., 1995 and 1996 prior to SCSCI), but were brought into compliance; see Individual Project Reports, below, for levels of production each year.

All programs adhered to production targets and there has been no need for disposition of excess individuals (broodstock, eggs, or juveniles).

For all supplementation and reintroduction programs, the technologies used to propagate summer chum followed SCSCI standards and were designed to ensure that rearing units and procedures were as non-invasive into the natural life cycle of the fish as possible. The duration of rearing within the hatchery environment was short, extending from incubation through early fry rearing. Incubation and rearing structures and procedures used mimic natural processes, while maintaining the survival advantage anticipated for fish produced in a controlled environment.

PROJECT MONITORING AND EVALUATION

Critical objectives of the SCSCI include the monitoring and evaluation of the effects of supplementation on the natural summer chum populations and of the effectiveness of the programs in the recovery of summer chum (see section 3.2.2.4 of the SCSCI). The basic approach is to collect information that will help determine 1) the degree of success of each project; 2) if a project is unsuccessful, why it was unsuccessful; 3) what measures can be implemented to adjust a program that is not meeting objectives for the project; and 4) when to stop a supplementation project.

Each project is to be fully consistent with the intent and implementation of the monitoring and evaluation component for supplementation programs identified in the SCSCI. The recommendations for monitoring and evaluation in the SCSCI respond to concerns regarding the uncertainty of summer chum supplementation and reintroduction effects by addressing the following four elements:

Element 1 - The estimated contribution of supplementation/reintroduction program-origin chum to the natural population during the recovery process;

Element 2 - Changes in the genetic, phenotypic, or ecological characteristics of populations (target and non-target) affected by the supplementation/reintroduction program;

Element 3 - The need and methods for improvement of supplementation/reintroduction activities in order to meet program objectives, or the need to discontinue a program because of failure to meet objectives; and

Element 4 - Determination of when supplementation has succeeded and is no longer necessary for recovery by collection and evaluation of information on adult returns.

Monitoring and evaluation were managed for each of the individual projects, consistent with the above four elements as follows:

Fish marking, mark recovery, and adult returns - The summer chum salmon juveniles (either embryos or fry) produced by each supplementation program are mass-marked (otolith-marked or fin-clipped) prior to release. Spawning ground surveys are conducted throughout the summer chum escapement period to enumerate spawners and to collect information on fish origin and age composition. Examination of otoliths or fin clip ratios from spawned adults (carcasses) is the method used to estimate the number of supplementation (hatchery) fish versus the number of natural origin (wild) fish and assists in determining the contribution of the supplementation program to the target population.

Genetic and age sampling - In order to detect any changes in genetic characteristics of populations, periodic allozyme and/or DNA samples have been collected from summer chum since most supplementation programs were started, for comparison to earlier collections. Analysis of allozyme samples has been completed (Kassler and Shaklee, 2003); see Appendix Report 3 of SCSCI Supplemental Report No. 4 (WDFW and PNPTT 2003). DNA samples have been analyzed to develop a baseline for summer chum (Small and Young 2003; see Appendix Report 4 of SCSCI Supplemental Report No. 4 (WDFW and PNPTT 2003)) and additional samples have been added to improve the DNA baseline and the baseline has been used to assign individual summer chum with "ambiguous" otolith marks to their region and stream of origin and/or to identify potential straying of hatchery-origin summer chum (e.g., see Small et al. 2006). Scales are also collected to age the adult fish.

Broodstocking and egg sources - To fully represent the demographics of donor populations, summer chum broodstock are collected randomly as the fish arrive in Quilcene Bay (e.g., Quilcene River), at temporary fish traps operated by WDFW or project sponsors (e.g., Jimmycomelately Cr., Salmon Cr., Union River, Big Beef Cr., Lilliwaup), or by beach seining in the lower reaches of the stream (e.g., Lilliwaup R., Hamma Hamma R.) in proportion to the timing, weekly abundance, and duration of the total return. Fish not retained as broodstock are released upstream of trap sites or returned to the stream to spawn naturally.

Hatchery operations - Records of fish cultural operations are regularly maintained and compiled. Project sponsors in collaboration with WDFW, summarize protocols and procedures, temperature unit records by developmental stage, ponding dates, feeding, rearing and release methods, and production and survival data, and recommend facility or protocol improvements.

Fish health - Fish health is monitored by a WDFW or USFWS fish health specialist in accordance with procedures in the Co-managers' disease control policy (NWIFC and WDFW 2006). Summer chum broodstock are sampled for the incidence of viral pathogens, there has been no significant mortality of broodstock or juveniles from unknown causes, and the health of fry from all projects prior to release has been good.

Additional descriptions of monitoring and evaluation activities and/or results are provided below in individual project reports.

INDIVIDUAL PROJECT REPORTS

Individual project reports are presented for each supplementation and reintroduction project in the Hood Canal and Strait of Juan de Fuca regions. Appendix Report 3.2 of the SCSCI provides descriptions of the Big Quilcene, Lilliwaup, Hamma Hamma, Big Beef Creek, Salmon Creek, and Chimacum Creek programs, including program objectives, broodstock and production data through brood year 1998, and operating procedures and objectives. Information on these projects has since been updated for the years 1999 and 2000, and project descriptions provided for the newer Union/Tahuya River and Jimmycomelately Creek projects in Supplemental Report No. 3 (WDFW and PNPTT 2001). Another update for all projects was provided for the years 2001 and 2002 (WDFW and PNPTT 2003). Now, information for all projects is updated for years 2003 and 2004 in the following reports.

HOOD CANAL REGION

Big Quilcene River

A supplementation program was started in 1992, in response to the critical condition of the stock and to take advantage of a year expected to be relatively strong in the Hood Canal summer chum return cycle. The program is operated by the USFWS at the Quilcene National Fish Hatchery (QNFH). The Quilcene program contributed eggs and fry to support the re-introduction program for summer chum at Big Beef Creek in its early years (from 1996 through 2000).

Annual Production

A summary of the production for each brood year of the project is presented in Table 4-1.

Table 4-1. Summary of Quilcene National Fish Hatchery summer chum supplementation program, brood years 1992-2003.

Brood year	Broodstock retained			Natural spawners	Percent removed	Fed fry released	Release size, g	Release dates(s)
	Males	Females	Total					
1992	225	186	411	320	56%	216,441	1.05	4/13/93
1993	19	17	36	97	27%	24,784	1.46	3/30/94
1994	184	178	362	349	51%	343,550	1.06	3/27/95
1995	243	256	499	4,029	11%	441,167	1.06	3/27/96
1996	438	333	771	8,479	8%	612,598	1.34	4/10/97
1997	296	261	557	7,339	7%	340,744	1.62	4/2, 4/15/98
1998	313	231	544	2,244	20%	343,530	1.28	3/8, 3/22, 4/2/99
1999	81	89	170	2,982	5%	181,711	1.03	3/9, 3/24/00
2000	187	195	382	5,126	7%	414,353	1.01	3/5, 3/19/01
2001	134	172	306	5,868	5%	351,709	0.98	3/3, 3/22/02
2002	174	181	355	3,662	9%	272,017	0.79	3/7, 3/24/03
2003	46	52	98	11,745	0.8%	92,559	1.78	3/12/04

The transfers of summer chum eyed eggs and fry from the Quilcene NFH to Big Beef Creek for brood years 1996 through 2004 are summarized in Table 4-2.

Table 4-2. Summer chum transfers from Quilcene NFH to Big Beef Creek, 1996-2004.

Brood year	Fry	Eyed eggs
1996	40,000	168,000
1997	0	157,000
1998	0	217,465
1999	0	40,298
2000	0	55,500
2001	0	0
2002	0	0
2003	0	0
2004	0	0

Monitoring and Evaluation

Monitoring and evaluation were consistent with the above described, generally applicable monitoring and evaluation actions carried out for all individual projects (see section above titled Project Monitoring and Evaluation). Following are additional details of monitoring and evaluation activities applicable to this project.

Fish marking, mark recovery and adult returns - Beginning with brood year 1997 (3-year olds returning in 2000), the summer chum fry released at Quilcene NFH were adipose-clipped to identify returning adults as hatchery-origin fish. Broodstock were collected from Quilcene Bay

and/or at Quilcene National Fish Hatchery. Spawning ground surveys were conducted throughout the summer chum return to enumerate spawners. Also, information on fish origin and age composition was collected from broodstock and natural spawners (see Section 2, Stock Assessment). Estimates of natural-origin and supplementation-origin escapement are shown in Table 2-12 for return years 2001 through 2004.

Most supplementation-origin summer chum from the Quilcene program returned to Big and Little Quilcene rivers; these streams support the same summer chum stock. For brood years 1996 through 2001, the percentage of Quilcene supplementation fish that returned to Big and Little Quilcene rivers averaged 87%, ranging from 82% to 93%. Strays from the Quilcene program were recovered in Dosewallips, Duckabush, Hamma Hamma, and Lilliwaup. For year-by-year estimates of stray supplementation returns by program and stream of recovery, see Appendix Tables 13 to 17.

The Big Quilcene supplementation program has been very successful in contributing to the return of adult summer chum. Estimates of the number of adipose-marked adults, their ages and survival from release as fed fry to return as spawners are presented for the 1997 through 2001 brood years in Table 4-3. The supplementation program contributed an estimated 2956, 2452, 2005, 4193, and 1152 adults during the 1997 through 2001 brood years, respectively; this includes strays to other streams.

Under the SCSCI, a fry to adult survival rate range of 0.83% to 1.66% was set as an objective for each supplementation and reintroduction program (WDFW and PNPTT 2000). For the Quilcene supplementation program, the return rate from fry release to adult return was 0.9%, 0.7%, 1.1%, 1.0%, and 0.3% for the 1997 and through 2001 brood years, respectively (Table 4-3). Note that for 2000 and 2001 broods, these represent incomplete brood returns.

Table 4-3. Return from fry to adult for summer chum salmon reared in supplementation program at Quilcene River, as determined from adipose-clips for the 1997 through 2001 brood years; this includes strays to other streams.

Brood year	No. fry released	Return year	Age	Adult return	Return rate
1997	340,744	1999	2	N/A	N/A
		2000	3	380	0.11%
		2001	4	2,548	0.75%
		2002	5	29	0.01%
			Total	2,956	0.87%
1998	343,530	2000	2	4	0.00%
		2001	3	1,707	0.50%
		2002	4	745	0.22%
		2003	5	0	0.00%
			Total	2,452	0.71%
1999	181,711	2001	2	0	0.00%
		2002	3	1,359	0.75%
		2003	4	615	0.34%
		2004	5	22	0.01%
			Total	1,997	1.10%
2000	414,353	2002	2	0	0.00%
		2003	3	1,602	0.39%
		2004	4	2,844	0.69%
		2005	5	N/A	N/A
			Total	4,446	1.07%
2001	351,709	2003	2	7	0.00%
		2004	3	1,259	0.36%
		2005	4	N/A	N/A
		2006	5	N/A	N/A
			Total	1,259	0.36%

Escapement of the Big/Little Quilcene stock exceeded one of the above-described SCSCI escapement standards for program reduction. The criterion is that the annual total of hatchery-origin and natural-origin escapement exceeds the mean 1974-1978 escapement for four consecutive years (section 3.2.2.2b of SCSCI). The Big/Little Quilcene mean escapement for 1974 through 1978 is 2,607 spawners. Table 4-4 shows that annual total escapement exceeds that level every year, beginning in 1995, the first year of adult returns from the supplementation project. The co-managers agreed to reduce the program production target to 300,000 fed fry for brood year 2002, and then to 250,000 fed fry for brood year 2003.

Table 4-4. Total escapement to Big Quilcene and Little Quilcene rivers (natural spawners and hatchery spawned).

Return year	Total escapement
1974	839
1975	2,273
1976	3,533
1977	1,594
1978	4,794
mean 1974-78	2,607
1979	455
1980	529
1981	222
1982	281
1983	276
1984	143
1985	45
1986	27
1987	79
1988	297
1989	2
1990	6
1991	50
1992	743
1993	148
1994	722
1995[1]	4,574
1996	9,515
1997	7,903
1998	3,053
1999	3,237
2000	5,898
2001	6,373
2002	4,487
2003	12,733
2004	38,153

[1] First year of returns from supplementation program.

Table 4-5 provides a summary description of percent hatchery-origin contributions to spawning escapement by brood year and spawner age. These early results show a substantial contribution of hatchery-origin fish to the spawning escapement, ranging from approximately 6% age 4 spawners from brood year 2000 to almost 80% of age 3 spawners from brood year 1998. Also

shown in Table 4-5 is percent of total escapement used as hatchery brood stock in each brood year. As adults return in subsequent broods, more complete results that better define the contribution of supplementation-origin fish will be obtained. Table 4-6 describes adult returns to the Big Quilcene River by brood year (from 1988 through 2004) and age; the estimates are of combined supplementation-origin and natural-origin fish.

Table 4-5. Age-specific percent hatchery-origin fish in the total resulting escapement to Big Quilcene River, observed from adipose-clips.

Parent brood	Age 3	Age 4	Age 5	Percent of parent brood total escapement that was spawned at Quilcene NFH
1997	45.6%	44.1%	18.1%	7%
1998	78.8%	35.3%	0.0%	20%
1999	28.6%	15.2%	0.0%	5%
2000	16.3%	6.4%	0.0%	7%
2001	6.7%	11.3%	-	5%
2002	11.7%	-	-	

Table 4-6. Big Quilcene River summer chum salmon brood returns, related to originating brood.

Brood year	Total adults contributing [1]	Hatchery release	Resulting escapement, number at age				Total resulting escapement
			2 yr	3 yr	4 yr	5 yr	
1988	120	0	--	--	710	95	805
1989	1	0	--	24	25	9	58
1990	6	0	0	8	44	0	52
1991	49	0	8	661	189	0	858
1992	734	216,441	7	4,331	8,712	362	13,412
1993	136	24,784	0	365	482	14	861
1994	722	343,550	173	6,995	938	0	8,106
1995	4,520	441,167	34	1,833	1,240	0	3,107
1996	9,250	612,598	7	1,913	4,996	149	7,065
1997	7,874	340,744	0	662	4,265	118	5,045
1998	2,792	343,530	0	1,760	579	65	2,404
1999	3,153	181,711	0	3,320	3,342	306	6,968
2000	5,630	414,353	0	8,436	25,371	0	33,807
2001	6,174	351,709	0	9,323			> 9,323
2002	4,017	272,017	0				
2003	11,843	92,559					
2004	35,108	0					

[1] Includes natural escapement and hatchery broodstock.

Broodstocking and egg sources - To represent the demographics of the donor population, Quilcene broodstock were collected as the fish arrived in Quilcene Bay and/or at the permanent trap operated by US Fish and Wildlife Service at QNFH.

Since the inception of the supplementation program in 1992, age and length information has been collected from adults processed at the hatchery. No trends in age or length are apparent (see Table 4-7 and Table 4-8). The high mean ages of source adults in 1992 and 1993 reflect the strength of the 1988 brood year.

Table 4-7. Mean fork length of adult summer chum to Big Quilcene, hatchery observations applied to total return.

Source brood	Mean fork length, mm			
	Source adults		Returning adults	
	Females	Males	Females	Males
1989	--	--	602	611
1990	--	--	642	642
1991	--	--	640	670
1992	619	660	653	703
1993	624	645	658	687
1994	632	667	622	650
1995	603	641	663	702
1996	677	721	666	708
1997	623	654	665	724
1998	658	691	646	707
1999	650	697	646	702

Table 4-8. Mean age of adult summer chum to Big Quilcene, hatchery observations applied to total return.

Source Brood	Mean age, years					
	Source adults			Returning adults		
	Combined	Females	Males	Combined	Females	Males
1989	--	--	--	3.7	4.0	3.4
1990	--	--	--	3.8	4.0	3.8
1991	--	--	--	3.2	3.2	3.2
1992	4.0	4.0	3.9	3.7	3.7	3.7
1993	4.5	4.7	4.4	3.6	3.6	3.6
1994	3.1	3.1	3.1	3.1	3.1	3.1
1995	3.0	3.0	3.1	3.3	3.4	3.3
1996	3.9	4.0	3.9	3.7	3.7	3.8
1997	3.2	3.2	3.1	3.9	3.9	3.9
1998	3.3	3.3	3.3	3.3	3.3	3.4
1999	3.4	3.4	3.4	3.6	3.5	3.7

General Program Assessment

The Quilcene supplementation program has resulted in substantial increases in the total number of summer chum salmon adults returning to spawn in the watershed. The escapement of natural-origin spawners in the Big/Little Quilcene stock has increased from a mean of 200 adults during 1989-1992 (just prior to initiation of supplementation) to a mean of 13,209 adults during 2001-2004 (Table 2-12). The Quilcene program also contributed eggs and fry to support the reintroduction program for summer chum at Big Beef Creek from 1996 through 2000.

The Quilcene supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Consistent with the standards set in the SCSCI and HGMP, the intended maximum duration of the program is 12 years (3 generations) beginning with brood year 1992. Accordingly, the program has been terminated and the last brood year of the Big Quilcene River program was 2003, with the last returns of supplementation program adults expected in 2006, 2007, and 2008.

Although it appears that impacts to natural processes in freshwater and/or estuarine habitats have likely limited natural summer chum production in the stream in some years, habitat restoration actions implemented in recent years are expected to improve survival and productivity conditions for natural fish. Commensurate with the summer chum salmon supplementation program, Hood Canal Salmon Enhancement Group, Jefferson County, the Skokomish Tribe, and WDFW have implemented habitat restoration projects designed to restore floodplain connectivity and reduce other channel degradation factors. These restoration actions have been designed to improve prospects for the survival and productivity of naturally spawning summer chum salmon, including adults produced through the hatchery effort.

Big Beef Creek

The Big Beef Creek project began with brood year 1996 when eyed eggs of Quilcene stock were transferred from Quilcene National Fish Hatchery (QNFH) to Big Beef Creek to initiate and support the reintroduction of a summer chum population there. WDFW operates an adult trap and hatchery facilities at the University of Washington's Big Beef Creek Research Station.

Annual Production

A summary of the production for each brood year of the project is provided in Table 4-9.

Table 4-9. Big Beef Creek summer chum reintroduction program, brood years 1996-2004.

Brood year	Broodstock		Total spawners	Natural spawners	Percent removed	No. eyed eggs from QNFH [1]	No. fed fry released	Release size (gm)	Release date
	Males	Females							
1996	-- [1]	-- [1]	-- [1]	0	--	168,000 [2]	204,000	0.5-0.7	2/7, 3/7/97
1997	-- [1]	-- [1]	-- [1]	0	--	157,000	100,280	0.8	2/9/98
1998	-- [1]	-- [1]	-- [1]	0	--	217,465	214,936	1.1-1.6	2/23, 3/15, 3/29/99
1999	-- [1]	-- [1]	-- [1]	4	--	40,298	39,800	1.4	3/10/00
2000	9	11	20	0	100%	81,672 [3]	80,550	1.4-1.8	2/26, 3/13/01
2001	34	34	68 [4]	826	7.6%	--	80,925	1.4-1.7	3/4, 3/14, 3/25/02
2002	32	33	65 [4]	677	8.8%	--	72,622	1.2-1.8	3/4, 3/18, 3/27/03
2003	38	34	72	824	8.0%	--	76,353	1.6-1.8	3/9, 3/22, 4/1/04
2004	33	31	64	1852	3.3%	--	14,814	1.8	2/28, 3/11, 3/25/05

[1] Eyed eggs received from Quilcene National Fish Hatchery (QNFH).
[2] Also received 40,000 swim-up fry from QNFH for BY 1996.
[3] Includes 26,172 eyed eggs from Big Beef Cr. fish and 55,500 eyed eggs from QNFH.
[4] Includes 2, 2, 4, and 0 broodstock mortalities in 2001, 2002, 2003, and 2004, respectively.

Unique otolith marks are applied to early, middle, and late egg takes each brood year so the survival of each group can be evaluated.

Monitoring and Evaluation

Monitoring and evaluation were consistent with the above described, generally applicable monitoring and evaluation actions carried out for all individual projects (see section above titled Project Monitoring and Evaluation). Following are additional details of monitoring and evaluation activities applicable to this project.

Fish marking and mark recovery - Beginning with brood year 1998, the otoliths of summer chum salmon embryos produced in the reintroduction program on Big Beef Creek were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from other summer chum. Since 1999, a permanent trap was operated each season throughout the summer chum return to collect broodstock, enumerate spawners, and to complement information on fish origin and age composition collected during spawner surveys (see Section 2, Stock Assessment). Estimates of natural-origin and supplementation-origin escapement are shown in Table 2-12 for return years 2001 through 2004.

For brood years 1996 through 2001, nearly all (range = 94% to 100%) of supplementation-origin summer chum from the Big Beef program returned to Big Beef Creek. A few strays from the Big Beef Creek program were recovered in Dosewallips, Hamma Hamma, Lilliwaup, Union, and Little Quilcene. For year-by-year estimates of stray supplementation returns by program and stream of recovery, see Appendix Tables 13 to 17.

Adult returns - The Big Beef Creek reintroduction program has been very successful in generating new returns of adult summer chum to a watershed where the original population had become extinct. An estimated 4, 20, 894, 742, 896, and 1,916 summer chum returned to spawn in Big Beef Creek during 1999 through 2004, respectively (Table 4-9). The first natural spawning by summer chum in Big Beef Creek since the early-1980's occurred during 2001 and 2002 (excepting the four spawners of 1999).

Estimates of the number of otolith-marked adults and survival from fed fry to spawner for summer chum reared in the supplementation program at Big Beef Creek are presented for the 1996 through 2001 brood years in Table 4-10. Including strays to other streams, the supplementation program contributed an estimated 4, 144, 1088, 782, 1441, and 1358 adults during the 1996 through 2001 brood years, respectively.

Under the SCSCI, a fry to adult survival rate range of 0.83% to 1.66% was set as an objective for each supplementation and reintroduction program (WDFW and PNPTT 2000). For the Big Beef Creek reintroduction program, the return rate from fry release to adult return was 0.1%, 0.5%, 0.4%, 1.8%, and 1.7% for the 1997 and through 2001 brood years, respectively (Table 4-10).

Hatchery survival rates - The Big Beef Creek summer chum program has generally been successful in meeting the survival rate objectives. The number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum reared at Big Beef Creek from 2001 through 2004 are presented in Table 4-11.

Table 4-10. Return from fry to adult for summer chum salmon reared in supplementation program at Big Beef Creek, as determined from otolith marks for the 1996 through 2001 brood years; this includes strays to other streams.

Brood year	No. fry released	Return year	Age	Adult return	Return rate
1996	204,000	1998	2	N/A	N/A
		1999	3	4	0.00%
		2000	4	0	0.00%
		2001	5	0	0.00%
			Total	4	0.00%
1997	100,280	1999	2	0	0.00%
		2000	3	0	0.00%
		2001	4	140	0.14%
		2002	5	4	0.00%
			Total	144	0.14%
1998	214,936	2000	2	0	0.00%
		2001	3	809	0.38%
		2002	4	279	0.13%
		2002	5	0	0.00%
			Total	1,088	0.51%
1999	39,800	2001	2	5	0.01%
		2002	3	660	0.31%
		2003	4	109	0.05%
		2004	5	8	0.00%
			Total	782	0.37%
2000	80,550	2002	2	11	0.01%
		2003	3	915	1.14%
		2004	4	519	0.64%
		2005	5	N/A	N/A
			Total	1,445	1.79%
2001	80,925	2003	2	17	0.02%
		2004	3	1,341	1.66%
		2005	4	N/A	N/A
		2006	5	N/A	N/A
			Total	1,358	1.68%

Table 4-11. Number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum salmon reared in the Big Beef Creek reintroduction program, brood years 2001 through 2004.

					% Survival by life stage			Cumulative % survival		
Brood Year	Green eggs	Eyed eggs	Swim-up fry	Fry released	Green egg to eyed egg	Eyed egg to swim-up	Swim-up to release	Green egg to eyed egg	Green egg to swim-up	Green egg to release
2001	93,398	87,951	81,214	80,919	94.2%	92.3%	99.6%	94.2%	87.0%	86.6%
2002	93,018	74,039	73,235	72,622	79.6%	98.9%	99.2%	79.6%	78.7%	78.1%
2003	83,329	78,350	77,603	76,353	94.0%	99.0%	98.4%	94.0%	93.1%	91.6%
2004	87,884	80,561	16,350	14,814	91.7%	20.3%	90.6%	91.7%	18.6%	16.9%

For brood year 2004, there was substantial mortality of eyed eggs when a water valve was found closed following an otolith marking event. Consequently, the survival from eyed egg to swim-up was only about 20% and survival from green egg to release was only about 17% (compared to the program objective of 85%).

Broodstocking and egg sources - From 1996 through 1999, all summer chum eggs incubated and released at Big Beef Creek were transferred from QNFH (Table 4-9). During 2000, a total of 26,890 green eggs (which resulted in 26,172 eyed eggs) were obtained from summer chum returning to Big Beef Creek and 55,500 eyed eggs were transferred from QNFH. To foster local adaptation of the reintroduced population, adults returning to Big Beef Creek during 2001 through 2004 were used as broodstock, and no eggs were transferred from QNFH. Broodstock are collected randomly as the fish arrive at the trap location, proportional to the timing, weekly abundance, and duration of the total return to the creek. Since the trap is located near the most downstream point of observed natural spawning activity, nearly the entire run is available for trapping, decreasing the risk that fish trapped through the program are not representative of the total run. Trap data for 2003 and 2004 are presented in Appendix Report 1.

General Program Assessment

The Big Beef Creek summer chum reintroduction program has generally been successful in collecting a representative sample of brood stock from the donor Quilcene River stock (1996-2000) and from Big Beef Creek returns (2001-2004). It is still early to judge the success of the program, but the numbers of summer chum adults that have returned during 2001 through 2004 are encouraging. A total of 742 to 1,916 fish escaped to spawn during 2001 to 2004 and >90% each year were produced from the supplementation program (see Table 2-13). No natural-origin productivity estimates are yet available (see Table 2-15) to indicate whether Big Beef Creek summer chum will become self-supporting. The Co-managers will continue to monitor the adult returns. Consistent with the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1996.

The Big Beef reintroduction project has addressed the program objectives described in section 3.2.3.4 of the SCSCI. In compliance with planned research objectives for the program, NMFS, in cooperation with the co-managers, has initiated a study comparing the productivity and reproductive success of hatchery and natural-origin summer chum spawners using the Big Beef Creek spawning channel. This study includes a comparison of relative survival of the progeny of hatchery and natural-origin summer chum salmon to adult return to Big Beef Creek.

Lilliwaup Creek

A supplementation program began on Lilliwaup Creek in 1992 as a cooperative project between HCSEG and WDFW. In 1994, LLTK assumed the role of the primary project operator. Through 1997, there were difficulties in collecting adequate numbers of brood stock from Lilliwaup Creek. Attempts in this regard were complicated by the lack of a fish collection trap, low overall summer chum return levels, and the presence (in odd-numbered years) of pink salmon in the same stream areas as summer chum. Beginning in 1998, WDFW was able to provide limited funding for this project, allowing for the installation of a trap in the lower creek (through 2001), increased agency assistance during fish spawning, and increased monitoring and evaluation of the supplementation program.

Annual Production

A summary of the production for each brood year of the project is provided in Table 4-12.

Table 4-12. Lilliwaup Creek summer chum supplementation program, brood years 1992-2004.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
	Males	Females	Total					
1992	--	--	18	90	16.7%	20,000	0.4	March
1993	--	--	10	72	12.2%	12,000	fed	March
1994	--	--	12	105	10.3%	15,000	fed	March
1995	--	--	0	79	0.0%	0	--	--
1996	--	--	12	40	23.1%	15,000	fed	March
1997	11	7	18	10	64.3%	14,200	1.0	3/1/98
1998	9	12	21	3	87.5%	17,200	0.7	2/24/99
1999	7	6	13	0	100.0%	17,400	1.5	3/11/00
2000	13	7	20	2	90.9%	14,800	1.4	3/12/01
2001	42	18	60 [1]	32	65.2%	38,000	1.1	3/15/02
2002	43	40	83	734	10.2%	96,000	1.2	3/21/03
2003	55	55	160 [1]	194	46.3%	103,913	1.3	3/25/04
2004	49	48	97	921	9.5%	99,500	0.8	4/1/05

[1] Includes 20 broodstock mortalities (all males due to lack of females) in 2001 and 50 broodstock mortalities (36 males and 14 females) in 2003.

Monitoring and Evaluation

Monitoring and evaluation were consistent with the above described, generally applicable monitoring and evaluation actions carried out for all individual projects (see section above titled Project Monitoring and Evaluation). Following are additional details of monitoring and evaluation activities applicable to this project.

Fish marking and mark recovery - Beginning with brood year 1997, the otoliths of summer chum salmon embryos produced in the supplementation program on Lilliwaup Creek were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from other summer chum. From 1998 through 2001, a temporary fish trap was operated each season throughout the summer chum return to collect broodstock, enumerate spawners and to complement information on fish origin and age composition collected during spawner surveys (see Section 2, Stock Assessment). Estimates of natural-origin and supplementation-origin escapement are shown in Table 2-12 for return years 2001 through 2004.

For brood years 1997, 1998, and 1999, nearly all (range = 93% to 100%) of supplementation-origin summer chum from the Lilliwaup program returned to Lilliwaup, with a few strays from Lilliwaup Creek recovered in Hamma Hamma and Duckabush. Brood years 2000 and 2001 are more difficult to assess since, as with the Hamma Hamma program (see below), ambiguous otolith marks became prevalent and definite assignment of otolith-marked adults to a specific program was not always possible. DNA analysis was used to identify some fish with ambiguous otoliths to a program of origin, and this helped, but many fish were not analyzed due to budget constraints. Consequently, estimates of supplementation program returns, including strays, for brood years 2000 and 2001 are of limited value. For year-by-year estimates of stray supplementation returns by program and stream of recovery, see Appendix Tables 13 to 17.

Adult returns - The Lilliwaup Creek supplementation program contributed to the returns of adult summer chum in the years 2001 through 2004. Few summer chum returned to Lilliwaup Creek through 2000, but total (natural + supplementation) adult returns increased to 92, 817, 354, and 1018 fish for years 2001 through 2004, respectively (Table 2-12). Summer chum adults originating from the supplementation program first returned in 2001, as 3 years olds from brood year 1998 and 4 year olds from brood year 1997. Estimates of the number of otolith-marked adults, their ages, and survival from fed fry to spawner for summer chum reared in the supplementation program at Lilliwaup Creek are presented for the 1997 through 2001 brood years in Table 4-13. The supplementation program contributed an estimated 9, 55, and 720 adults during the 1997 through 1999 brood years, respectively; this includes strays to other streams. As noted above, estimates of supplementation program returns for brood years 2000 and 2001 are of limited value.

Under the SCSCI, a fry to adult survival rate range of 0.83% to 1.66% was set as an objective for each supplementation and reintroduction program (WDFW and PNPTT 2000). For the Lilliwaup River supplementation program, the return rate from fry release to adult return was 0.06%, 0.3%, and 4.1% for the 1997 through 1999 brood years, respectively (Table 4-13).

Hatchery survival rates – Sufficient data have not been collected and/or recorded to be able to fully assess survival rates by life stage for summer chum reared in the supplementation program at Lilliwaup. There were improvements in the data collecting and recording during brood years

2003 and 2004. The estimated survival rate from green egg to fry release was about 92% for brood year 2003 and about 85% for brood year 2004 (compared to the program objective of 85% survival).

Broodstocking and egg sources - To represent the demographics of the donor population at the current low population levels, up to 100% of the summer chum returning to Lilliwaup Creek may be used as broodstock. During 1998 through 2001, all or nearly all summer chum returning to Lilliwaup Creek were included in the supplementation program (Table 4-12). During 2002 through 2004, the return of summer chum increased substantially, more broodstock were collected for the program, and more summer chum spawned naturally in Lilliwaup Creek.

General Program Assessment

Until 2001 and 2002, adult return levels had not improved since the program began. Program operational improvements begun in 1998 have apparently contributed to increased adult returns. Otolith mark analysis of returning adults is now available for some years. Observed spawning escapements of 858 fish in 2002, 353 fish in 2003, and 1,017 fish in 2004 included 822, 326, and 881 supplementation program adults, respectively (see Table 2-12). The Co-managers will continue to monitor the adult returns. According to the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations). The original program began in 1992, however, due to the lack of adequate broodstock collection until 1998 and only recent indications of stock recovery, the Co-managers have established 1998 as the first effective year of the program and will extend the program beyond the original 12-year maximum.

The Lilliwaup supplementation project has generally addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Table 4-13. Return from fry to adult for summer chum salmon reared in supplementation program at Lilliwaup Creek, as determined from otolith marks for the 1997 through 2001 brood years; this includes strays to other streams.

Brood year	No. fry released	Return year	Age	Adult return	Return rate
1997	14,200	1999	2		0.00%
		2000	3	0	0.00%
		2001	4	9	0.06%
		2002	5	0	0.00%
			Total	9	0.06%
1998	17,200	2000	2	0	0.00%
		2001	3	20	0.12%
		2002	4	36	0.21%
		2003	5	0	0.00%
			Total	55	0.32%
1999	17,400	2001	2	5	0.03%
		2002	3	710	4.08%
		2003	4	5	0.03%
		2004	5	0	0.00%
			Total	720	4.14%
2000	14,800	2002	2	0	0.00%
		2003	3	30	0.20%
		2004	4	115	0.77%
		2005	5	N/A	N/A
			Total	144	0.97%
2001	38,000	2003	2	0	0.00%
		2004	3	0	0.00%
		2005	4	N/A	N/A
		2006	5	N/A	N/A
			Total	0	0.00%

Hamma Hamma River

The Hamma Hamma multi-species salmonid recovery project was developed by HCSEG with support from others. Out of this effort evolved the Hamma Hamma summer chum supplementation project on John Creek, a Hamma Hamma River tributary. A review of freshwater habitat conditions, summer chum escapements, potential causes for decline in escapement, and current restoration efforts in Hood Canal by the Co-managers and cooperators, led to the recommendation to initiate the summer chum supplementation project, beginning with brood year 1997.

Annual Production

A summary of the production for each brood year of the project is provided in Table 4-14.

Table 4-14. Hamma Hamma River summer chum supplementation program, brood years 1997-2004.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
	Males	Females	Total					
1997	9	5	14	104	11.8%	12,000	1.0	3/1/98
1998	15	17	32	95	22.4%	2,800	1.0	3/15/99
1999	21	22	43	210	16.9%	51,600	1.1-1.5	3/11, 3/25/00
2000	30	26	56	173	24.4%	55,400	1.1-1.2	3/12, 3/20/01
2001	27	27	54	1,173	4.4%	49,500	1.0	3/4, 3/7, 3/15/02
2002	34	34	68	2,260	2.9%	61,000	1.0-1.2	2/26, 3/5, 3/20/03
2003	28	30	58	796	6.8%	75,356	1.1-1.3	2/27, ¾, 3/20/04
2004	32	32	64	2,493	2.5%	57,000	1.2	3/27/05

Monitoring and Evaluation

Monitoring and evaluation were consistent with the above described, generally applicable monitoring and evaluation actions carried out for all individual projects (see section above titled Project Monitoring and Evaluation). Following are additional details of monitoring and evaluation activities applicable to this project.

Fish marking and mark recovery - Beginning with brood year 1997, the otoliths of summer chum salmon embryos produced in the supplementation program on Hamma Hamma River were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from other summer chum. Spawning ground surveys were conducted throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment). Estimates of natural-origin and supplementation-origin escapement are shown in Table 2-12 for return years 2001 through 2004.

Evaluation of the Hamma Hamma supplementation program is difficult. The Hamma Hamma and Lilliwaup supplementation programs are both otolith-marked at LLTK's Lilliwaup Hatchery and apparently, for some brood years (e.g., 2000-2003), otolith marking schedules were not closely followed and/or reference collections of otolith marks applied were not representative of fed fry released from the program. Consequently, ambiguous otolith marks were common from summer chum adults recovered in the Hamma Hamma River and in some other streams, with

Hamma Hamma supplementation program being one of the possibilities. These otolith-marked adults could be identified as being produced from a supplementation program, but definite assignment to a specific program was not always possible. DNA analysis was used to identify some fish with ambiguous otoliths to a program of origin, and this helped, but many fish were not analyzed due to budget constraints. In addition, although sampling rates were generally good, expansion rates applied to the actual number of fish sampled to obtain total mark rates in the estimated total escapement could be a source of error.

Preliminary analysis indicates that, of otolith-marked adults recovered from the Hamma Hamma supplementation program, 56% of brood year 1997, 91% of brood year 1998, 76% of brood year 1999, 10% of brood year 2000, and 12% of brood year 2001 were recovered in the Hamma Hamma River. This means that 44%, 9%, 24%, 90%, and 88% of Hamma Hamma program adults for brood years 1997 through 2001, respectively, were strays to other rivers. As noted above, these estimates may be of limited value due to the ambiguity of otolith marks recovered.

As described earlier (see Section 2, Stock Assessment), most straying of supplementation-origin fish occurred between neighboring streams within the region of origin. Strays from Hamma Hamma River were most commonly recovered in Duckabush, Dosewallips, and Lilliwaup (which are adjacent west Hood Canal streams) and Union River. Smaller numbers of strays were recovered in Little Quilcene, Big Beef, Dewatto, and Chimacum. For year-by-year estimates of stray supplementation returns by program and stream of recovery, see Appendix Tables 13 to 17.

Adult returns - The Hamma Hamma River supplementation program has contributed to the return of adult summer chum, but the contributions have been sporadic. Summer chum adults originating from the supplementation program first returned in 2000, as three year olds. Estimates of the number of otolith-marked adults, their ages, and survival from fed fry to spawner for summer chum reared in the supplementation program at Hamma Hamma River are presented for the 1997 through 2001 brood years in Table 4-15. The supplementation program contributed an estimated 39, 23, 1,668, 1,401, and 150 adults during the 1997 through 2001 brood years, respectively; this includes apparent strays to other streams.

Under the SCSCI, a fry to adult survival rate range of 0.83% to 1.66% was set as an objective for each supplementation and reintroduction program (WDFW and PNPTT 2000). For the Hamma Hamma River supplementation program, the return rate from fry release to adult return was 0.3%, 0.8%, 3.2%, 2.5%, and 0.3% for the 1997 through 2001 brood years, respectively (Table 4-15). Note that for 2000 and 2001 broods, these represent incomplete brood returns.

Hatchery survival rates – Sufficient data have not been collected and/or recorded to be able to fully assess survival rates by life stage for summer chum reared in the supplementation program at Hamma Hamma. There were improvements in the collecting and recording of data during brood years 2001 through 2004. The estimated survival rate from green egg to fry release was about 77%, 68%, 92%, and 74% for brood year 2001, 2002, 2003, and 2004, respectively (compared to the program objective of 85% survival). Measures to increase hatchery survival rates have been discussed and implemented.

Table 4-15. Return from fry to adult for summer chum salmon reared in supplementation program at Hamma Hamma River, as determined from otolith marks for the 1997 through 2001 brood years; this includes strays to other streams.

Brood year	No. fry released	Return year	Age	Adult return	Return rate
1997	12,000	1999	2	0	0.00%
		2000	3	9	0.08%
		2001	4	17	0.14%
		2002	5	12	0.10%
			Total	39	0.32%
1998	2,800	2000	2	0	0.00%
		2001	3	9	0.31%
		2002	4	14	0.49%
		2003	5	0	0.00%
			Total	23	0.80%
1999	51,600	2001	2	0	0.00%
		2002	3	1,245	2.41%
		2003	4	423	0.82%
		2004	5	0	0.00%
			Total	1,668	3.23%
2000	55,400	2002	2	0	0.00%
		2003	3	659	1.19%
		2004	4	742	1.34%
		2005	5	N/A	N/A
			Total	1,401	2.53%
2001	49,500	2003	2	5	0.01%
		2004	3	145	0.29%
		2005	4	N/A	N/A
		2006	5	N/A	N/A
			Total	150	0.30%

Broodstocking and egg sources - To represent the demographics of the donor population, broodstock are collected proportional to the timing, weekly abundance, and duration of the entire return to the Hamma Hamma. Broodstock are collected near the most downstream point of observed spawning activity in the Hamma Hamma, so nearly the entire run is available for broodstock and the probability is increased that broodstock are representative of the total run.

General Program Assessment

It appears that the Hamma Hamma River summer chum supplementation program was generally successful in collecting a representative sample of broodstock from the natural Hamma Hamma River summer chum stock. Consistent with the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1997. It is too early in the program to assess the success of adult returns from the supplementation program. Early indications are, however, that natural-origin summer chum productivity is good (Table 2-15). The Co-managers will continue to monitor the returns.

The Hamma Hamma supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Union River/Tahuya River

The Union River supplementation program is a cooperative effort between the Hood Canal Salmon Enhancement Group and WDFW and was initiated in brood year 2000. The goal is to reintroduce a healthy, natural, self-sustaining population of summer chum into the Tahuya River. The strategy is to boost the abundance of the Union River population to allow for transfers of surplus fish for a reintroduction of summer chum on the Tahuya River using Union River stock. The supplementation program, its goal, objectives, and guidelines are presented in an HGMP consistent with the SCSCI.

Annual Production

A summary of the production for each brood year of the project is provided in **Table 4-16** for Union River and **Table 4-17** for Tahuya River.

All eggs are incubated to eyed egg at WDFW's George Adams Hatchery, eyed eggs were transferred to remote hatchery facilities, and fry were reared to target size at the remote hatchery facilities and released during February and March each year. Some fish were also reared to swim-up at George Adams Hatchery prior to transfer; this rearing strategy reduced the risk of catastrophic hatchery failure at the remote sites. Fry reared at George Adams Hatchery and at each remote site (Huson springs and Tahuya) received different otolith marks so the rearing strategies can be evaluated.

Table 4-16. Union River summer chum supplementation program, brood years 2000-2004.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
	Males	Females	Total					
2000	30	32	62	682	8.3%	75,876	1.0	2/21, 2/27/01
2001	32	32	64	1,486	4.3%	73,472	1.0	2/21, 2/27/02
2002	32	33	65	807	7.5%	82,636	1.0	3/3, 3/10, 3/20/03
2003	68	68	136	11,780	4.4%	35,343 [1/]	1.1-1.1	3/10/04
2004	49	51	100	5,876	1.7%	0 [2/]	- -	- - - -

[1/] In addition, for BY 2003, a total of 111,232 fed fry were released from a remote rearing site on the Tahuya River.
[2/] In addition, for BY 2004, a total of 118,872 fed fry were released from a remote rearing site on the Tahuya River.

Table 4-17. Tahuya River summer chum reintroduction program, brood years 2003-2004.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
	Males	Females	Total					
2003	[1/]	[1/]	[1/]	0	[1/]	111,232 [2/]	1.4	3/8, 3/17, 3/22, 3/29/04
2004	[1/]	[1/]	[1/]	8	[1/]	118,872 [3/]	1.0-1.1	2/16, 3/10/05

[1/] For BY 2003 and BY 2004, broodstock were collected from Union River and eggs were eyed and otolith marked at George Adams Hatchery.

[2/] For BY 2003, 74,298 fry were marked with "Tahuya" otolith mark and 36,934 fry were marked with "George Adams/Huson transfer" otolith mark.

[3/] For BY 2004, 40,619 fry were marked with "Tahuya vertical incubator" otolith mark, 34,163 fry were marked with "Tahuya RSI" otolith mark, and 44,090 fry were marked with "George Adams incubated and reared" otolith mark.

Monitoring and Evaluation

Monitoring and evaluation were consistent with the above described, generally applicable monitoring and evaluation actions carried out for all individual projects (see section above titled Project Monitoring and Evaluation). Following are additional details of monitoring and evaluation activities applicable to this project.

Fish marking and mark recovery - Brood year 2000 was the first year of the Union River supplementation program. The otoliths of summer chum salmon embryos produced in the program were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from naturally-spawned summer chum in the Union River and from summer chum fry released from other supplementation programs. During 2000 through 2004, a permanent trap was operated throughout the summer chum return to collect broodstock, enumerate spawners and to complement information on fish origin and age composition collected during spawner surveys (see Section 2, Stock Assessment). Estimates of natural-origin and supplementation-origin escapement are shown in Table 2-12 for return years 2001 through 2004.

For brood years 2000 and 2001, nearly all (99.8%) supplementation-origin summer chum from the Union River program returned to the Union River. A few strays from Union River were recovered in Lilliwaup and Chimacum creeks. For year-by-year estimates of stray supplementation returns by program and stream of recovery, see Appendix Tables 13 to 17.

Adult returns - The Union River supplementation program has been very successful in contributing to the return of adult summer chum. Summer chum adults originating from the supplementation program first returned in 2003, as three year olds. Estimates of the number of otolith-marked adults, their ages, and survival from fed fry to spawner for summer chum reared in the supplementation program at Union River are presented for the 2000 and 2001 brood years in Table 4-18. The supplementation program contributed an estimated 3,555 and 1,723 adults from the 2000 and 2001 brood years, respectively; this includes strays to other streams.

Under the SCSCI, a fry to adult survival rate range of 0.83% to 1.66% was set as an objective for each supplementation and reintroduction program (WDFW and PNPTT 2000). For the Union River supplementation program, the return rate from fry release to adult return was 4.7% and

2.3% for the 2000 and 2001 brood years, respectively (Table 4-18).

Brood year 2003 was the first year of the Tahuya River reintroduction program and the first adults returned in 2006, as three year olds (WDFW and PNPTC 2007).

Table 4-18. Return from fry to adult for summer chum salmon reared in supplementation program at Union River, as determined from otolith marks for the 2000 through 2001 brood years; this includes strays to other streams.

Brood year	No. fry released	Return year	Age	Adult return	Return rate
2000	75,876	2002	2	0	0.00%
		2003	3	3,109	4.10%
		2004	4	446	0.59%
		2005	5	N/A	N/A
			Total	3,555	4.69%
2001	73,472	2003	2	54	0.07%
		2004	3	1,668	2.27%
		2005	4	N/A	N/A
		2006	5	N/A	N/A
			Total	1,722	2.34%

Hatchery survival rates - The Union River/Tahuya River summer chum program has generally been successful in meeting the hatchery survival rate objectives. The number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum reared in the supplementation program at Huson Springs site, Tahuya site, and George Adams Hatchery from 2000 through 2004 are presented in Table 4-19.

Table 4-19. Number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum salmon reared in the Union/Tahuya reintroduction program, 2000 through 2004 brood years

						% Survival by life stage			Cumulative % survival		
Brood Year	**Facility**	**Green eggs [1]**	**Eyed eggs**	**Swim-up fry**	**Fry released**	**Green egg to eyed egg**	**Eyed egg to swim-up**	**Swim-up to release**	**Green egg to eyed egg**	**Green egg to swim-up**	**Green egg to release**
2000	G. Adams	42,539	40,359	40,311	39,997	94.9%	99.9%	99.2%	94.9%	94.8%	94.0%
	Huson site	42,538	40,358	39,816	35,879	94.9%	98.7%	90.1%	94.9%	93.6%	84.3%
2001	G. Adams	41,824	37,906	37,731	37,214	90.6%	99.5%	98.6%	90.6%	90.2%	89.0%
	Huson site	41,824	37,906	37,786	36,258	90.6%	99.7%	96.0%	90.9%	90.3%	86.7%
2002	G. Adams	44,699	43,195	42,670	41,833	96.6%	98.8%	98.0%	96.6%	95.5%	93.6%
	Huson site	44,698	43,195	43,189	40,753	96.6%	100.0%	94.4%	96.6%	96.6%	91.2%
2003	G. Adams	169,802	--	--	--	91.7%	--	--		91.7%	--
	Huson site	--	38,936	38,515	35,343	--	98.9%	91.8%		--	90.7%
	Tahuya site	--	116,704	115,601	111,232	--	99.1%	96.2%		--	90.8%
2004	G. Adams	130,249	--	--	--	93.2%	--	--		93.2%	--
	Huson site	--	--	--	--	--	--	--		--	--
	Tahuya site	--	121,413	120,080	118,872	--	98.9%	99.0%		--	92.2%

[1] All green eggs are incubated at WDFW George Adams Hatchery; eyed eggs are shipped to the Huson and Tahuya remote sites; and, some eyed eggs are retained at G.A. Hatchery and shipped as swim-up fry to the remote sites.

The average weight of female summer chum salmon, egg size, fecundity, egg loss, and sex ratio for broodstock used in the Union River supplementation program, 2000 through 2004, are shown in Table 4-20.

Table 4-20. Average summer chum salmon female weight, egg size, fecundity, egg loss, and sex ratio for broodstock used in the Union River supplementation program, 2000 through 2004.

Brood year	Average adult female weight (lbs)	Average green egg sample (#/lb.)	Average eyed egg sample (#/lb.)	Average fecundity (eggs/female)	Average % egg loss	Male::female ratio (%) in trap
2000	7.11	1,990	1,774	2,659	5.12%	42.9::57.1
2001	6.95	2,050	1,827	2,614	9.37%	47.5::52.5
2002	6.90	2,082	1,842	2,798	3.52%	53.0::47.0
2003	6.2	2,090	1,903	2,121	8.3%	47.4::52.6
2004	7.6	1,848	1,673	2,546	6.8%	50.9::49.1
Average	7.0	2,012	1,804	2,548	6.6%	48.3::51.7

Fish Health - Fish health exams found bacterial gill disease in fry at the Huson Springs site during 2001, 2002, and 2003 and at the Tahuya site during 2003 and 2004; treatment was successful. To reduce the risk of bacterial gill disease at Huson Springs and Tahuya, changes to the incubation and rearing systems were designed and implemented for the 2003 and 2004 brood years. To date, this is the only fish health issue that has arisen among all of the summer chum fish culture facilities.

General Program Assessment

It appears that the Union River summer chum supplementation program was generally successful in collecting a representative sample of broodstock from the natural Union River summer chum stock. The Union River supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Consistent with the standards set in the SCSCI, the co-managers decided that the Union River supplementation program could be terminated since adult return targets were met before the three-generation (12 year) maximum limit. Based on an increased abundance of adult returns in recent years (2001-2004 average of 5,064 adults) relative to post population decline years (1988-1991 average of 391 adults), indications that the supplementation program had successfully bolstered total return levels (e.g., by contributing 3,162 hatchery adults in 2003 and 2,115 hatchery adults in 2004 (Table 4-18)), and indications that natural-origin summer chum productivity is good (see Table 2-15), the decision was made that supplementation program fry releases into the Union River in 2004 (brood year 2003) would be the final releases. The returns of supplementation program adults from this last brood year are expected in 2006, 2007, and 2008.

The phase of the project to reintroduce summer chum into the Tahuya River began with brood year 2003 and continued during brood year 2004, with fry releases into the Tahuya in 2004 and 2005. Broodstock will continue to be collected from the Union River to support the Tahuya River program.

STRAIT OF JUAN DE FUCA REGION

Salmon Creek

Wild Olympic Salmon initiated a project to boost the number of summer chum in the Snow/Salmon Creek stock so it could be used as a donor stock to reintroduce summer chum into Chimacum Creek. The supplementation program, begun on Salmon Creek in 1992, was originally conceived with the objectives to rebuild and stabilize the Snow/Salmon Creek stock and to allow for the transfer of surplus eggs or fry to reintroduce summer chum to Chimacum Creek. The supplementation project is a cooperative effort between WDFW, North Olympic Salmon Coalition, and Wild Olympic Salmon.

Annual Production

A summary of the production for each brood year of the project is provided in Table 4-21.

Table 4-21. Salmon Creek summer chum supplementation program, brood years 1992-2003.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry [1] released	Release size[1] (gms)	Release date
	Males	Females	Total					
1992	35	27	62	371	14.3%	19,200	1.1	5/7/93
1993	29	23	52	400	11.5%	44,000	1.8	4/27/94
1994	12	12	24	137	14.9%	2,000	1.3	3/31/95
1995	35	18	53	538	9.0%	38,808	1.3	4/23/96
1996	59	50	109	785	12.2%	62,000 [2]	1.3	4/8, 4/24/97
1997	60	50	110	724	13.2%	71,821 [2]	1.0-1.3	3/31, 4/16/98
1998	65	56	121	1,023	10.6%	67,832 [2]	1.0-1.3	3/31, 4/21, 5/4/99
1999	34	31	65	434	13.0%	34,680 [2]	1.3-2.6	4/23, 6/12/00
2000	71	65	136	710	16.1%	90,435 [2]	0.6-1.1	4/14, 4/26/01
2001	77	77	154	2,484	5.8%	18,110 [2]	1.0-1.1	4/18, 4/27/02
						72,870 [3]	0.35	3/1/02-4/18/02
2002	64	64	128	5,389	2.3%	118,347 [2,3]	0.35	2/19/03-3/28/03
2003	65	65	130	5,521	2.3%	88,610 [2,3]	0.35	2/1/04-3/18/04

[1] Release number and size data from Wild Olympic Salmon (1997; 1998) and WDFW files.
[2] Release numbers do not include 28,788; 36,840; 70,050; 39,170; 73,200; 79,500; 57,300; and 57,435 fry of Salmon Creek-origin, released into Chimacum Creek in 1997, 1998, 1999, 2000, 2001, 2002, 2003, and 2004, respectively.
[3] Unfed fry release from remote site incubators; for BY 2002, includes 33,880 unfed fry transferred from Hurd Creek Hatchery and released directly into Salmon Creek.

Monitoring and Evaluation

Monitoring and evaluation were consistent with the above described, generally applicable monitoring and evaluation actions carried out for all individual projects (see section above titled Project Monitoring and Evaluation). Following are additional details of monitoring and evaluation activities applicable to this project.

Fish marking and mark recovery - The otoliths of summer chum salmon embryos produced in the supplementation program on Salmon Creek are thermally mass-marked (otolith-marked) prior to release. An adult trap was operated and spawning ground surveys were conducted

throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment). Estimates of natural-origin and supplementation-origin escapement are shown in Table 2-12 for return years 2001 through 2004.

Most supplementation-origin summer chum from the Salmon Creek program returned to Salmon Creek or Snow Creek; these two streams support the same summer chum stock. For brood years 1996 through 2001, the percentage of Salmon Creek supplementation fish that returned to Salmon and/or Snow creeks averaged 95%, ranging from 89% to 99%.

As noted earlier (see Section 2, Stock Assessment), most straying of supplementation-origin fish occurred between neighboring streams within the region of origin. Strays from Salmon Creek were recovered in Jimmycomelately, Little Quilcene, Duckabush, Hamma Hamma, Lilliwaup, and Big Beef Creek in small numbers. Recoveries occurred in more substantial numbers in Chimacum Creek, the recipient of the Salmon Creek stock as the donor for the reintroduction program there. For year-by-year estimates of stray supplementation returns by program and stream of recovery, see Appendix Tables 13 to 17.

Adult returns - The Salmon Creek supplementation program has been very successful in contributing to the return of adult summer chum. Estimates of the number of otolith-marked adults, their ages and survival from fed fry to spawner for summer chum reared in the supplementation program at Salmon Creek are presented for the 1994 through 2001 brood years in Table 4-22. The supplementation program contributed an estimated 96, 648, 422, 1037, 1647, 1532, 1623, and 1106 adults during the 1994 through 2001 brood years, respectively; this includes strays to other streams.

Under the SCSCI, a fry to adult survival rate range of 0.83% to 1.66% was set as an objective for each supplementation and reintroduction program (WDFW and PNPTT 2000). For the Salmon Creek supplementation program, the return rate from fry release to adult return was 4.8%, 1.7%, 0.7%, 1.4%, 2.4%, 4.4%, 1.8%, and 1.2% for the 1994 through 2001 brood years, respectively (Table 4-22). Note that for 2000 and 2001 broods, these represent incomplete brood returns.

The number of supplementation-origin recruits and natural-origin recruits to Salmon Creek increased substantially since 2001 (Table 4-23). The number of natural-origin recruits in Salmon Creek during 2002, 2003, and 2004 each exceeded the previous recorded high of 3,074 natural-origin recruits in 1980 (Figure 4-2).

Table 4-22. Return from fry to adult for summer chum salmon reared in supplementation program at Salmon Creek, as determined from otolith marks for the 1994 through 2001 brood years; this includes strays to other streams.

Brood year	No. fry released	Return year	Age	Adult return	Return rate
1994	2,000	1996	2	N/A	N/A
		1997	3	46	2.30%
		1998	4	50	2.50%
		1999	5	0	0.00%
			Total	96	4.80%
1995	38,808	1997	2	13	0.03%
		1998	3	471	1.21%
		1999	4	164	0.42%
		2000	5	0	0.00%
			Total	648	1.67%
1996	62,000	1998	2	8	0.01%
		1999	3	220	0.36%
		2000	4	194	0.31%
		2001	5	0	0.00%
			Total	422	0.68%
1997	71,821	1999	2	0	0.00%
		2000	3	235	0.33%
		2001	4	802	1.12%
		2002	5	0	0.00%
			Total	1,037	1.44%
1998	67,832	2000	2	14	0.02%
		2001	3	825	1.22%
		2002	4	788	1.16%
		2003	5	21	0.03%
			Total	1,647	2.43%
1999	34,680	2001	2	43	0.12%
		2002	3	1,332	3.84%
		2003	4	157	0.45%
		2004	5	0	0.00%
			Total	1,532	4.42%
2000	90,435	2002	2	0	0.00%
		2003	3	1,493	1.65%
		2004	4	130	0.14%
		2005	5	N/A	N/A
			Total	1,623	1.79%
2001	92,415	2003	2	32	0.03%
		2004	3	1,075	1.16%
		2005	4	N/A	N/A
		2006	5	N/A	N/A
			Total	1,106	1.20%

Table 4-23. Natural-origin recruits and supplementation-origin recruits in the spawner escapement to Salmon Creek, 1997 through 2004 return years.

Return year	Natural-origin recruits in spawner escapement		Supplementation-origin recruits in spawner escapement		Total spawner escapement
1997	768	(92%)	66	(8%)	834
1998	605	(53%)	529	(47%)	1,134
1999	132	(27%)	367	(73%)	499
2000	439	(52%)	407	(48%)	846
2001	1,168	(44%)	1,470	(56%)	2,638
2002	3,745	(68%)	1,772	(32%)	5,517
2003	3,785	(67%)	1,866	(32%)	5,651
2004	4,103	(68%)	1,918	(32%)	6,021

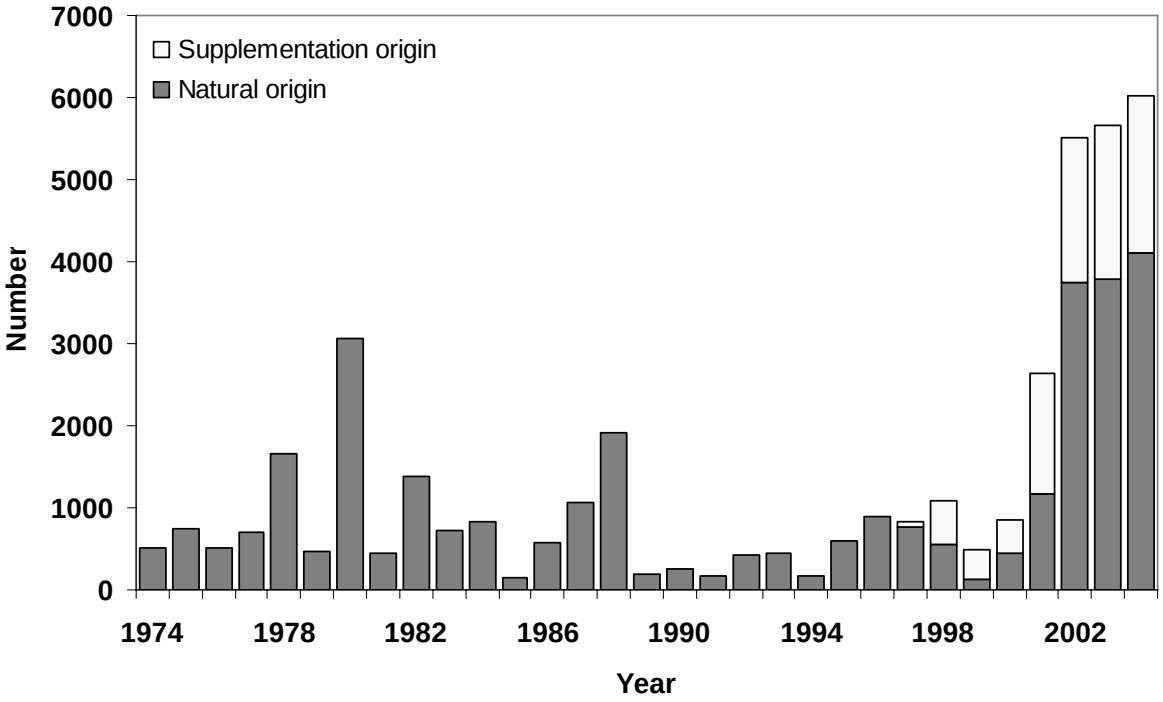

Figure 4-2. Salmon Creek summer chum supplementation-origin and natural-origin escapement, 1974-2004

Hatchery survival rates - The Salmon Creek summer chum program has generally been successful in meeting the hatchery survival rate objectives. The number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum reared in the supplementation program at Salmon Creek Hatchery for 1992 through 2002 brood years are presented in Table 4-24.

Table 4-24. Number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum salmon reared in the supplementation program at Salmon Creek Hatchery, 1992 through 2003 brood years.

	Number of eggs or fry					% Survival by life stage			Cumulative % survival	
	Total		Salmon Cr. Hatchery			Salmon Cr. Hatchery			Salmon Cr. Hatchery	
Brood year	Green eggs	Eyed eggs	Eyed eggs	Swim-up fry	Fry released	Green egg to eyed egg	Eyed egg to swim-up	Swim-up to release	Green egg to swim-up	Green egg to release
1992	46,980	44,280	44,280	18,684	19,200	94.3	42.2	100.0	39.8	39.8
1993	--	46,300	46,300	26,837	44,000	--	58.0	100.0	--	--
1994	--	24,200	24,200	2,000	2,000	--	8.3	100.0	--	--
1995	41,750	39,200	39,200	38,808	38,808	93.9	99.0	100.0	93.0	93.0
1996	--	114,900 [1]	64,900	62,300	62,000	--	96.0	99.5	--	--
1997	133,340	112,900 [1]	72,900	71,011	71,821	87.7	97.4	100.0	85.4	85.4
1998	164,300	149,100 [1]	69,100	68,423	67,807	90.7	99.0	99.1	89.8	89.0
1999	87,350	78,300 [1]	29,200	28,950	28,400 [2]	89.6	99.1	98.1	88.8	87.1
2000	174,550	165,400 [1]	91,350	90,755	90,435	94.8	99.3	99.6	94.1	93.8
2001	198,685	177,150 [1]	93,309	92,644	92,415	89.2	99.3	99.7	88.6	88.3
2002	184,450	177,150 [1]	119,150	--	117,797[3]	96.0	--	98.9	--	94.9
2003	154,200	150,300[1]	90,225	--	88,610	97.5	--	98.2	--	95.8

[1] Total includes eggs taken for both Salmon Creek supplementation and Chimacum Creek reintroduction programs; all green eggs are incubated at Dungeness Hatchery and shipped as eyed eggs to Salmon Creek Hatchery and Chimacum Creek Hatchery.
[2] Does not include 6,300 fish transferred June 1 at 256 fish per pound (fpp) from Dungeness Hatchery and 6,280 released June 12 at 175 fpp at RM 0.1 in Salmon Creek after rearing in freshwater there; total release was 34,680 fish for BY 1999.
[3] Includes 33,580 fish incubated at Hurd Creek and transferred and released upon swim-up at Salmon Creek RM 0.8.

Broodstocking and egg sources - To represent the demographics of the donor stock, summer chum broodstock are collected randomly as the fish arrive at a temporary fish trap operated by WDFW, Wild Olympic Salmon, and North Olympic Salmon Coalition, proportional to the timing, weekly abundance, and duration of the total return to the creek. Fish not retained for use as broodstock are released upstream of the trap site to spawn naturally. Trap data for 2003 and 2004 are presented in Appendix Report 1.

General Program Assessment

The Salmon Creek supplementation program has resulted in substantial increases in the total number of summer chum salmon adults returning to spawn in the watershed. The abundance of natural-origin spawners in Salmon Creek has increased from a mean of 261 adults (283 adults for Salmon/Snow stock) during 1989-1992 (just prior to initiation of supplementation) to a mean of 3,198 adults (3,421 adults for Salmon/Snow stock) during 2001-2004. In addition, the hatchery program succeeded as a donor stock for reintroduction of a summer chum return in Chimacum Creek. Adult returns to Chimacum Creek have been re-established to the level that transfers of Salmon Creek stock were no longer necessary beginning in 2004.

It appears that the Salmon Creek summer chum supplementation program was generally successful in collecting a representative sample of broodstock from the natural Snow/Salmon

summer chum stock. The Salmon Creek supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Consistent with the standards set in the SCSCI and HGMP, the intended maximum duration of the program is 12 years (3 generations) beginning with brood year 1992. Accordingly, the last brood year of the Salmon Creek program was 2003, with the returns of adults of this brood year expected in 2006, 2007, and 2008.

Although it appears that impacts to natural processes in freshwater and/or estuarine habitats have likely limited natural summer chum production in the stream in some years, habitat restoration actions implemented in recent years are expected to improve survival and productivity conditions for natural fish. Commensurate with the summer chum salmon supplementation program, WDFW and Jefferson Land Trust purchased properties in the lower freshwater reaches and along the Salmon/Snow creek estuary and North Olympic Salmon Coalition, Jefferson County Conservation District, and WDFW have implemented habitat restoration projects designed to remedy major sediment input and lower channel degradation factors. These restoration actions were designed to improve prospects for the survival and productivity of naturally spawning summer chum salmon, including adults produced through the hatchery effort.

Chimacum Creek

Chimacum Creek supported an indigenous summer chum population until the mid-1980s, when a combination of habitat degradation and poaching evidently led to its demise (WDFW and PNPTT 2000). In 1992, Wild Olympic Salmon initiated a project to boost the number of summer chum in the Salmon Creek stock so it could be used as a donor stock to reintroduce summer chum into Chimacum Creek. Beginning with brood year 1996, eyed eggs from the Salmon Creek broodstock were transferred to, and released from, Chimacum Creek hatchery facilities to reintroduce summer chum to formerly occupied habitat. The reintroduction project is a cooperative effort between WDFW, North Olympic Salmon Coalition, and Wild Olympic Salmon.

Annual Production

A summary of the production for each brood year of the project is provided in Table 4-25.

Table 4-25. Chimacum Creek summer chum reintroduction program, brood years 1996-2003.

Brood year	No. eggs received	No. fed fry released	Release size (gm)	Release date
1996	50,000	28,788	0.4-1.5	3/23, 5/9/97
1997	40,000	36,840	0.7	3/27, 4/11, 4/19/98
1998	80,000	70,050	0.6-0.8	3/26, 3/28, 4/21/99
1999	41,300	39,170	0.4-0.8	3/20, 3/31, 4/7, 4/24/00
2000	74,050	73,300	0.8-1.2	4/5, 4/17, 4/18, 4/23, 5/3, 5/10/01
2001	82,490	71,500	0.9-1.8	4/18, 4/27, 4/30, 5/2/02
		8,000 [1]	0.35	3/12/02
2002	58,000	57,300	0.9-1.0	3/4, 3/15, 3/19, 3/23/03
2003	60,075	57,435	0.7-1.0	4/6, 4/15, 4/27/04

[1] Unfed fry released accidentally into tributary to Chimacum Creek due to tank overflow.

Fry were successfully reared to target size in freshwater and saltwater facilities and released during March, April and May. Fry reared at the freshwater and saltwater sites received different otolith marks so the rearing and release strategies could be evaluated. For example, in 2004, 19,075 fry were released from saltwater netpens and 38,360 fry were from freshwater facilities into Chimacum Creek.

Monitoring and Evaluation

Monitoring and evaluation were consistent with the above described, generally applicable monitoring and evaluation actions carried out for all individual projects (see section above titled Project Monitoring and Evaluation). Following are additional details of monitoring and evaluation activities applicable to this project.

Fish marking and mark recovery - Beginning with brood year 1999, the otoliths of summer chum salmon embryos produced in the supplementation program on Chimacum Creek were thermally mass-marked (otolith-marked) prior to release to distinguish them from naturally-spawned summer chum in Chimacum Creek and from summer chum fry released from other supplementation programs. Spawning ground surveys were conducted throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment). Estimates of natural-origin and supplementation-origin escapement in Chimacum Creek are shown in Table 2-13 for return years 2001 through 2004.

Most supplementation-origin summer chum from the Chimacum Creek program returned to Chimacum Creek. For brood years 1999 through 2001, the percentage of Chimacum Creek supplementation fish that returned to Chimacum Creek averaged 76%, ranging from 41% to 100%.

As noted earlier (see Section 2, Stock Assessment), most straying of supplementation-origin fish occurred between neighboring streams within the region of origin. Strays from Chimacum Creek were recovered most commonly in Salmon Creek (the donor stock), with small numbers of recoveries in Jimmycomelately, Snow, Duckabush, and Lilliwaup. For year-by-year estimates of stray supplementation returns by program and stream of recovery, see Appendix Tables 13-16.

Adult returns - The Chimacum Creek reintroduction program has been successful in contributing to the re-establishment of adult summer chum to a stream previously occupied by summer chum. An estimated 38, 52, 903, 864, 558, and 1,139 summer chum returned to spawn in Chimacum Creek during 1999, 2000, 2001, 2002, 2003, and 2004, respectively (Appendix Table 2). This was the first natural spawning by summer chum in Chimacum Creek since the mid-1980s.

Estimates of the number of reintroduction program adults, their ages and survival from fed fry to spawner for summer chum reared in the reintroduction program at Chimacum Creek are presented for the 1996 through 2001 brood years in Table 4-26. The reintroduction program contributed an estimated 38, 428, 912, 484, 422, and 222 summer chum adults from brood years 1996 through 2001, respectively; this includes strays to other streams.

Under the SCSCI, a fry to adult survival rate range of 0.83% to 1.66% was set as an objective for each supplementation and reintroduction program (WDFW and PNPTT 2000). For the Chimacum reintroduction program, the return rate from fry release to adult return was 0.1%, 1.2%, and 1.3%, 0.7%, 0.6% and 0.3% for the 1996 through 2001 brood years, respectively (Table 4-26). Note that for 2000 and 2001 broods, these represent incomplete brood returns.

Table 4-26. Return from fry to adult for summer chum salmon reared in reintroduction program at Chimacum Creek, as determined from otolith marks for the 1996 through 2001 brood years; this includes strays to other streams.

Brood year	No. fry released	Return year	Age	Adult return	Return rate
1996	28,788	1998	2	N/A	N/A
		1999	3	38	0.13%
		2000	4	0	0.00%
		2001	5	0	0.00%
			Total	38	0.13%
1997	36,840	1999	2	0	0.00%
		2000	3	0	0.00%
		2001	4	404	1.10%
		2002	5	24	0.07%
			Total	428	1.16%
1998	70,050	2000	2	0	0.00%
		2001	3	419	0.60%
		2002	4	488	0.70%
		2002	5	5	0.01%
			Total	912	1.30%
1999	39,170	2001	2	0	0.00%
		2002	3	60	0.09%
		2003	4	420	0.60%
		2004	5	4	0.01%
			Total	484	0.69%
2000	73,300	2002	2	0	0.00%
		2003	3	169	0.23%
		2004	4	252	0.34%
		2005	5	N/A	N/A
			Total	422	0.58%
2001	71,750	2003	2	4	0.01%
		2004	3	218	0.30%
		2005	4	N/A	N/A
		2006	5	N/A	N/A
			Total	222	0.31%

Hatchery survival rates - The Chimacum Creek summer chum program has generally been successful in meeting the survival rate objectives. The number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum reared in the supplementation program at Chimacum Creek Hatchery from 1996 through 2002 are presented in Table 4-27.

Table 4-27. Number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum salmon reared in the reintroduction program at Chimacum Creek Hatchery, 1996 through 2003 brood years.

	Number of eggs or fry					% Survival by life stage				
	Total [1]		Chimacum Cr. Hatchery			Chimacum Cr. Hatchery				
Brood year	Green eggs	Eyed eggs	Eyed eggs	Swim-up fry	Fry released	Green eggs to eyed eggs	Eyed egg to swim-up	Swim-up to release	Green egg to release	Eyed egg to release
1996	--	114,900	50,000	31,243	28,788	--	62.5	92.1	--	57.6
1997	133,340	112,900	40,000	38,000	36,840	84.7	95.0	96.9	78.0	92.1
1998	164,300	149,100	80,000	73,750	70,050	90.7	92.2	95.0	79.5	87.6
1999	87,350	78,300	41,300	40,880	39,170	89.6	99.0	95.8	85.0	94.8
2000	174,550	165,400	74,050	--	73,300	94.8	--	--	93.8	99.0
2001	198,685	177,150	83,841	--	71,750	89.2	--	--	76.3	85.6
2002	184,450	177,150	58,000	--	57,300	96.0	--	--	94.9	98.8
2003	154,200	150,300	60,075	--	57,435	97.5	--	--	93.1	95.6

[1] Total includes eggs taken for both Salmon Creek supplementation and Chimacum Creek reintroduction programs; all green eggs are incubated at Dungeness Hatchery and shipped as eyed eggs to Salmon Creek Hatchery and Chimacum Creek Hatchery.

Broodstocking and egg sources - Summer chum broodstock were collected randomly as the fish arrived at a temporary fish trap operated by WDFW, Wild Olympic Salmon, and North Olympic Salmon Coalition on Salmon Creek, proportional to the timing, weekly abundance, and duration of the total return to the creek. Trap data are presented in Appendix Report 1. Eggs from each female used as broodstock were represented in the Chimacum Creek reintroduction program.

General Program Assessment

It appears that the Chimacum Creek summer chum reintroduction program has generally been successful in collecting a representative sample of broodstock from the natural Snow/Salmon Creek summer chum stock and successful in contributing to the return of adult summer chum to Chimacum Creek. Consistent with the standards set in the SCSCI and HGMP for the program, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1996. Substantial numbers of returning adults to the creek, and data showing that the reintroduction program had led to the production, return, and spawning of natural-origin fish that were the progeny of naturally spawning hatchery fish, drove the decision to terminate the reintroduction program with brood year 2003; this was four years in advance of the 12-year duration limit. The Co-managers will continue to monitor the adult returns from fry released from the reintroduction program, with returns of supplementation program adults expected through 2008.

The Chimacum Creek reintroduction project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Habitat protection and restoration actions implemented in recent years are expected to improve survival and productivity conditions for natural fish. Commensurate with the summer chum

salmon reintroduction program, North Olympic Salmon Coalition, Wild Olympic Salmon, Jefferson County, Jefferson Land Trust and WDFW implemented habitat restoration projects and purchased properties in the lower freshwater reaches and along the estuary. The projects are designed to protect lands adjacent to summer chum spawning and rearing areas from development impacts and to restore habitat function to freshwater and estuarine habitats. These restoration actions were designed to improve prospects for the survival and productivity of naturally spawning summer chum salmon, including adults produced through the hatchery program.

Jimmycomelately Creek

Summer chum in Jimmycomelately (JCL) Creek were identified as at high risk of extinction in the SCSCI and a supplementation project was initiated with the 1999 brood year. The supplementation project is a cooperative effort between WDFW and North Olympic Salmon Coalition.

Annual Production

A summary of the production for each brood year of the project is provided in Table 4-28.

Table 4-28. Jimmycomelately Creek summer chum supplementation program, brood years 1999-2004.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
	Males	Females	Total					
1999	2	4 [1]	6	1	85.7%	3,880	1.0	4/8/00
2000	33	13	46	9	83.6%	25,900	1.0	4/20, 4/28/01
2001	36	32	68 [2]	192 [3]	26.1%	54,515	0.9-1.2	4/17, 4/26/02
2002	21	15	36 [4]	6 [5]	85.7%	20,887	0.8-1.1	4/7, 4/21/03
2003	37	39	76 [6]	369 [6]	17.1%	49,897	0.9-1.2	3/26, 4/7, 4/16, 4/22, 4/26/04
2004	30	31	61	1,601	3.7%	76,982	0.7-1.1	3/25, 3/30, 4/1, 4/8, 4/15/05

[1] Includes two females trapped for brood stock, but not be used because they were spawned out.
[2] Includes 4 male mortalities in brood stock due to lack of available females.
[3] An additional 24 pre-escapement adults were known to be lost to predation in the bay and are not included in the total of natural spawners.
[4] Includes 8 male mortalities due to lack of available females and 1female mortality in brood stock.
[5] An additional 15 pre-escapement adults were known to be lost to predation in bay and are not included in the total of natural spawners.
[6] Includes 2 female and 3 male mortalities in broodstock; an additional 12 pre-escapement adults were known to be lost to predation in bay/creek and are not included in the total of natural spawners.

Fry are reared to target size in two freshwater remote hatchery facilities and released during March and April each year. Incubation and rearing at multiple sites is intended to reduce the risk of catastrophic hatchery failure. Fry reared at the Woods and Valhalla remote sites received different otolith marks so the two rearing strategies can be evaluated. For example, in 2004, 25,472 fry were released from the Woods site and 51,510 fry were released from the Valhalla site.

Monitoring and Evaluation

Monitoring and evaluation were consistent with the above described, generally applicable monitoring and evaluation actions carried out for all individual projects (see section above titled Project Monitoring and Evaluation). Following are additional details of monitoring and evaluation activities applicable to this project.

Fish marking and mark recovery - Beginning with brood year 1999, the otoliths of summer chum salmon embryos produced in the supplementation program on Jimmycomelately (JCL) Creek were thermally mass-marked prior to release to distinguish them from naturally-spawned summer chum in JCL Creek and from summer chum fry released from other supplementation programs. An adult trap was operated and spawning ground surveys were conducted throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment). Estimates of natural-origin and supplementation-origin escapement in JCL Creek are shown in Table 2-12 for return years 2001 through 2004.

Most supplementation-origin summer chum from the JCL Creek program returned to JCL Creek. For brood years 1999 through 2001, the percentage of JCL Creek supplementation fish that returned to JCL Creek averaged 89%, ranging from 81% to 98%.

As noted earlier (see Section 2, Stock Assessment), most straying of supplementation-origin fish occurred between neighboring streams within the region of origin. Small numbers of strays from the JCL Creek program were recovered in Salmon, Snow, Duckabush, Hamma Hamma, and Lilliwaup. For year-by-year estimates of stray supplementation returns by program and stream of recovery, see Appendix Tables 13 to 17.

Adult returns - The JCL Creek supplementation program has been very successful in contributing to the return of adult summer chum. Estimates of the number of otolith-marked adults, their ages and survival from fed fry to spawner for summer chum reared in the supplementation program at JCL Creek are presented for the 1999 through 2001 brood years in Table 4-29. The supplementation program contributed an estimated 220, 277, and 795 adults from the 1999, 2000, and 2001 brood years, respectively; this includes strays to other streams.

Under the SCSCI, a fry to adult survival rate range of 0.83% to 1.66% was set as an objective for each supplementation and reintroduction program (WDFW and PNPTT 2000). For the JCL supplementation program, the return rate from fry release to adult return was 5.7%, 1.1%, and 1.5%, for the 1999, 2000, and 2001 brood years, respectively (Table 4-29).

Table 4-29. Return from fry to adult for summer chum salmon reared in reintroduction program at Jimmycomelately Creek, as determined from otolith marks for the 1999 through 2001 brood years; this includes strays to other streams.

Brood year	No. fry released	Return year	Age	Adult return	Return rate
1999	3,880	2001	2	0	0.00%
		2002	3	65	1.68%
		2003	4	149	3.83%
		2004	5	6	0.15%
			Total	220	5.67%
2000	25,900	2002	2	0	0.00%
		2003	3	200	0.77%
		2004	4	77	0.30%
		2005	5	N/A	N/A
			Total	277	1.07%
2001	54,515	2003	2	12	0.02%
		2004	3	783	1.44%
		2005	4	N/A	N/A
		2006	5	N/A	N/A
			Total	795	1.46%

Hatchery survival rates - The Jimmycomelately Creek summer chum program has generally been successful in meeting the hatchery survival rate objectives. Survival rates are presented in Table 4-30. For brood years 2001 and 2003 the egg to swim-up goals for the Woods site were not met. In April of 2002 several thousand dead and live fry were found trapped beneath a screen in the barrel incubator, and there were approximately 5,000 fry mortalities. In January of 2004 approximately 28,000 alevin were killed when the water intake line froze up. In both cases modifications were made to the facilities to minimize potential future losses.

Table 4-30. Number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum salmon reared in the Jimmycomelately Creek supplementation program, 2000 through 2004 brood years

						% Survival by life stage			Cumulative % survival		
Brood Year	Facility	Green eggs [1]	Eyed eggs	Swim-up fry	Fry released	Green egg to eyed egg	Eyed egg to swim-up	Swim-up to release	Green egg to eyed egg	Green egg to swim-up	Green egg to release
2000	Woods site Incubation & rearing	13,783	13,104	13,059	12,900	95.1	99.7	98.8	95.1	94.7	93.6
	Woods site Rearing only	13,783	13,134	13,050	13,000	95.3	99.4	94.7	95.3	94.7	94.3
2001	Valhalla site	35,181	30,517	30,360	29,690	86.7	99.5	97.8	86.7	86.3	84.4
	Woods site	35,182	30,517	25,415	24,825	86.7	83.3	97.7	86.7	72.2	70.6
2002	Valhalla site	14,120	12,442	11,642	11,095	88.1	93.7	95.3	88.1	82.5	78.6
	Woods site	14,120	12,442	10,598	9,792	88.1	85.2	92.4	88.1	75.1	69.3
2003	Valhalla site	53,787	48,930	48,150	47,740	91.0	98.4	99.1	91.0	89.5	88.8
	Woods site	32,966	29,989	2,170	2,157	91.0	7.2	99.4	90.1	6.6	6.5
2004	Valhalla site	53,966	52,000	51,695	51,510	96.4	99.4	99.6	96.4	95.8	95.4
	Woods site	31,414	30,276	26,216	25,472	96.4	86.6	97.2	96.4	83.5	81.1

[1] All green eggs are incubated at WDFW Hurd Creek Hatchery; eyed eggs are shipped to the Valhalla and Woods remote sites.

Broodstocking and egg sources - To represent the demographics of the donor population at the initial extremely low population levels, the intent was to use 100% of the summer chum returning to Jimmycomelately Creek as broodstock. A temporary adult trap (operated by WDFW and North Olympic Salmon Coalition) was located near the most downstream point of observed natural spawning activity; nearly the entire run was available for trapping, decreasing the risk that fish trapped through the program were not representative of the total run. During 1999, 2000, and 2002, approximately 85% of the summer chum returning to Jimmycomelately Creek were included in the supplementation program (Table 4-28). During 2001, 2003, and 2004, the escapements of summer chum were larger, adequate numbers of broodstock were collected for the program throughout the run timing, and the remainder of the summer chum were passed upstream to spawn naturally in Jimmycomelately Creek. Trap data for 2003 and 2004 are presented in Appendix Report 1.

General Program Assessment

It appears that the JCL Creek summer chum supplementation program has been generally successful in collecting a representative sample of broodstock from the natural JCL Creek summer chum stock. The supplementation program has contributed to the increase of adult returns from the post population decline (1989-1991) average escapement of 88 fish to an average escapement of 722 fish during 2002-2004. Supplementation program adults comprised

85% of the total escapement of 446 fish in 2003 and 63% of the total escapement of 1,662 fish in 2004 (see Table 2-13). The Co-managers will continue to monitor the adult returns from natural spawners and from fry released from the supplementation program.

Consistent with the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1999.

The Jimmycomelately Creek supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

The SCSCI noted that habitat impacts are high in JCL Creek and may be contributing to the risk to summer chum, and recommended that habitat protection and recovery measures should be addressed concurrent with supplementation project development. The Jamestown S'Klallam Tribe, WDFW, and numerous other partners have implemented habitat restoration projects in freshwater and estuarine areas of JCL Creek. In particular, the restoration and improvement of lower creek and upper estuarine habitat in the watershed now provides improved access to spawning areas, and improved spawning and incubation conditions, for adult summer chum salmon returning as a result of the supplementation program. The integration of these habitat restoration actions with the supplementation program is designed to improve prospects for supporting a self-sustaining, viable natural summer chum salmon population in the watershed after the supplementation program terminates.

PROGRAM RECOMMENDATIONS

The summer chum supplementation and reintroduction programs have been effective and SCSCI standards should continue to be implemented for ongoing programs.

The monitoring and evaluation of the supplementation programs and naturally spawning populations is being done well and should continue to adhere to the guidelines in the SCSCI. To assess whether the natural populations are self-sustaining, it will be important to monitor population trends and reproductive success of natural populations in years following the termination of each hatchery program.

It is important to continue to integrate hatchery, habitat, and harvest management actions consistent with the SCSCI. An overarching premise assumed in implementing these conservation hatchery programs in the region is that summer chum salmon populations threatened with extinction can not be recovered to viable population levels with harvest and hatchery measures alone. Commensurate, timely improvements in the condition of habitat critical for summer chum salmon survival are necessary to recover the listed populations to healthy levels.

SELECTION OF NEW PROJECTS

Consistent with the SCSCI, it is possible to consider new projects, but the selection process will not be implemented at this time lacking new at risk populations and pending completion of assessments of ongoing projects.

OTHER SCSCI HATCHERY PROGRAM REVIEWS

HATCHERY SCIENTIFIC REVIEW GROUP

The Hatchery Scientific Review Group (HSRG 2002, 2004) favorably reviewed the SCSCI summer chum hatchery programs and provided recommendations and comments, including:

- *"Continue the existing programs consistent with the SCSCI, including collecting and analyzing all data necessary to evaluate the programs' success"*

- *"The SCSCI is a well-designed, well-conducted program that appears to be achieving its goals. It is an example of a successful conservation program and partnership among state, tribal, private, and federal entities"*

- *"The program, which may serve as a prototype for similar efforts in the future, has met the HSRG's first key principle of beginning with a solid goal setting process. Ensuring complete monitoring and evaluation of this program will be crucial to meeting the second and third principles -- scientific defensibility and informed decision-making"*

- *"Like all integrated hatchery programs, success will depend on good habitat being available to both and hatchery- and natural-origin components of the integrated population".*

RECOVERY SCIENCE REVIEW PANEL

The Recovery Science Review Panel (RSRP) was convened by NOAA Fisheries to guide the scientific and technical aspects of recovery planning for listed salmon and steelhead species throughout the West Coast. The co-managers made a presentation to the RSRP on August 31, 2004 on the development and implementation of artificial production (hatchery) approaches presented in the SCSCI to assist in the recovery of summer chum. The RSRP (2004) reviewed and commented on the SCSCI program, as follows:

- "*This program is especially notable for its dual commitment not only to hatchery and management measures but also to habitat improvement to follow the ESA mandate of restoring numbers of fish and the ability of the natural environment to sustain fish"*

- *"This program has developed a rigorous set of protocols for conservation-driven hatchery programs so as to limit risk of predation on wild stock fish, limit potential competition between hatchery and wild fish, minimize potential disease introduction from hatcheries to the natural system, and maintain genetic variability among and within wild populations. In cases where recovery objectives have been met, hatchery augmentation has ceased. Thus the focus of the restoration program falls unambiguously on promoting recovery of wild stocks and the habitat required to sustain them"*

- *"This work is so important, and is of such high quality, that its results deserve wide dissemination in the scientific community".*

NMFS SALMON RECOVERY DIVISION

The NMFS Salmon Recovery Division has recently reviewed the Hood Canal summer chum ESU hatchery programs (NMFS 2005). The report discussed summer chum stocks included in the ESU populations, status of natural populations, broodstock/program history, similarity between hatchery origin and natural origin fish, program design, program performance, and an assessment of viable salmonid population (VSP) parameters.

The summary of the VSP assessment in NMFS (2005) concluded that (1) hatchery populations produced by the eight programs have benefited the abundance, diversity, and spatial structure of the Hood Canal summer chum ESU; (2) hatchery program effects on the productivity of the natural summer chum populations are as yet unknown; and (3) monitoring of summer chum salmon population trends and reproductive success in years following the last hatchery origin adult returns is needed to assess whether the natural populations are self-sustaining. In addition, it was stated that the eight hatchery programs have benefited the diversity of the ESU by preserving populations threatened with extinction (preventing extirpations), bolstering total population sizes (retaining within population genetic diversity), and creating genetic reserves (through reintroductions of transplanted stocks into historical summer chum streams where the native populations were extirpated).

Also, it was noted that the ESU spatial structure has benefited through summer chum spawning range extensions resulting from reintroduction efforts at Big Beef Creek, Chimacum Creek, and (in 2006) the Tahuya River. And finally, the increased summer chum spawner abundances and densities in supplemented watersheds has led to increased areal distribution of spawners in the Big Quilcene and Salmon Creek watersheds, relative to pre-supplementation years.

5) ECOLOGICAL INTERACTIONS

The SCSCI addressed two specific areas of potentially adverse effects on summer chum from ecological interactions: artificial production and marine mammal predation. Recommendations were made to address negative interactions associated with artificial production and there was acknowledgment that further study was needed to help identify possible future actions to mitigate predation impacts of marine mammals. Following are updates of progress in these two areas of concern.

HATCHERIES

The SCSCI assessed potential effects of existing hatchery programs upon summer chum in four categories: hatchery operations, predation, competition/behavior modification, and fish disease (SCSCI, section 3.3.2.1). Hatchery programs for individual salmonid species (other than summer chum) were rated as high, medium or low risk for designated hazards within each category. Those programs with hazards of high or medium risk were assigned specific risk aversion and monitoring/evaluation mitigation measures that if implemented would reduce the hazards to low risk.

Table 5-1 shows the programs that were in existence in 1998. The table duplicates Table 3.15 of the SCSCI, except that strikethroughs indicate the programs that have been discontinued through 2004 (program terminations and reductions since 2004 are noted in table footnotes). Also shown in the table are the risk aversion and monitoring/evaluation mitigation measures to be met by each program that was determined to have one or more hazards of high or medium risk (the table describes the measures in abbreviated form; expanded descriptions of the measures are provided in Appendix Report 5 and complete descriptions are available in section 3.3.2.1 of the SCSCI). Finally, Table 5-1 indicates the status of implementing the mitigation measures in both 2003[2] and 2004 by the accompanying symbols (in bold font): **Y** = yes, measure(s) was implemented, **N** = no, measure(s) was not implemented, **Y/N** = partial implementation of the measure(s), or **NA** = not applicable. More detailed descriptions of the individual program's status in meeting the mitigation measures are provided in Appendix Report 5.

The vast majority of the mitigation measures have been implemented since they were identified. The only exceptions have been for several relatively small citizen group projects; these fall into two categories – monitoring and reporting project operations, and on-site health monitoring and certification of juvenile fish by a pathologist before release.

Prior to 2003, there was a problem with monitoring, record keeping and reporting of hatchery operations with several citizen projects. However, over the years, this problem has for the most part been effectively addressed by WDFW working with and encouraging the project operators. No problems are indicated in this area for years 2003 and 2004 in Table 5-1 because the monitoring and reporting were accomplished for all projects, though reporting was delayed for

[2] The status of mitigation measures for years prior to 2003 was previously described in SCSCI Supplemental Report Nos. 3 and 4 (WDFW and PNPTT 2001 and 2003).

most citizen projects as described in Appendix Report 5. WDFW continues to work with the operators to improve the timeliness of reporting and to ensure the adequacy of project monitoring and record keeping.

Also for all citizen group projects, the mitigation measures calling for monitoring and certifying fish health are not being fully met as indicated in Table 5-1. This is because WDFW does not routinely monitor fish health during the rearing of juvenile fish by citizen group projects (the exception is for summer chum projects); also for these projects, there is no pre-release health certification. However, the WDFW pathologists do respond to any requests or concerns expressed about fish health by the project operators. It is assumed that there is low risk of unmonitored fish disease incidents with this approach; still, the protocol do not fully meet the specified measures addressing fish health in the hazard categories; thus there is only partial implementation of the measures. Because the risk appears to be relatively low, no change in the WDFW's current protocol is planned. Project-specific information regarding the mitigation measures is provided in Appendix Report 5.

Overall, since implementation of the hatchery ecological interactions mitigation measures, there has been good compliance within the Hood Canal summer chum ESU. Moreover, the risk of such interactions has decreased with the substantial reduction of total production and number of non-summer chum hatchery programs.

Table 5-1. Summary description for the years 2003 and 2004 of Risk Aversion (r.a.) and Monitoring and Evaluation measures planned for artificial propagation programs in the Hood Canal summer chum region**.** Abbreviations "Y", "N", or "Y/N" shown in parentheses next to each measure indicate: "yes", the measure was implemented, "no" the measure was not implemented, or "yes and no" the measure was partially implemented (see specific comments in Appendix Report 3). "NA" means the measure was not applicable. Strikethroughs indicate the project was discontinued prior to and including 2004; Program terminations and reductions after 2004 are described in footnotes.

			Hazard Categories and Assigned Risk Control Measures /1			
Agency	***Species*** **Project**	**Release Class**	**Hatchery Operations**	**Predation**	**Competition and Behavior Modification**	**Disease Transfer**
	Fall Chinook					
WDFW	Hoodsport FH /2	Fingerling	--	--	--	--
		Yearling	--	--	--	--
	George Adams FH	Fingerling	--	--	--	--
	~~Sund Rock Net Pens~~	~~Yearling~~	--	--	~~r.a. #7, m&e#1~~	--
Skokomish Tribe	~~Enetai~~	~~Fingerling~~	--	--	~~m&e#1~~	--
Port Gamble Tribe	~~Little Boston~~	~~Fingerling~~	--	--	--	--
Citizen Groups	~~Union River~~	~~Fingerling~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#4, m&e#1, 2~~	~~r.a.#4, m&e#1, 2~~
	~~Tahuya River~~	~~Fingerling~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#4, m&e#1, 2~~	~~r.a.#4, m&e#1, 2~~
		~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#4, m&e#1, 2~~	~~r.a.#4, m&e#1, 2~~
	~~Dewatto River~~	~~Fingerling~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#4, m&e#1, 2~~	~~r.a.#4, m&e#1, 2~~
	~~Big Beef Creek~~	~~Fingerling~~	~~m&e#3 (Y/N),4 (Y), 5 (NA)~~	~~m&e#1 (Y)~~	~~r.a.#4 (Y); m&e#1 (Y)~~	~~r.a. #1 (Y/N), 2 (Y), 3 (N), 4 (Y), m&e#1 Y/N), 2 (Y)~~
	Skokomish River	Yearling	m&e#3 (Y), 4 (Y), 5 (NA)	m&e#1 (Y)	m&e#1 (Y)	m&e#1 (Y), 2 (Y)
		~~Fingerling~~	~~r.a.#4,6; m&e#1-5~~	~~m&e#1~~	~~m&e#1~~	~~m&e#1, 2~~
	Hamma Hamma River	Fingerling	r.a.#4 (Y),#6 (Y); m&e#1-2, (Y), 3 (Y/N), 4 (Y), 5 (NA)	m&e#1 (Y)	m&e#1 (Y)	m&e#1 (Y/N), 2 (Y)
	~~Johnson Creek (Duckabush)~~	~~Fingerling~~	~~m&e#3-5~~	~~m&e#1~~	~~m&e#1~~	~~r.a.#1-3; m&e#1, 2~~
	~~Unnamed tribs.~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~m&e#1, 2~~	~~r.a.#1-4, m&e#1,2~~
	~~Pleasant Harbor Net Pens~~	~~Yearling~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#7, m&e#1~~	~~m&e#1,2~~
	~~HC Marina Net Pens~~	~~Yearling~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#7, m&e#1~~	~~m&e#1,2~~

(Table continues on next page)

Table 5-1, Continued.

Agency	Project	Release Class	Hazard Categories and Assigned Risk Control Measures[1]			
			Hatchery Operations	Predation	Competition and Behavior Modification	Disease Transfer
	Chinook					
WDFW	Dungeness FH	~~Fry~~	--	~~m&e#2 (Y)~~	--	--
		Fingerling	--	m&e#2 (Y)	--	--
		Yearling	--	m&e#2 (Y)	--	--
	Coho					
WDFW	Dungeness FH	Yearling	--	--	--	--
	Pt. Gamble Net pens	Yearling	--	--	r.a.#7 (Y)	--
	Quilcene Net pens	Yearling	--	--	r.a.#7 (Y)	--
	George Adams FH /3	Yearling	--	--	--	--
	~~Tarboo Creek~~	~~Fingerling~~	--	--	--	--
	Snow Creek	Unfed fry	--	m&e#2 (Y)	m&e#3 (Y)	--
		Presmolts	--	m&e#2 (Y)	m&e#3 (Y)	--
USFWS	Quilcene NFH /4	Yearling	--	--	--	--
		~~Fingerling~~	--	~~r,a#2, 3~~	--	--
	Pink					
WDFW	Hoodsport FH /5	Fed fry	--	r.a.#4 (Y)	r.a.#1, 2 (Y)	--
	~~Dungeness FH~~	~~Fed fry~~	~~r.a.#1-5~~	--	~~r.a.#6~~	--
	Fall Chum					
WDFW	Hoodsport FH /6	Fed fry	--	r.a.#4 (Y)	r.a.#1, 2 (Y)	--
	George Adams FH /7	Fed fry	--	--	--	--
	McKernan FH	Fed fry	--	r.a.#4 (Y)	r.a.#1, 2 (Y)	--
Skokomish Tribe	Enetai	Fed fry	--	--	--	--
Pt. Gamble Tribes	Port Gamble FH /8	Fed fry	--	--	--	--
USFWS	~~Quilcene NFH~~	~~Fed fry~~	--	--	--	--

(Table continues on next page)

Table 5-1, Continued.

Agency	Project	Release Class	Hatchery Operations	Predation	Competition and Behavior Modification	Disease Transfer
			Hazard Categories and Assigned Risk Control Measures[1]			
	Fall Chum (continued)					
Citizen Groups	~~Mills Creek~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#3, m&e#1-2~~	~~r.a.#1; m&e#1,2~~
	~~Tahuya River~~	~~Unfed fry~~	~~m&e#3-5~~	~~r.a.#4, m&e#1~~	~~r.a.#3, m&e#1-2~~	~~r.a.#1; m&e#1,2~~
	~~Union River~~	~~Unfed fry~~	~~m&e#3-5~~	~~r.a.#4, m&e#1~~	~~r.a.#2, 3; m&e#2~~	~~r.a.#1; m&e#1,2~~
	~~L. Mission Creek~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#2, m&e#2~~	~~r.a.#1; m&e#1,2~~
	~~Skull Creek~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#2; m&e#2~~	~~r.a.#1; m&e#1,2~~
	Sweetwater Creek	Unfed fry	m&e#3 (Y/N), 4 (Y), 5 (NA)	m&e#1 (Y)	r.a.#2 (Y); m&e#2 (Y)	r.a.#1 (Y/N), 2,4 (Y) 3 (N); m&e1 (Y/N), 2 (Y)
	Unnamed 14.01xx (Grimm)	Unfed fry	m&e#3 (Y/N), 4 (Y), 5 (NA)	m&e#1 (Y)	r.a.#2 (Y); m&e#2 (Y)	r.a.#1 (Y/N), 2,4 (Y) 3 (N); m&e1 (Y/N), 2 (Y)
	~~Chinom Pt. (Ck)~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#2;m&e#2~~	~~r.a.#1-4; m&e 1,2~~
	Unnamed 14.0136 (Hood Canal Schools, formerly Adams)	Unfed fry	m&e#3 (Y/N), 4 (Y), 5 (NA)	m&e#1 (Y)	r.a.#2 (Y); m&e#2 (Y)	r.a.#1 (Y/N), 2,4 (Y) 3 (N); m&e1 (Y/N), 2 (Y)
	~~Skokomish River~~	~~Unfed fry~~	~~m&e#3-5~~	~~r.a.#4; m&e~~#1	~~r.a.#2; m&e#2~~	~~r.a.#1-4; m&e 1,2~~
	~~Jump-off Joe Creek~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#2; m&e#2~~	~~r.a.#1-4; m&e 1,2~~
	Unnamed 14.01xx (Mulberg, formerly Koopman)	Unfed fry	m&e#3 (Y/N), 4 (Y), 5 (NA)	m&e #1 (Y)	r.a.#2 (Y); m&e#2 (Y)	r.a.#1 (Y/N), 2, 4 (Y), 3 (N); m&e 1 (Y/N) 2 (Y)
	Steelhead					
WDFW	Skokomish River /9	Yearling	--	r.a.#1-3 (Y)	--	--
	Dosewallips River /9	Yearling	--	r.a.#1,2 (Y), 3 (Y/N)	--	--
	Duckabush River /9	Yearling	--	r.a.#1,2 (Y), 3 (Y/N)	--	--
	Dungeness FH	Yearling	--	r.a.#1-3 (Y)	--	--
Citizen Groups	Hamma Hamma River /10	2+ Yearling	r.a.#4, 6 (Y); m&e#1,2,4 (Y), 3 (Y/N), 5 (NA)	r.a.#1,2 (Y/N), 3 (Y); m&e#1 (Y)	m&e#3 (NA)	m&e#1 (Y/N), 2 (Y)

1 Risk aversion ("r.a.") and monitoring and evaluation ("m&e") measures indicated as required for each project are keyed by number to measure applicable to each hazard described in section 3.3.2.1 of the Summer Chum Salmon Conservation Initiative.

2 At Hoodsport Hatchery following release year 2005, Chinook fingerling production was reduced from 3.0 million 2.8 million and Chinook yearling production was reduced from 250 thousand to 120 thousand.

3 At George Adams Hatchery following release year 2004, coho yearling production was reduced from 500 thousand to 300 thousand.

4 At Quilcene National Fish Hatchery following release year 2006, coho production will be reduced from 450 thousand to 400 thousand.

5 At Hoodsport Hatchery following release year 2004, pink salmon production was reduced from 1.0 million to 500 thousand.

6 At Hoodsport Hatchery following release year 2004, fall chum production was reduced from 15 million to 12 million.

7 At George Adams Hatchery following release year 2004, the fall chum program was terminated.

8 At Port Gamble (Little Boston) Hatchery following release year 2005, fall chum production was reduced from 900 thousand to 500 thousand.

9 Following the 2004 release year, steelhead plants in the Skokomish, Dosewallips and Duckabush rivers were terminated.

10 Hamma Hamma River steelhead releases occurred in 2003 but not 2004. The program continues.

MARINE MAMMALS

WDFW began evaluating adverse effects of predation by pinnipeds on summer chum and other salmon species of Hood Canal in late 1998. The study continued through 2001, but then was terminated. A preliminary report on results of these efforts through 1999 was provided in SCSCI Supplemental Report No. 3 (Jeffries et al. 2000 in WDFW and PNPTT 2001), and through 2001 in SCSCI Supplemental Report No. 4 (London et al. 2003 in WDFW and PNPTT 2003). In his University of Washington PhD dissertation, London (2006) updated and summarized the studies done on the consumption of salmon within the intertidal regions of four rivers in Hood Canal and concluded (1) estimates of summer chum consumption by seals averaged 8.0% (with a range of 0.84% to 27.7%) of returning adults across all sites and all years, (2) the number of seals observed foraging in the river for salmon averaged from two to seven seals, and (3) since summer chum populations in the study streams have increased over the time of the study to near historical highs, the levels of predation observed were not believed to significantly impact the recovery of summer chum in Hood Canal.

The field study was resurrected in 2003, partly in response to movement of transient killer whales into Hood Canal in the early part of that year. London (2006) also reported that the mammal-eating killer whales foraged exclusively within Hood Canal for 59 days in 2003 and again for 172 days in 2005. Bioenergetic models and boat based observations were used to estimate harbor seal consumption and, in both years, the predicted consumption was approximately 950 seals. However, aerial surveys conducted following the two foraging events did not detect a significant decline in the harbor seal population.

These events and studies have generated considerable interest in the condition of the remaining harbor seal population and its current effects on salmon resources. The Co-managers will continue to monitor results from any new studies with respect to marine mammal impacts on summer chum populations.

6) HABITAT

The Co-managers recognize the critical importance of habitat management to the protection and recovery of summer chum salmon. However, habitat management is usually a shared responsibility with local jurisdictions, private landowners, and other state and federal agencies. Except for management of lands in their possession and the issuing of restrictions through Hydraulic Project Approvals, the Co-managers generally have no jurisdiction over land and water resources, and therefore do not directly regulate land or water use for protection of the habitat. We therefore work with the aforementioned jurisdictions and others to effect habitat protection. Most recently, in particular, we have been working with the counties and agencies that do have jurisdiction, to provide information and support that is consistent with habitat management recommendations contained in the SCSCI. Section 3.4 of the SCSCI provides guidance and direction for pursuit of habitat protection and recovery measures with 1) an initial analysis of factors limiting summer chum habitat in the watersheds and sub-estuaries, 2) descriptions of habitat protection and restoration strategies, 3) recommendations for monitoring and research, and 4) a discussion of implementation focusing on what participants and what their roles need to be for effective habitat protection and improvement. The SCSCI's Appendix Report 3.6 shows detailed results of habitat analysis and provides recommendations for recovery actions specific to individual watersheds. More recent habitat protection and restoration planning efforts that update, extend and even supersede those of the SCSCI are described below.

Since the SCSCI was completed in 2000, considerable activity promoting habitat protection and improvement has occurred in Hood Canal and the eastern Strait. The following outline briefly describes major actions implemented over the past five years and currently in process. No priority is implied by the order of items in the outline. However, the below described Hood Canal and Eastern Strait of Juan de Fuca Summer Chum Recovery Plan (item # 10) has been adopted by NMFS as the recovery plan required under ESA for a listed species; this plan is intended to incorporate all summer chum related habitat planning efforts and direct future summer chum habitat recovery activities.

1) The Washington State Conservation Commission led a joint effort to identify habitat limiting factors for all salmonids in the Watershed Resource Inventory Areas (WRIAs) within Hood Canal and the eastern Strait (Correa 2002 – WRIA 17, Correa 2003 – WRIA 16, Haring 1999 – WRIA 18, Kuttel 2003 – WRIAs 15[west] and 14[north]). These limiting factors analyses addressed all salmon species, including Hood Canal summer chum, and were useful sources of information for various recovery planning forums (see below). The analyses addressed estuarine and nearshore as well as freshwater habitats.

2) Within Hood Canal and the eastern Strait, watershed planning has been under way that addresses water issues (water quality and flow), accounting for effects on salmonid habitat (as provided under Washington State RCW 90.82 [HB 2514]). Planning groups addressing WRIAs 16, 15, 14 (the northern portion that drains into Hood Canal), and 17 are nearing completion of the watershed plans. As explained within the HCCC summer chum salmon recovery plan (HCCC 2005):

> *Chapter 90.82 RCW provides a process to plan and manage water resources in designated water resource inventory areas (WRIA). Each WRIA under this process*

has established Planning Units, comprised of councils of governmental and non-governmental entities to perform two tasks: 1) determine the status of water resources in a watershed and 2) resolve the often conflicting demands for the water, including ensuring adequate supplies for salmon (WRIA 17, 2003). The WRIA Planning Units are to develop a watershed plan that accomplishes these tasks. RCW 90.82 further states that the watershed plan shall be coordinated or developed to protect or enhance fish habitat in the management area. Watershed plans are to be integrated with strategies, developed under other processes, to respond to potential and actual ESA listings of salmon and other fish species

Water issues are particularly relevant to summer chum recovery as adult fish enter the rivers during late summer and early fall. Low flow conditions at that time can limit fish access, affect spawning distribution, and impact survival of eggs and alevins in the gravel.

3) Dissolved oxygen levels in Hood Canal marine areas recently reached historic lows, triggering a strong response at all levels of government. The Puget Sound Action Team and the Hood Canal Coordinating Council developed a Preliminary Assessment and Corrective Action Plan that provided an initial assessment of human contributions to the problem and proposed some initial actions to address problem areas (PSAT and HCCC 2004).

   Salmon are thought to be mobile enough to avoid most of the effects of low dissolved oxygen but more study is needed. The long-term consequences of low dissolved oxygen levels to marine life are not well understood. Local groups and county, state and federal entities are joining forces to study and identify the potential causes through the newly formed Hood Canal Dissolved Oxygen Program. Several remedial projects to address likely causative factors, including new sewage treatment programs, have been initiated or soon will be. Updated information can be found at the website, http://www.hoodcanal.washington.edu/.

4) The counties (Jefferson, Kitsap and Mason) contracted for studies, now completed, to identify habitat refugia important for the support of salmonids at different stages of their life histories (Kitsap County 2000, May and Peterson 2003). These studies help inform recovery planning and regulatory actions by accounting for the value of refugia and connections between salmonid habitats.

5) The SCSCI recognized the importance of nearshore habitat (see SCSCI Appendix Report 3.5) and influenced the ongoing pursuit of nearshore habitat assessments within Hood Canal and the Eastern Strait[3]. A major federal habitat initiative for Puget Sound, the Puget Sound Nearshore Ecosystem Recovery Project (PSNERP) has been created and hopefully will assist in making federal funding available for large scale projects (e.g. Highway 101 causeway retrofits) relevant to summer chum recovery. Early action nearshore habitat projects funded by the U.S. Army Corps of Engineers program, Puget Sound and Adjacent Waters, may focus on the Skokomish estuary restoration.

[3] Relevant studies in Hood Canal and the eastern Strait include an inventory of anthropogenic shoreline modifications (Hirschi et al. 2003), an assessment of intertidal eelgrass landscapes (Simenstad et al. In prep.), and an evaluation of historical changes to estuaries, spits and tidal wetlands (Todd et al. 2006).

6) Counties within the ESU have been or will soon be in the process of updating shoreline management plans, critical area ordinances and comprehensive plans that regulate land use activities. We anticipate the planning processes described here will positively influence these updates leading to continuing and improved measures to protect summer chum habitat.

7) Funding for salmon habitat projects became available through the Washington State Salmon Recovery Funding Board (SRFB) in 2000, leading to coordination and implementation of many habitat projects in the Hood Canal and eastern Strait of Juan de Fuca watersheds. The Hood Canal Coordinating Council and North Olympic Peninsula Lead Entity have served as the lead entities (under House Bill 2496 and Senate Bill 5595) in Hood Canal and the Strait of Juan de Fuca to coordinate local project proposals for funding by the SRFB. These two organizations have developed procedures for prioritizing project proposals within their respective areas, in cooperation with tribes, local and state agencies, and non-governmental organizations. The SCSCI has been used in developing strategies for recovery planning; for example, see below item #9.

8) The Washington State SRF Board has funded numerous salmon habitat recovery assessments and recovery projects within the Hood Canal summer chum ESU over the last five years. Other funding sources have also contributed to the recovery effort.

9) The Hood Canal Coordinating Council (HCCC), working with agencies, tribes, non-governmental organizations and other local parties, prepared a Hood Canal / Eastern Strait of Juan de Fuca Salmon Habitat Recovery Strategy to serve as the basis for planning and funding salmon recovery projects (HCCC 2004). The SCSCI, along with other information sources described above, was used in developing this Salmon Habitat Recovery Strategy. The Strategy applied to all salmonid species but emphasized Hood Canal summer chum (and Puget Sound Chinook) because of ESA threatened listing status. It was the basis for prioritizing and selecting recovery projects for funding by the Washington State Salmon Recovery Funding (SRF) Board in Hood Canal and the Eastern Strait (extending to and including Sequim Bay). Recently, this strategy was incorporated into the Hood Canal summer chum recovery plan described below.

10) The HCCC, working with counties of the ESU (Jefferson, Kitsap and Mason), has prepared a Hood Canal and Eastern Strait of Juan de Fuca Summer Chum Salmon Recovery Plan that assessed potential development effects on summer chum habitat relative to county land use management and identifies habitat recovery projects within summer chum watersheds and the stream deltas (HCCC 2005). The plan also incorporated the Co-mangers' approach to harvest and hatchery management (based on SCSCI provisions, approved by NMFS under the ESA 4(d) rule). The HCCC plan was reviewed by agencies, tribes and others. Following public review, NMFS adopted it as the Recovery Plan for the listed summer chum ESU as required under rule 4(f) of the ESA (NMFS 2007a, 2007b).

11) A major salmon recovery effort, focusing primarily on Puget Sound Chinook but also including bull trout, recently produced a Puget Sound Salmon Management Plan (PSSS 2005). The Puget Sound Shared Salmon Strategy, a Washington State designated salmon recovery planning group for the region, led this effort that included the participation of

local watershed planning groups throughout Puget Sound. The plan has been adopted by NMFS as the Puget Sound Chinook ESU Recovery Plan, consistent with rule 4(f) of the ESA (NMFS 2007c). This Chinook recovery effort overlaps with that for Hood Canal summer chum, specifically in the Hood Canal watersheds of Dosewallips, Duckabush, Hamma Hamma and Skokomish, and the eastern Strait Dungeness watershed, but also in the nearshore and marine areas. Potential for implementation of habitat actions by local, state, federal and tribal governments is strengthened when benefits are obtained for more than one species and under two ESA Recovery Plans.

In conclusion, progress has been made in addressing habitat affecting summer chum over the last five years. New information has been gained to help direct management actions and habitat management planning has continued, incorporating participation at all levels, including local governments, nongovernmental organizations, tribes, and state and federal agencies. Considerable investment has been made in habitat recovery projects that have been selected in planning processes that account for priorities arrived at through joint local planning efforts. Progress with land use management has been slower. Local governments have been updating or are about to update shoreline management plans, critical area ordinances and comprehensive plans. A summer chum recovery plan has been developed by the Hood Canal Coordinating Council and has been adopted by NMFS as the listed species Recovery Plan required under the ESA. This new plan provides direction for current and future actions to protect and restore summer chum habitat. However, the co-managers remain concerned that with the pressures of population growth, existing land use management measures may be compromised or not enforced. The Co-managers advocate a strong habitat adaptive management program be developed under the new summer chum Recovery Plan and that it be integrated with the existing SCSCI harvest and hatchery management programs.

7) SCSCI PERFORMANCE STANDARDS

Section 3.6.4 of the SCSCI describes performance standards "…meant to provide immediate criteria upon which to measure progress toward recovery of summer chum populations". The standards are described within four categories: abundance, productivity, escapement, and management actions. Following is a review and discussion of how well these standards have been met.

ABUNDANCE

Each performance standard is listed below, followed by a discussion of how the standard has been addressed.

1. *Annual post-season estimated abundance must be equal to, or greater than that of the parent brood abundance. When this is not the case, an investigation of the causes shall be made and remedial measures shall be formulated when appropriate*.

The comparison of the post-season annual abundance estimate to the parent brood abundance estimate was intended as a simple, short-term means of alerting managers of a potential downturn in abundance. With such an alert, managers were to proceed with caution, taking appropriate remedial measures. At the time this standard was developed, we lacked the information needed to track returns by age directly to the brood year source; the standard was supposed to provide a rough approximation of performance relative to brood abundance based on annual abundance estimates. The brood year abundance was calculated as the average of the annual abundances estimated three and four years prior to the indicated year of annual post-season abundance. Table 7-1 provides the ratios of estimated post-season annual abundance to estimated brood abundance for the years 2000 through 2004.

Table 7-1 shows that in 2000, the estimated post-season abundance was less than the estimated brood year abundance for three of the six management units, the 12D/Union and Sequim/Jimmycomelately management units being the exceptions (returns from Chimacum reintroduction project did not begin until 2002). The standard therefore was not met in this year for the majority of management units and stocks. However, in each of the subsequent years, 2001 –2004, all management units and stocks (except Sequim/Jimmycomelately in 2002) showed higher post-season annual abundance than brood year abundance, thus meeting the standard.

Though we determined post-season that the standard was not met for three management units in 2000, we chose not to take additional harvest management measures the following year because estimated harvest levels in 2000 and the immediately previous years had been very low (WDFW and PNPTT 2001), suggesting little to nothing would be gained from additional harvest constraints. Additionally, we had begun several supplementation programs intended to help rebuild runs and efforts were underway to restore summer chum habitat. We believed we were already undertaking as many remedial measures as reasonably practicable.

Table 7-1. Ratio of post-season total annual abundance estimate to parent brood year total annual abundance estimate for adult return years 2000-2004.[1,2]

Management Unit/Stock	2000	2001	2002	2003	2004
12D/Union	1.52	4.22	4.46	25.82	5.27
12A/Quilcene	0.74	1.33	1.79	2.51	8.83
12-12B-12C/Mainstem[3]	0.36	5.90	8.09	7.92	8.24
Chimacum	na	na	45.63	12.51	2.38
Discovery/Salmon-Snow	0.95	2.63	6.95	8.51	3.49
Sequim/Jimmycomelately	1.18	3.20	0.77	14.52	10.51

1. The brood year abundance estimate is the average of abundance estimates 3 and 4 years prior to the indicated post-season annual abundance year.

2. The term "na" (for not applicable) occurs in post-seaon abundance years when the estimate of brood year abundance is zero.

3. Mainstem stocks include Big Beef, Dosewallips, Duckabush, Hamma Hamma, Lilliwaup, and Dewatto, though zero abundance was estimated for Big Beef from 1999 through 2001 and for Dewatto in 1999.

Regarding Jimmycomelately Creek in 2002, there were no additional harvest management measures the co-managers could implement that would have any meaningful effect on adult returns in 2003; fishery interception rates were already very low (WDFW and PNPTT 2003). The primary problem for this summer chum stock was known to be the poor habitat conditions in the stream and estuary. The low returns to Jimmycomelately Creek were being addressed by a supplementation program initiated in 1999 to help rebuild the summer chum population, though the number of releases in the first year of the program (1999) were very small and would have had little impact on the first adult returns (3 year old fish) in 2002. Also, major stream and estuary habitat improvements were planned to begin shortly (and were subsequently implemented).

It should be noted that the abundances shown in Table 7-1 represent combined NORs and HORs. We could not compare annual abundances with parent brood abundances for NORs only. The first year we were able to distinguish HORs from NORs, for the majority of stocks, was 2001. So, within the range of recent years shown in the table, the NOR estimates do not extend far enough back in time to compare annual abundance to parent brood abundance for NORs only (Note, this limitation applies primarily to the parent brood abundance estimates).

From our experience, this well intentioned but crude standard of abundance comparison was not a very useful management tool. In practice we found, as described previously, that harvest

exploitation rates were at very low levels and artificial production programs were successfully generating adult returns, indicating that little or no additional immediate remedial actions were needed beyond those already under way.

Given the success of recent data collection and analysis, a more direct approach now exists to relate fish returns to parent brood year; that is, we have generated estimates of NOR productivity (recruits per spawner) that are more effective in addressing the brood year performance implied by this standard.

NOR productivity results are described in Table 2-15 of the Stock Assessment section for brood years 1996 through 2001. Discounting 2001 because the estimates are incomplete (do not include 4 or 5 year old returns), recruits per spawner values were estimated to be equal to or greater than 1.0 and actually exceeded 1.0 by a considerable margin for most stocks and all MUs. The notable exception was for all estimates of brood year 1996; productivity estimates were consistently below 1.0 for that year. Since then productivity of all stocks, while variable, has on average been relatively high. See also the below productivity performance standards.

2. *Annual abundance should be stable or increasing and the 5 year average abundance must be higher than the threshold. Annual abundances shall not fall below the critical threshold in more than two out of five consecutive years. Information concerning the productivity and productive capacity of the stocks(s) shall be pursued to further refine the thresholds themselves.*

Post season abundance estimates for the five years, 2000 through 2004, are provided in Table 3-2 of the Harvest Management section. These estimates are for each of the five management units within the ESU and combine NORs with HORs. Table 3-2 shows the Sequim Bay management unit fell below the critical threshold in two of the five years (2000 and 2002) and the Mainstem Hood Canal management unit fell below the critical threshold in 2000. No other management unit's escapement fell below the critical threshold in any year. Each management unit shows an increasing trend over the five years and the abundance average of every management unit exceeds the critical threshold (averages not shown in Table 3-2). See also discussion in Harvest Management section. Recently available NOR escapement information is shown below under the escapement performance standards subsection.

3. *Liberalization of actions under the Base Conservation Regime shall not be considered unless number 2 above is met.*

As shown above, the performance standards of number 2 have been met and, as noted at the end of the Harvest Management section, the co-managers intend to begin developing criteria and provisions for a "Recovering" regime. These criteria would describe the conditions under which the Base Conservation Regime restrictions could be relaxed and these provisions would describe the specific management measures under a "Recovering" regime. See also discussion in Harvest Management section.

PRODUCTIVITY

The following standards apply to productivity of management units and stocks.

1. Five year estimated mean productivity shall be greater than 1.2 recruits per spawner.

As shown in Table 7-2, mean productivity for the five brood years, 1996 through 2000 (or for available years as indicated), exceeds 1.2 natural-origin recruits per spawner for each stock and management unit. The table results are based on analysis of collected age data for adult return years 1999 through 2004.

Table 7-2. Mean productivity of management units and stocks, brood years 1996-2000[1]

Management Unit **Stock**	**1996-2000 Mean Productivity (natural-origin recruits/spawner)**
Sequim Bay	
Jimmycomelately	5.83
Discovery Bay	
Salmon/Snow	4.23
Port Townsend	
Chimacum	5.52[2]
Quilcene/Dabob Bays	
Big/Little Quilcene	3.22[3]
Mainstem Hood Canal	5.05
Dosewallips	6.13
Duckabush	5.68
Hamma Hamma	6.45
Lilliwaup	6.89[4]
SE Hood Canal	
Union	5.94

1. Means calculated based on productivity results shown in Table 2-15.
2. Applies to only two brood years, 1999 and 2000 (See Table 2-15).
3. Applies to only four brood years, 1997 through 2000 (See Table 2-15).
4. Applies only to two brood years, 1997 and 1998 (see Table 2-15).

2. The number of recruits per spawner when management units are at or near critical threshold abundances must be stable or increasing.

The productivity estimates (recruits per spawner) for stocks and management units, while variable, show a generally increasing trend from brood year 1996 through 2000 (see Table 2-15 in Stock Assessment section). The productivity of all management units and stocks was estimated to be below the critical threshold for brood year 1996, Duckabush was below the threshold for brood year 1997, and Quilcene was below the threshold for brood years 1997 and 1998. All management units and stocks increased to relatively high productivities for brood years 1999 and 2000 (Table 2-15).

ESCAPEMENT

1. *The annual post-season estimated NOR escapement rate of each run must be within or above the range specified by the Base Conservation Regime.*

Table 7-3 provides NOR escapement rate information by stock and management unit, for the years 2000 through 2004. The table results are based on annual run reconstructions (for example, see Appendix Report 2). It is assumed that NOR and HOR escapement rates are the same. In all cases except for the Quilcene/Dabob management unit, the escapement rate has exceeded the upper end of the range. The Quilcene/Dabob management unit is managed for a flexible escapement range linked to achieving minimum escapements and the minimum escapement has been met every year.

Table 7-3. BCR Target, actual annual, and mean escapement rates by management unit and stock for Hood Canal summer chum, 2000-2004.

Management Unit Stock	BCR Target (Range)	2000	2001	2002	2003	2004	Mean
Sequim Bay Jimmycomelately	91.2% (88.2%-97.2%)	100.0%[1]	99.2%	100.0%[1]	99.1%	99.8%	99.6%
Discovery Bay Salmon/Snow	91.2% (88.2%-97.2%)	99.7%	99.3%	99.6%	99.2%	99.8%	99.5%
Port Townsend Chimacum	91.2% (88.2%-97.2%)	100.0%[1]	99.3%	99.7%	99.1%	99.7%	99.6%
Quilcene/Dabob Big/Little Quilcene	[2]	88.0%	83.9%	74.2%	97.4%	67.3%	82.1%
Mainstem Hood Canal Dosewallips Duckabush Hamma Hamma Lilliwaup Big Beef	89.1% (84.7%-96.7%)	98.5% 98.5% 98.5% 98.3% 99.6% 99.6%	98.4% 98.4% 98.3% 98.4% 98.2% 98.4%	98.0% 98.0% 98.0% 98.0% 98.0% 98.0%	99.2% 99.2% 99.1% 99.2% 99.2% 99.2%	99.8% 99.8% 99.8% 99.7% 99.8% 99.8%	98.8% 98.8% 98.7% 98.7% 99.0% 99.0%
Southeast Hood Canal Union	89.1% (84.7%-96.7%)	98.3%	98.4%	98.0%	99.2%	99.8%	98.7%

1. In this year the escapement number is very low which along with a very low exploitation rate, leads to an estimate of virtually no harvest impact on this stock; therefore the escapement rate is virtually 100% as shown.
2. Exploitation rate of the Big/Little Quilcene stock may vary owing to allowance for increased terminal fishing (for coho salmon) when in season monitoring leads to summer chum escapement projection above a minimum threshold.

2. *Annual NOR escapements shall be stable or increasing and 5 year average escapements must be higher than the critical thresholds. Information concerning the productivity and productive capacity of the stock(s) shall be used to further refine the thresholds themselves.*

The NOR post season escapements for management units and stocks have been estimated

beginning with 2001, the first year when the vast majority of returning supplementation fish were marked and the ongoing sampling of spawners would accommodate separating NORs from HORs for all stocks. Table 7-4 describes estimated NOR post season escapements for the years 2001 through 2004 and four year mean abundances for each management unit and stock.

Table 7-4 shows that the four year mean NOR escapement exceeded the critical threshold for all management units. Annual escapement fell below the threshold in the Sequim Bay management unit in 2002 and 2003 and in the Mainstem Hood Canal management unit in 2001. The only stock's mean escapement to fall below the minimum escapement flag is Lilliwaup's and its annual escapement fell below the flag in all four years. The Duckabush stock fell below the minimum escapement flag in 2001 and 2002. Excepting Lilliwaup, the management units and stocks show increasing trends over the four years.

Table 7-4. Thresholds, actual annual, and mean NOR escapement estimates for Hood Canal summer chum, 2001-2004.[1]

Management Unit/ Stock	Critical Thresh./Flag[2]	2001	2002	2003	2004	Mean
Sequim Bay	200	251	***7***	***68***	613	235
Discovery Bay	720	1,222	4,085	3,986	4,392	3,421
Quilcene	1,110	3,048	3,211	10,740	35,838	13,209
Mainstem H.C.[3]	2,660	***2,616***	2,755	8,672	20,720	8,691
Dosewallips	736	757	1,313	6,510	10,325	4,726
Duckabush	700	***662***	***355***	1,600	7,850	2,617
Hamma	1042	1,155	1,050	***535***	2,409	1,287
Lilliwaup	182	***41***	***36***	***27***	***136***	***60***
S.E. Hood Canal	300	1,491	872	7,923	3,603	3,472

1. Escapement estimates are from Table 2-1 in the Stock Assessment section.

2. Shown are critical thresholds that apply to management units and minimum escapement flags that apply to stocks within the Mainstem Hood Canal management unit (SCSCI 2000). Values that fall below the applicable threshold/flag are shown with bold and italicized font.

3. Note that for the purpose of this table, the Mainstem Hood Canal management unit includes only the stocks shown.

3. *Expected escapement rates are based on numerous assumptions made during the formulation of the Base Conservation Regime. Annually estimated rates, for the period to be evaluated, must be normally distributed across the Base Conservation Regime's anticipated range. If this does not occur, the Base Conservation Regime, its underlying assumptions, and the application of the Regime shall be reevaluated and remedial measures shall be formulated.*

The escapement rates are tightly bunched within the range of 98 to 100% (Table 7-3). The exception is for the Quilcene management unit where management of terminal fisheries (that are directed at co-occurring coho salmon) is designed to accommodate a lower escapement rate (and higher harvest rate) by meeting a minimum summer chum escapement number. The escapement rates are thus at the high end of the expected ranges. Quite obviously they are not normally distributed across the Base Conservation Regime's anticipated range and the underlying assumptions for the anticipated range have not been borne out so far. For now, however, the co-

managers don't anticipate formally changing the anticipated range under the Base Conservation Regime. The co-managers plan to explore development of a set of escapement rate (and exploitation rate) criteria and provisions that would apply under conditions of a "recovering" regime and would accommodate relaxing the current Base Conservation Regime restrictions (see also above point no. 3 under Abundance performance standards).

MANAGEMENT ACTIONS

1. *At a minimum the plan (conservation initiative) strategies and actions shall result in stable recruit abundances at current levels, while ensuring that escapement rates are high. The plan's strategies shall be considered successful if progress toward recovery is demonstrated by positive trends in NOR abundance.*

Generally positive NOR trends exist for recent years as indicated in the preceding descriptions of results relative to the abundance, productivity and escapement performance standards.

2. *Strategies and actions directed at management units or stocks, whose abundance is below their currently estimated critical threshold, will be considered successful if they stop and reverse the decline in productivity and/or abundance.*

Abundance, escapement and productivity have improved for the management units and stocks as shown above. The only management unit/stock where improvement is still in question based on results through 2004 is the Lilliwaup stock..

3. *Plan (conservation initiative) strategies and actions shall be considered successful when all management units are maintained on average, above their critical abundance and escapement thresholds.*

All management units and stocks are on average above their critical abundance and escapement thresholds, the one exception being the Lilliwaup stock with an average excapement below its critical threshold (Table 7-4).

8) RECOVERY GOALS

In 2003, the Co-managers identified interim recovery goals for individual stocks that addressed annual abundance (run size) and escapement, productivity and diversity (PNPTT and WDFW 2003). More recently, the Puget Sound Technical Recovery Team (PSTRT) has identified two independent summer chum populations (Strait and Hood Canal) within the ESU (PSTRT 2007) and viable salmonid population criteria providing for low extinction risk for these two populations. The PSTRT supports managing for recovery at the level of the Co-managers' individual stocks (or what may be described as sub-populations of the PSTRT's two independent populations) as compatible with and a reasonable intermediate step toward the PSTRT's long-term population viability criteria. For the present, the Co-managers will continue to measure progress toward recovery by the individual stock recovery goals. What follows is a description of current stock status relative to these recovery goals, followed by a brief discussion about updating the goals.

ABUNDANCE AND ESCAPEMENT

Individual Stocks: To meet the abundance and escapement recovery goal criteria, a summer chum stock must, over the most recent 12 years, (1) have a mean abundance and a mean escapement of natural-origin recruits that respectively meets or exceeds its abundance and escapement recovery goal thresholds and (2) have the natural-origin abundance and escapement fall below the respective stock's critical thresholds (or where applicable, minimum escapement flags) in no more than two of the most recent eight years and, additionally, in no more than one of the most recent four years. Table 8-1 describes the most recent 12 year (1993-2004) annual mean abundance and mean escapement by stock in comparison to the stock's abundance and escapement recovery goal thresholds.

The mean abundances of Table 8-1 include both HORs and NORs, though also shown within parentheses are NOR mean abundances and NOR mean escapements for the years 2001 through 2004. The NOR estimates are limited to the recent four years because 2001 is the first year for which separate NOR escapements are generally available.

Table 8-1 shows that only three of the eight stocks, Quilcene, Union and Salmon/Snow, meet or exceed their abundance and/or escapement recovery goal thresholds; however, the mean values shown include HORs that are direct returns to instream supplementation programs in the three watersheds (beginning in 1995 for Quilcene and Salmon/Snow, and in 2003 for Union). The thresholds are meant to apply only to NORs. Actually, since NOR returns can be distinguished for the Union stock in all 12 years[4], the applicable abundance and escapement mean values to that stock are properly calculated as NOR estimates - 1,511 and 1,469, respectively - demonstrating that the Union River clearly exceeds both NOR recovery goal thresholds. None

[4] Because returns from its instream supplementation program did not begin until 2003, we can assume that only NORs returned to the Union River for the years 1993 through 2002 (discounting for now the small number of strays from other out-of-watershed supplementation programs). We can also separate NOR and HOR returns for the two years, 2003 and 2004, so that NOR 12 year mean abundance and mean escapement can be estimated for the Union River.

of the mean values of the other stocks meet the recovery goal thresholds, even when, as reflected in the table values, HORs of instream supplementation program returns and possible return strays from out of watershed hatchery programs are included. The relatively higher four year mean values, shown in parentheses (NORs only) within Table 8-1, are a reflection of the generally greater abundances and escapements that have occurred in recent years (Lilliwaup and Jimmycomelately are the exceptions).

Table 8-1. Mean total (combined NOR and HOR) stock abundances and escapements over most recent 12 years compared to recovery goal thresholds[1]. Recent NOR mean abundances and escapements (available only for the last four years) are shown in parentheses

Stock	1993-2004[2] Mean Abundance	Abundance Threshold	1993-2004[2] Mean Escapement	Escapement Threshold
Hood Canal				
Quilcene	9,930 (19,536)	4,570	8,066 (13,209)	2,860
Dosewallips	***2,825*** (4,746)	3,880	2,777 (4,716)	2,420
Duckabush	***1,446*** (2,629)	4,630	***1,423*** (2,617)	2,900
Hamma Hamma	***813*** (1,301)	7,690	***793*** (1,288)	4,800
Lilliwaup	***235*** (61)	1,330	***229*** (60)	830
Union	2,045 (3,497)	720	2,000 (3,467)	450
Strait				
Salmon/Snow	2,275 (3,438)	1,630	2,249 (3,422)	1,020
Jimmycomelately	***254*** (235)	530	***251*** (234)	330

[1] Twelve year mean values that are less than the recovery thresholds are indicated by italics with bold font.
[2] Four year (2001-2004) mean NOR only values are shown in parentheses.

Table 8-2 describes abundance and escapement values for the most recent eight years by stock. Also shown in the table are each stock's critical abundance and escapement thresholds or, where applicable, minimum escapement flags.

Table 8-2. Annual stock abundance and escapement over the most recent eight years compared to critical thresholds.[1]

Hood Canal	Critical Thresh.[2]	1997	1998	1999	2000	2001[3]	2002[3]	2003[3]	2004[3]
Quilcene									
Abundance	1,260	8,199	3,201	3,544	6,704	3,632	4,330	10,850	59,333
Escapement	1,110	7,903	3,053	3,237	5,898	3,048	3,211	10,740	35,838
Dosewallips									
Escapement	736	***47***	***336***	***351***	1,260	757	1,313	6,510	10,284
Duckabush									
Escapement	700	***475***	***226***	***92***	***464***	***662***	***355***	1,600	7,850
Hamma Hamma									
Escapement	1,042	***111***	***127***	***255***	***229***	1,155	1,050	***536***	2,409
Lilliwaup									
Escapement	182	***27***	***24***	***13***	***22***	***41***	***36***	***27***	***136***
Union									
Abundance	340	493	***255***	***173***	755	1,517	890	7,974	3,606
Escapement	300	410	***223***	***159***	744	1,491	872	7,906	3,598
Strait									
Salmon/Snow									
Abundance	790	923	1,215	532	879	1,230	4,100	4,021	4,402
Escapement	720	901	1,171	528	876	1,222	4,085	3,988	4,392
Jimmycomelately									
Abundance	220	***62***	***102***	***7***	***55***	253	***2***	***69***	614
Escapement	200	***61***	***98***	***7***	***55***	251	***2***	***68***	613

[1] Annual values that are less than the critical thresholds or minimum escapement flags are indicated by italics with bold font.

[2] Critical abundance and escapement thresholds have been defined for all management units in the SCSCI that, except for the mainstem Hood Canal management unit, are equivalent to individual stocks. Minimum escapement flags have been described for individual stocks of the mainstem Hood Canal management unit (see Appendix 1.5 of SCSCI for description of thresholds and flags and their derivation).

[3] Values shown for the years 2001 through 2004 are estimates of annual abundances and escapements of natural-origin recruits (NORs) only.

Regarding the aforementioned second recovery goal criterion of not having more than two in the most recent eight years and one in the most recent four years of either annual abundance or escapement estimates that fall below defined critical thresholds or minimum escapement flags, Table 8-2 shows that only the Quilcene, Union and Salmon/Snow stocks currently meet the criterion. Even for these three stocks, because the criterion applies specifically to NORs and separate NOR estimates are not available for the earlier years (before 2002), the criterion is not yet actually being met, except for the Union stock where values in all years represent only NOR returns.

In conclusion, only the Union stock strictly meets the NOR recovery goal criteria for abundance and escapement. The Quilcene and Snow/Salmon stocks have total returns that exceed the recovery goal threshold values specified by the criteria but, since the estimates of annual

abundance and escapement are of combined NORs and HORs in most years of the 12 year span, the NOR criteria are not demonstrably being met. At this time, clearly none of the other stocks are meeting these recovery criteria, though that may change if the apparent trends of higher returns in recent years for the majority of them were to continue.

ESU: The recovery goal criterion for the ESU is that all six Hood Canal stocks and two Strait stocks meet the individual abundance and escapement criteria. Since only the Union stock is currently meeting its individual stock criteria, the ESU falls short of its criterion.

PRODUCTIVITY

The productivity recovery goal criteria for each stock are (1) that natural recruits per spawner average at least 1.6 over the most recent eight brood years and (2) that no more than two of these eight years fall below 1.2 recruits per spawner. Currently available recruit per spawner data exist for five brood years or less, 1996 through 2000, depending on available data for individual stocks (see Table 2-15 of the Stock Assessment section). So, at this time, insufficient information exists to determine the recovery status of stocks since the productivity recovery goal criteria require measurements extending over eight brood years. However, as shown in Table 7-2 of the SCSCI Performance Standards section, the mean productivity for available years of all stocks exceeds the mean productivity recovery goal criterion of 1.6 recruits per spawner by a good margin. The ESU productivity goal criterion also has not been achieved since, as with the abundance and escapement ESU criteria, the ESU productivity criterion requires that all six Hood Canal stocks and two Strait stocks meet the individual stock productivity criterion, and because none of them can be met at this time.

DIVERSITY

Goals to protect and increase summer chum population diversity are listed below along with a brief description of the co-managers' current efforts to meet these goals:

1. *Support planning and implementation of effective habitat protection and recovery actions by agencies and local governments that have jurisdiction.*
   The co-managers have actively supported planning efforts including the State Conservation Commission's limiting factors analyses within the ESU, the Hood Canal Coordinating Council's and North Olympic Peninsula's development of recovery strategies to guide selection of habitat protection and restoration projects funded under the State's Salmon Recovery Funding Board, and development of the Hood Canal Summer Chum Salmon Recovery Plan by the Hood Canal Coordinating Council recently adopted by NMFS as the formal summer chum recovery plan under the Endangered Species Act. The co-managers have also been active in implementing studies and restoration projects; the restoration of Jimmycomelately Creek and Salmon Creek being two examples of the latter. See also the Habitat section of this report.
2. *Rebuild by natural or artificial means the existing summer chum stocks to meet their abundance and recovery goals.*
   As described in the Artificial Production section of this report, the co-managers have successfully implemented hatchery supplementation programs that have contributed substantially to the rebuilding of many of the extant natural stocks. These programs have

been consistent with guidelines described in the SCSCI to help ensure genetic diversity of the natural populations. For example, two of the programs (Big Quilcene River and Salmon Creek) were terminated after 12 years to limit potential hatchery domestication effects, after rebuilding the populations to relatively strong numbers of naturally reproducing salmon.

Recovery by natural means is also being facilitated by habitat protection and restoration projects that have been developed through processes to which the co-managers have provided support. See the Habitat section of this report.

3. *Restablish by natural and artificial (i.e., reintroduction) means the selected extinct summer chum stocks.*
   Similar to the above description of hatchery supplementation of extant stocks, hatchery reintroduction programs, in watersheds where the population had become extinct, have also been successful as described in the Artificial Production section. Reintroduction programs have been ongoing through 2004 in three watersheds, Big Beef, Tahuya and Chimacum. Habitat projects have also helped to reestablish the populations by protecting and improving natural habitat in the watersheds.

UPDATING RECOVERY GOALS

When the current interim recovery goals were developed, the co-managers acknowledged that the goals preferably should be "based on knowledge and assessment of how the habitat affects potential production, productivity and diversity of the stocks" (p. 3, PNPTT and WDFW 2003). But lacking that knowledge, the co-managers estimated interim goals based on available historic population data. The hope and anticipation was that future studies would lead to developing quantitative relationships between habitat conditions and summer chum performance that would provide the desired knowledge to improve the goals.

Also, at the time, a question was raised about the accuracy of the population based estimates of abundance and escapement thresholds for two stocks, Quilcene and Liliwaup, owing to uncertainty about interpretation of the historical population data (p. 5, PNPTT and WDFW 2003). The co-managers decided then that productivity and capacity of summer chum would be assessed for these two watersheds and their estuaries so that these stocks' interim recovery goals could be reevaluated during the first five year review of the SCSCI.

Unfortunately, the resources have not been available to accomplish either the broader based (ESU-wide) or more narrowly focused (Quilcene and Lilliwaup) assessments that would provide the desired new habitat-based knowledge. The co-managers still wish to follow through with these assessments in the future.

9) CONCLUDING REMARKS & SUMMARY

The Washington Department of Fish and Wildlife and Point No Point Treaty Tribes, as Co-managers within Hood Canal and the Strait of Juan de Fuca, started to actively pursue recovery of Hood Canal summer chum in 1992. At that time, the Co-managers began implementing terminal area harvest restrictions to protect summer chum escapements and initiated several hatchery conservation programs to help rebuild summer chum spawning populations. These efforts were expanded and refined as work progressed on preparation of a recovery initiative. The initiative, titled the "Summer Chum Salmon Conservation Initiative" or SCSCI was completed in April 2000, at which time the provisions of the initiative were already being fully implemented.

The Co-managers' have continued to carry out the SCSCI's provisions to the present day. Our focus has been primarily on the harvest management and artificial production components of the SCSCI. We recognize, however, that without habitat protection and restoration, which requires participation of land use managers and other entities, summer chum recovery cannot be accomplished. Support of habitat management actions is a major part of the Co-managers' SCSCI and is key to the overall integrated management approach necessary for recovery to be successful (see section 6, Habitat).

Critical to the success of the recovery efforts is effective monitoring of summer chum, so that we may know the status and trends of the spawning populations or stocks over time, evaluate the effects of protection and recovery actions, and make adjustments as appropriate. The Co-managers have closely monitored the individual stocks and management actions associated with them. Stock specific data and analyses have been collected pertaining to spawning escapements, harvests, runsizes, hatchery effects, straying, and biological and genetic characteristics. This information is presented in detail within the sections and appendices of the current report that address stock assessment (section 2), harvest (section 3) and artificial production (section 4). How well the Co-managers' recovery actions have met performance standards identified in the SCSCI is described in section 7. Section 6 describes progress with habitat protection and recovery. Also, the Co-managers' efforts to address ecological interactions and the current status of the summer chum stocks relative to the Co-managers' recovery goals are described in sections 5 and 8, respectively.

The data and analyses reported here also apply to the NMFS' viable salmonid population (VSP) parameters of abundance, productivity, spatial distribution and diversity (McElhany et al. 2000) and the factors affecting them. Current information about the VSP parameters, including status and trends where information is sufficient, is contained in this 5 year review. Below are sub-sections with (1) brief summaries addressing NMFS' four VSP parameters, (2) summaries of each previous section of this 5 year review report, (3) a commentary addressing the SCSCI's specific five year plan review requirements, and (4) a brief description of the future needs and direction of summer chum recovery.

VIABLE SALMONID POPULATION (VSP) PARAMETERS

In early 2007, the NMFS Puget Sound Technical Recovery Team identified two independent populations within the Hood Canal summer chum ESU: a Hood Canal population and a Strait of Juan de Fuca population (PSTRT 2007). Following are brief information summaries applicable to each of the NMFS' VSP parameters and considered in the context of these two populations.

ABUNDANCE (ESCAPEMENTS AND RUNSIZES)

Escapements and runsizes of the two populations have shown increasing trends in recent years (see annual escapements in Table 2-2, Figure 2-1, and Figure 2-2, and annual runsizes in Table 2-4). Briefly, as an indication of the magnitude of increases, averages of the most recent ten years may be compared with averages of the previous ten years. The Hood Canal population's ten year average total escapement has increased approximately 12.5 times from 1,472 spawners (1985-1994) to 18,488 spawners (1995-2004) and its average total runsize has grown by about a factor of 5.8 from 3,735 adults (1985-1994) to 21,637 adults (1995-2004). More moderate increases have occurred with the Strait of Juan de Fuca population, where ten year average total escapement has increased 3.3 times from 986 spawners (1985-1994) to 3,292 spawners (1995-2004) and the average ten year total runsize has grown by a factor of 2.8, from 1,194 adults (1985-1994) to 3,319 adults (1995-2004). These numbers include natural origin as well as hatchery origin recruits.

Separation of natural origin from hatchery origin recruits is only available beginning in year 2001 (see Table 2-10) and therefore too few years are available thus far for meaningful evaluation. Still, a comparison may be made of the mean natural origin escapements of the years 2001-2004 with the mean escapement for the four years immediately prior to the first year of hatchery returns in 1995; i.e. for years 1991-1994 (these earlier years precede any signs of recovery). The mean escapements of the Hood Canal population are 1,577 natural-origin spawners for 1991-1994 and 25,410 natural-origin spawners for 2001-2004. The mean escapements of the Strait of Juan de Fuca population are 533 natural-origin spawners for 1991-1994 and 3,923 natural-origin spawners for 2001-2004.

The PSTRT investigated the question of population viability for its two summer chum populations (PSTRT 2007). In one approach, using a Beverton-Holt modeling analysis that assumed density dependence and did not include harvest, it found that for the Hood Canal population to be viable (less than five percent probability of extinction over a 100-year period) its escapements would need to be between 18,300 and 19,100 spawners (with intrinsic productivities of 6.0 to 8.0 recruits per spawner). Similarly, the Strait of Juan de Fuca population would need escapements between 4,500 and 5,100 spawners (with intrinsic productivities of 3.0 to 5.0 recruits per spawner). In both cases, these results were based on assumptions about the Beverton-Holt population model parameters of intrinsic productivity (α) and capacity (β). For both populations, alternative analyses by the PSTRT that assumed density independence (i.e., intrinsic productivity = 1.0) indicated higher escapements would be needed for population viability (PSTRT 2007).

Trends for natural origin escapements of the individual extant stocks identified by the Co-managers may also be considered for the years 2001-2004 (see Table 7-4). Over this short span of years, all extant stocks show a generally increasing trend. The one exception is Lilliwaup, where escapements every year are below the stock's critical threshold.

PRODUCTIVITY

Productivity estimates (natural-origin recruits per spawner) have become available for recent years as age and mark data have been collected. Productivities are generally increasing for both the Hood Canal and Strait of Juan de Fuca populations (Table 2-14). The same is true across the Co-manager's management units and stocks (Table 2-15). The time span of the productivity estimates is five brood years or less, not yet long enough for meaningful assessment of trends, though monitoring continues. Productivity estimates of the two populations range from approximately 0.2 (year 1996 for Strait) to over 10.0 natural-origin recruits per spawner (years 2000 for Strait and 2001 for Hood Canal) (see Table 2-14).

SPATIAL DISTRIBUTION

The increased summer chum spawner abundances and densities in supplemented watersheds have led to increased areal distribution of spawners in the Union, Big Quilcene, Little Quilcene, and Salmon Creek watersheds, relative to pre-supplementation years.

The spatial distribution within the summer chum ESU is increasing through efforts to reintroduce summer chum to streams where they had become extinct. Summer chum have been successfully reintroduced to one stream, Chimacum Creek (within the Strait of Juan de Fuca population), and are now being reintroduced into two additional streams: Big Beef Creek and Tahuya River (within the Hood Canal population). These reintroductions have been implemented through use of artificial production (see section 2, Artificial Production). The successful hatchery effort on Chimacum Creek began with brood year 1996 and was terminated following brood year 2003 after eight years of operation (see information on returning spawners in Table 2-12). The Big Beef Creek hatchery program began with brood year 1996 and the Tahuya River program with brood year 2003. Natural origin summer chum salmon are returning to Big Beef Creek (Table 2-12); the first adult returns to Tahuya River from the hatchery program were observed in 2006. Besides these streams, there have been no indications of reestablishment of a sustainable natural population to other streams where summer chum had become extinct (e.g., through straying of hatchery-origin or natural-origin adults).

DIVERSITY

The Co-managers have been collecting genetic stock information and analysis of the data by WDFW scientists and others has demonstrated genetic differences exist among stocks and populations (Kassler and Shaklee 2003, Small and Young 2003, PSTRT 2007). Genetic data baselines have been established and monitoring continues (see extent of monitoring in Table 2-5 and 2-6 and similar tables in the earlier SCSCI Supplemental Reports WDFW and PNPTT 2001, 2003) and progress reports (WDFW and PNPTT 2006, 2007). In the future, the co-managers expect to continue tracking genetic diversity, analyzing the data and reporting the results. In

particular, our interest will be with indications of any change in diversity that may be associated with recovery actions (e.g., artificial production) or environmental effects (e.g., climate change or loss/degradation of habitat).

The Co-managers have also been collecting data on length, age and sex and either have been or in the future will be evaluating possible changes or trends of these phenotypic indicators. No obvious changes or differences have been noted to date. This report includes summaries and initial analyses of length data (see section 2 Stock Assessment and Appendix Report 3). Generally, though mean lengths are variable, the 95% confidence intervals overlap for the same age and sex (with exceptions for small sample sizes). In addition, mean lengths were similar for supplementation vs. natural-origin adults and for adults collected for broodstock vs. adults spawning naturally.

5-YEAR REVIEW SECTION SUMMARIES

Following are brief summaries of progress in the implementation of the SCSCI, organized to follow the above sections of the report.

STOCK ASSESSMENT

Updates of escapement and runsize estimates are provided including details for the years 2003 and 2004. Notably the escapements and runsizes of 2004 overall, and for the majority of stocks, are the largest on record. The results for 2003 and 2004 (e.g., total escapements of 42,655 and 79,336 spawners, respectively) continue to reflect the trend in recent years of increasing fish abundances for both the Hood Canal and Strait of Juan de Fuca regions of the summer chum ESU.

The continued collection of data on genetics (from DNA), hatchery vs. natural stock origin (from otoliths), age (from fish scales and otoliths), fish length and fish sex is reported. Sampling is done from streams (carcasses during spawner surveys), during collection of broodstock (by trap or seine), and from reef nets in the San Juan Islands (for 2002 and 2003 only). Age analysis has been updated for 2003 and 2004 and used for estimates of productivity (see below). Length data from 1998 through 2004 have been summarized and analyzed. While variable, no significant differences in length are apparent within ages and years of the individual stocks.

Mark recovery data for the adult return years available (2001-2004) have been analyzed to differentiate natural-origin from supplementation-origin fish. Proportions of natural and supplementation origin fish are described for the Hood Canal and Strait regions and for the ESU (Table 2-10 and Table 2-11). Natural origin recruits generally comprise 60% or more of escapements and runsizes after 2001 for each of the two regions and for the ESU and exceed 80% of escapement and runsize for the ESU in 2004. Specific numbers of natural and supplementation origin recruits are provided for each stream and/or management unit in Table 2-12 and Table 2-13. These data allow us to evaluate the effects of the artificial production programs (see below) and measure progress with natural production (see SCSCI performance standards below).

The collection of age data and its analysis currently allow estimates of productivity (recruits per spawner) for up to five brood years for some stocks (Table 2-15). For the ESU as a whole, productivity has ranged from 0.88 (BY 1997) to 10.71 (BY2000) (Table 2-14). Currently, too few years exist for a meaningful trend assessment. However, the existing productivity results are useful in assessing recent summer chum performance (see SCSCI performance standards below).

An updated assessment of extinction risk has been provided using the methodology of Allendorf et al. (1997). Comparing this new assessment of extant stocks for the years 2001-2004 with an assessment for years prior to recovery efforts (1988-1991 for Hood Canal stocks and 1989-1992 for Strait stocks) shows the current years' stock risk ratings of two "moderate" and six "low", whereas for the earlier years there are seven ratings of "high" and one (Union) of "moderate" risk (Table 2-17). The two stocks currently assessed to be at moderate risk are Lilliwaup and Jimmycomelately.

HARVEST MANAGEMENT

Harvest management is reviewed over the five year time span, 2000 through 2004. Presented and discussed are results of forecasting runs and of managing for harvest and escapement under provisions of the Base Conservation Regime (BCR).

Forecasts have been made using moving averages of post season annual runsize estimates. Generally, the forecasts have underestimated runsizes, which in retrospect is not unexpected during this period of an upward trend in summer chum abundance. The BCR calls for checking forecasts against specified critical thresholds as an alert to potential risks of low returns in a given year. We evaluated those cases where the population forecast fell below the threshold, triggering our consideration of possible further protective measures; however, in every case we found a prior pattern of extremely low exploitation rates suggesting current protective measures were adequate. Also, there were no practical additional protective actions to take. Subsequent evaluation of post season abundance estimates showed almost no effects of harvest within Washington on these groups of fish.

Annual estimates of forecast runsizes, post season runsizes, harvests and escapements, and of harvest exploitation rates are provided in Table 3-8 and Table 3-9. Exploitation rates in every year are shown to fall well below the expected rates under the BCR, with the exception of the Quilcene extreme terminal fishery where provisions accommodate alternative management for escapement. In the latter case, escapement exceeded the pre-set escapement range target every year (Table 3-6). The Co-managers did not take any in-season actions that differed from the provisions of the BCR.

Over the five years, a few incidents occurred, but overall there were no significant, or persistent, compliance or enforcement problems with the fisheries. Catch and escapement data were collected, recorded and later analyzed each year. No biological data were collected from the fisheries because of the general scarcity of summer chum catch and the impracticality of setting up sampling programs for expected very small numbers of fish. It may, however, be possible to sample catch from the Quilcene Bay fishery with some additional planning and effort.

Though the harvest management provisions of the BCR were set up to provide conserable protection, harvest management performance has far exceeded the co-managers' expectations. Given the current performance of the BCR provisions, the co-managers recommend continuing these provisions in the interim. It is recommended, though, that the comanagers improve implementation of BCR provisions in the Quilcene extreme terminal fishery. In addition, the co-managers plan to develop new provisions and criteria for a "Recovering" regime that in the future may be implemented as an alternative to the BCR. To be applied only after sufficient summer chum status improvement, this new regime would relieve at least some of the BCR's harvest restrictions on other species.

ARTIFICIAL PRODUCTION

There have been a total of eight artificial production projects, five of these for supplementation (to rebuild existing stocks) and three for reintroduction (to reintroduce summer chum to a stream where the spawning population was extirpated). Four of the projects were terminated in 2003, consistent with the limit on project duration specified in SCSCI operations guidelines. Table 9-1 lists the projects, and includes information on project type, start date and status as of 2004.

Table 9-1. Summer chum artificial production projects, including type of project (supplementation or reintroduction), start date and status as of 2004.

Project	Type	Start Date[1]	2004 Status
Hood Canal			
Big Quilcene River	Supplementation	1992	Terminated 2003[2]
Big Beef Creek	Reintroduction	1996	Continuing
Lilliwaup Creek	Supplementation	1992	Extended[3]
Hamma Hamma River	Supplementation	1997	Continuing
Union R./Tahuya R.	Suppl./Reintrod.	2000/2003	Terminated/Continuing[4]
Strait of Juan de Fuca			
Salmon Creek	Supplementation	1992	Terminated 2003[2]
Chimacum Creek	Reintroduction	1996	Terminated 2003[5]
Jimmycomelately Creek	Supplementation	1999	Continuing

[1] First brood year.
[2] Project ended after 12 years (approximately three brood cycles) consistent with the provisions of the SCSCI.
[3] Project extended beyond 12 years because of extenuating circumstances. See section 4.
[4] Union River supplementation started in 2000 and ended in 2003; Tahuya River reintroduction started in 2003
[5] Project ended after 8 years (approximately two brood cycles)

Individual detailed project reports have been provided for each artificial production project. These reports update project information through 2004 and include annual production numbers (e.g., adult returns, number of fish spawned, and number, size and date of fry releases), additional monitoring and evaluation (e.g., fish marking information, hatchery survival rates, fish health), and general program assessment. The reports vary somewhat, accommodating each project's specific situation. All of the supplementation and reintroduction projects have been

effective and have followed the standards and guidelines of the SCSCI. The overall summer chum artificial production program has been reviewed by the Hatchery Scientific Review Group, the NOAA Fisheries Recovery Science Review Panel, and the NMFS Salmon Recovery Division. All three groups gave positive reviews of the way the program was designed and being implemented.

ECOLOGICAL INTERACTIONS

Two areas of potential adverse ecological interactions effects on summer chum are identified in the SCSCI: artificial production (or hatchery) programs of other species and marine mammal predation. Regarding the first of these two areas, the SCSCI contains an assessment of other species' hatchery programs, which identifies risks within four categories: hatchery operations, predation, competition/behavior modification and fish disease. The SCSCI also specifies risk aversion and monitoring/evaluation measures within these categories for those hatchery programs evaluated to be at risk of negatively impacting summer chum. As of 2004, the co-managers have implemented virtually all of these mitigation measures as described in Table 5-1 and Appendix Report 5. Another factor in reducing the risk of ecological interactions from this source has been the substantial reduction of the total production and number of hatchery programs for other species, also described in Table 5-1.

In response to concerns over the potential impact seals may have on recovering populations of summer chum salmon, direct observations of harbor seals consuming salmon were conducted within the inter-tidal regions of four rivers in Hood Canal from 1998-2001 and in 2003. Seals were observed feeding on chinook, coho, pink, summer chum and fall chum salmon, but the levels of predation observed are not believed to have significantly impacted the recovery of Hood Canal summer chum (see Marine Mammals subsection of Ecological Interactions section, above).

HABITAT

The Co-managers recognized within the SCSCI that habitat is the key to long term recovery and sustainability of summer chum. The SCSCI provided assessments and recommendations for protection of summer chum habitat that have since been built upon and, in large part, superseded by subsequent planning efforts. The Co-managers saw their role to be participants in collaborative actions with local jurisdictions, private landowners and other state and federal agencies in protecting and restoring land and water resources important in the life history of summer chum. For example, since the SCSCI was issued, the Co-managers have been involved (1) in a comprehensive effort to identify habitat limiting factors in watersheds of Hood Canal and the Strait of Juan de Fuca; (2) with watershed planning groups working on water issues and accounting for effects on salmonid habitat; (3) with the task force addressing low dissolved oxygen levels in Hood Canal; (4) in updating county shoreline master programs and critical area ordinances; (5) in researching nearshore habitat; (6) in recommending and reviewing habitat restoration projects for funding by the State's Salmon Recovery Funding Board and other sources; and (7) with other actions to benefit summer chum habitat as described in the above Habitat section.

Perhaps the most important recent development is the Hood Canal and Eastern Strait of Juan de Fuca Summer Chum Salmon Recovery Plan prepared by the Hood Canal Coordinating Council in cooperation with local counties of the ESU and the Co-managers. This plan includes assessments of the effects of land use management on summer chum habitat and identifies habitat recovery projects within the ESU. The plan, approved by NMFS consistent with section 4(f) of the Endangered Species Act, will guide summer chum habitat protection and restoration. The Co-managers remain concerned that, with the pressures of population growth, existing land use management measures may be compromised or not enforced. To help mitigate against loss of effective habitat protection and ensure proper habitat restoration, we advocate completion of a yet to be developed habitat adaptive management program as part of the recovery plan and also recommend that this program be integrated with the existing harvest and hatchery management programs.

SCSCI PERFORMANCE STANDARDS

Specific standards of performance were identified in the SCSCI that were "…meant to provide immediate criteria upon which to measure progress toward recovery of summer chum populations". These standards were expressed relative to measurements affecting abundance (runsize), productivity and escapement, and also relative to trends affected by management actions.

Generally, the extant summer chum stocks identified in the SCSCI have met performance standards as is described in detail within section 7 of this report. The exception is Lilliwaup, which on average and in each year, from 2001 through 2004, had natural origin escapements below the critical threshold.

RECOVERY GOALS

The Co-managers developed interim recovery goal criteria for summer chum that addressed abundance (runsize) and escapement, productivity and diversity (PNPTT and WDFW 2003). The status of each of the eight extant summer chum stocks relative to the goal criteria has been assessed in this report (section 8).

Though there have been improvements in the abundance, escapement and productivity of the stocks in recent years, no stocks have met all the applicable recovery goal criteria for these parameters. This is at least partially due to the criteria on length of the time span required for exceeding thresholds, coupled with the relatively short time span that population parameters have been measured. A further complication is that these criteria apply only to NOR returns and NOR estimates exist for relatively few recent years in streams that also have HOR returns. Only one stock, Union, meets all the recovery goal criteria for abundance and escapement. No stocks meet the productivity recovery goal criteria. Stocks may better meet recovery criteria as longer records of the relevant parameter measurements become available in coming years, assuming the recent trends toward higher or stable adult returns and productivities continue.

The interim recovery goals for diversity include: support of planning and implementation of habitat protection and restoration measures (where strong co-managers support exists – see Habitat, section 6), rebuilding existing stocks, and reintroduction of extinct stocks. The latter

two goals are to be accomplished by natural and artificial means. The Co-managers are actively involved in using artificial production to build and reintroduce summer chum stocks (see Artificial Production, section 4) and, again, have been supporting habitat protection and restoration to augment stock recovery by natural means.

In setting up the interim recovery goals, the Co-managers recognized that over time, with new information and analyses, the goals should be updated. We had hoped to be able to reconsider the goals in time for this five year report. Unfortunately, the resources have not been available to meet that objective. The interim goals do, however, continue to provide tangible objectives that point toward summer chum recovery.

SCSCI Five-Year Plan Review Requirements

Section 3.6.3 of the SCSCI specifies steps required for the five year plan reviews. These steps have been addressed within the previous sections of this report. However, following is a listing of the steps, including brief commentary on how they have been addressed.

1. *Review and describe performance of each element of the plan in meeting their specific compliance and effectiveness standards, as provided in previous sections (***[SCSCI]** *sections 3.2 - 3.5), by management unit and stock, since the last review period and since adoption of the plan.*

   The SCSCI sections 3.2 – 3.5 correspond in subject matter to the artificial production, ecological interactions, habitat and harvest sections in the present report. Performance in each of these areas is reviewed within these sections of the report.

2. *Evaluate management unit and stock performance relative to the standards provided in section 3.6.4* **[of the SCSCI].**

   The review of these standards is provided in Section 7, SCSCI Performance Standards, of the present report.

3. *Determine which strategies and actions and conservation objectives were most effective and least effective and which management unit and stock did or did not see the desired improvement. Document the findings by management unit and stock and at the region-wide level, i.e., were successes concentrated geographically or were certain units chronically falling short of objectives.*

   Generally, within the scope of this 5 year review report, all of the strategies, actions and objectives have been shown to be effective. See the above individual sections 2 through 6, addressing stock assessment, harvest management, artificial production, ecological interactions and habitat, and also section 7 regarding SCSCI performance standards. Recovery effort results have been documented by stock, management unit and region. Through 2004, only the performance of the Lilliwaup stock has fallen below performance standards in that its average escapement was below the critical threshold.

4. *Identify causes of successes and failures and categorize them according to type:*

   <u>Compliance:</u> Actions were not implemented correctly or had a significant degree of non-compliance by user groups or governments.

Initially, there were problems with monitoring, record keeping and reporting of some non-summer chum volunteer/citizen hatchery project operations. This problem was corrected over time (see section 5, Ecological Interactions). Some relatively minor harvest compliance issues arose and were addressed in the extreme terminal Quilcene fishery. The co-managers will continue to monitor, evaluate, and improve implementation of the BCR provisions for this fishery (see also the below subsection describing future needs and direction).

Effectiveness: Actions were implemented correctly and had high degrees of compliance but did not have the intended effect(s).

The Lilliwaup artificial production project had not as of 2004 produced expected adult return rates based on experience with other summer chum artificial production projects. These results likely are at least partly due to operational problems in the project's early years. Needed improvements to project operations were made beginning with brood year 1998 and now appear to be contributing to increased returns (see section 4, Artificial Production). Still, the Lilliwaup stock had not met its escapement performance standard through 2004.

Assumptions: Assessment methods or parameters were accurately or inaccurately estimated and applied.

Observed summer chum exploitation rates under the harvest management base conservation regime have been substantially lower than what was expected (see section 3, Harvest Management). Since this result does not imply any increased risk to summer chum (in fact, lower risk is indicated), the Co-managers will continue to conservatively manage harvest under the provisions of the base conservation regime. The Co-managers plan to develop new provisions and criteria for a "Recovering" regime that in the future may be implemented as an alternative to the base conservation regime.

5. *Make adjustments to plan elements as provided in sections 3.2 - 3.5. Co-managers will incorporate new information from monitoring, evaluation and research studies in making adjustments as prescribed.*

Based on new information through 2004, there are no compelling reasons for making any adjustments.

6. *Make recommendations for plan changes or amendments. This information should be as specific as possible, including the watersheds, river systems, estuaries, management units, stocks, programs or projects, and fisheries affected, the type of suggested change and the time frame over which it should be implemented.*

Owing to the generally successful implementation of the recovery strategies and actions, and to the generally positive results with respect to the summer chum populations, the Co-managers are not recommending any major changes at this time. However, see the following subsection describing future needs and direction of summer chum recovery.

FUTURE NEEDS AND DIRECTION

The Co-managers intend to continue to follow the provisions and guidelines of the SCSCI for managing recovery of summer chum, essentially in the same manner as is described in this report. It should be emphasized, however, that resources to maintain the current levels of performance are being stretched. The situation is especially tenuous with regard to the ongoing extensive monitoring effort, including data analysis. Of most immediate concern is that funding for reading otolith marks and analyzing genetic samples is not secure. Each year, it has been a challenge to find complete support for these analyses. Any future breakdowns in funding support could result in delays or even gaps in results of the monitoring efforts that are critical to the evaluation and support of recovery.

The Co-managers emphasize and will strive in the future to accommodate the following tasks:

1) Continue effective population, biological and genetic monitoring of summer chum.
2) As data become available, review options for improving forecasts of summer chum runsizes used in preseason harvest management planning
3) Continue to monitor, evaluate and improve implementation of the provisions of the Base Conservation Regime for the Quilcene extreme terminal fishery.
4) Develop a "Recovering" regime for harvest management of summer chum.
5) Continue monitoring and adaptively managing artificial production operations of summer chum and other species within the ESU.
6) Continue to support and advocate for habitat protection and restoration actions.
7) Support and advocate for development of a strong and effective habitat adaptive management program that is integrated with the programs for harvest and hatcheries.
8) Review new information and revise as appropriate the Co-managers' interim recovery goals.
9) Continue to report on progress of summer chum recovery actions, consistent with the guidelines of the SCSCI.

10) REFERENCES

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APPENDIX

APPENDIX TABLES

Appendix Table 1. Summer chum salmon spawning escapement estimates in the Hood Canal Region, 1968-2004.

Appendix Table 2. Summer chum salmon spawning escapement estimates in the Strait of Juan de Fuca Region, 1968-2004.

Appendix Tables 3 through 12. Recruit per spawner worksheets for natural-origin summer chum returning to individual streams in the Hood Canal and Strait of Juan de Fuca.

Appendix Tables 13 through 17. Estimated numbers of supplementation-origin Hood Canal summer chum escaping to streams other than their stream of origin in 2000-2004.

Appendix Table 1. Summer chum escapement estimates in the Hood Canal region, 1968- 2004. *(Excluded values = no estimates; Italicized= estimates based on regression or extrapolation. Excluded values in brood column = no broodstock collected).*

Return		Big Beef						Union		
Year	Skokomish	Wild	Brood	Total	Anderson	Dewatto	Tahuya	Wild	Brood	Total
1968		100				2,275				
1969		100				280				
1970		178			65	2,666				
1971		159			125	2,012				
1972		177			225	1,403	4,487			
1973		244				691				
1974		75			0	181	880	68		
1975		1,152			195	613	1,389	*84*		
1976		1,281			234	741	3,200	100		
1977		302			*26*	225	726	75		
1978		680			16	544	266	64		
1979		191			6	49	117	*97*		
1980		123			2	117	179	208		
1981		90			1	41	140	41		
1982		0			0	21	86	*153*		
1983		0			0	15	86	170		
1984		22			1	44	142	194		
1985		0			0	19	122	334		
1986		0			0	20	109	1,892		
1987		6			0	5	91	497		
1988		0			0	23	145	629		
1989		0			0	2	9	450		
1990		0			0	0	6	275		
1991		0			0	31	5	208		
1992		0			0	0	0	140		
1993		0			0	1	0	251		
1994		0			0	0	0	738		
1995		0			0	0	0	721		
1996		0			0	0	5	494		
1997		0			0	6	0	410		
1998		0			0	12	0	223		
1999		0	4	4	0	2	1	159		
2000		0	20	20	0	10	2	682	62	744
2001	3	826	68	894	0	32	0	1,426	65	1,491
2002	0	677	65	742	0	10	0	807	65	872
2003	0	824	72	896	0	9	0	11,780	136	11,916
2004	24	1,852	64	1,916	1	23	8	5,876	100	5,976

Appendix Table 1, cont.

Return	Lilliwaup			Hamma Hamma					Quilcene			
Year	Wild	Brood	Total	Wild	Brood	Total	Duckabush	Dosewallips	Big Quil	Little Quil	Brood	Total
1968				13,548			4,693		5,797	897		6,694
1969				3,104			3,802		1,307			
1970				1,390			2,301		655	12		667
1971	318			4,282			3,904		1,798	71		1,869
1972	716			5,346			13,546	1,733	2,067	300		2,367
1973							5,761	623	3,107	238		3,345
1974	616			*2,448*			3,581	*3,593*	795	44		839
1975	706			*7,341*			2,245	*2,250*	1,405	868		2,273
1976	1,612			*7,648*			6,095	3,271	2,445	1,088		3,533
1977	420			*1,675*			2,453	3,215	821	773		1,594
1978	1,331			*8,215*			1,898	*1,901*	2,978	1,816		4,794
1979	163			*3,096*			1,190	*1,190*	345	110		455
1980	247			329			827	1,216	375	154		529
1981	293			926			557	63	138	84		222
1982	84			801			690	507	156	125		281
1983	18			190			80	64	100	176		276
1984	187			*170*			299	212	60	83		143
1985	92			*231*			30	236	44	1		45
1986	97			173			177	57	15	12		27
1987	32			26			12	9	8	71		79
1988	275			440			497	661	120	177		297
1989	43			16			60	16	1	1		2
1990	2			90			42	8	6	0		6
1991	30			71			102	250	49	1		50
1992	81	18	99	123			617	655	320	9	414	743
1993	67	10	77	69			105	105	97	12	39	148
1994	99	12	111	370			263	225	349	0	373	722
1995	79	0	79	476			825	2,787	4,029	54	491	4,574
1996	64	12	76	774			2,650	6,976	8,479	265	771	9,515
1997	9	18	27	97	14	111	475	47	7,339	29	535	7,903
1998	3	21	24	95	32	127	226	336	2,244	265	544	3,053
1999	0	13	13	212	43	255	92	351	2,981	84	172	3,237
2000	2	20	22	173	56	229	464	1,260	5,126	268	504	5,898
2001	32	60	92	1,173	54	1,227	942	990	5,868	199	306	6,373
2002	775	83	858	2,260	68	2,328	530	1,627	3,662	470	355	4,487
2003	194	159	353	796	58	854	1,869	7,066	11,745	890	98	12,733
2004	922	95	1,017	2,628	63	2,691	8,637	11,549	35,000	3,045	108	38,153

Appendix Table 2. Summer chum escapement estimates in the Strait of Juan de Fuca region, 1968-2004. *(Excluded values = missing estimates; Italicized= estimates based on regression or extrapolation. Excluded values in brood column = no broodstock collected).*

Return	Jimmycomelately				Salmon			
Year	Wild	Brood	Total	Snow	Wild	Brood	Total	Chimacum
1968								
1969								
1970								
1971					249			
1972				435	534			
1973					636			
1974	*438*			818	512			0
1975	*353*			340	755			0
1976	*365*			608	521			0
1977	*405*			538	701			0
1978	*787*			629	1,664			0
1979	*170*			133	458			0
1980	*1,326*			709	3,074			0
1981	*203*			242	439			0
1982	599			766	1,386			0
1983	254			154	731			0
1984	367			384	828			0
1985	61			20	151			0
1986	292			213	582			0
1987	464			465	1,062			0
1988	1,052			723	1,915			0
1989	173			21	194			0
1990	63			33	245			0
1991	125			12	172			0
1992	616			21	371	62	433	0
1993	110			11	400	52	452	0
1994	15			2	137	24	161	0
1995	223			25	538	53	591	0
1996	30			160	785	109	894	0
1997	61			67	724	110	834	0
1998	98			27	1,023	121	1,144	0
1999	1	6	7	29	434	65	499	38
2000	9	46	55	30	710	136	846	52
2001	192	68	260	154	2,484	154	2,638	903
2002	6	36	42	532	5,389	128	5,517	864
2003	369	77	446	304	5,521	130	5,651	558
2004	1,601	61	1,662	396	6,021			1,139

Appendix Table 3. Recruit per spawner worksheet for summer chum salmon returning to Jimmycomelately Creek.

Return year	1999	2000	2001*	2002	2003	2004
Age 2 NOR's	0	29	2	0	6	0
Age 3 NOR's	0	25	191	1	57	521
Age 4 NOR's	7	1	60	1	6	93
Age 5 NOR's	0	0	0	0	0	0
Total NOR's	**7**	**55**	**253**	**2**	**69**	**614**

Brood year	1995	1996	1997	1998	1999*	2000	2001	2002
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**29**	**2**	**0**	**6**	**0**
% total brood return			0.00%	13.11%	24.25%	0.00%	1.06%	0.00%
Age 3 return year		*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return		**0**	**25**	**191**	**1**	**57**	**521**	
% total brood return		0.00%	29.58%	86.53%	9.57%	38.16%	98.94%	
Age 4 return year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*		
Age 4 return	**7**	**1**	**60**	**1**	**6**	**93**		
% total brood return	100.00%	100.00%	70.42%	0.37%	66.17%	61.84%		
Age 5 return year	*2000*	*2001*	*2002*	*2003*	*2004*			
Age 5 return	**0**	**0**	**0**	**0**	**0**			
% total brood return	0	0	0	0	0			
Total brood return	7	1	85	221	9	150	526	

Brood year	1995	1996	1997	1998	1999	2000	2001	2002
Parent wild escapement	223	30	61	98	1	9	192	6
Age 2 R/S			0.00	0.30	2.13	0.00	0.03	0.00
Age 3 R/S		0.00	0.41	1.95	0.84	6.37	2.71	
Age 4 R/S	0.03	0.03	0.98	0.01	5.81	10.32		
Age 5 R/S	0.00	0.00	0.00	0.00	0.00			
Total R/S	0.03	0.03	1.39	2.26	8.78	16.68	2.74	

*JCL supplementation & marking programs began in 1999 - first returns (age 2) occurred in 2001

Appendix Table 4. Recruit per spawner worksheet for summer chum salmon returning to Salmon and Snow creeks.

Return year	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Age 2 NOR's	0	37	79	0	0	0
Age 3 NOR's	87	329	446	3,517	2,816	1,129
Age 4 NOR's	56	83	706	572	1,183	3,197
Age 5 NOR's	6	5	0	12	21	75
Total NOR's	**149**	**454**	**1,230**	**4,100**	**4,021**	**4,401**

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**37**	**79**	**0**	**0**	**0**
% total brood return			0.0%	3.4%	1.6%	0.0%		
Age 3 return year		*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return		**87**	**329**	**446**	**3517**	**2816**	**1129**	
% total brood return		51.1%	31.4%	41.5%	72.5%	46.8%		
Age 4 return year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*		
Age 4 return	**56**	**83**	**706**	**572**	**1183**	**3197**		
% total brood return		48.9%	67.4%	53.2%	24.4%	53.2%		
Age 5 return year	*2000*	*2001*	*2002*	*2003*	*2004*			
Age 5 return	**5**	**0**	**12**	**21**	**75**			
% total brood return		0.0%	1.2%	1.9%	1.6%			
Total brood return	61	169	1,047	1,075	4,854	6,013	1,129	

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Parent wild escapement	563	945	791	1050	463	740	2638	5921
Age 2 R/S			0.00	0.04	0.17	0.00	0.00	0.00
Age 3 R/S		0.09	0.42	0.42	7.60	3.81	0.43	
Age 4 R/S	0.10	0.09	0.89	0.54	2.56	4.32		
Age 5 R/S	0.01	0.00	0.02	0.02	0.16			
Total R/S	0.11	0.18	1.32	1.02	10.48	8.13	0.43	

Appendix Table 5. Recruit per spawner worksheet for summer chum salmon returning to Chimacum Creek.

Return year	**1999***	**2000***	**2001***	**2002**	**2003**	**2004**
Age 2 NOR's			0	5	5	0
Age 3 NOR's				124	176	436
Age 4 NOR's					48	157
Age 5 NOR's						0
Total NOR's	**0**	**0**	**0**	**129**	**229**	**593**

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Age 2 return year					*2001*	*2002*	*2003*	*2004*
Age 2 return					**0**	**5**	**5**	**0**
% total brood return					0.0%	1.4%		
Age 3 return year					*2002*	*2003*	*2004*	
Age 3 return					**124**	**176**	**436**	
% total brood return					71.9%	52.0%		
Age 4 return year					*2003*	*2004*		
Age 4 return					**48**	**157**		
% total brood return					28.1%	46.6%		
Age 5 return year					*2004*			
Age 5 return					**0**			
% total brood return					0.0%			
Total brood return	0	0	0	0	172	338	441	

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Parent wild escapement					38	52	903	864
Age 2 R/S					0.00	0.09	0.01	0.00
Age 3 R/S					3.26	3.38	0.48	
Age 4 R/S					1.27	3.03		
Age 5 R/S					0.00			
Total R/S					4.54	6.50	0.49	

*No otoliths collected - reintroduction fish not marked for first brood cycle, all returns assumed to be supplementation-origin
Chimacum reintroduction program began in 1996, marking initiated in 1999, first significant NOR's returned as age 3's in 2002

Appendix Table 6. Recruit per spawner worksheet for summer chum salmon returning to Big and Little Quilcene rivers.

Return year	**1999***	**2000***	**2001***	**2002****	**2003****	**2002****
Age 2 NOR's		0	3	0	0	0
Age 3 NOR's		241	517	3,391	7,743	14,650
Age 4 NOR's			2,936	850	3,036	44,159
Age 5 NOR's				88	70	525
Total NOR's	**N/A**	**241**	**3,456**	**4,330**	**10,849**	**59,334**

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**0**	**3**	**0**	**0**	**0**
% total brood return			0.0%	0.0%	0.0%	0.0%		
Age 3 return year			*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return			**241**	**517**	**3,391**	**7,743**	**14,650**	
% total brood return			7.4%	35.9%	48.8%	14.9%		
Age 4 return year			*2001*	*2002*	*2003*	*2004*		
Age 4 return			**2,936**	**850**	**3,036**	**44,159**		
% total brood return			89.9%	59.1%	43.7%	85.1%		
Age 5 return year			*2002*	*2003*	*2004*			
Age 5 return			**88**	**70**	**525**			
% total brood return			2.7%	4.9%	7.5%			
Total brood return	N/A	N/A	3,266	1,438	6,955	51,902	14,650	

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Parent wild escapement	4,083	8,744	7,368	2,509	3,065	5,394	6,067	4,132
Age 2 R/S			0.00	0.00	0.00	0.00	0.00	0.00
Age 3 R/S			0.03	0.21	1.11	1.44	2.41	
Age 4 R/S			0.40	0.34	0.99	8.19		
Age 5 R/S			0.01	0.03	0.17			
Total R/S	N/A	N/A	0.44	0.57	2.27	9.62	2.41	

* Big Quilcene supplementation fish unmarked

** Clips sampled, but some broods of returning Big Quilcene supplementation fish were not marked

*** Clips sampled and all Big Quilcene supplementation fish ad-clipped

Big Quilcene supplementation program began in 1992, ad-clipping began in 1997, meaning 2000 age 3 return was first significant marked return

Appendix Table 7. Recruit per spawner worksheet for summer chum salmon returning to Dosewallips River.

Return year	**1999***	**2000***	**2001***	**2002****	**2003****	**2004****
Age 2 NOR's	0	0	0	0	60	0
Age 3 NOR's	173	32	358	634	4,949	580
Age 4 NOR's	199	1,236	297	577	1,543	9,707
Age 5 NOR's	9	0	115	129	15	19
Total NOR's	**381**	**1,267**	**770**	**1,340**	**6,566**	**10,306**

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2001**
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**0**	**0**	**0**	**60**	**0**
% total brood return			0.0%	0.0%	0.0%	0.0%		
Age 3 return year		*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return		**173**	**32**	**358**	**634**	**4,949**	**580**	
% total brood return		11.4%	6.9%	37.7%	28.9%	33.8%		
Age 4 return year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*		
Age 4 return	**199**	**1,236**	**297**	**577**	**1,543**	**9,707**		
% total brood return		81.1%	64.9%	60.7%	70.2%	66.2%		
Age 5 return year	*2000*	*2001*	*2002*	*2003*	*2004*			
Age 5 return	**0**	**115**	**129**	**15**	**19**			
% total brood return		7.6%	28.2%	1.6%	0.9%			
Total brood return	199	1,524	458	950	2,196	14,656	640	

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Parent wild escapement	2787	6976	47	336	351	1260	990	1627
Age 2 R/S			0.00	0.00	0.00	0.00	0.06	0.00
Age 3 R/S		0.02	0.67	1.07	1.81	3.93	0.59	
Age 4 R/S	0.07	0.18	6.32	1.72	4.39	7.71		
Age 5 R/S	0.00	0.02	2.75	0.04	0.06			
Total R/S	0.07	0.22	9.74	2.83	6.26	11.63	0.65	0.00

* Dosewallips was sampled for ad-clips, was not sampled for otoliths

** Dosewallips was sampled for ad-clips and otoliths

Appendix Table 8. Recruit per spawner worksheet for summer chum salmon returning to Duckabush River.

Return year	**1999***	**2000***	**2001***	**2002****	**2003****	**2004****
Age 2 NOR's	0	0	0	0	0	0
Age 3 NOR's	25	37	203	241	1,136	628
Age 4 NOR's	75	384	417	106	478	7,239
Age 5 NOR's	0	13	53	15	0	0
Total NOR's	**100**	**435**	**673**	**362**	**1,614**	**7,867**

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**0**	**0**	**0**	**0**	**0**
% total brood return			0.0%	0.0%	0.0%	0.0%	0.0%	
Age 3 return year		*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return		**25**	**37**	**203**	**241**	**1,136**	**629**	
% total brood return		5.4%	8.0%	65.6%	33.5%	13.6%		
Age 4 return year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*		
Age 4 return	**75**	**384**	**417**	**106**	**478**	**7,239**		
% total brood return	84.8%	83.1%	88.8%	34.4%	66.5%	86.4%		
Age 5 return year	*2000*	*2001*	*2002*	*2003*	*2004*			
Age 5 return	**13**	**53**	**15**	**0**	**0**			
% total brood return	15.2%	11.5%	3.2%	0.0%	0.0%			
Total brood return	88	462	470	309	718	8,377	629	

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Parent wild escapement	825	2650	475	226	92	464	942	530
Age 2 R/S			0.00	0.00	0.00	0.00	0.00	0.00
Age 3 R/S		0.01	0.08	0.90	2.62	2.45	0.67	
Age 4 R/S	0.09	0.14	0.88	0.47	5.19	15.60		
Age 5 R/S	0.02	0.02	0.03	0.00	0.00			
Total R/S	0.11	0.17	0.99	1.37	7.81	18.05	0.67	

* Duckabush was sampled for ad-clips, was not sampled for otoliths

** Duckabush was sampled for ad-clips and otoliths

Appendix Table 9. Recruit per spawner worksheet for summer chum salmon returning to Hamma Hamma River.

Return year	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Age 2 NOR's	0	8	13	0	8	0
Age 3 NOR's	135	38	267	697	305	508
Age 4 NOR's	142	172	756	324	223	1,907
Age 5 NOR's	0	0	139	51	4	0
Total NOR's	**277**	**218**	**1,175**	**1,072**	**541**	**2,415**

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**8**	**13**	**0**	**8**	**0**
% total brood return			0.0%	1.3%	1.4%	0.0%		
Age 3 return year		*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return		**135**	**38**	**267**	**697**	**305**	**508**	
% total brood return		30.3%	4.5%	44.3%	74.7%	13.8%		
Age 4 return year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*		
Age 4 return	**142**	**172**	**756**	**324**	**223**	**1,907**		
% total brood return		38.6%	89.5%	53.7%	23.9%	86.2%		
Age 5 return year	*2000*	*2001*	*2002*	*2003*	*2004*			
Age 5 return	**0**	**139**	**51**	**4**	**0**			
% total brood return		31.1%	6.0%	0.7%	0.0%			
Total brood return	142	446	845	603	933	2,212	516	0

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Parent wild escapement	476	774	104	95	212	173	1173	2260
Age 2 R/S			0.00	0.08	0.06	0.00	0.01	0.00
Age 3 R/S		0.17	0.37	2.81	3.29	1.76	0.43	
Age 4 R/S	0.30	0.22	7.27	3.41	1.05	11.03		
Age 5 R/S	0.00	0.18	0.49	0.04	0.00			
Total R/S	0.30	0.58	8.13	6.35	4.40	12.79	0.44	0.00

Supplementation marking began in 1997 - first returns as age 3 in 2000

Appendix Table 10. Recruit per spawner worksheet for summer chum salmon returning to Lilliwaup Creek.

Return year	1999*	2000*	2001*	2002**	2003**	2002**
Age 2 NOR's		0	0	0	0	0
Age 3 NOR's		7	20	25	20	65
Age 4 NOR's			20	12	7	71
Age 5 NOR's				0	0	0
Total NOR's				**37**	**27**	**137**

Brood year	1995***	1996***	1997	1998	1999	2000	2001	2002
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**0**	**0**	**0**	**0**	**0**
% total brood return			0	0	0	0	0	#DIV/0!
Age 3 return year			*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return			**7**	**20**	**25**	**20**	**65**	
% total brood return			0.270285	0.633422	0.788258	0.2213	1	
Age 4 return year			*2001*	*2002*	*2003*	*2004*		
Age 4 return			**20**	**12**	**7**	**71**		
% total brood return			0.729715	0.366578	0.211742	0.7787		
Age 5 return year			*2002*	*2003*	*2004*			
Age 5 return			**0**	**0**	**0**			
% total brood return			0	0	0			
Total brood return			27	32	32	92	65	

Brood year	1995***	1996***	1997	1998	1999	2000	2001	2002
Parent wild escapement			9	3	0	2	32	775
Age 2 R/S			0.00	0.00	N/A	0.00	0.00	0.00
Age 3 R/S			0.81	6.82	N/A	10.16	2.04	
Age 4 R/S			2.20	3.95	N/A	35.75		
Age 5 R/S			0.00	0.00	N/A			
Total R/S	0.00	0.00	3.01	10.76	N/A	45.91	2.04	

Program begin with 1992 brood; first otolith marking was 1997 brood with 1st age 3 marked returns in 2000

*Some ages of returning supplementation fish were marked, some were not.

** All returning supplementation fish were marked

*** Supplementation returns unmarked - cannot estimate NOR's

Appendix Table 11. Recruit per Spawner worksheet for summer chum returning to the mainstem Hood Canal management unit.

Return year	**1999***	**2000**	**2001**	**2002**	**2003**	**2004**
Age 2 NOR's	0	8	13	0	68	0
Age 3 NOR's	333	115	864	1,597	6,411	1,955
Age 4 NOR's	416	1,792	1,491	1,031	2,250	18,924
Age 5 NOR's	9	13	307	195	19	19
Total NOR's	**758**	**1,928**	**2,675**	**2,823**	**8,748**	**20,899**

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**8**	**13**	**0**	**68**	**0**
% total brood return			0.0%	0.4%	0.3%	0.0%		
Age 3 return year		*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return		**333**	**115**	**864**	**1,597**	**6,410**	**1,955**	
% total brood return		13.7%	6.4%	45.0%	41.2%	25.3%		
Age 4 return year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*		
Age 4 return	**416**	**1,792**	**1,491**	**1,031**	**2,250**	**18,924**		
% total brood return		73.7%	82.8%	53.6%	58.0%	74.7%		
Age 5 return year	*2000*	*2001*	*2002*	*2003*	*2004*			
Age 5 return	**13**	**307**	**195**	**19**	**19**			
% total brood return		12.6%	10.8%	1.0%	0.5%			
Total brood return	429	2,432	1,800	1,922	3,879	25,340	2,024	0

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Parent wild escapement	4088	10400	635	660	655	1899	3963	5869
Age 2 R/S			0.00	0.01	0.02	0.00	0.02	0.00
Age 3 R/S		0.03	0.18	1.31	2.44	3.38	0.49	
Age 4 R/S	0.10	0.17	2.35	1.56	3.44	9.97		
Age 5 R/S	0.00	0.03	0.31	0.03	0.03			
Total R/S	0.11	0.23	2.83	2.91	5.92	13.34	0.51	0.00

See footnotes on individual stream worksheets for caveats on marking and sampling history for each program/stream.

Appendix Table 12. Recruit per spawner worksheet for summer chum salmon returning to Union River.

Return year	**1999***	**2000***	**2001***	**2002***	**2003****	**2004****
Age 2 NOR's	0	9	11	85	0	17
Age 3 NOR's	20	670	214	625	7,362	747
Age 4 NOR's	153	76	1293	151	585	2,825
Age 5 NOR's	0	0	0	28	27	17
Total NOR's	**173**	**755**	**1,518**	**890**	**7,974**	**3,606**

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	
Age 2 return year			*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Age 2 return			**0**	**9**	**11**	**85**	**0**	**17**
% total brood return			0.0%	2.3%	0.9%	0.8%		
Age 3 return year		*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	
Age 3 return		**20**	**670**	**214**	**625**	**7,362**	**747**	
% total brood return		21.2%	33.6%	53.3%	50.5%	71.7%		
Age 4 return year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*		
Age 4 return	**153**	**76**	**1,293**	**151**	**585**	**2,825**		
% total brood return		78.8%	64.9%	37.7%	47.3%	27.5%		
Age 5 return year	*2000*	*2001*	*2002*	*2003*	*2004*			
Age 5 return	**0**	**0**	**28**	**27**	**17**			
% total brood return		0.0%	1.4%	6.7%	1.4%			
Total brood return	153	96	1,991	402	1,238	10,272	747	

Brood year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Parent wild escapement	721	494	410	223	159	682	1426	807
Age 2 R/S			0.00	0.04	0.07	0.12	0.00	0.02
Age 3 R/S		0.04	1.63	0.96	3.93	10.79	0.52	
Age 4 R/S	0.21	0.15	3.15	0.68	3.68	4.14		
Age 5 R/S	0.00	0.00	0.07	0.12	0.11			
Total R/S	0.21	0.19	4.86	1.80	7.79	15.06	0.52	

* No otoliths sampled

**Otoliths sampled

Supplementation program and otolith marking began in 2000; first returns were age 3's in 2003.

Appendix Table 13. Estimated numbers of supplementation-origin Hood Canal summer chum escaping to streams other than their stream of origin in 2000.

	Program of origin																								
	Age 2							Age 3							Age 4						Age 5			
Stream of escapement	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Total	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Total	Salmon	Chimacum	Lilliwaup	Big Beef	Big Quilcene	Total	Salmon	Lilliwaup	Big Quilcene	Total
JCL							0							0						0				0
Salmon							0							0						0				0
Snow							0							0						0				0
Chimacum							0	2						2	16					16				0
L. Quilcene							0							0						0				0
B. Quilcene																								
Dosewallips							0						11	11						0				0
Duckabush							0						36	36						0				0
Hamma							0						4	4						0				0
Lilliwaup					2		2							0						0				0
Union							0							0						0				0
Dewatto							0							0						0				0
Big Beef							0							0						0				0

Black boxes indicate that returns were to stream of origin, meaning that they could not be strays.

Grey boxes indicate that supplementation returns to that program were not mass marked, or that stream of return was not sampled for otoliths. In these cases, there may have been stray supplementation-origin fish that were not detected.

Dotted lines divide programs and streams into Hood Canal and Strait of Juan de Fuca regions.

Appendix Table 14. Estimated numbers of supplementation-origin summer chum escaping to streams other than their stream of origin in 2001.

Stream of escapement	Program of origin																													
	Age 2								Age 3								Age 4								Age 5					
	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Total	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Total	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Total	Salmon	Chimacum	Lilliwaup	Big Beef	Big Quilcene	Total
JCL								0							0							0						0
Salmon								0							0							0						0
Snow								0							0							0						0
Chimacum								0	28						28	57						57						0
L. Quilcene		3						3			2				2			10				10						0
B. Quilcene																												
Dosewallips								0						104	104						128	128						0
Duckabush								0						106	106						174	174						0
Hamma								0					48		48							0						0
Lilliwaup								0					17		17					1		1						0
Union								0							0							0						0
Dewatto								0							0							0						0
Big Beef								0							0			5				5						0

Black boxes indicate that returns were to stream of origin, meaning that they could not be strays.

Grey boxes indicate that supplementation returns to that program were not mass marked, or that stream of return was not sampled for otoliths. In these cases, there may have been stray supplementation-origin fish that were not detected.

Dotted lines divide programs and streams into Hood Canal and Strait of Juan de Fuca regions.

Appendix Table 15. Estimated numbers of supplementation-origin summer chum escaping to streams other than their stream of origin in 2002.

	Program of origin																															
	Age 2									Age 3									Age 4							Age 5						
Stream	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Union	Big Beef	Big Quilcene	Total	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Total	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Total	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Total
JCL									0								0							0							0
Salmon									0	13		13					26							0							0
Snow									0								0							0							0
Chimacum									0		164						164	10				5		15							0
Little Quilcene									0								0							0							0
Big Quilcene																															
Dosewallips									0	12			83		24	51	170						145	145							0
Duckabush									0				65	11		27	103						67	67						5	5
Hamma Hamma									0					37	49	53	139					27	50	77							0
Lilliwaup									0				31		62	6	99					41		41							0
Union									0								0							0							0
Dewatto									0								0							0							0
Big Beef Cr									0				4				4							0							0

Black boxes indicate that returns were to stream of origin, meaning that they could not be strays.

Grey boxes indicate that supplementation returns to that program were not mass marked, or that stream of return was not sampled for otoliths. In these cases, there may have been stray supplementation-origin fish that were not detected.

Dotted lines divide programs and streams into Hood Canal and Strait of Juan de Fuca regions.

Appendix Table 16. Estimated numbers of supplementation-origin summer chum escaping to streams other than their stream of origin in 2003.

	Program of origin																																							
	Age 2										Age 3										Age 4										Age 5									
Stream	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Union	Big Beef	Big Quilcene	Marked, origin indefinite	Total	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Union	Big Beef	Big Quilcene	Marked, origin indefinite	Total	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Marked, origin indefinite	Total	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Marked, origin indefinite	Total
JCL									5	5		7							17	24									0								0
Salmon									16	16			34						162	196			217					63	280								0
Snow									0	0	8								68	76			8	4				12	24								0
Chimacum									0	0									64	64								66	66							0	0
L. Quilcene									0	0		9					9		0	18				10				0	10							0	0
B. Quilcene																																							
Dosewallips										0				85			28	106	137	356				98			62	39	199								0
Duckabush										0				69				25	58	152				56			33	28	117								0
Hamma										0							10	8	10	28						6	4	28	38								0
Lilliwaup				5					5	10				137			43		34	214			3	42		3		21	69								0
Union										0				320			29		495	844								30	30								0
Dewatto										0							9			9									0								0
Big Beef										0										0									0								0

Black boxes indicate that returns were to stream of origin, meaning that they could not be strays.

Grey boxes indicate that supplementation returns to that program were not mass marked, or that stream of return was not sampled for otoliths. In these cases, there may have been stray supplementation-origin fish that were not detected.

Dotted lines divide programs and streams into Hood Canal and Strait of Juan de Fuca regions.

Appendix Table 17. Estimated numbers of supplementation-origin summer chum escaping to streams other than their streams of origin in 2004.

Stream of escapement	Program of origin									
	Age 2									
	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Union	Big Beef	Big Quilcene	Marked, origin indefinite	Total
JCL										0
Salmon										0
Snow										0
Chimacum										0
L. Quilcene										0
B. Quilcene										
Dosewallips										0
Duckabush										0
Hamma										0
Lilliwaup										0
Union										0
Dewatto										0
Big Beef										0

Stream of escapement	Age 3									
	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Union	Big Beef	Big Quilcene	Marked, origin indefinite	Total
JCL		29							122	151
Salmon									120	120
Snow	16								8	24
Chimacum		10		10		5			47	72
L. Quilcene										
B. Quilcene										
Dosewallips								169	90	259
Duckabush				47					31	78
Hamma		6					6	37		49
Lilliwaup				37		3	13		652	705
Union				18			54		18	90
Dewatto				6			6			12
Big Beef				8						8

Stream of escapement	Age 4									
	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Union	Big Beef	Big Quilcene	Marked, origin indefinite	Total
JCL									96	96
Salmon	15		15						592	622
Snow									67	67
Chimacum	5			5		10				20
L. Quilcene							21			21
B. Quilcene										
Dosewallips				189				65	729	983
Duckabush	15			325	15			43	310	708
Hamma	7						7	25	72	111
Lilliwaup	3			100			15		22	140
Union				18	71				89	178
Dewatto							3		3	6
Big Beef									9	9

Stream of escapement	Age 5									
	JCL	Salmon	Chimacum	Hamma	Lilliwaup	Big Beef	Big Quilcene	Marked, origin indefinite	Total	
JCL									0	
Salmon								15	15	
Snow			4						4	
Chimacum								5	5	
L. Quilcene									0	
B. Quilcene										
Dosewallips							22		22	
Duckabush									0	
Hamma									0	
Lilliwaup				6					6	
Union									0	
Dewatto									0	
Big Beef									0	

Black boxes indicate that returns were to stream of origin, meaning that they could not be strays.

Grey boxes indicate that stream of return (Big Quilcene) was not sampled for otoliths. There may have been stray supplementation-origin fish that were not detected.

Dotted lines divide programs and streams into Hood Canal and Strait of Juan de Fuca regions.

APPENDIX REPORT 1

Derivation of escapement estimates for the 2003 and 2004 returns of summer chum salmon to the streams of Hood Canal and the Strait of Juan de Fuca

Escapement estimates for Hood Canal and Strait of Juan de Fuca summer chum populations are based upon the collection and analysis of multiple live and dead fish counts made in each stream throughout the spawning season. An estimate of the total abundance of summer chum in each stream from this data is made by use of an "area-under-the-curve" (AUC) methodology. The AUC escapement methodology is based upon escapement curves developed from serial spawner counts, which are converted into total escapement estimates for the surveyed stream using the average chum salmon spawner residence life. Other methods, such as rack and redd counts, were also used where available and/or appropriate. For a more detailed discussion see SCSCI Appendix Report 1.1.

The following are the 2003 and 2004 return year summaries of the summer chum escapements, quality ratings and the spawner count data used for estimating escapement. Survey data directly used in estimation process are highlighted with **bold text** in the annual summary tables.

Survey data from several small streams not included in the first SCSCI Annual Report (WFDW and PNPTT, 2001) are presented here. Some of these streams were identified as possibly being part of the historic distribution of summer chum salmon based on evidence of former summer chum occurrence, but insufficient evidence to determine whether each represented a distinct stock (see SCSCI 1.7.2.3, WDFW and PNPTT, 2000). These streams were also monitored to determine if summer chum are re-colonizing these streams and/or if summer chum adults returning from supplementation programs may be straying to these watersheds.

2003 SUMMER CHUM NATURAL SPAWNING ESCAPEMENT SUMMARY

LITTLE ANDERSON CREEK (WRIA 15.0377)

SUMMER CHUM 2003

Reach **River mile 0.0-1.0**
Estimate 0
Method Peak live + dead count
Quality Rating Good
Comments Assumed 10/11 fish were early fall chum. Surveys by Kitsap Stream Team volunteers

Table AR1- 1. Little Anderson Creek 2003 survey data.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0377	09/16/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0377	09/29/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0377	10/11/03	0.0	0.7	0.7	2	0	2					INDX	FOOT	KST
15.0377	10/20/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0377	11/01/03	0.0	0.7	0.7	0	3	3					INDX	FOOT	KST

Notes:

BIG BEEF CREEK (WRIA 15.0389)

SUMMER CHUM 2003

Reach **River mile 0.0 upstream**
Estimate 896
Method Trap count – (broodstock take adjustment)
Quality Rating Very good
Comments Trap operated from September 6 through the fall chum run; October 15 set as end of summer run. 72 fish were used for broodstock. 52 fish counted dead downstream or entered trap after spawning. Total return = (772 + 52 natural escapement) + (72 broodstock) = 896

Table AR1- 2. Big Beef Creek 2003 summer chum trapping and downstream survey data.

	Unspawned released		Spawnouts released		Sp. Dead Below Weir		Broodstock		Total	
Date	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
09/06/03	2	2							2	2
09/07/03	2								2	0
09/08/03	2	3							2	3
09/09/03	1	1							1	1
09/10/03									0	0
09/11/03									0	0
09/12/03	4								4	0
09/13/03	3								3	0
09/14/03	3	1							3	1
09/15/03	12						4	5	16	5
09/16/03	51	34					3	2	54	36
09/17/03	26	24			1	3			27	27
09/18/03	21	18							21	18
09/19/03	43	30							43	30
09/20/03	32	21							32	21
09/21/03	14	8							14	8
09/22/03			1				7	7	8	7
09/23/03	32	42					2	5	34	47
09/24/03	25	11	3		3	7	3		34	18
09/25/03	12	10		1					12	11
09/26/03	14	12	1	1					15	13
09/27/03	38	13	2						40	13
09/28/03	10	11	1						11	11
09/29/03	6	2	1				8	8	15	10
09/30/03	9	8	1				2		12	8
10/01/03	11	12	1		3	4	3		18	16
10/02/03	9	9							9	9
10/03/03	10	12							10	12
10/04/03	6	4	1	1					7	5
10/05/03	4	3							4	3
10/06/03	4	1			4	12			8	13
10/07/03	4	2					6	5	10	7
10/08/03	3	4						2	3	6
10/09/03	24	20							24	20
10/10/03	8	4							8	4
10/11/03		1							0	1
10/12/03	2	2							2	2
10/13/03									0	0
Total	**447**	**325**	**12**	**3**	**11**	**26**	**38**	**34**	**508**	**388**

SEABECK CREEK (WRIA 15.0400)

SUMMER CHUM 2003

Reach **River mile 0.0-0.7**
Estimate 1
Method Peak live + dead count
Quality Rating Good
Comments Single dead chum observed on 10/11, late in the summer chum spawning period, but prior to the first observations of live fall chum on 10/28. Surveys by Kitsap Stream Team volunteers

Table AR1- 3. Seabeck Creek 2003 survey data.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0400	09/15/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0400	09/22/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0400	09/30/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0400	10/11/03	0.0	0.7	0.7	0	1	1					INDX	FOOT	KST
15.0400	10/20/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0400	10/28/03	0.0	0.7	0.7	8	2	10					INDX	FOOT	KST

Notes:

HARDING CREEK (WRIA 15.0408)

SUMMER CHUM 2003

Reach **River mile 0.0-0.7**
Estimate 0
Method Peak live + dead count
Quality Rating Good
Comments No chum seen before 10/27 survey. Surveys by Kitsap Stream Team volunteers

Table AR1- 4. Harding Creek 2003 survey data.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0408	09/08/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0408	09/19/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0408	10/03/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0408	10/19/03	0.0	0.7	0.7	0	0	0					INDX	FOOT	KST
15.0408	10/27/03	0.0	0.7	0.7	7	0	7					INDX	FOOT	KST
15.0408	11/10/03	0.0	0.7	0.7	17	2	19					INDX	FOOT	KST
15.0408	11/20/03	0.0	0.7	0.7	170	4	174					INDX	FOOT	KST

SUMMER CHUM 2003

Reach **River mile 0.0-1.0**
Estimate 0
Method Peak live + dead count
Quality Fair
Rating
Comments Assigned fair rating due to lack of surveys in September. Assumed escapement was zero due to apparent extirpation of population, and no fish observed in October surveys. Surveyors noted extensive beaver activity.

Table AR1- 5. Anderson Creek 2003 survey data through November 4.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0412	10/06/2003	0.0	0.2	0.2	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0412	10/20/2003	0.1	0.1	0.0	0	0	0		HIGH	NOT SURVEYABLE	0	SPOT	FOOT	WDFW
15.0412	11/04/2003	0.0	1.0	1.0	373	17	390	80	LOW	GOOD	2	INDX	FOOT	WDFW
15.0412	11/04/2003	1.0	1.5	0.5	115	9	124	80	LOW	EXCELLENT	6	SUPP	FOOT	WDFW

Notes:
10/06 – Surveyors noted series of beaver dams impassable at current flow, starting at RM 0.2.
10/20 – Heavy rains.

SUMMER CHUM 2003

Reach **River mile 0.3-1.8**
Estimate 9
Method Peak live + dead count
Quality Rating Good
Comments Used 10/2 live + dead count as estimate. Assumed chum counted on 10/15 were fall chum, due to zero live count on 10/09 and large live count on 10/28.

Table AR1- 6. Dewatto River 2003 survey data through October 28.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0420	08/29/2003	0.3	1.8	1.5	0	0	0	90	LOW	EXCELLENT	4.5	INDX	FOOT	WDFW
15.0420	09/05/2003	0.3	1.8	1.5	0	0	0	80	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0420	09/15/2003	0.3	1.8	1.5	0	0	0	90	LOW	EXCELLENT	5.5	INDX	FOOT	WDFW
15.0420	09/22/2003	0.3	1.8	1.5	0	1	1	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0420	**10/02/2003**	**0.3**	**1.8**	**1.5**	**6**	**3**	**9**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
15.0420	10/09/2003	0.3	1.8	1.5	0	2	2	95	LOW	EXCELLENT	4	INDX	FOOT	WDFW
15.0420	10/15/2003	0.3	1.8	1.5	5	0	5	70	LOW	POOR	2	INDX	FOOT	WDFW
15.0420	10/20/2003	0.3	0.3	0.0	0	0	0		FLOOD	NOT SURVEYABLE	0	SPOT	FOOT	WDFW
15.0420	10/28/2003	0.3	1.8	1.5	229	8	237	80	LOW	EXCELLENT	4	INDX	FOOT	WDFW
15.0420	10/28/2003	4.8	5.8	1.0	1	0	1	90	LOW	EXCELLENT	4.5	SUPP	FOOT	WDFW
15.0420	10/28/2003	5.8	7.5	1.7	0	0	0	90	LOW	EXCELLENT	4.5	SUPP	FOOT	WDFW

Notes:
10/15 – Dark pools and heavy rains.
10/20 – Heavy rains.

SUMMER CHUM 2003

Reach **River mile 0.6-5.0**
Estimate 0
Method Peak live + dead count
Quality Very Good
Rating
Comments No chum counted until October 29 survey.

Table AR1- 7. Tahuya River 2003 survey data through October 29.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0446	09/05/2003	0.6	1.0	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0446	09/05/2003	1.0	2.6	1.6	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0446	09/05/2003	2.6	5.0	2.4	0	0	0	95	LOW	EXCELLENT	6	SUPP	FOOT	WDFW
15.0446	09/15/2003	0.6	1.0	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0446	09/15/2003	1.0	2.6	1.6	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0446	09/15/2003	2.6	5.0	2.4	0	0	0	95	LOW	EXCELLENT	6	SUPP	FOOT	WDFW
15.0446	09/22/2003	0.6	1.0	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0446	09/22/2003	1.0	2.6	1.6	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0446	09/22/2003	2.6	5.0	2.4	0	0	0	95	LOW	EXCELLENT	6	SUPP	FOOT	WDFW
15.0446	10/02/2003	0.6	1.0	0.4	0	0	0	95	LOW	EXCELLENT	8	INDX	FOOT	WDFW
15.0446	10/02/2003	1.0	2.6	1.6	0	0	0	95	LOW	EXCELLENT	8	INDX	FOOT	WDFW
15.0446	10/02/2003	2.6	5.0	2.4	0	0	0	95	LOW	EXCELLENT	8	SUPP	FOOT	WDFW
15.0446	10/09/2003	0.6	1.0	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0446	10/09/2003	1.0	2.6	1.6	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0446	10/09/2003	2.6	5.0	2.4	0	0	0	95	LOW	EXCELLENT	10	SUPP	FOOT	WDFW
15.0446	10/15/2003	0.6	1.0	0.4	0	0	0	75	LOW	GOOD	5	INDX	FOOT	WDFW
15.0446	10/15/2003	1.0	2.6	1.6	0	0	0	75	LOW	GOOD	5	INDX	FOOT	WDFW
15.0446	10/15/2003	2.6	5.0	2.4	0	0	0	75	LOW	GOOD	5	SUPP	FOOT	WDFW
15.0446	10/20/2003	2.6	2.6	0.0	0	0	0		HIGH	NOT SURVEYABLE	0	SPOT	FOOT	WDFW
15.0446	10/29/2003	0.6	1.0	0.4	14	0	14	90	MEDI	FAIR	3	INDX	FOOT	WDFW
15.0446	10/29/2003	1.0	2.6	1.6	60	0	60	90	MEDI	FAIR	3	INDX	FOOT	WDFW
15.0446	10/29/2003	2.6	5.0	2.4	47	0	47	90	MEDI	GOOD	5	SUPP	FOOT	WDFW

Notes:
09/15 – Stream very low.
10/15 – Heavy rains.

SUMMER CHUM 2003

Reach **River mile 0.3 upstream**
Estimate 11,779
Method (Trap count) – (broodstock take adjustment)
Quality Rating Very Good
Comments Trap was operated by Hood Canal Salmon Enhancement Group and WDFW from August 14 through October 10 to collect broodstock for the supplementation program. A total of 11,916 adults were trapped, and 137 were removed for broodstock (including one mortality on 8/28).

Table AR1- 8. Union River 2003 summer chum trapping data.

	Adults trapped		Spawned at trap				Adults trapped		Spawned at trap	
Date	Females	Males	Females	Males		Date	Females	Males	Females	Males
8/14/03	0	0				9/12/03	134	129		
8/15/03	7	5				9/13/03	139	70		
8/16/03	13	11				9/14/03	78	47		
8/17/03	8	8				9/15/03	194	101	12	12
8/18/03	7	20				9/16/03	149	127		
8/19/03	7	8				9/17/03	108	69	12	12
8/20/03	38	61				9/18/03	221	187		
8/21/03	41	65				9/19/03	164	130		
8/22/03	33	39				9/20/03	196	135		
8/23/03	66	70				9/21/03	112	94		
8/24/03	103	161				9/22/03	178	172		
8/25/03	135	183				9/23/03	102	85		
8/26/03	199	466				9/24/03	112	103	6	6
8/27/03	342	588				9/25/03	68	77		
8/28/03	108	99	4	5		9/26/03	84	50		
8/29/03	58	59				9/27/03	52	35		
8/30/03	40	60				9/28/03	62	56		
8/31/03	71	113				9/29/03	20	8	6	6
9/1/03	93	127				9/30/03	46	29		
9/2/03	179	342	8	8		10/1/03	39	15		
9/3/03	209	341				10/2/03	33	12		
9/4/03	166	205	4	4		10/3/03	11	12		
9/5/03	145	139				10/4/03	15	6		
9/6/03	98	99				10/5/03	15	7		
9/7/03	246	283				10/6/03	31	19		
9/8/03	307	301	4	4		10/7/03	23	17		
9/9/03	161	183				10/8/03	9	6		
9/10/03	178	237				10/9/03	4	0		
9/11/03	195	192	12	12		10/10/03	1	0		
						Total	**5,653**	**6,263**	**68**	**69**

SUMMER CHUM 2003

Reach

Estimate NA
Method See comments
Quality NA
Rating
Comments No chum counted until November 13 survey. In the past, the Skokomish estimate has been treated as NA when summer chum were not observed during early season index surveys.

Table AR1- 9. Skokomish River 2003 survey data through November 13.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0001	09/03/2003	5.3	6.3	1.0	0	0	0		LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0001	09/03/2003	6.3	8.0	1.7	0	0	0		LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0001	09/03/2003	8.0	9.0	1.0	0	0	0		LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0001	09/10/2003	5.3	6.3	1.0	0	0	0		LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0001	09/10/2003	6.3	8.0	1.7	0	0	0		LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0001	09/10/2003	8.0	9.0	1.0	0	0	0		LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0001	09/29/2003	8.0	9.0	1.0	0	0	0		LOW	VERY GOOD	5	INDX	FOOT	WDFW
16.0001	10/15/2003	5.3	6.3	1.0	0	0	0	75	LOW	VERY GOOD	4	INDX	RAFT	WDFW
16.0001	10/15/2003	6.3	8.0	1.7	0	0	0	75	LOW	VERY GOOD	4	INDX	RAFT	WDFW
16.0001	10/15/2003	8.0	9.0	1.0	0	0	0		LOW	VERY GOOD	4	INDX	RAFT	WDFW
16.0001	10/30/2003	12.3	12.7	0.4	0	0	0	75	MEDIUM	GOOD	3.5	SUPP	FOOT	WDFW
16.0001	10/30/2003	12.7	13.3	0.6	0	0	0	65	MEDIUM	GOOD	3	SUPP	FOOT	WDFW
16.0001	10/30/2003	13.3	15.6	2.3	0	0	0	65	MEDIUM	FAIR	3	SUPP	FOOT	WDFW
16.0001	11/07/2003	12.3	12.7	0.4	0	0	0	70	LOW	GOOD	3.5	SUPP	FOOT	WDFW
16.0001	11/07/2003	12.7	13.3	0.6	0	0	0	70	LOW	GOOD	3.5	SUPP	FOOT	WDFW
16.0001	11/07/2003	13.3	15.6	2.3	0	0	0	70	LOW	GOOD	3	SUPP	FOOT	WDFW
16.0001	11/13/2003	12.3	12.7	0.4	3	0	3	80	LOW	GOOD	4	SUPP	FOOT	WDFW
16.0001	11/13/2003	12.7	13.3	0.6	55	0	55	80	LOW	GOOD	4	SUPP	FOOT	WDFW
16.0001	11/13/2003	13.3	15.6	2.3	13	0	13	70	LOW	GOOD	4	SUPP	FOOT	WDFW

Notes:

FINCH CREEK (WRIA 16.0222)

SUMMER CHUM 2003

Reach **River mile 0.0**
Estimate 0
Method Rack count
Quality Good
Rating
Comments All chum trapped at Hoodsport Hatchery prior to 10/15 are released to protect potential summer chum. In 2003, chum were trapped beginning 9/24, but it is unknown whether they were summer chum or early returning fall chum.

Table AR1- 10. 2003 chum daily trapping totals for Hoodsport Hatchery through October 15.

Date	Trapped Adults	Released Males	Released Females
09/24/03	3	2	1
09/29/03	6	5	1
10/06/03	8	4	4
10/15/03	200	0	0

LITTLE LILLIWAUP CREEK (WRIA 16.0228)

SUMMER CHUM 2003

Reach **River mile 0.0-0.4**
Estimate 0
Method Peak live + dead count
Quality Very Good
Rating
Comments No chum counted until October 30 survey.

Table AR1- 11. Little Lillliwaup Creek 2003 survey data through October 28.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0228	09/11/2003	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	5	INDX	FOOT	WDFW
16.0228	09/26/2003	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	10/06/2003	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	5	INDX	FOOT	WDFW
16.0228	10/13/2003	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	10/20/2003	0.0	0.0	0.0	0	0	0		FLOODING	NOT SURVEYABLE	0.1	SPOT	FOOT	WDFW
16.0228	10/22/2003	0.0	0.4	0.4	0	0	0	85	MEDIUM	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	10/30/2003	0.0	0.4	0.4	12	0	12	95	LOW	EXCELLENT	4	INDX	FOOT	WDFW

Notes:

SUMMER CHUM 2003

Reach **River mile 0.0-0.7**
Estimate 194
Method AUC – 10-day stream life (w/broodstock take adjustment)
Quality Rating Very Good
Comments Entire curve well-defined. Assumed chum counted on 10/13 were summer chum, although some or all may have been early fall chum. Stream was not surveyable between 10/13 and 10/27, making interpretation of 10/13 count difficult. 159 fish were collected for use in the supplementation program. Adjusted escapement = [(2739 total FD) – (159 broodstock x 5 days assumed average residence before removal)] / 10 day stream life = 194 fish. Total return = (194 natural spawners) + (159 broodstock) = 353.

Table AR1- 12. Lillliwaup Creek 2003 survey data through October 27.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0230	**08/18/2003**	**0.0**	**0.7**	**0.7**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**08/29/2003**	**0.0**	**0.7**	**0.7**	**3**	**0**	**3**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**09/04/2003**	**0.0**	**0.7**	**0.7**	**10**	**1**	**11**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**09/11/2003**	**0.0**	**0.7**	**0.7**	**23**	**0**	**23**	**90**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0230	**09/19/2003**	**0.0**	**0.7**	**0.7**	**154**	**12**	**166**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**09/26/2003**	**0.0**	**0.7**	**0.7**	**110**	**56**	**166**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**10/06/2003**	**0.0**	**0.7**	**0.7**	**10**	**113**	**123**	**95**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0230	**10/13/2003**	**0.0**	**0.7**	**0.7**	**22**	**65**	**87**	**90**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
16.0230	10/20/2003	0.3	0.3	0.0	0	0	0		FLOODING	NOT SURVEYABLE	0.1	SPOT	FOOT	WDFW
16.0230	10/22/2003	0.5	0.5	0.0	0	0	0		HIGH	NOT SURVEYABLE	1	SPOT	FOOT	WDFW
16.0230	10/27/2003	0.0	0.7	0.7	202	3	205	90	MEDIUM	VERY GOOD	4	INDX	FOOT	WDFW

Notes:

EAGLE CREEK (WRIA 16.0243)

SUMMER CHUM 2003

Reach **River mile 0.0-0.7**
Estimate 0
Method Peak live + dead count
Quality Rating Fair
Comments Rated fair due to lack of surveys between 09/11 and 10/06. Assumed fish counted on 10/13 were fall chum due to late arrival and lack of dead fish.

Table AR1- 13. Eagle Creek 2003 survey data through October 27.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0243	09/11/2003	0.0	0.7	0.7	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0243	10/06/2003	0.0	0.7	0.7	0	0	0	95	LOW	EXCELLENT	5	INDX	FOOT	WDFW
16.0243	10/13/2003	0.0	0.7	0.7	5	0	5	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0243	10/13/2003	0.7	1.2	0.5	0	0	0	95	LOW	EXCELLENT	6	SUPP	FOOT	WDFW
16.0243	10/20/2003	0.0	0.0	0.0	0	0	0		FLOODING	NOT SURVEYABLE	0.1	SPOT	FOOT	WDFW
16.0243	10/27/2003	0.0	0.7	0.7	205	1	206	90	MEDIUM	VERY GOOD	4	INDX	FOOT	WDFW
16.0243	10/27/2003	0.7	1.2	0.5	41	0	41	90	MEDIUM	VERY GOOD	4	SUPP	FOOT	WDFW

JORSTED CREEK (WRIA 16.0248)

SUMMER CHUM 2003

Reach **River mile 0.0-0.7**
Estimate 0
Method Peak live + dead count
Quality Rating Poor
Comments Assigned poor rating due to lack of full survey before 10/27.

Table AR1- 14. Jorsted Creek 2003 survey data through October 27.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0248	10/06/2003	0.3	0.3	0.0	0	0	0	95	LOW	EXCELLENT	5	SPOT	FOOT	WDFW
16.0248	10/20/2003	0.0	0.0	0.0	0	0	0		FLOODING	NOT SURVEYABLE	0.1	SPOT	FOOT	WDFW
16.0248	10/22/2003	0.0	0.0	0.0	0	0	0		MEDIUM	NOT SURVEYABLE	0	SPOT	FOOT	WDFW
16.0248	10/27/2003	0.0	0.7	0.7	10	0	10	80	MEDIUM	GOOD	2	INDX	FOOT	WDFW

Notes:

SUMMER CHUM 2003

Reach **0.0-1.8**
Estimate 796
Method AUC – 10 day stream life (w/broodstock adjustment)
Quality Rating Very Good
Comments Entire curve well-defined. Assumed fish counted on 10/13 were last of the summer chum. 58 fish were collected for use by the supplementation program. Adjusted escapement = [(8250 fish days) – (58 broodstock x 5 day assumed average residence before removal)] / 10 day stream life = 796 fish. Total return = (796 natural spawners) + (58 broodstock) = 854.

Table AR1- 15. Hamma Hamma River 2003 survey data through November 4.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0251	**08/21/2003**	**0.3**	**1.4**	**1.1**	**4**	**0**	**4**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**08/21/2003**	**1.4**	**1.8**	**0.4**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**08/29/2003**	**0.3**	**1.4**	**1.1**	**45**	**0**	**45**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**08/29/2003**	**1.4**	**1.8**	**0.4**	**5**	**0**	**5**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**09/04/2003**	**0.3**	**1.4**	**1.1**	**34**	**1**	**35**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**09/04/2003**	**1.4**	**1.8**	**0.4**	**22**	**0**	**22**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**09/11/2003**	**0.3**	**1.4**	**1.1**	**116**	**3**	**119**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**09/11/2003**	**1.4**	**1.8**	**0.4**	**71**	**0**	**71**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**09/19/2003**	**0.3**	**1.4**	**1.1**	**311**	**85**	**396**	**85**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0251	**09/19/2003**	**1.4**	**1.8**	**0.4**	**63**	**14**	**77**	**85**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0251	**09/26/2003**	**0.3**	**1.4**	**1.1**	**170**	**60**	**230**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**09/26/2003**	**1.4**	**1.8**	**0.4**	**76**	**32**	**108**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**10/06/2003**	**0.3**	**1.4**	**1.1**	**35**	**42**	**77**	**95**	**LOW**	**EXCELLENT**	**20**	**INDX**	**FOOT**	**WDFW**
16.0251	**10/06/2003**	**1.4**	**1.8**	**0.4**	**12**	**38**	**50**	**95**	**LOW**	**EXCELLENT**	**20**	**INDX**	**FOOT**	**WDFW**
16.0251	**10/13/2003**	**0.3**	**1.4**	**1.1**	**18**	**3**	**21**	**70**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0251	**10/13/2003**	**1.4**	**1.8**	**0.4**	**0**	**9**	**9**	**70**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0251	10/22/2003	0.3	0.3	0.0	0	0	0		HIGH	NOT SURVEYABLE	0	SPOT	FOOT	WDFW
16.0251	11/04/2003	0.3	1.8	1.5	645	11	656	85	LOW	FAIR	2.5	INDX	FOOT	WDFW

Notes:

JOHN CREEK (WRIA 16.0253)

SUMMER CHUM 2003

Reach **0.0-1.6**
Estimate 0
Method Peak live + dead
Quality Rating Very Good
Comments The mouth of John Creek was very low or completely dry during summer chum run, preventing access.

Table AR1- 16. John Creek 2003 survey data through October 13.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0253	08/21/2003	0.0	0.0	0.0	0	0	0		LOW	EXCELLENT	6	SPOT	FOOT	WDFW
16.0253	08/29/2003	0.0	0.0	0.0	0	0	0	99	LOW	EXCELLENT	6	SPOT	FOOT	WDFW
16.0253	09/11/2003	0.0	0.0	0.0	0	0	0		DRY	NOT SURVEYABLE	5	SPOT	FOOT	WDFW
16.0253	09/19/2003	0.0	0.1	0.1	0	0	0		LOW	EXCELLENT	5	SPOT	FOOT	WDFW
16.0253	09/26/2003	0.0	0.0	0.0	0	0	0		DRY	EXCELLENT	6	SPOT	FOOT	WDFW
16.0253	10/06/2003	0.0	0.0	0.0	0	0	0		DRY	EXCELLENT	5	SPOT	FOOT	WDFW
16.0253	10/13/2003	0.0	1.6	1.6	0	0	0	95	LOW	EXCELLENT	10	INDX	FOOT	WDFW
16.0253	10/20/2003	0.0	0.0	0.0	0	0	0		FLOODING	NOT SURVEYABLE	0.1	SPOT	FOOT	WDFW
16.0253	10/27/2003	0.0	1.6	1.6	137	7	144	90	MEDIUM	VERY GOOD	3	INDX	FOOT	WDFW

Notes:
08/21 – Stream too low at mouth for salmon access.
08/29 – Stream too low at mouth for salmon access.
09/11-10/06 – Stream dry at mouth on survey dates, some flow upstream.

FULTON CREEK (WRIA 16.0332)

SUMMER CHUM 2003

Reach **0.0-0.8**
Estimate 0
Method Peak live + dead
Quality Rating Poor
Comments Rated poor due to lack of surveys before 10/27.

Table AR1- 17. Fulton Creek 2003 survey data through .

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0332	10/27/2003	0.0	0.8	0.8	10	0	10	90	LOW	EXCELLENT	4	INDX	FOOT	WDFW
16.0332	11/04/2003	0.0	0.8	0.8	9	5	14	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW

SUMMER CHUM 2003

Reach **0.0-2.3**
Estimate 1,869
Method AUC – 10 day stream life
Quality Very good
Rating
Comments Entire curve well-defined.

Table AR1- 18. Duckabush River 2003 survey data through November 12.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0351	**08/15/2003**	**0.0**	**2.3**	**2.3**	**0**	**0**	**0**	**90**	**LOW**	**EXCELLENT**	**6**			**WDFW**
16.0351	**08/25/2003**	**0.0**	**2.3**	**2.3**	**9**	**0**	**9**	**90**	**LOW**	**EXCELLENT**	**6**		**FOOT**	**WDFW**
16.0351	**09/04/2003**	**0.0**	**2.3**	**2.3**	**18**	**1**	**19**	**95**	**LOW**	**EXCELLENT**	**8**		**FOOT**	**WDFW**
16.0351	**09/12/2003**	**0.0**	**2.3**	**2.3**	**498**	**2**	**500**	**95**	**LOW**	**EXCELLENT**	**8**		**FOOT**	**WDFW**
16.0351	**09/18/2003**	**0.0**	**2.3**	**2.3**	**1086**	**41**	**1127**	**95**	**LOW**	**EXCELLENT**	**6**		**FOOT**	**WDFW**
16.0351	**09/18/2003**	**2.3**	**2.6**	**0.3**	**19**	**0**	**19**	**95**	**LOW**	**EXCELLENT**	**6**	**SUPP**	**FOOT**	**WDFW**
16.0351	**09/26/2003**	**0.0**	**2.3**	**2.3**	**660**	**458**	**1118**	**90**	**LOW**	**EXCELLENT**	**6**		**FOOT**	**WDFW**
16.0351	**09/26/2003**	**2.3**	**2.6**	**0.3**	**24**	**6**	**30**	**95**	**LOW**	**EXCELLENT**	**6**	**SUPP**	**FOOT**	**WDFW**
16.0351	**10/03/2003**	**0.0**	**2.3**	**2.3**	**138**	**417**	**555**	**95**	**LOW**	**EXCELLENT**	**6**		**FOOT**	**WDFW**
16.0351	**10/03/2003**	**2.3**	**2.6**	**0.3**	**14**	**11**	**25**	**90**	**LOW**	**EXCELLENT**	**6**	**SUPP**	**FOOT**	**WDFW**
16.0351	**10/10/2003**	**0.0**	**2.3**	**2.3**	**16**	**102**	**118**	**85**	**LOW**	**EXCELLENT**	**6**		**FOOT**	**WDFW**
16.0351	10/22/2003	2.3	2.3	0.0	0	0	0		HIGH	NOT SURVEYABLE	0	SPOT	FOOT	WDFW
16.0351	10/30/2003	2.3	2.3	0.0	0	0	0		HIGH	POOR	0.5	SPOT	FOOT	WDFW
16.0351	11/04/2003	0.0	2.3	2.3	5	1	6		MEDIUM	GOOD	3	INDX	FOOT	WDFW
16.0351	11/12/2003	0.0	2.3	2.3	295	6	301	85	LOW	VERY GOOD	4.5	INDX	FOOT	WDFW

Notes:

SUMMER CHUM 2003

Reach **0.0-2.3**
Estimate 7,066
Method AUC – 10 day stream life
Quality Very good
Rating
Comments Entire curve well-defined.

Table AR1- 19. Dosewallips River 2003 survey data through November 13.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0442	**08/15/2003**	**0.0**	**2.3**	**2.3**	**0**	**0**	**0**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0442	**08/25/2003**	**0.0**	**2.3**	**2.3**	**8**	**0**	**8**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0442	**09/04/2003**	**0.0**	**2.3**	**2.3**	**693**	**0**	**693**	**85**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0442	**09/04/2003**	**3.6**	**6.7**	**3.1**	**0**	**0**	**0**	**85**	**LOW**	**EXCELLENT**	**6**	**SUPP**	**FOOT**	**WDFW**
16.0442	**09/12/2003**	**0.0**	**2.3**	**2.3**	**2483**	**56**	**2539**	**85**	**LOW**	**VERY GOOD**	**4.5**	**INDX**	**FOOT**	**WDFW**
16.0442	**09/12/2003**	**3.6**	**6.7**	**3.1**	**0**	**0**	**0**	**75**	**LOW**	**EXCELLENT**	**6**	**SUPP**	**FOOT**	**WDFW**
16.0442	**09/19/2003**	**0.0**	**2.3**	**2.3**	**3593**	**430**	**4023**	**85**	**LOW**	**VERY GOOD**	**4.5**	**INDX**	**FOOT**	**WDFW**
16.0442	**09/19/2003**	**3.6**	**6.7**	**3.1**	**10**	**0**	**10**	**75**	**LOW**	**GOOD**	**3**	**SUPP**	**FOOT**	**WDFW**
16.0442	**09/26/2003**	**0.0**	**2.3**	**2.3**	**1808**	**1533**	**3341**	**85**	**LOW**	**VERY GOOD**	**4.5**	**INDX**	**FOOT**	**WDFW**
16.0442	**09/26/2003**	**3.6**	**6.7**	**3.1**	**1**	**0**	**1**	**90**	**LOW**	**GOOD**	**4**	**SUPP**	**FOOT**	**WDFW**
16.0442	**10/03/2003**	**0.0**	**2.3**	**2.3**	**146**	**1354**	**1500**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0442	**10/03/2003**	**3.6**	**6.7**	**3.1**	**0**	**0**	**0**	**85**	**LOW**	**GOOD**	**3.5**	**SUPP**	**FOOT**	**WDFW**
16.0442	**10/10/2003**	**0.0**	**2.3**	**2.3**	**24**	**0**	**24**	**85**	**LOW**	**GOOD**	**3.5**	**INDX**	**FOOT**	**WDFW**
16.0442	**10/10/2003**	**3.6**	**6.7**	**3.1**	**3**	**4**	**7**	**85**	**LOW**	**GOOD**	**3.5**	**SUPP**	**FOOT**	**WDFW**
16.0442	10/22/2003	2.3	2.3	0.0	0	0	0		HIGH	NOT SURVEYABLE	0	SUPP	FOOT	WDFW
16.0442	11/04/2003	2.3	2.3	0.0	0	0	0		HIGH	NOT SURVEYABLE	1	SPOT	FOOT	WDFW
16.0442	11/13/2003	0.0	2.3	2.3	31	2	33	70	MEDIUM	FAIR	4	INDX	FOOT	WDFW

Notes:
09/04 – High glare in pools. Approximately 500 fish unidentifiable due to glare, mostly in lower river.
09/12 – Some glare in pools. Majority of chum spawning in lower half of index. Colored tinge in deeper pools.
09/19 – Light rain, some glare. 40% vis in deeper pools, greenish tinge to water. Majority of chum on spawning grounds.
09/26 – Some glare, poor visibility in some pools. Majority of chum on spawning grounds.
10/10 – Some color to water, high glare.

SUMMER CHUM 2003

Reach **0.0-2.7**
Estimate 11,745
Method AUC – 10 day stream life
Quality Rating Very Good
Comments Entire curve well-defined. U.S. Fish and Wildlife Service collected 98 fish for the supplementation program, using beach seine sets in Quilcene Bay. Total return = 11,843.

Table AR1- 20. Big Quilcene River 2003 survey data through November 5.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead*	Live + Dead*	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
17.0012	**08/12/2002**	**0.0**	**2.7**	**2.7**	**4**	**0**	**4**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**SNOR**	**USFW**
17.0012	**08/19/2003**	**0.0**	**0.8**	**0.8**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**08/27/2003**	**0.0**	**0.8**	**0.8**	**28**	**0**	**28**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**08/27/2003**	**0.8**	**1.0**	**0.2**	**29**	**0**	**29**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**08/27/2003**	**1.0**	**2.7**	**1.7**	**13**	**0**	**13**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/05/2003**	**0.0**	**0.8**	**0.8**	**549**	**15**	**564**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/05/2003**	**0.8**	**1.0**	**0.2**	**198**	**1**	**199**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/05/2003**	**1.0**	**2.7**	**1.7**	**1249**	**30**	**1279**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/12/2003**	**0.0**	**0.8**	**0.8**	**788**	**253**	**1041**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/12/2003**	**0.8**	**1.0**	**0.2**	**190**	**59**	**249**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/12/2003**	**1.0**	**2.7**	**1.7**	**3040**	**424**	**3464**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/19/2003**	**0.0**	**0.8**	**0.8**	**1364**	**-**	**-**	**90**	**LOW**	**GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/19/2003**	**0.8**	**1.0**	**0.2**	**307**	**-**	**-**	**90**	**LOW**	**GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/19/2003**	**1.0**	**2.7**	**1.7**	**5241**	**-**	**-**	**90**	**LOW**	**GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/26/2003**	**0.0**	**0.8**	**0.8**	**554**	**1542**	**2096**	**90**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/26/2003**	**0.8**	**1.0**	**0.2**	**77**	**526**	**603**	**90**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**09/26/2003**	**1.0**	**2.7**	**1.7**	**1247**	**6254**	**7501**	**90**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**10/02/2003**	**0.0**	**0.8**	**0.8**	**269**	**-**	**-**	**95**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0012	**10/02/2003**	**0.8**	**1.0**	**0.2**	**16**	**-**	**-**	**95**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0012	**10/02/2003**	**1.0**	**2.7**	**1.7**	**233**	**-**	**-**	**95**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0012	**10/10/2003**	**0.0**	**0.8**	**0.8**	**140**	**-**	**-**	**90**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0012	**10/10/2003**	**0.8**	**1.0**	**0.2**	**13**	**-**	**-**	**90**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0012	**10/10/2003**	**1.0**	**2.7**	**1.7**	**249**	**-**	**-**	**90**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0012	11/05/2003	0.0	2.7	2.7	4	0	4	95	MEDIUM	VERY GOOD	4	INDX	FOOT	WDFW

Notes:
* Missing values indicate dead counts were not conducted for summer chum.

SUMMER CHUM 2003

Reach **0.0-1.8**
Estimate 890
Method AUC – 10 day stream life
Quality Very Good
Rating
Comments Entire curve well-defined.

Table AR1- 21. Little Quilcene River 2003 survey data through November 6.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
17.0076	08/20/2003	0.0	0.8	0.8	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
17.0076	**08/27/2003**	**0.0**	**0.8**	**0.8**	**0**	**0**	**0**	**95**	**LOW**	**GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0076	**09/05/2003**	**0.0**	**1.2**	**1.2**	**17**	**0**	**17**	**95**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
17.0076	**09/13/2003**	**0.0**	**0.8**	**0.8**	**115**	**12**	**127**	**90**	**LOW**	**GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
17.0076	**09/13/2003**	**0.8**	**1.8**	**1.0**	**18**	**2**	**20**	**90**	**LOW**	**GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
17.0076	**09/19/2003**	**0.0**	**0.8**	**0.8**	**399**	**37**	**436**	**90**	**LOW**	**GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**09/19/2003**	**0.8**	**1.8**	**1.0**	**253**	**5**	**258**	**90**	**LOW**	**GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**09/29/2003**	**0.0**	**0.8**	**0.8**	**110**	**339**	**449**	**90**	**LOW**	**VERY GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**09/29/2003**	**0.8**	**1.8**	**1.0**	**27**	**77**	**104**	**90**	**LOW**	**VERY GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
17.0076	**10/06/2003**	**0.0**	**0.8**	**0.8**	**73**	**431**	**504**	**95**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0076	**10/06/2003**	**0.8**	**1.8**	**1.0**	**7**	**83**	**90**	**95**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0076	**10/06/2003**	**1.8**	**2.3**	**0.5**	**0**	**0**	**0**	**90**	**LOW**	**VERY GOOD**	**5**	**SUPP**	**FOOT**	**WDFW**
17.0076	11/06/2003	0.0	1.8	1.8	0	0	0		LOW	VERY GOOD	4	INDX	FOOT	WDFW
17.0076	11/06/2003	1.8	3.0	1.2	0	0	0		LOW	VERY GOOD	4	SUPP	FOOT	WDFW
17.0076	11/06/2003	3.0	5.4	2.4	0	0	0		LOW	VERY GOOD	4	SUPP	FOOT	WDFW

Notes:

SUMMER CHUM 2003

Reach **0.0-1.0**
Estimate 558
Method AUC – 10 day stream life
Quality Rating Very Good
Comments Entire curve well-defined. Surveys conducted by Wild Olympic Salmon and North Olympic Salmon Coalition.

Table AR1- 22. Chimacum Creek 2003 survey data.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
17.0203	08/29/2003	0.0	0.4	0.4	0	0	0		LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	08/29/2003	0.4	1.0	0.6	0	0	0		LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	09/05/2003	0.0	0.4	0.4	5	2	7	80	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	09/05/2003	0.4	1.0	0.6	0	0	0	90	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	09/12/2003	0.0	0.4	0.4	10	3	13	80	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	09/12/2003	0.4	1.0	0.6	22	8	30	90	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	09/19/2003	0.0	0.4	0.4	26	21	47	75	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	09/19/2003	0.4	1.0	0.6	130	8	138	90	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	09/26/2003	0.0	0.4	0.4	48	36	84	85	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	09/26/2003	0.4	1.0	0.6	230	65	295	95	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	10/03/2003	0.0	0.4	0.4	27	87	114	95	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	10/03/2003	0.4	1.0	0.6	83	161	244	80	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	10/10/2003	0.0	0.4	0.4	24	57	81	90	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	10/10/2003	0.4	1.0	0.6	23	128	151	85	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	10/17/2003	0.0	0.4	0.4	48	63	111	75	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	10/17/2003	0.4	1.0	0.6	43	87	130	70	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	10/24/2003	0.0	0.4	0.4	1	45	46	80	LOW	VERY GOOD	2	INDX	FOOT	WOS
17.0203	10/24/2003	0.4	1.0	0.6	17	56	73	80	LOW	VERY GOOD	2	INDX	FOOT	WOS

Notes:

SUMMER CHUM 2003

Reach **River mile 0.0 upstream**
Estimate 304
Method (Trap count) + (downstream redd count adjustment)
Quality Rating Very Good
Comments Trap was operated continuously by WDFW from August 15 through October 24. 81 fish were passed upstream. 98 redds were counted downstream of trap; assuming 1 female per redd, and using sex ratio from Salmon Creek trap of 1.349 males/female, an estimated 230 fish spawned downstream. (The Snow Creek sex ratio was skewed to males and would generate a very large redd-based estimate. The AUC method generates a downstream estimate of only 151 fish, which seemed low based on redd count of 98.) Total return = (81 upstream escapement) + (230 downstream escapement) = 311.

Table AR1- 23. 2003 Snow Creek summer chum trapping data and downstream redd data.

	Adults trapped			Redds		Adults trapped			Redds
Date	Female	Male	Total	downstream	Date	Female	Male	Total	downstream
	Trap installed 8/15				10/5/03	0	2	2	
	No chum trapped until 09/19				10/6/03	3	6	9	19
9/9/03				4	10/7/03	0	1	1	
					10/8/03	1	3	4	
9/19/03	1	4	5	30	10/9/03	0	5	5	
9/20/03	0	1	1		10/10/03	0	0	0	
9/21/03	0	0	0		10/11/03	0	0	0	
9/22/03	2	9	11		10/12/03	0	0	0	
9/23/03	1	12	13		10/13/03	1	1	2	
9/24/03	1	0	1		10/14/03	0	0	0	
9/25/03	0	0	0		10/15/03	1	5	6	3
9/26/03	0	2	2		10/16/03	1	2	3	
9/27/03	0	0	0		10/17/03	0	0	0	
9/28/03	0	2	2	42	10/18/03	0	0	0	
9/29/03	0	0	0		10/19/03	0	0	0	
9/30/03	1	3	4		10/20/03				
10/1/03	1	3	4		10/21/03				
10/2/03	0	0	0		10/22/03				
10/3/03	0	5	5		10/23/03				
10/4/03	0	1	1		10/24/03				
					Totals	**14**	**67**	**81**	**98**

SUMMER CHUM 2003

Reach	**River mile 0.0 upstream**
Estimate	5,521
Method	(Trap count) – (broodstock take adjustment) + (downstream redd count adjustment)
Quality Rating	Very Good
Comments	Trap was installed at RM 0.3 on August 27 and operated through October 29 as part of a supplementation program. 5,455 fish were passed upstream. 28 redds were counted downstream of the trap; assuming 1 female per redd, and using sex ratio from the trap of 1.349 males/female, and estimated 66 fish spawned downstream. An additional 130 adults were collected for broodstock. Total return = (5,455 + 66 natural escapement) + (130 broodstock) = 5,651.

Table AR1- 24. 2003 Salmon Creek summer chum trapping data and downstream redd data.

	Passed upstream		Spawned at trap		Redds		Passed upstream		Spawned at trap		Redds
Date	Female	Male	Female	Male	downstream	Date	Female	Male	Female	Male	downstream
8/27/03	0	0				9/28/03	28	60			
8/28/03	0	0				9/29/03	31	66	21	20	
8/29/03	0	0				9/30/03	67	84			
8/30/03	0	0				10/1/03	35	74			
8/31/03	0	0				10/2/03	39	46			
9/1/03	1	4				10/3/03	43	64			
9/2/03	2	6				10/4/03	53	77			8
9/3/03	9	20				10/5/03	36	67			
9/4/03	15	23				10/6/03	65	120	10	10	
9/5/03	9	31				10/7/03	59	83			
9/6/03	25	46				10/8/03	39	50			
9/7/03	87	214				10/9/03	66	66			
9/8/03	118	144				10/10/03	27	23			
9/9/03	12	19				10/11/03	--	--			
9/10/03	13	17				10/12/03	102	95			
9/11/03	27	69				10/13/03	69	73			
9/12/03	31	42			4	10/14/03	12	23			
9/13/03	20	25				10/15/03	40	26			
9/14/03	0	6				10/16/03	96	82			
9/15/03	36	59	10	10		10/17/03	97	88			
9/16/03	70	125				10/18/03	29	26			
9/17/03	37	78				10/19/03	18	24			4
9/18/03	58	69				10/20/03	55	25			
9/19/03	94	132				10/21/03	19	17			
9/20/03	52	78				10/22/03	5	6			
9/21/03	71	85				10/23/03	3	5			
9/22/03	52	49	14	15		10/24/03	7	6			
9/23/03	72	118			12	10/25/03	2	2			
9/24/03	20	54				10/26/03	0	0			
9/25/03	102	109	10	10		10/27/03	4	4			
9/26/03	65	93				10/28/03	0	1			
9/27/03	69	44				10/29/03	0	0			
						Totals	**2313**	**3142**	**65**	**65**	**28**

SUMMER CHUM 2003

Reach **River mile 0.0 upstream**
Estimate 369
Method (Trap count) – (broodstock take adjustment) + (downstream redd count adjustment)
Quality Rating Very Good
Comments Trap operated by WDFW and North Olympic Salmon Coalition from 08/29 through 10/20 at RM 0.1, as part of a supplementation program. 301 fish passed upstream. Downstream spawning escapement = 68 (based on 25 redds counted, assumed 1 female per redd, and sex ratio of 1.72 males/female from trap). 77 fish collected for broodstock (including 5 mortalities). Additional 12 fish pre-escapement loss to predation (in estuary and/or creek mouth). Total return = (369 natural escapement) + (77 broodstock) + (12 pre-escapement loss) = 458.

Table AR1- 25. 2003 Jimmycomelately summer chum trapping data and downstream count data.

	Adults Trapped		Spawned At Trap		Passed Upstream		Down-stream	Pre-Escape Loss		
Date	Fem	Male	Fem	Male	Fem	Male	Redds	Fem	Male	Notes
8/28/03							4	2		
8/29/03										Trap installed
8/30/03	2	4			2	4				
8/31/03	1	2			1	2				
9/1/03	5	9			5	9	2	1		
9/2/03	2	5			2	5				
9/3/03	2	3			2	3				
9/4/03	6	10			0	8	1			
9/5/03	2	6			1	3				
9/6/03	1	3			0	3		3		
9/7/03	3	6			1	2				
9/8/03	2	10	4	4	7	15				1F died in tube
9/9/03	2	5			2	5		1		
9/10/03	1	2			0	0				
9/11/03	3	3			0	2	2			
9/12/03	5	1			0	0				
9/13/03	2	5			0	0				
9/14/03	3	11			1	11	1			
9/15/03	4	8	10	11	7	6				
9/16/03	9	21			9	21	1	1		
9/17/03	9	22			9	22	3			
9/18/03	6	7			1	2				
9/19/03	5	9			0	4				
9/20/03	6	5			4	5		1		
9/21/03	2	1			0	1	2			
9/22/03	1	2	14	11	1	0		1		1M died in tube
9/23/03	6	13			6	13				
9/24/03	2	0			2	0	1			
9/25/03	3	4			3	4				

Table AR1- 25. 2003 Jimmycomelately summer chum trapping data and downstream count data.

Date	Adults Trapped Fem	Adults Trapped Male	Spawned At Trap Fem	Spawned At Trap Male	Passed Upstream Fem	Passed Upstream Male	Down-stream Redds	Pre-Escape Loss Fem	Pre-Escape Loss Male	Notes
9/26/03	1	1			0	0				
9/27/03	1	5			0	0				
9/28/03	2	10			0	6	3	1	1	
9/29/03	2	3	5	5	0	8				1F died in tube
9/30/03	0	0			0	0				
10/1/03	2	7			0	3				
10/2/03	4	1			0	0				
10/3/03	0	6			0	3	2			
10/4/03	1	1			0	1				
10/5/03	2	2			0	2				2M died in tube
10/6/03	0	0	4	4	5	2				
10/7/03	0	0			0	0				
10/8/03	5	4			5	4				
10/9/03	2	2			2	2	2			
10/10/03	2	3			2	3	1			
10/11/03	3	1			3	1				
10/12/03	0	1			0	1				
10/13/03	8	2			8	2				
10/14/03	0	1			0	1				
10/15/03	3	2			3	2				
10/16/03	1	1			1	1				
10/17/03	1	0			1	0				High stream flows
10/18/03	4	9			4	9				
10/19/03	0	0			0	0				
10/20/03	0	0			0	0				Very high flows, trap panels opened
10/24/03	0	0			0	0				Trap removed
Totals	**139**	**239**	**37**	**35**	**100**	**201**	**25**	**11**	**1**	

SUMMER CHUM 2003

Reach **River mile 0.0 upstream**
Estimate 0
Method Peak Count
Quality Fair
Rating
Comments Regular surveys are conducted from August through early October. Data presented here are summaries of those multi-day surveys. No chum were observed.

Table AR1- 26. Dungeness River 2003 survey data.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
18.0018	**08/04/2003**	**0.0**	**15.8**	**15.8**	**0**	**0**	**0**	**75**	**MOD**	**GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**08/11/2003**	**0.0**	**17.5**	**15.5**	**0**	**0**	**0**	**80**	**MOD**	**GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**08/18/2003**	**0.0**	**18.7**	**18.7**	**0**	**0**	**0**	**80**	**MD-LOW**	**VERY GD-GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**08/25/2003**	**0.0**	**18.7**	**15.9**	**0**	**0**	**0**	**80**	**LOW**	**EXCELLENT**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/02/2003**	**0.0**	**18.7**	**18.7**	**0**	**0**	**0**	**80**	**LOW**	**EXCELLENT**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/08/2003**	**0.0**	**18.7**	**18.7**	**0**	**0**	**0**	**80**	**LOW**	**EXCELLENT**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/15/2003**	**0.0**	**18.7**	**17.0**	**0**	**0**	**0**	**85**	**LOW**	**EXCELLENT**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/22/2003**	**0.0**	**17.5**	**13.7**	**0**	**0**	**0**	**85**	**MD-LOW**	**VERY GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/29/2003**	**0.0**	**9.2**	**9.2**	**0**	**0**	**0**	**85**	**MD-LOW**	**VERY GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**10/07/2003**	**0.0**	**6.4**	**6.4**	**0**	**0**	**0**	**85**	**MD-LOW**	**VERY GD-EXCEL**		**INDEX**	**FOOT**	**WDFW**

Notes:
08-04 – Multi-day Chinook survey conducted from 08/04 to 08/08; no chum observed.
08-11 – Multi-day Chinook survey conducted from 08/11 to 08/14; no chum observed. RM 13.8-15.8 not surveyed.
08-18 – Multi-day Chinook survey conducted from 08/18 to 08/22; no chum observed.
08-25 – Multi-day Chinook survey conducted from 08/25 to 08/29; no chum observed. RM 6.4-9.2 not surveyed.
09-02 – Multi-day Chinook survey conducted from 09/02 to 09/05; no chum observed.
09-08 – Multi-day Chinook survey conducted from 09/08 to 09/12; no chum observed.
09-15 – Multi-day Chinook survey conducted from 09/15 to 09/18; no chum observed. RM 15.8-17.5 not surveyed.
09-22 – Multi-day Chinook survey conducted from 09/22 to 09/26; no chum observed. RM 12.0-15.8 not surveyed.
09-29 – Multi-day Chinook survey conducted from 09/29 to 10/01; no chum observed.

2004 SUMMER CHUM NATURAL SPAWNING ESCAPEMENT SUMMARY

LITTLE ANDERSON CREEK (WRIA 15.0377)

SUMMER CHUM 2004

Reach	**River mile 0.0-1.0**
Estimate	0
Method	N/A
Quality Rating	N/A
Comments	*First survey occurred 10/29/2004, after summer chum spawning period.*

BIG BEEF CREEK (WRIA 15.0389)

SUMMER CHUM 2004

Reach	**River mile 0.0 upstream**
Estimate	1,852
Method	(Trap count) – (broodstock take adjustment) + (downstream AUC estimate)
Quality Rating	Very good
Comments	1788 fish passed upstream from trap. 64 fish collected for broodstock. 64 fish spawned downstream based on AUC estimate. Total return = (1,852 trapped) + (64 downstream) = 1,916.

Table AR1- 27. Big Beef Creek 2004 summer chum trapping and downstream survey data.

	Unspawned released		Spawnouts released		Downstream of trap		Broodstock		Total trapped	
Date	Male	Female	Male	Female	Live	Dead	Male	Female	Male	Female
09/02/04	10	3				1			10	3
09/03/04	12	7							12	7
09/04/04	9	5							9	5
09/05/04	4	6							4	6
09/06/04	6	1							6	1
09/07/04	10	4							10	4
09/08/04	21	7							21	7
09/09/04	15	12							15	12
09/10/04	12	5							12	5
09/13/04	56	24			8		6	6	62	30
09/14/04	67	33				2			67	33
09/15/04	43	27							43	27
09/16/04	46	34							46	34
09/17/04	36	27							36	27
09/18/04	47	29							47	29
09/19/04	56	49							56	49
09/20/04	43	27			58		6	6	49	33
09/21/04	33	38				6			33	38
09/22/04	32	39							32	39
09/23/04	25	40							25	40
09/24/04	36	53							36	53
09/25/04	34	34							34	34
09/26/04	57	45				1			57	45
09/27/04	18	14			16				18	14
09/28/04	45	42				14	15	12	60	54
09/29/04	48	50							48	50
09/30/04	31	29							31	29
10/01/04	38	31							38	31
10/02/04	20	23							20	23
10/03/04	17	25							17	25
10/04/04	14	8			6		1	2	15	10
10/05/04	2	3				7	5	5	7	8
10/06/04	7	14							7	14
10/07/04	6	7							6	7
10/08/04	5	6							5	6
10/09/04	3	2							3	2
10/10/04	5	6							5	6
10/11/04	2	2							2	2
10/12/04	2								2	0
10/13/04	2	1							2	1
10/14/04	1								1	0
10/15/04									0	0
Totals	976	812	0	0	88	31	33	31	1009	843

SEABECK CREEK (WRIA 15.0400)

SUMMER CHUM 2004

Reach	**River mile 0.0-0.7**
Estimate	0
Method	N/A
Quality	N/A
Rating	
Comments	*First survey occurred 11/05/2004, after summer chum spawning period.*

HARDING CREEK (WRIA 15.0408)

SUMMER CHUM 200

Reach	**River mile 0.0-0.7**
Estimate	0
Method	N/A
Quality	N/A
Rating	
Comments	*First survey occurred 11/09/2004, after summer chum spawning period.*

SUMMER CHUM 2004

Reach **River mile 0.0-1.0**
Estimate 1
Method Peak live + dead count
Quality Very good
Rating
Comments Good survey coverage through September and October. One dead chum observed on 9/10, prior to arrival of fall chum on 10/25 survey.

Table AR1- 28. Anderson Creek 2004 survey data through October 25.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0412	02-Sep-04	0.0	0.2	0.2	0	0	0	95	LOW	EXCELLENT	4		FOOT	WDFW
15.0412	10-Sep-04	0.0	0.2	0.2	0	1	1	95	LOW	GOOD	3		FOOT	WDFW
15.0412	17-Sep-04	0.0	0.3	0.3	0	0	0	95	LOW	GOOD	4		FOOT	WDFW
15.0412	24-Sep-04	0.0	1.0	1.0	0	0	0	95	LOW	EXCELLENT	4		FOOT	WDFW
15.0412	01-Oct-04	0.0	0.2	0.2	0	0	0	95	LOW	EXCELLENT	5		FOOT	WDFW
15.0412	18-Oct-04	0.0	1.0	1.0	0	0	0	95	LOW	VERY GOOD	4.5		FOOT	WDFW
15.0412	25-Oct-04	0.1	1.0	0.9	12	0	12	95	LOW	GOOD	2.5		FOOT	WDFW

Notes:
9/02-10/18 – Lots of beaver dams, probably impassable.
10/25 – All chum seen were below beaver dam at RM 0.2.

SUMMER CHUM 2004

Reach **River mile 0.3-1.8**
Estimate 23
Method AUC – 10-day stream life
Quality Very good
Rating
Comments Good survey coverage throughout September and October. Assumed chum seen on 10/18 were fall fish.

Table AR1- 29. Dewatto River 2004 survey data through October 25.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0420	02-Sep-04	0.3	1.8	1.5	0	0	0	90	LOW	EXCELLENT	6	INDX	FOOT	WDFW
15.0420	10-Sep-04	0.3	1.8	1.5	7	0	7	90	LOW	GOOD	4	INDX	FOOT	WDFW
15.0420	17-Sep-04	0.3	1.8	1.5	12	1	13	90	LOW	GOOD	4	INDX	FOOT	WDFW
15.0420	24-Sep-04	0.3	1.8	1.5	10	0	10	90	HIGH	VERY GOOD	4	INDX	FOOT	WDFW
15.0420	01-Oct-04	0.3	1.8	1.5	2	5	7	90	LOW	EXCELLENT	4	INDX	FOOT	WDFW
15.0420	08-Oct-04	0.3	1.8	1.5	0	7	7	90	LOW	VERY GOOD	4	INDX	FOOT	WDFW
15.0420	18-Oct-04	0.3	1.8	1.5	25	0	25	90	LOW	EXCELLENT	4.5	INDX	FOOT	WDFW
15.0420	22-Oct-04	4.8	5.8	1.0	0	0	0	90	LOW	EXCELLENT	6	SUPP	FOOT	WDFW
15.0420	25-Oct-04	0.3	1.8	1.5	92	11	103	80	LOW	VERY GOOD	3.5	INDX	FOOT	WDFW

Notes:
10/8 – All chum in lower 0.5 miles.

SUMMER CHUM 2004

Reach **River mile 0.6-5.0**
Estimate 8
Method Peak live + dead count
Quality Very Good
Rating
Comments Assumed chum counted on 10/18 were fall fish. Chum counted on 10/01 were considered summer chum due to timing, and due to count of only 1 fish on 10/08. It is possible that fish present on 10/1 were early fall chum.

Table AR1- 30. Tahuya River 2004 survey data through October 29.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
15.0446	02-Sep-04	0.6	1.0	0.4	0	0	0	95	LOW	EXCELLENT	6		FOOT	WDFW
15.0446	02-Sep-04	1.0	2.5	1.5	0	0	0	95	LOW	EXCELLENT	6		FOOT	WDFW
15.0446	02-Sep-04	2.5	5.0	2.5	0	0	0	95	LOW	EXCELLENT	6		FOOT	WDFW
15.0446	10-Sep-04	0.6	2.6	2.0	0	0	0	95	LOW	EXCELLENT	4		FOOT	WDFW
15.0446	10-Sep-04	2.6	5.0	2.4	0	0	0	95	LOW	EXCELLENT	4		FOOT	WDFW
15.0446	17-Sep-04	0.6	1.0	0.4	0	0	0	95	LOW	EXCELLENT	5		FOOT	WDFW
15.0446	17-Sep-04	1.0	2.6	1.6	0	0	0	95	LOW	EXCELLENT	5		FOOT	WDFW
15.0446	17-Sep-04	2.6	5.0	2.4	0	0	0	95	LOW	EXCELLENT	5		FOOT	WDFW
15.0446	01-Oct-04	0.6	1.5	0.9	7	1	8	95	LOW	EXCELLENT	5		FOOT	WDFW
15.0446	08-Oct-04	0.6	1.2	0.6	1	0	1	95	MED	GOOD	3		FOOT	WDFW
15.0446	18-Oct-04	0.6	1.0	0.4	18	0	18	90	LOW	VERY GOOD	5		FOOT	WDFW
15.0446	18-Oct-04	1.0	2.6	1.6	38	1	39	90	LOW	VERY GOOD	5		FOOT	WDFW
15.0446	18-Oct-04	2.6	5.0	2.4	23	0	23	90	LOW	VERY GOOD	6		FOOT	WDFW

Notes:
10/08 – Beaver dam blockage at RM 1.2.

SUMMER CHUM 2004

Reach **River mile 0.3 upstream**
Estimate 5,876
Method (Trap count) – (broodstock take adjustment)
Quality Rating Very Good
Comments Trap was operated by Hood Canal Salmon Enhancement Group and WDFW from August 15 through October 13 to collect broodstock for the Tahuya reintroduction program. A total of 5,976 adults were trapped, and 100 were removed for broodstock.

Table AR1- 31. 2004 Union River summer chum trapping data.

	Trapped		Broodstock			Trapped		Broodstock	
Date	Females	Males	Females	Males	Date	Females	Males	Females	Males
08/15/04	0	0			09/14/04	23	20	2	2
08/16/04	3	0			09/15/04	61	40		
08/17/04	3	2			09/16/04	52	24	10	10
08/18/04	0	3			09/17/04	67	42		
08/19/04	3	0			09/18/04	74	81		
08/20/04	0	0			09/19/04	67	42		
08/21/04	0	1			09/20/04	11	6	8	6
08/22/04	3	5			09/21/04	84	28	9	9
08/23/04	33	39			09/22/04	75	46		
08/24/04	30	39			09/23/04	108	71	5	5
08/25/04	46	70			09/24/04	54	50		
08/26/04	18	21			09/25/04	88	63		
08/27/04	5	4			09/26/04	60	38		
08/28/04	17	30			09/27/04	80	55		
08/29/04	58	79			09/28/04	79	55	3	3
08/30/04	37	54			09/29/04	30	33		
08/31/04	39	41			09/30/04	20	14		
09/01/04	29	37			10/01/04	29	28		
09/02/04	36	52	4	4	10/02/04	12	13		
09/03/04	54	81			10/03/04	19	10		
09/04/04	249	292			10/04/04	23	18		
09/05/04	160	210			10/05/04	23	19		
09/06/04	162	238			10/06/04	32	16		
09/07/04	134	125			10/07/04	9	10		
09/08/04	74	86	4	4	10/08/04	22	24		
09/09/04	135	129	2	2	10/09/04	17	24		
09/10/04	59	78			10/10/04	6	19		
09/11/04	339	265			10/11/04	2	1		
09/12/04	62	48			10/12/04	2	0		
09/13/04	25	15	4	4	**Total**	**3,042**	**2,934**	**51**	**49**

SUMMER CHUM 2004

Reach **RM 5.3 – 9.0**
Estimate 24
Method AUC
Quality Fair
Rating
Comments Difficult to construct spawner curve due to differing reaches covered in September. This should likely be viewed as a minimum estimate.

Table AR1- 32. Skokomish River 2004 survey data through October 27.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0001	30-Aug-04	5.3	6.3	1.0	5	0	5	80	LOW	EXCELLENT	6		FOOT	WDFW
16.0001	30-Aug-04	6.3	8.0	1.7	1	0	1		LOW	EXCELLENT	6		FOOT	WDFW
16.0001	30-Aug-04	8.0	9.0	1.0	0	0	0		LOW	EXCELLENT	6		FOOT	WDFW
16.0001	09-Sep-04	5.3	6.3	1.0	4	0	4	80	LOW	VERY GOOD	6		FOOT	WDFW
16.0001	09-Sep-04	6.3	8.0	1.7	1	0	1	80	LOW	VERY GOOD	6		FOOT	WDFW
16.0001	09-Sep-04	8.0	9.0	1.0	3	0	3	80	LOW	VERY GOOD	6		FOOT	WDFW
16.0001	16-Sep-04	5.3	6.3	1.0	7	0	7		LOW	FAIR	2		FOOT	WDFW
16.0001	24-Sep-04	5.3	6.3	1.0	7	0	7		LOW	EXCELLENT	6		FOOT	WDFW
16.0001	01-Oct-04	5.3	6.3	1.0	0	2	2		LOW	EXCELLENT	6		RAFT	WDFW
16.0001	01-Oct-04	6.3	8.0	1.7	0	1	1		LOW	EXCELLENT	6		RAFT	WDFW
16.0001	14-Oct-04	5.3	6.3	1.0	2	0	2		LOW	EXCELLENT	6		RAFT	WDFW
16.0001	14-Oct-04	6.3	8.0	1.7	1	2	3		LOW	EXCELLENT	6		RAFT	WDFW
16.0001	14-Oct-04	8.0	9.0	1.0	3	0	3		LOW	EXCELLENT	6		RAFT	WDFW
16.0001	27-Oct-04	12.3	12.7	0.4	0	0	0	90	LOW	EXCELLENT	6		FOOT	WDFW
16.0001	27-Oct-04	12.7	13.3	0.6	0	0	0		LOW	EXCELLENT	6		FOOT	WDFW
16.0001	27-Oct-04	13.3	15.6	2.3	0	0	0	95	LOW	EXCELLENT	6		FOOT	WDFW

Notes:

FINCH CREEK (WRIA 16.0222)

SUMMER CHUM 2004

Reach **River mile 0.0**
Estimate 0
Method Rack count
Quality Good
Rating
Comments All chum trapped at Hoodsport Hatchery prior to 10/15 are released to protect potential summer chum. In 2004, 3 chum were trapped beginning 9/28, but it is unknown whether they were summer chum or early returning fall chum.

Table AR1- 33. 2004 chum daily trapping totals for Hoodsport Hatchery through October 15.

Date	Trapped Adults	Released Males	Released Females
9/28/04	1	1	
10/04/04	2	1	1

LITTLE LILLIWAUP CREEK (WRIA 16.0228)

SUMMER CHUM 2004

Reach **River mile 0.0-0.4**
Estimate 0
Method Peak live + dead count
Quality Very Good
Rating
Comments No chum counted until October 26 survey.

Table AR1- 34. Little Lillliwaup Creek 2004 survey data through October 26.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0228	17-Aug-04	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	24-Aug-04	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	02-Sep-04	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	13-Sep-04	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	21-Sep-04	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	27-Sep-04	0.0	0.4	0.4	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	06-Oct-04	0.0	0.3	0.3	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	13-Oct-04	0.0	0.3	0.3	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0228	19-Oct-04	0.0	0.4	0.4	0	0	0	95	MEDIUM	GOOD	1.5	INDX	FOOT	WDFW
16.0228	26-Oct-04	0.0	0.4	0.4	2	0	2		LOW	EXCELLENT	6	INDX	FOOT	WDFW

Notes:

LILLIWAUP CREEK (WRIA 16.0230)

SUMMER CHUM 2004

Reach **River mile 0.0-0.7**
Estimate 922
Method AUC – 10-day stream life (w/broodstock take adjustment)
Quality Rating Very Good
Comments Entire curve well-defined. 95 fish were collected for supplementation program. Adjusted escapement = [(9,697 total FD) – (95 broodstock x 5 days assumed average residence before removal)] / 10 day stream life = 922 fish. Total return = (922 wild escapement) + (95 broodstock) = 1,017.

Table AR1- 35. Lillliwaup Creek 2004 survey data through October 22.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0230	**17-Aug-04**	**0.0**	**0.7**	**0.7**	**0**	**0**	**0**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**24-Aug-04**	**0.2**	**0.7**	**0.5**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**02-Sep-04**	**0.0**	**0.7**	**0.7**	**19**	**0**	**19**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**10-Sep-04**	**0.2**	**0.7**	**0.5**	**107**	**14**	**121**	**90**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**16-Sep-04**	**0.0**	**0.7**	**0.7**	**409**	**62**	**471**	**90**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0230	**23-Sep-04**	**0.4**	**0.7**	**0.3**	**220**	**111**	**331**	**65**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0230	**27-Sep-04**	**0.0**	**0.7**	**0.7**	**289**	**243**	**532**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**06-Oct-04**	**0.0**	**0.7**	**0.7**	**147**	**372**	**519**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	**13-Oct-04**	**0.0**	**0.7**	**0.7**	**97**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0230	19-Oct-04	0.3	0.3	0.0	0	0	0		HIGH	NOT SURVEYABLE	1	SPOT	SPOT	WDFW
16.0230	22-Oct-04	0.0	0.7	0.7	254	60	314	95	MEDIUM	FAIR	2	INDX	FOOT	WDFW

EAGLE CREEK (WRIA 16.0243)

SUMMER CHUM 2004

Reach **River mile 0.0-0.7**
Estimate 0
Method Peak live + dead count
Quality Rating Poor
Comments Rated poor due to lack of surveys prior to 10/12. Assume fish on 10/12 survey were early fall chum.

Table AR1- 36. Eagle Creek 2004 survey data through October 26.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0243	12-Oct-04	0.0	0.7	0.7	2	0	2	85	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0243	19-Oct-04	0.7	1.2	0.5	3	0	3	85	MEDIUM	GOOD	2		FOOT	WDFW
16.0243	26-Oct-04	0.0	7.0	7.0	448	1	449		LOW	EXCELLENT	6	INDX	FOOT	WDFW

SUMMER CHUM 2004

Reach **River mile 0.0-0.7**
Estimate 0
Method Peak live + dead count
Quality Rating Fair
Comments Assigned fair due to lack of surveys prior to 09/29. No chum counted until 10/26 survey.

Table AR1- 37. Jorsted Creek 2004 survey data through October 26.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0248	29-Sep-04	0.0	0.7	0.7	0	0	0	95	LOW	EXCELLENT	4	INDX	FOOT	WDFW
16.0248	12-Oct-04	0.0	0.7	0.7	0	0	0	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW
16.0248	19-Oct-04	0.0	0.7	0.7	0	0	0	95	MEDIUM	POOR	1	INDX	FOOT	WDFW
16.0248	26-Oct-04	0.0	0.7	0.7	2	0	2		LOW	EXCELLENT	6	INDX	FOOT	WDFW

Notes:

SUMMER CHUM 2004

Reach **0.0-1.8**
Estimate 2,493
Method AUC – 10 day stream life (w/broodstock adjustment)
Quality Rating Very Good
Comments Entire curve well-defined. Assumed fish counted on 10/12 were a mix of summer and fall run chum, due to large number of fall chum counted on 10/29. 63 fish were collected for use by the supplementation program. Adjusted escapement = [(25,247 fish days) – (63 broodstock x 5 day assumed average residence before removal)] / 10 day stream life = 2,493 fish. Total return = (2,493 natural spawners) + (63 broodstock) = 2,556.

Table AR1- 38. Hamma Hamma River 2004 survey data through November 4.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0251	**17-Aug-04**	**0.3**	**1.4**	**1.1**	**5**	**0**	**5**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**17-Aug-04**	**1.4**	**1.8**	**0.4**	**2**	**0**	**2**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**24-Aug-04**	**0.3**	**1.4**	**1.1**	**32**	**0**	**32**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**24-Aug-04**	**1.4**	**1.8**	**0.4**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**02-Sep-04**	**0.3**	**1.4**	**1.1**	**359**	**0**	**359**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**02-Sep-04**	**1.4**	**1.8**	**0.4**	**113**	**0**	**113**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**10-Sep-04**	**0.3**	**1.4**	**1.1**	**421**	**85**	**506**	**95**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0251	**10-Sep-04**	**1.4**	**1.8**	**0.4**	**195**	**40**	**235**	**95**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
16.0251	**16-Sep-04**	**0.3**	**1.4**	**1.1**	**665**	**108**	**773**	**85**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**16-Sep-04**	**1.4**	**1.8**	**0.4**	**199**	**47**	**246**	**90**	**LOW**	**VERY GOOD**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**23-Sep-04**	**0.3**	**1.4**	**1.1**	**460**	**200**	**660**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**23-Sep-04**	**1.4**	**1.8**	**0.4**	**245**	**100**	**345**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**30-Sep-04**	**0.3**	**1.4**	**1.1**	**295**	**368**	**663**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**30-Sep-04**	**1.4**	**1.8**	**0.4**	**102**	**183**	**285**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**12-Oct-04**	**0.3**	**1.4**	**1.1**	**217**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	**12-Oct-04**	**1.4**	**1.8**	**0.4**	**57**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0251	29-Oct-04	0.3	1.4	1.1	2262	50	2312	80	LOW	VERY GOOD	6	INDX	FOOT	WDFW
16.0251	29-Oct-04	1.4	1.8	0.4	2075	12	2087	85	LOW	VERY GOOD	6	INDX	FOOT	WDFW

Notes:

JOHN CREEK (WRIA 16.0253)

SUMMER CHUM 2004

Reach **0.0-1.6**
Estimate 135
Method AUC
Quality Very Good
Rating
Comments Assumed chum counted on 10/12 were a mix of fall run fish, due to large count of fall fish on 10/22.

Table AR1- 39. John Creek 2004 survey data through October 13.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0253	**17-Aug-04**	**0.0**	**0.2**	**0.2**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0253	**24-Aug-04**	**0.0**	**0.2**	**0.2**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0253	**02-Sep-04**	**0.0**	**0.2**	**0.2**	**4**	**0**	**4**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0253	**10-Sep-04**	**0.0**	**0.3**	**0.3**	**33**	**18**	**51**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
16.0253	**16-Sep-04**	**0.0**	**0.8**	**0.8**	**94**	**53**	**147**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0253	**23-Sep-04**	**0.0**	**1.2**	**1.2**	**48**	**134**	**182**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0253	**30-Sep-04**	**0.0**	**1.2**	**1.2**	**13**	**96**	**109**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0253	**12-Oct-04**	**0.0**	**1.6**	**1.6**	**18**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0253	22-Oct-04	0.0	1.6	1.6	250	27	277	95	MEDIUM	GOOD	2.5	INDX	FOOT	WDFW

Notes:
8/17 – 9/16 – Partial surveys due to low stream flows.

FULTON CREEK (WRIA 16.0332)

SUMMER CHUM 2004

Reach **0.0-0.8**
Estimate 6
Method Peak live + dead
Quality Fair
Rating
Comments Rated fair due to lack of surveys prior to 09/23. For run reconstruction purposes, the 6 fish estimated escapement to Fulton Creek will be added to the Duckabush production unit.

Table AR1- 40. Fulton Creek 2004 survey data through October 22.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0332	**23-Sep-04**	**0.0**	**0.8**	**0.8**	**6**	**0**	**6**	**95**	**LOW**	**EXCELLENT**	**8**	**INDX**	**FOOT**	**WDFW**
16.0332	**29-Sep-04**	**0.0**	**0.8**	**0.8**	**6**	**0**	**6**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0332	**12-Oct-04**	**0.0**	**0.8**	**0.8**	**0**	**0**	**0**	**80**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0332	19-Oct-04	0.3	0.3	0.0	0	0	0		HIGH	NOT SURVEYABLE	1	SPOT	FOOT	WDFW
16.0332	22-Oct-04	0.0	0.8	0.8	55	3	58	95	LOW	EXCELLENT	6	INDX	FOOT	WDFW

SUMMER CHUM 2004

Reach **0.0-2.3**
Estimate 8,631
Method AUC – 10 day stream life
Quality Very good
Rating
Comments Entire curve well-defined. Assumed chum counted on 10/15 were a mix of summer and fall fish, due to large count of fall chum on 10/29. For run reconstruction purposes, the 6 fish estimated escapement to Fulton Creek will be added to the Duckabush escapement, giving a total of 8,637 escapement to the Duckabush unit.

Table AR1- 41. Duckabush River 2004 survey data through November 12.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0351	**17-Aug-04**	**0.0**	**2.3**	**2.3**	**2**	**0**	**2**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0351	**24-Aug-04**	**0.0**	**2.3**	**2.3**	**8**	**0**	**8**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0351	**02-Sep-04**	**0.0**	**2.3**	**2.3**	**555**	**0**	**555**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0351	**10-Sep-04**	**0.1**	**2.3**	**2.2**	**1208**	**68**	**1276**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0351	**16-Sep-04**	**0.0**	**1.3**	**1.3**	**1146**	**161**	**1307**	**80**	**MEDIUM**	**VERY GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
16.0351	**16-Sep-04**	**1.3**	**2.3**	**1.0**	**1109**	**54**	**1163**	**80**	**MEDIUM**	**VERY GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
16.0351	**23-Sep-04**	**0.0**	**2.3**	**2.3**	**3744**	**1071**	**4815**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0351	**29-Sep-04**	**0.0**	**2.3**	**2.3**	**3134**	**3050**	**6184**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0351	**03-Oct-04**	**4.8**	**6.0**	**1.2**	**0**	**0**	**0**		**LOW**	**EXCELLENT**	**4**	**SUPP**	**FOOT**	**WDFW**
16.0351	**08-Oct-04**	**0.0**	**2.3**	**2.3**	**570**	**3430**	**4000**	**90**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0351	**15-Oct-04**	**0.0**	**2.3**	**2.3**	**349**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
16.0351	29-Oct-04	0.0	2.3	2.3	634	5	639	80	MEDIUM	EXCELLENT	4	INDX	FOOT	WDFW

Notes:

SUMMER CHUM 2004

Reach **0.0-2.3**
Estimate 11,549
Method AUC – 10 day stream life
Quality Rating Very good
Comments Some uncertainty in early portion of curve due to glacial nature of Dosewallips reducing visibility in late August. Remainder of curve well defined. Timing of summer chum in other streams in 2004 and timing of Dosewallips chum in past years used for guidance in drawing early part of spawner curve. Assumed chum counted on 10/15 were a mix of summer and fall fish, due to large count of fall chum on 10/29.

Table AR1- 42. Dosewallips River 2004 survey data through.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
16.0442	**17-Aug-04**	**2.3**	**2.3**	**0.0**	**0**	**0**	**0**	**0**	**MEDIUM**	**NOT**	**0**	**SPOT**	**FOOT**	**WDFW**
16.0442	**24-Aug-04**	**0.3**	**0.3**	**0.0**	**0**	**0**	**0**		**LOW**	**POOR**	**1**	**SPOT**	**FOOT**	**WDFW**
16.0442	**02-Sep-04**	**0.3**	**0.3**	**0.0**	**10**	**0**	**10**	**1**	**MEDIUM**	**NOT**	**1**	**SPOT**	**FOOT**	**WDFW**
16.0442	**10-Sep-04**	**0.0**	**2.3**	**2.3**	**3212**	**174**	**3386**	**80**	**LOW**	**GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
16.0442	**17-Sep-04**	**0.3**	**0.3**	**0.0**	**5**	**3**	**8**	**0**	**HIGH**	**NOT**	**0**	**SPOT**	**FOOT**	**WDFW**
16.0442	**21-Sep-04**	**0.0**	**2.3**	**2.3**	**4805**	**1953**	**6758**	**85**	**LOW**	**VERY GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
16.0442	**21-Sep-04**	**7.0**	**9.0**	**2.0**	**0**	**0**	**0**	**85**	**LOW**	**EXCELLENT**	**4**	**SUPP**	**FOOT**	**WDFW**
16.0442	**21-Sep-04**	**9.0**	**11.0**	**2.0**	**0**	**0**	**0**	**85**	**LOW**	**EXCELLENT**	**4**	**SUPP**	**FOOT**	**WDFW**
16.0442	**23-Sep-04**	**3.6**	**6.7**	**3.1**	**2**	**2**	**4**	**85**	**LOW**	**FAIR**	**1.5**	**SUPP**	**FOOT**	**WDFW**
16.0442	**29-Sep-04**	**0.0**	**2.3**	**2.3**	**1786**	**4901**	**6687**	**90**	**LOW**	**VERY GOOD**	**4.5**	**INDX**	**FOOT**	**WDFW**
16.0442	**01-Oct-04**	**9.0**	**11.0**	**2.0**	**0**	**0**	**0**	**80**	**LOW**	**VERY GOOD**	**3**	**SUPP**	**FOOT**	**WDFW**
16.0442	**08-Oct-04**	**0.0**	**2.3**	**2.3**	**624**			**90**	**LOW**	**VERY GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
16.0442	**11-Oct-04**	**3.6**	**6.7**	**3.1**	**0**	**0**	**0**		**MEDIUM**	**GOOD**	**2**	**INDX**	**FOOT**	**WDFW**
16.0442	**15-Oct-04**	**0.0**	**2.3**	**2.3**	**393**			**90**	**LOW**	**VERY GOOD**	**4.5**	**INDX**	**FOOT**	**WDFW**
16.0442	29-Oct-04	0.0	2.3	2.3	310	3	313	85	LOW	VERY GOOD	5	INDX	FOOT	WDFW

Notes:

SUMMER CHUM 2004

Reach **0.0-2.7**
Estimate 35,000
Method AUC – 10 day stream life
Quality Very Good
Rating
Comments Entire curve well defined. Assumed chum counted on 10/21 were last of the summer run. Summer chum were collected from Quilcene Bay for use as broodstock (108 broodstock + 43 mortalities) in a reproductive success study conducted at Big Beef Creek. Of the 108 broodstock, 99 were estimated to be returning to the Big Quilcene. Total escapement = (35,000 natural escapement) + (99 broodstock) = 35,099. The 43 mortalities will be accounted for has harvest in run reconstruction.

Table AR1- 43. Big Quilcene River 2004 survey data through.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead*	Live + Dead*	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
17.0012	**13-Aug-04**	**0.8**	**2.7**	**1.9**	**13**	**0**	**13**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**SNOR**	**WDFW**
17.0012	**16-Aug-04**	**0.0**	**0.8**	**0.8**	**1**	**0**	**1**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**23-Aug-04**	**0.0**	**0.8**	**0.8**	**4**	**0**	**4**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**23-Aug-04**	**0.8**	**1.8**	**1.0**	**6**	**0**	**6**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**23-Aug-04**	**1.8**	**2.7**	**0.9**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**01-Sep-04**	**0.0**	**0.8**	**0.8**	**230**	**1**	**231**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**01-Sep-04**	**0.8**	**2.7**	**1.9**	**1887**	**11**	**1898**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**09-Sep-04**	**0.0**	**1.0**	**1.0**	**963**	**272**	**1235**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**09-Sep-04**	**1.0**	**2.7**	**1.7**	**5334**	**992**	**6326**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**16-Sep-04**	**0.0**	**2.8**	**2.8**	**8600**	**8550**	**17150**	**95**	**LOW**	**GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0012	**23-Sep-04**	**0.0**	**2.8**	**2.8**	**12540**	**11390**	**23930**	**90**	**LOW**	**GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**29-Sep-04**	**0.0**	**2.8**	**2.8**	**12832**	**16911**	**29743**	**95**	**LOW**	**VERY GOOD**	**4**	**INDX**	**FOOT**	**WDFW**
17.0012	**07-Oct-04**	**0.0**	**1.0**	**1.0**	**980**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**07-Oct-04**	**1.0**	**2.7**	**1.7**	**3820**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**14-Oct-04**	**0.0**	**1.0**	**1.0**	**159**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**14-Oct-04**	**1.0**	**2.7**	**1.7**	**662**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0012	**21-Oct-04**	**0.0**	**1.0**	**1.0**	**12**			**80**	**MEDIUM**	**GOOD**	**2**	**INDX**	**FOOT**	**WDFW**
17.0012	**21-Oct-04**	**1.0**	**2.8**	**1.8**	**46**			**80**	**MEDIUM**	**GOOD**	**2**	**INDX**	**FOOT**	**WDFW**
17.0012	01-Nov-04	0.0	2.8	2.8	42	71	113		MEDIUM	VERY GOOD	4		FOOT	WDFW
17.0012	09-Nov-04	0.0	2.8	2.8	28	21	49		MEDIUM	GOOD	4		FOOT	WDFW

Notes:
* Missing values indicate dead counts were not conducted for summer chum.

SUMMER CHUM 2004

Reach **0.0-1.8**
Estimate 3,045
Method AUC – 10 day stream life
Quality Very Good
Rating
Comments Entire curve well-defined. Summer chum were collected from Quilcene Bay for use as broodstock (108 broodstock + 43 mortalities) in a reproductive success study conducted at Big Beef Creek. Of the 108 broodstock, 9 were estimated to be returning to the Little Quilcene. Total escapement = (3,045 natural escapement) + (9 broodstock) = 3,054. The 43 mortalities will be accounted for has harvest in run reconstruction.

Table AR1- 44. Little Quilcene River 2004 survey data through November 6.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead*	Live + Dead*	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
17.0076	**16-Aug-04**	**0.0**	**0.8**	**0.8**	**0**	**0**	**0**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**23-Aug-04**	**0.0**	**0.8**	**0.8**	**1**	**0**	**1**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**31-Aug-04**	**0.0**	**0.8**	**0.8**	**53**	**1**	**54**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**31-Aug-04**	**0.8**	**1.8**	**1.0**	**13**	**0**	**13**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**08-Sep-04**	**0.0**	**0.8**	**0.8**	**267**	**24**	**291**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**08-Sep-04**	**0.8**	**1.8**	**1.0**	**214**	**6**	**220**	**95**	**LOW**	**EXCELLENT**	**4**	**INDX**	**FOOT**	**WDFW**
17.0076	**16-Sep-04**	**0.0**	**1.8**	**1.8**	**1044**	**268**	**1312**	**95**	**LOW**	**VERY GOOD**	**5**	**INDX**	**FOOT**	**WDFW**
17.0076	**22-Sep-04**	**0.0**	**1.0**	**1.0**	**752**	**405**	**1157**	**95**	**LOW**	**VERY GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
17.0076	**22-Sep-04**	**1.0**	**1.8**	**0.8**	**407**	**202**	**609**	**95**	**LOW**	**VERY GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
17.0076	**28-Sep-04**	**0.0**	**0.8**	**0.8**	**521**	**870**	**1391**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0076	**28-Sep-04**	**0.8**	**1.8**	**1.0**	**410**	**319**	**729**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0076	**06-Oct-04**	**0.0**	**1.8**	**1.8**	**346**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0076	**06-Oct-04**	**0.8**	**1.8**	**1.0**	**152**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0076	**14-Oct-04**	**0.0**	**1.8**	**1.8**	**67**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0076	**14-Oct-04**	**0.8**	**1.8**	**1.0**	**11**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0076	**21-Oct-04**	**0.0**	**0.8**	**0.8**	**6**			**90**	**MEDIUM**	**VERY GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
17.0076	**21-Oct-04**	**0.8**	**1.8**	**1.0**	**2**			**90**	**MEDIUM**	**VERY GOOD**	**3**	**INDX**	**FOOT**	**WDFW**
17.0076	01-Nov-04	0.0	1.8	1.8	8	15	23		MEDIUM	EXCELLENT	5	INDX	FOOT	WDFW
17.0076	09-Nov-04	0.0	1.8	1.8	5	1	6		LOW	EXCELLENT	6		FOOT	WDFW

Notes:
* Missing values indicate dead counts were not conducted for summer chum.

SUMMER CHUM 2004

Reach **0.0-1.0**
Estimate 1,139
Method AUC – 10 day stream life
Quality Rating Very Good
Comments Entire curve well-defined. Surveys conducted by Wild Olympic Salmon and North Olympic Salmon Coalition. Upper section (RM 1.1 – 2.0) was not surveyed until 09/28 when 71 live and 36 dead chum were counted. These fish create some difficulties with analysis, since some fish in the upper section may have been counted in lower sections on the 09/24 survey. Due to the considerable dead number in the upper section, it is believed that there were significant numbers of fish in the upper section by 09/24, so the 09/28 and 09/24 counts were added together when drawing the curve. This assumes that the dead fish counted in the upper section on 09/28, along with half of the live fish counted in that section on 09/28, would have been alive in the upper section on 09/24.

Table AR1- 45. Chimacum Creek 2004 survey data.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
17.0203	10-Sep-04	0.0	0.4	0.4	18	0	18	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	10-Sep-04	0.4	1.0	0.6	13	12	25	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	17-Sep-04	0.0	0.4	0.4	48	7	55	80	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	17-Sep-04	0.4	1.1	0.7	129	12	141	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	24-Sep-04	0.0	0.4	0.4	36	47	83	80	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	24-Sep-04	0.4	1.2	0.8	388	49	437	80	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	28-Sep-04	1.1	2.0	0.9	71	36	107	85	LOW	VERY GOOD	3	SUPP	FOOT	WOS
17.0203	01-Oct-04	0.0	0.4	0.4	94	120	214	90	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	01-Oct-04	0.4	1.1	0.7	288	203	491	90	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	01-Oct-04	1.1	2.0	0.9	79	64	143	90	LOW	VERY GOOD	3	SUPP	FOOT	WOS
17.0203	08-Oct-04	0.0	0.4	0.4	76	160	236	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	08-Oct-04	0.4	1.1	0.7	161	368	529	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	08-Oct-04	1.1	2.0	0.9	21	81	102	85	LOW	VERY GOOD	3	SUPP	FOOT	WOS
17.0203	15-Oct-04	0.0	0.4	0.4	49	325	374	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	15-Oct-04	0.4	1.1	0.7	38	400	438	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	15-Oct-04	1.1	2.0	0.9	1	48	49	85	LOW	VERY GOOD	3	SUPP	FOOT	WOS
17.0203	22-Oct-04	0.0	0.4	0.4	15	86	101	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	22-Oct-04	0.4	1.1	0.7	34	116	150	85	LOW	VERY GOOD	3	INDX	FOOT	WOS
17.0203	08-Nov-04	0.0	1.1	1.1	0	0	0	85	LOW	VERY GOOD	3	INDX	FOOT	WDFW

Notes:
09/28 – see text above for explanation of 09/28 survey.

SUMMER CHUM 2004

Reach **River mile 0.0 upstream**
Estimate 396
Method (Trap count) + (downstream AUC estimate)
Quality Very Good
Rating
Comments Total count at trap of 79 fish (not including spawnouts entering the trap, which would have been previously counted on one or more downstream surveys and included in the AUC estimate). Downstream AUC estimate of 317 fish. Total escapement = 396. This method assumes that unspawned fish counted at the trap traveled through the downstream reach too quickly to have been counted during one of the foot surveys used for the downstream AUC estimate.

Table AR1- 46. 2004 Snow Creek summer chum trapping data.

Date	Adults trapped			Date	Adults trapped		
	Female	Male	Total		Female	Male	Total
	Trap installed 8/15/04			10/05/2004	0	0	0
	No chum trapped until 9/18/04			10/06/2004	1	3	4
				10/07/2004	4	5	9
09/18/2004	0	1	1	10/08/2004	1	2	3
09/19/2004	0	3	3	10/09/2004	1	0	1
09/20/2004	0	0	0	10/10/2004	2	6	8
09/21/2004	0	0	0	10/11/2004	1	5	6
09/22/2004	0	1	1	10/12/2004	0	0	0
09/23/2004	0	0	0	10/13/2004	0	0	0
09/24/2004	0	0	0	10/14/2004	0	0	0
09/25/2004	2	3	5	10/15/2004	0	0	0
09/26/2004	0	0	0	10/16/2004	0	0	0
09/27/2004	1	2	3	10/17/2004	2	1	3
09/28/2004	3	2	5	10/18/2004	0	0	0
09/29/2004	7	5	12	10/19/2004	0	0	0
09/30/2004	4	2	6	10/20/2004	0	0	0
10/01/2004	0	3	3	10/21/2004	0	0	0
10/02/2004	1	2	3	10/22/2004	0	0	0
10/03/2004	1	1	2	10/23/2004	0	0	0
10/04/2004	0	1	1				
				Totals	**31**	**48**	**79**

Table AR1- 47. Snow Creek 2004 survey data (downstream of weir).

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
17.0219	**08-Sep-04**	**0.0**	**0.8**	**0.8**	**2**	**0**	**2**	**90**	**LOW**	**EXCELLENT**	**5**	**INDX**	**FOOT**	**WDFW**
17.0219	**20-Sep-04**	**0.0**	**0.8**	**0.8**	**86**	**3**	**89**	**95**	**LOW**	**EXCELLENT**	**3**	**INDX**	**FOOT**	**WDFW**
17.0219	**26-Sep-04**	**0.0**	**0.8**	**0.8**	**144**	**22**	**166**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0219	**04-Oct-04**	**0.0**	**0.8**	**0.8**	**144**	**86**	**230**	**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0219	**12-Oct-04**	**0.0**	**0.8**	**0.8**	**26**			**95**	**LOW**	**EXCELLENT**	**6**	**INDX**	**FOOT**	**WDFW**
17.0219	**17-Oct-04**	**0.0**	**0.0**	**0.0**	**0**			**0**	**HIGH**	**NOT SURVEYABLE**	**0**	**SPOT**	**FOOT**	**WDFW**

Notes:

SALMON CREEK (WRIA 17.0245)

SUMMER CHUM 2004

Reach	**River mile 0.0 upstream**
Estimate	5,969
Method	(Fish passed upstream of trap) + (downstream redd count adjustment)
Quality Rating	Very Good
Comments	Trap was installed at RM 0.3 on August 25 and operated through October 25. 5,873 fish were passed upstream. 42 redds were counted downstream of the trap; assuming 1 female per redd, and using sex ratio from the trap of 1.29 males/female, and estimated 96 fish spawned downstream. Total wild escapement = 5,873 upstream + 96 downstream = 5,969. 52 fish counted as mortalities in the trap. Total return = (5,969 wild escapement) + (52 trap mortality) = 6,021.

Table AR1- 48. 2004 Salmon Creek summer chum trapping data and downstream redd data.

Date	Adults trapped			Redds downstream	Date	Adults trapped			Redds downstream
	Female	Male	Total			Female	Male	Total	
	Trap installed 8/25/04								
08/25/2004	0	0	0		09/29/2004	83	110	193	
08/26/2004	0	0	0		09/30/2004	102	92	194	
08/27/2004	1	0	1		10/01/2004	36	47	83	
08/28/2004	2	0	2	0	10/02/2004	105	102	207	
08/29/2004	0	2	2		10/03/2004	52	55	107	
08/30/2004	4	6	10		10/04/2004	55	59	114	
08/31/2004	1	3	4		10/05/2004	174	259	433	
09/01/2004	5	19	24		10/06/2004	89	142	231	
09/02/2004	21	35	56		10/07/2004	29	41	70	
09/03/2004	32	60	92		10/08/2004	152	226	378	
09/04/2004	23	27	50		10/09/2004	44	66	110	
09/05/2004	9	9	18		10/10/2004	5	2	7	
09/06/2004	6	10	16		10/11/2004	49	38	87	
09/07/2004	7	12	19		10/12/2004	21	28	49	
09/08/2004	26	44	70	0	10/13/2004	13	22	35	
09/09/2004	25	20	45		10/14/2004	40	68	108	
09/10/2004	26	34	60		10/15/2004	36	47	83	
09/11/2004	124	123	247		10/16/2004	7	7	14	
09/12/2004	28	49	77		10/17/2004	75	104	179	
09/13/2004	27	37	64		10/18/2004	15	19	34	
09/14/2004	47	58	105		10/19/2004	16	23	39	
09/15/2004	155	209	364		10/20/2004	2	3	5	
09/16/2004	38	80	118	2	10/21/2004	6	2	8	
09/17/2004	59	60	119		10/22/2004	6	5	11	
09/18/2004	25	36	61		10/23/2004	5	11	16	
09/19/2004	7	12	19		10/24/2004	1	1	2	
09/20/2004	6	13	19		10/25/2004	3	10	13	
09/21/2004	53	52	105		10/26/2004	Trap removed 10/25			
09/22/2004	70	107	177		10/27/2004				29
09/23/2004	109	135	244		10/28/2004				
09/24/2004	95	125	220		10/29/2004				
09/25/2004	63	64	127		10/30/2004				
09/26/2004	81	108	189		10/31/2004				
09/27/2004	48	64	112	11					
09/28/2004	135	144	279						
					Totals	**2,579**	**3,346**	**5,925**	**42**

SUMMER CHUM 2004

Reach	**River mile 0.0 upstream**
Estimate	1601
Method	(Trap count) – (broodstock take adjustment) + (downstream carcass count adjustment)
Quality Rating	Very Good
Comments	Trap operated by WDFW and North Olympic Salmon Coalition from 08/27 through 10/25 at RM 0.1, as part of a supplementation program. 1,480 fish passed upstream. Downstream spawning escapement = 121 (based on number of carcasses counted downstream). 61 fish collected for broodstock (including 1 mortality). Additional 36 fish pre-escapement loss to predation (in estuary and/or creek mouth). Total return = (1,601 natural escapement) + (61 broodstock) + (36 pre-escapement loss) = 1,698.

Table AR1- 49. 2004 Jimmycomelately Creek summer chum trapping data and downstream count data.

Date	Downstream Dead		Pre-escapement Loss		Trapped		Spawned at Trap		Passed Upstream	
	Fem	Male	Fem	Male	Fem	Male	Fem	Male	Fem	Male
08/27/04					Trap installed					
09/05/04				1						
09/06/04										
09/07/04										
09/08/04			1							
09/15/04					5	11			2	1
09/16/04					4				3	
09/17/04				1	5	11			1	11
09/18/04		1	3	3	34	45			32	49
09/19/04				1	61	98			59	98
09/20/04	1		1		44	54	10	10	46	50
09/21/04	4	2			53	64			53	64
09/22/04					19	13			19	13
09/23/04	8	1			56	32			52	32
09/24/04	2		2	1	38	31			35	31
09/25/04					30	32			27	32
09/26/04					29	38			27	32
09/27/04					20	31	12	12	20	25
09/28/04					14	15			14	15
09/29/04	12	6	4	1	23	22			23	22
09/30/04					34	32			31	29
10/01/04			4	1	34	40			37	43
10/02/04					22	42			22	42
10/03/04				0	32	46			27	41
10/04/04	36	17	3	3	21	27	4	4	22	28
10/05/04					12	12			12	12
10/06/04					21	27			21	27
10/07/04					22	19			20	17
10/08/04				3	17	16			17	16
10/09/04	16	9	1	1	10	15			12	17
10/10/04					12	24			9	20
10/11/04					12	12	5	4	10	12
10/12/04					2	5			2	5
10/13/04	5	1	1		4	3			4	3
10/14/04					4	0			4	
10/15/04					5	6			5	6
10/16/04					5	1			5	1
10/17/04					3	1			3	1
10/18/04					4	3			4	3
10/19/04					0	2				2
10/20/04					0	0				
10/21/04					0	0				
10/22/04					0	0				
10/23/04					0	0				
10/24/04					0	0				
10/25/04					0	0				
Totals	**84**	**37**	**20**	**16**	**711**	**830**	**31**	**30**	**680**	**800**

SUMMER CHUM 2004

Reach **River mile 0.0 upstream**
Estimate 123
Method AUC
Quality Fair
Rating
Comments Regular surveys are conducted from August through early October. Data presented here are summaries of those multi-day surveys. Live summer chum were observed on three consecutive surveys in late September and early October, making AUC estimate possible.

Table AR1- 50. Dungeness River 2003 survey data.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Flow	Visibility	Water clarity (ft)	Survey type	Survey method	Agency
18.0018	**08/02/2004**	**0.0**	**17.5**	**15.5**	**0**	**0**	**0**	**70**	**MOD**	**FAIR-GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**08/09/2004**	**0.0**	**17.5**	**17.5**	**0**	**0**	**0**	**80**	**MOD**	**GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**08/16/2004**	**0.0**	**18.7**	**18.7**	**0**	**0**	**0**	**85**	**MODLOW**	**GOOD-EXCEL**		**INDEX**	**FOOT**	**WDFW**
18.0018	**08/23/2004**	**0.0**	**18.7**	**15.0**	**0**	**0**	**0**	**80**	**MODLOW**	**VERY GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**08/31/2004**	**0.0**	**18.7**	**18.7**	**0**	**0**	**0**	**85**	**MODLOW**	**VERY GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/07/2004**	**0.0**	**18.7**	**18.7**	**0**	**0**	**0**	**90**	**MODLOW**	**VERY GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/13/2004**	**0.0**	**17.5**	**17.5**	**0**	**0**	**0**	**80**	**MOD**	**GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/20/2004**	**0.0**	**17.5**	**17.5**	**3**	**0**	**3**	**85**	**MODLOW**	**VERY GOOD**		**INDEX**	**FOOT**	**WDFW**
18.0018	**09/28/2004**	**0.0**	**11.5**	**11.5**	**100**	**0**	**100**	**90**	**LOW**	**EXCELLENT**		**INDEX**	**FOOT**	**WDFW**
18.0018	**10/11/2004**	**0.0**	**3.8**	**3.8**	**35**	**1**	**36**	**85**	**MOD**	**GOOD**		**INDEX**	**FOOT**	**WDFW**

Notes:
Multi-day Chinook survey 08/02-08/06. RM 13.8-15.8 not surveyed.
Multi-day Chinook survey 08/09-08/13.
Multi-day Chinook survey 08/16-08/20.
Multi-day Chinook survey 08/23-08/27. RM 13.8-17.5 not surveyed due to rain / highwater.
Multi-day Chinook survey 08/31-09/02.
Multi-day Chinook survey 09/07-09/10.
Multi-day Chinook survey 09/13-09/17.
Multi-day Chinook survey 09/20-09/23. 3 live summer chum seen in RM 3.3-6.4 section on 09/23.
Multi-day Chinook survey 09/28-10/02. 100 live summer chum seen in RM 0.0-3.3 section on 10/02.
Single day survey 10/11. 35 live and 1 dead summer chum seen in RM 0.0-3.3 section.

APPENDIX REPORT 2

Summer Chum Salmon Run Reconstruction – 1999–2004 Return Years

Management Unit & Total Run Summaries

Year														Terminal	Seattle (Area 10) (HC-SJF)	Admiralty (Area 9) (HC-SJF)	U.S. Conv. Areas (HC-SJF)	CDN Area 20 (HC-SJF)
1999		**Harvest**		20	0	0	28	10	161	161	0	0	0		0	8	5	24
				********** Run Abundance by Location **********														
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		20		20			20	21	21			*	21	21	21	21	21
12D	Tahuya	1			1	1			1	1	1				172	172	173	173	174
	Union	159			159	159			165	171	171								
12A	L. Quilcene	84						84	88	91	91				3,528	3,528	3,533	3,537	3,554
	B. Quilcene	2,981	172				3,181	3,191	3,314	3,437	3,437								
12-12B-12C	Big Beef	0	4						4	4	4				772	772	774	774	778
	Anderson	0							0	0	0								
	Dosewallips	351							365	378	378								
	Duckabush	92							96	99	99								
	HammaHamma	212	43						265	275	275								
	Lilliwaup	0	13			13			14	14	14								
	Dewatto	2				2			2	2	2								
Chimacum	Chimacum	38													38		38	38	38
Discovery	Snow	29										29			528		529	529	532
	Salmon	434	65									499							
Sequim	Jimmycomelately	1	6										7		7		7	7	7
Totals		4,384	303	20	160	195	3,181	3,275	4,333	4,494	4,494	528	7		5,067	4,494	5,075	5,079	5,104
	Hood Canal Portion	3,882	232												4,494	4,494	4,501	4,505	4,527
	E. Strait Portion	502	71												573		574	574	577

2000		**Harvest**		9	0	0	0	707	52	52	0	0	0		1	1	13	27
				********** Run Abundance by Location **********														
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		9		9			9	9	9			*	9	9	9	9	9
12D	Tahuya	2			2	2			2	2	2				754	754	754	755	757
	Union	682	62		744	744			748	752	752								
12A	L. Quilcene	268						300	302	303	303				6,678	6,678	6,679	6,687	6,704
	B. Quilcene	5,126	504				5,630	6,305	6,340	6,374	6,374								
12-12B-12C	Big Beef	0	20						20	20	20				2,027	2,027	2,027	2,030	2,035
	Anderson	0							0	0	0								
	Dosewallips	1,260							1,267	1,274	1,274								
	Duckabush	464							467	469	469								
	HammaHamma	173	56						230	232	232								
	Lilliwaup	2	20			22			22	22	22								
	Dewatto	10				10			10	10	10								
Chimacum	Chimacum	52													52		52	52	52
Discovery	Snow	30										30			876		876	877	879
	Salmon	710	136									846							
Sequim	Jimmycomelately	9	46										55		55		55	55	55
Totals		8,788	844	9	746	787	5,630	6,605	9,417	9,468	9,468	876	55		10,451	9,469	10,453	10,466	10,493
	Hood Canal Portion	7,987	662												9,468	9,469	9,470	9,482	9,506
	E. Strait Portion	801	182												983		983	984	987

Management Unit & Total Run Summaries

Year														Terminal	Seattle (Area 10) (HC-SJF)	Admiralty (Area 9) (HC-SJF)	U.S. Conv. Areas (HC-SJF)	CDN Area 20 (HC-SJF)
2001		**Harvest**		12	0	0	59	1,036	62	62	0	0	0		10	18	36	65
				********** Run Abundance by Location **********														
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	3		15		15			15	15	15			* 15	15	15	15	15
12D	Tahuya	0			0	0			0	0	0			1,505	1,506	1,508	1,511	1,516
	Union	1,426	65		1,491	1,491			1,498	1,505	1,505							
12A	L. Quilcene	199						231	232	233	233			7,538	7,544	7,551	7,567	7,595
	B. Quilcene	5,868	306				6,233	7,237	7,271	7,305	7,305							
12-12B-12C	Big Beef	826	68						898	902	902			4,216	4,219	4,224	4,232	4,248
	Anderson	0							0	0	0							
	Dosewallips	990							995	999	999							
	Duckabush	942							946	951	951							
	HammaHamma	1,173	54						1,233	1,238	1,238							
	Lilliwaup	32	60			92			92	93	93							
	Dewatto	32				32			32	32	32							
Chimacum	Chimacum	903												903		904	906	909
Discovery	Snow	154										154		2,792		2,795	2,801	2,811
	Salmon	2,484	154									2,638						
Sequim	Jimmycomelately	192	68										260	260		260	261	262
Totals		15,224	775	15	1,491	1,630	6,233	7,468	13,213	13,274	13,274	2,792	260	17,229	13,284	17,257	17,292	17,357
	Hood Canal Portion	11,491	553											13,274	13,284	13,297	13,325	13,375
	E. Strait Portion	3,733	222											3,955		3,959	3,967	3,982

2002		**Harvest**		10	0	0	5	1,437	0	214	0	0	0		0	5	30	41
				********** Run Abundance by Location **********														
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	0		10		10			10	10	10			* 10	10	10	10	10
12D	Tahuya	0			0	0			0	0	0			886	886	887	888	890
	Union	807	65		872	872			872	886	886							
12A	L. Quilcene	470						620	620	631	631			6,027	6,027	6,029	6,038	6,050
	B. Quilcene	3,662	355				4,022	5,309	5,309	5,397	5,397							
12-12B-12C	Big Beef	677	65						742	754	754			6,196	6,196	6,198	6,207	6,220
	Anderson	0							0	0	0							
	Dosewallips	1,627							1,627	1,654	1,654							
	Duckabush	530							530	539	539							
	HammaHamma	2,260	68						2,328	2,367	2,367							
	Lilliwaup	775	83			858			858	872	872							
	Dewatto	10				10			10	10	10							
Chimacum	Chimacum	864												864		864	866	867
Discovery	Snow	532										532		6,049		6,051	6,060	6,072
	Salmon	5,389	128									5,517						
Sequim	Jimmycomelately	6	36										42	42		42	42	42
Totals		17,609	800	10	872	1,750	4,022	5,929	12,906	13,120	13,120	6,049	42	20,075	13,120	20,080	20,110	20,151
	Hood Canal Portion	10,818	636											13,120	13,120	13,123	13,143	13,170
	E. Strait Portion	6,791	164											6,955		6,957	6,967	6,981

Management Unit & Total Run Summaries

Year															Terminal	Seattle (Area 10) (HC-SJF)	Admiralty (Area 9) (HC-SJF)	U.S. Conv. Areas (HC-SJF)	CDN Area 20 (HC-SJF)
2003		**Harvest**		0	0	0	20	0	0	0	13	0	0			0	57	263	33
			********** Run Abundance by Location **********																
Mgmt Unit	**Prod. Unit**	Escapement	Brood-stock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim						
Skokomish	Skokomish	0		0		0			0	0	0			*	0	0	0	0	0
12D	Tahuya	0			0	0			0	0	0				11,920	11,920	11,936	12,010	12,019
	Union	11,780	136		11,916	11,916			11,916	11,916	11,920								
12A	L. Quilcene	890						890	890	890	890				12,758	12,758	12,775	12,853	12,863
	B. Quilcene	11,745	98				11,863	11,863	11,863	11,863	11,867								
12-12B-12C	Big Beef	824	72						896	896	896				11,051	11,051	11,066	11,134	11,142
	Anderson	0							0	0	0								
	Dosewallips	7,066							7,066	7,066	7,069								
	Duckabush	1,869							1,869	1,869	1,870								
	HammaHamma	796	58						854	854	854								
	Lilliwaup	194	159			353			353	353	353								
	Dewatto	9				9			9	9	9								
Chimacum	Chimacum	558													558		559	562	563
Discovery	Snow	304										304			5,955		5,963	6,000	6,004
	Salmon	5,521	130									5,651							
Sequim	Jimmycomelately	369	77										446		446		447	449	450
Totals		41,925	730	0	11,916	12,278	11,863	12,753	35,716	35,716	35,729	5,955	446		42,688	35,729	42,745	43,008	43,040
	Hood Canal Portion	35,173	523												35,729	35,729	35,777	35,997	36,024
	E. Strait Portion	6,752	207												6,959		6,968	7,011	7,016
2004		**Harvest**		0	0	0	0	24,878	0	0	4	0	0			3	16	124	76
			********** Run Abundance by Location **********																
Mgmt Unit	**Prod. Unit**	Escapement	Brood-stock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim						
Skokomish	Skokomish	24		24		24			24	24	24			*	24	24	24	24	24
12D	Tahuya	8			8	8			8	8	8				5,984	5,984	5,985	5,993	5,997
	Union	5,876	100		5,976	5,976			5,976	5,976	5,976								
12A	L. Quilcene	3,045						5,031	5,031	5,031	5,031				63,034	63,036	63,045	63,121	63,167
	B. Quilcene	35,000	108				35,108	58,000	58,000	58,000	58,003								
12-12B-12C	Big Beef	1,852	64						1,916	1,916	1,916				25,835	25,836	25,840	25,871	25,890
	Anderson	1							1	1	1								
	Dosewallips	11,549							11,549	11,549	11,549								
	Duckabush	8,637							8,637	8,637	8,637								
	HammaHamma	2,628	63						2,691	2,691	2,691								
	Lilliwaup	922	95			1,017			1,017	1,017	1,017								
	Dewatto	23				23			23	23	23								
Chimacum	Chimacum	1,139													1,139		1,139	1,141	1,141
Discovery	Snow	396										396			6,417		6,418	6,426	6,430
	Salmon	6,021	0									6,021							
Sequim	Jimmycomelately	1,601	61										1,662		1,662		1,662	1,664	1,665
Dungeness	Dungeness	123													123		123	123	123
Totals		78,845	491	24	5,984	7,048	35,108	63,031	94,873	94,873	94,877	6,417	1,662		104,218	94,880	104,237	104,361	104,437
	Hood Canal Portion	69,565	430												94,877	94,880	94,895	95,008	95,077
	E. Strait Portion	9,280	61												9,341		9,342	9,354	9,360

APPENDIX REPORT 3

Summer Chum Length Data Analysis

Available length data for returning adult summer chum were used to compare mean lengths of supplementation vs. natural-origin adults, and mean lengths of adults collected for broodstock vs. adults spawning naturally. For streams without supplementation programs, the mean lengths of natural-origin fish were compared to the mean lengths of stray supplementation-origin fish recovered in the stream. Means were calculated by sex and age class (data are only presented for age 3 and 4 fish, due to small sample sizes of age 2 and 5 fish). Figures AR3-1 through AR3-9 show the data as means with 95% confidence intervals, and figures AR3-10 through AR3-17 show the data as length frequency histograms. The means, standard deviations, sample sizes, and confidence intervals are presented in table AR3-1. Years of collection vary between programs, but all results are from collections occurring between 1998 and 2004.

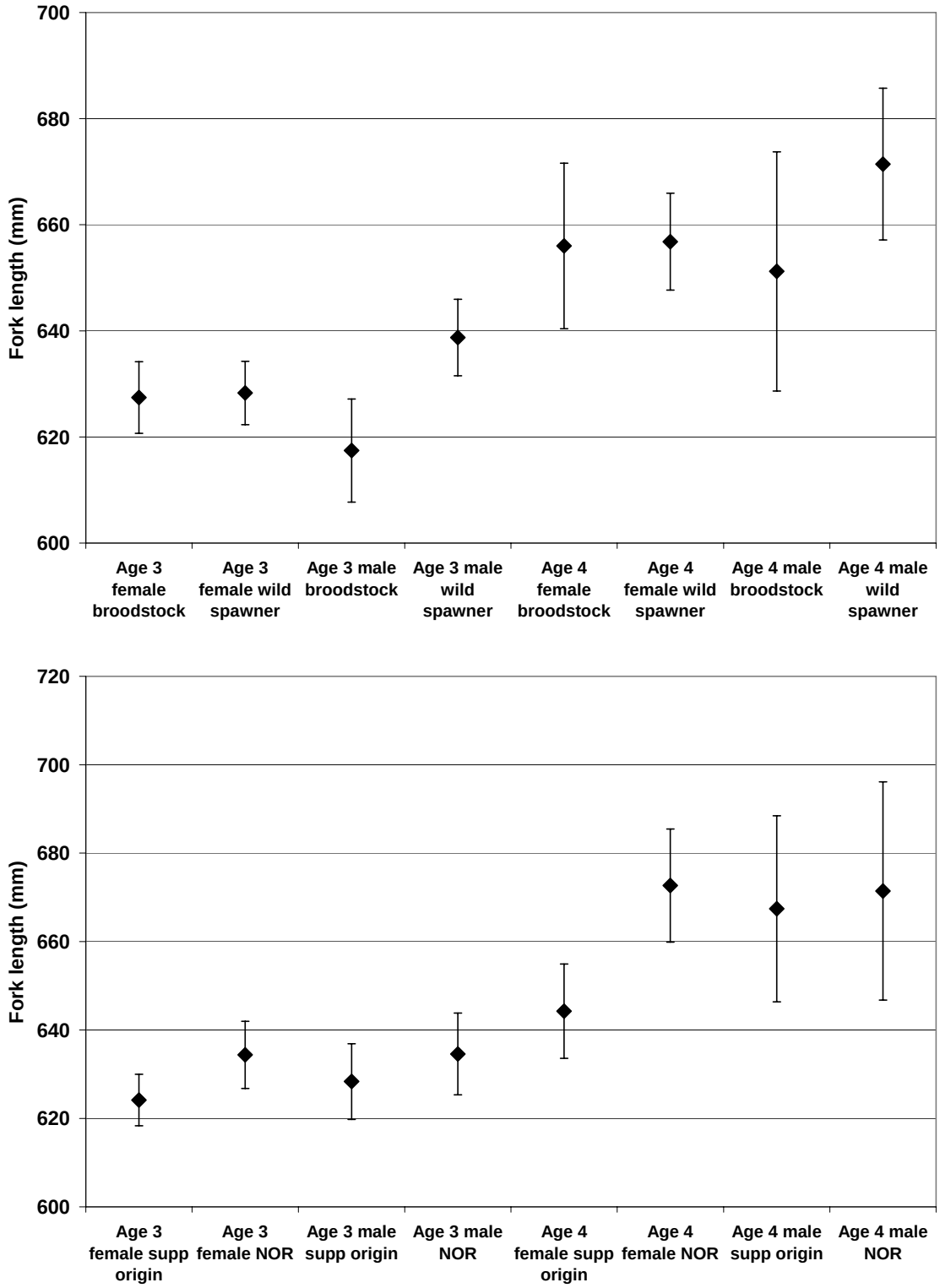


Figure AR3-1. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon returning to Jimmmycomelately Creek (1999-2004) and collected as broodstock vs. spawning naturally (top), and mean fork lengths (+/- 95% confidence intervals) for fish of JCL supplementation origin (including strays) vs. natural origin fish returning to JCL (bottom).

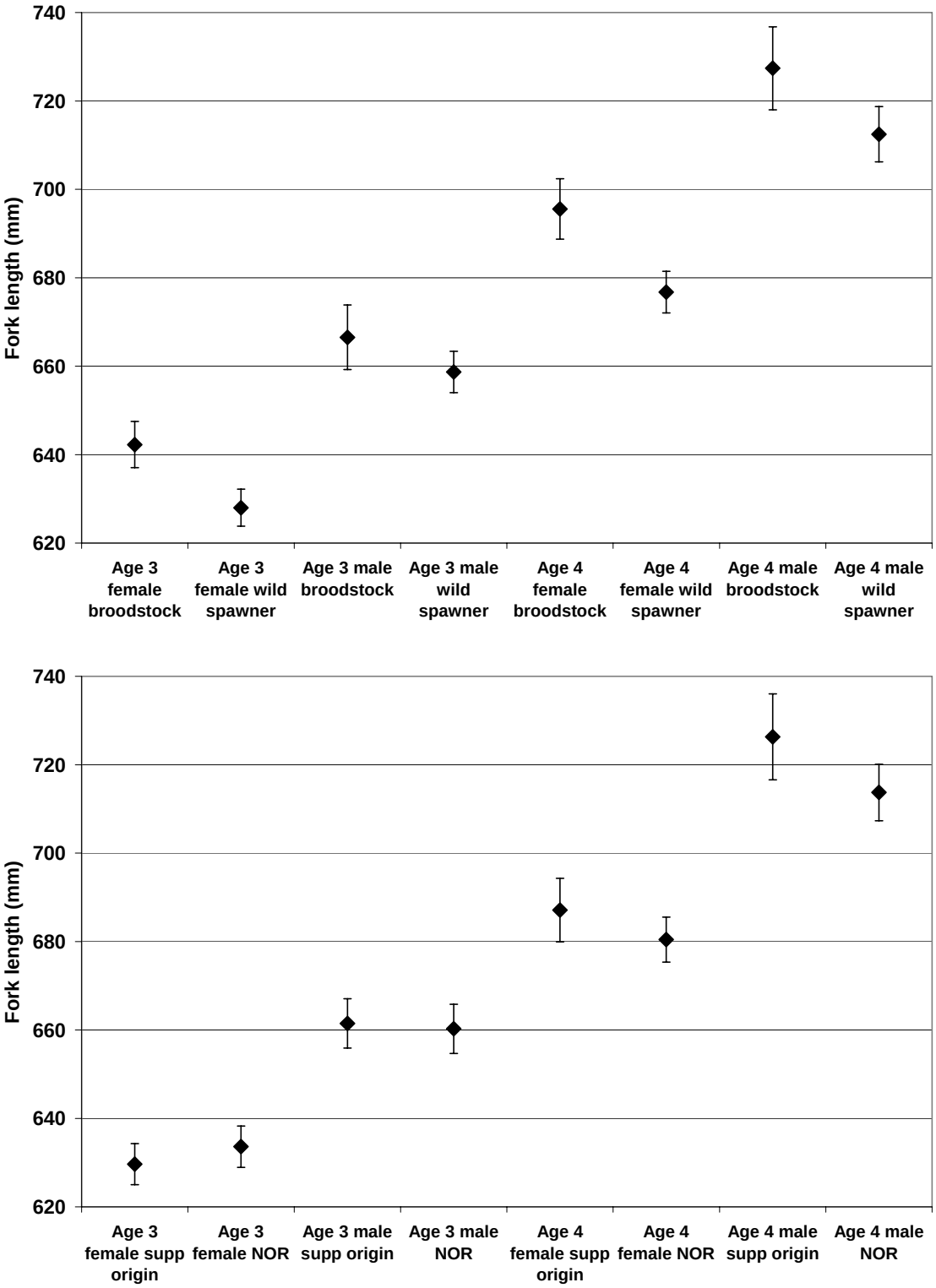


Figure AR3-2. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon returning to Salmon Creek (1998-2004) and collected as broodstock vs. spawning naturally (top), and mean fork lengths (+/- 95% confidence intervals) for fish of Salmon Creek supplementation origin (including strays) vs. natural origin fish returning to Salmon Creek (bottom).

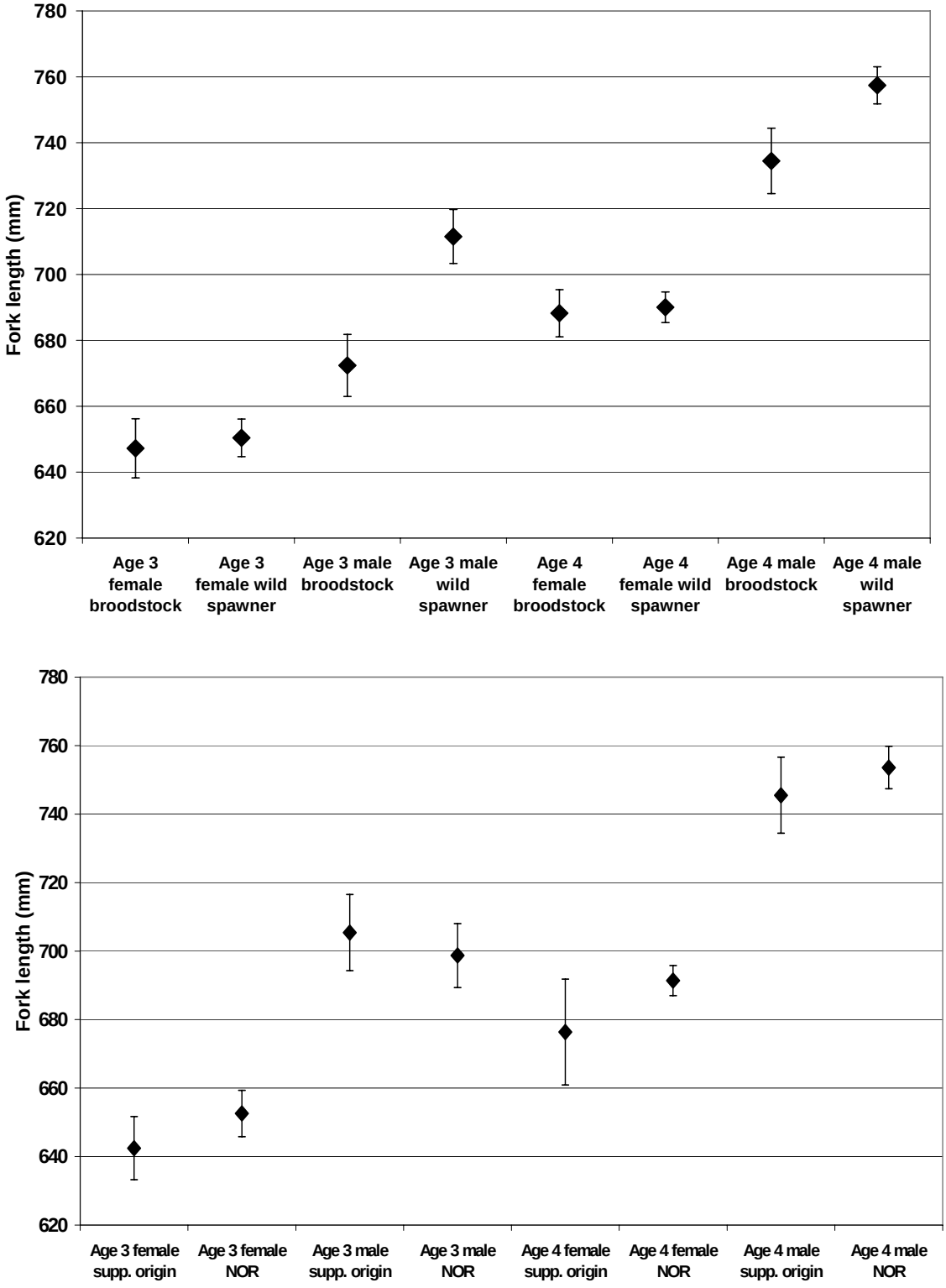


Figure AR3-3. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon returning to Hamma Hamma (1998-2004) and collected as broodstock vs. spawning naturally (top), and mean fork lengths (+/- 95% confidence intervals) for fish of Hamma supplementation origin (including strays) vs. natural-origin fish returning to the Hamma Hamma (bottom).

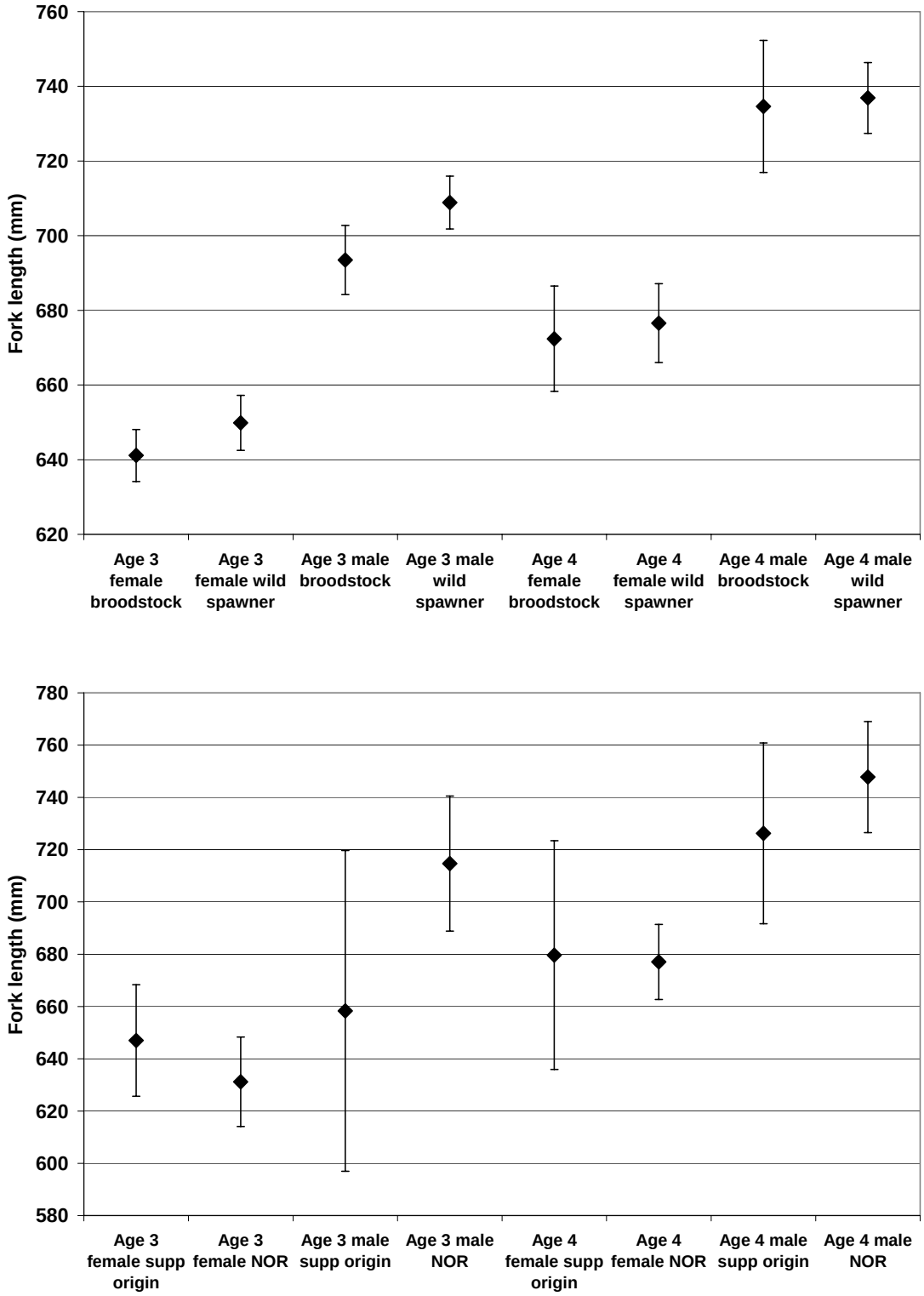
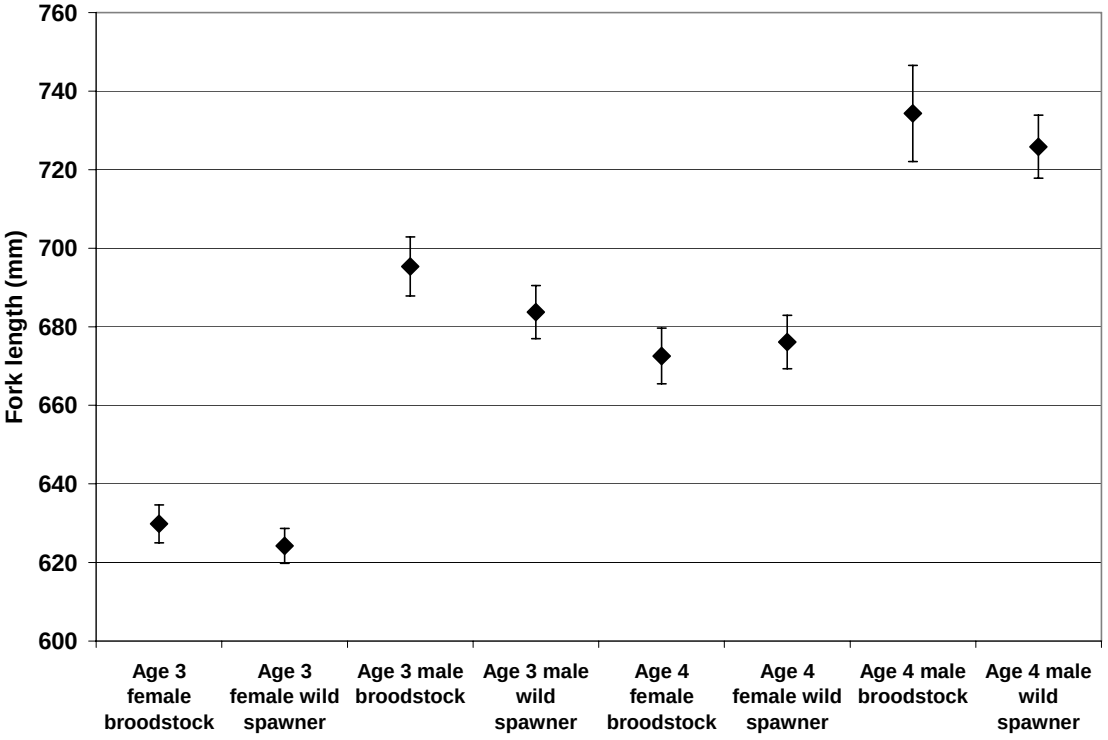


Figure AR3-4. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon returning to Lilliwaup Creek (1998-2004) and collected as broodstock vs. spawning naturally (top), and mean fork lengths (+/- 95% confidence intervals) for fish of Lilliwaup supplementation origin (including strays) vs. natural-origin fish returning to Lilliwaup (bottom).



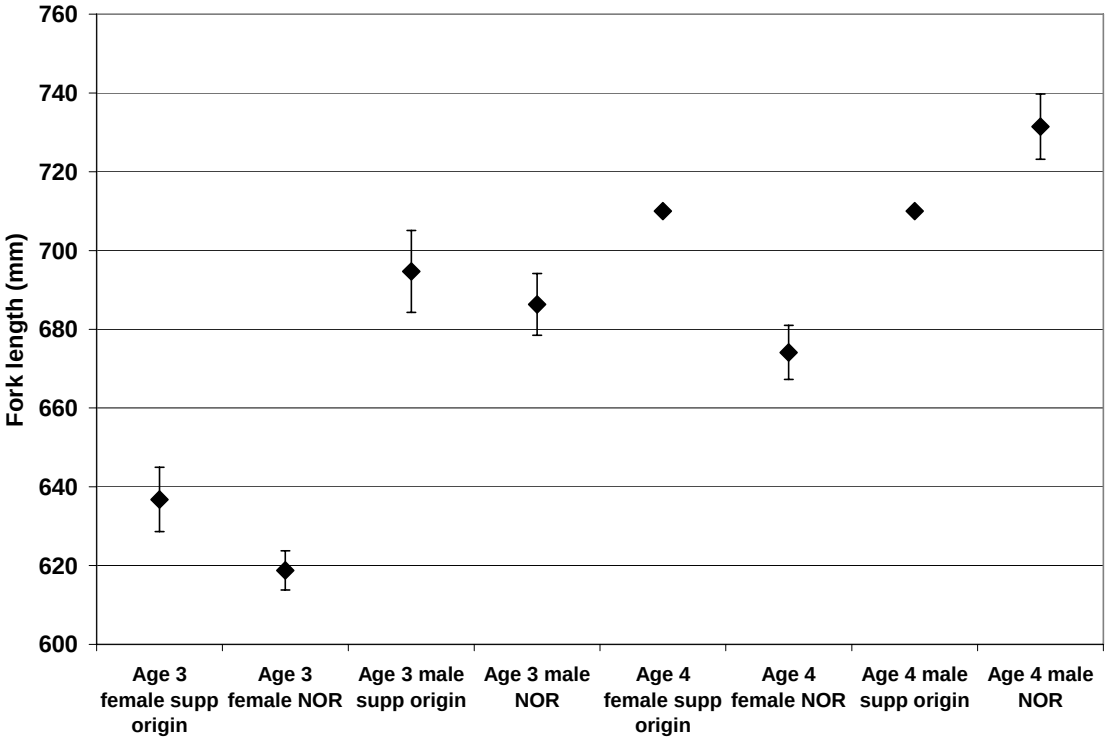


Figure AR3-5. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon returning to Union River (2000-2004) and collected as broodstock vs. spawning naturally (top), and mean fork lengths (+/- 95% confidence intervals) for fish of Union supplementation-origin vs. natural-origin fish returning to Union (bottom).

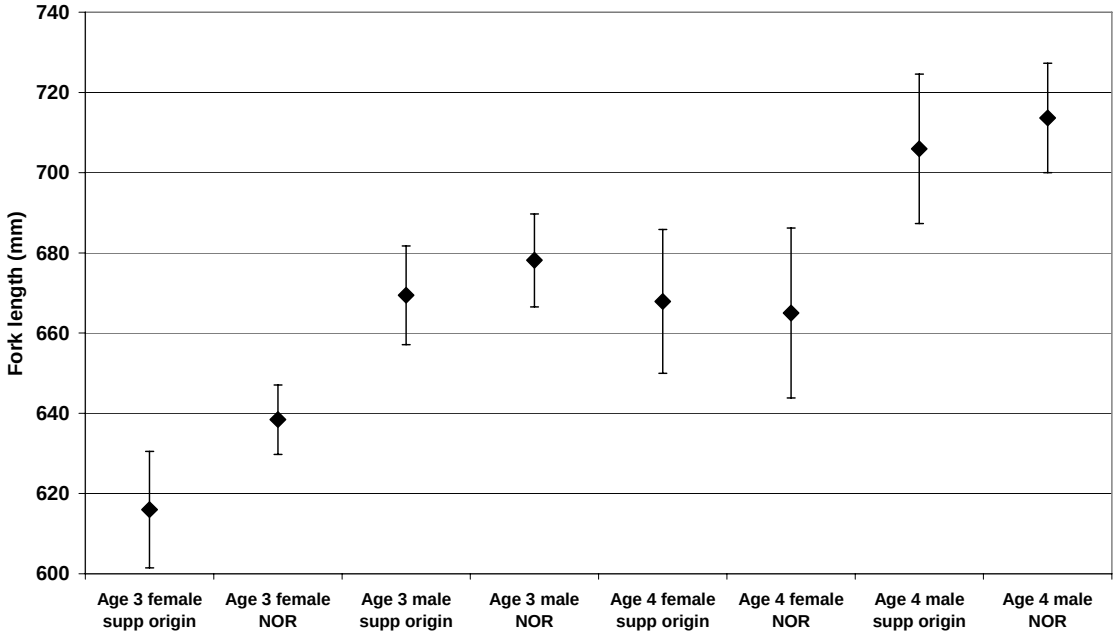


Figure AR3-6. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon of Chimacum supplementation origin (including strays) vs. natural-origin fish returning to Chimacum, 2002-2004. Broodstock collection for Chimacum Creek was conducted at Salmon Creek (previous figure), so no broodstock vs. natural spawner comparison is possible for returns to Chimacum.

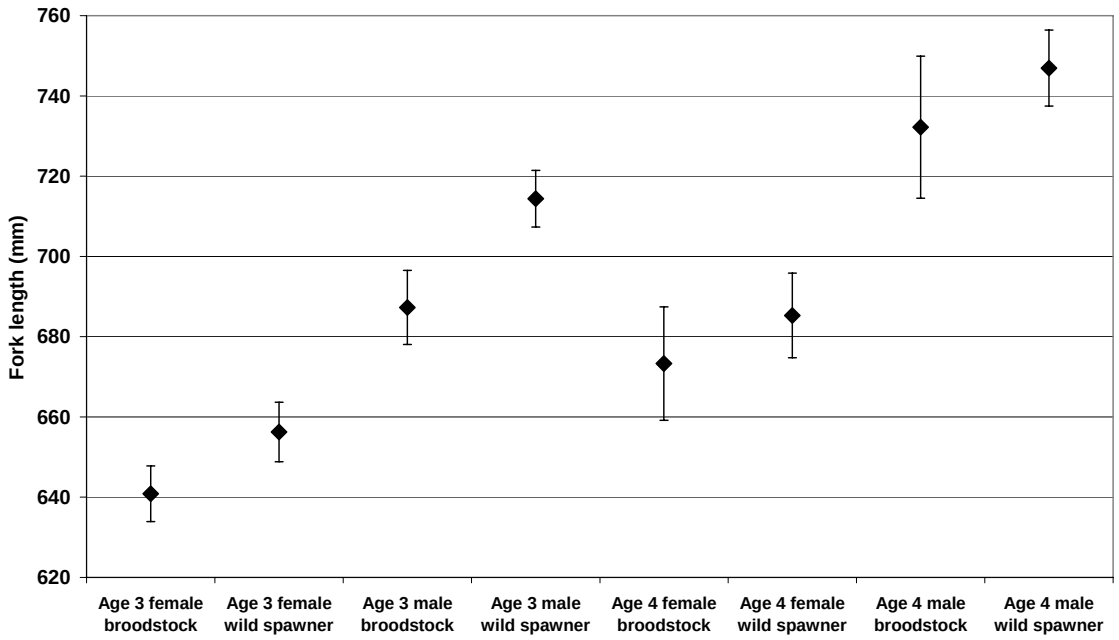


Figure AR3-7. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon returning to Big Beef Creek (2000-2004) and collected as broodstock vs. spawning naturally. Natural-origin returns to Big Beef have been insufficient for natural vs. supplementation-origin comparisons.

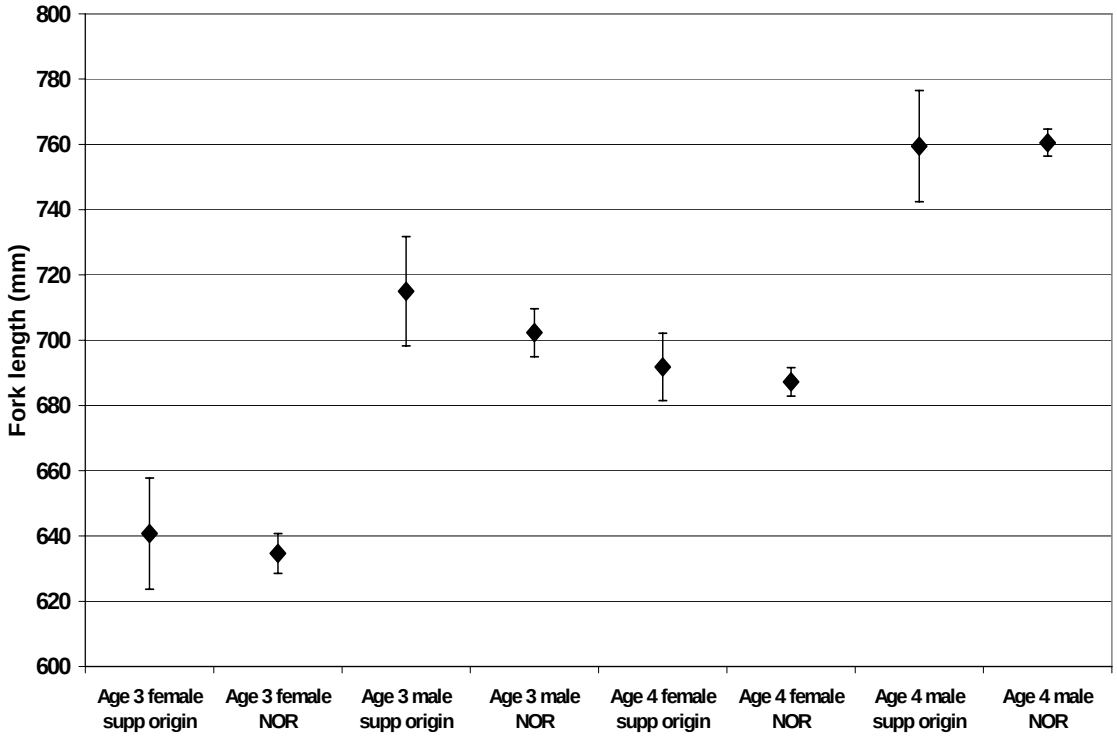


Figure AR3-8. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon returning to Dosewallips (2000-2004), supplementation-origin fish (strays) vs. natural-origin fish.

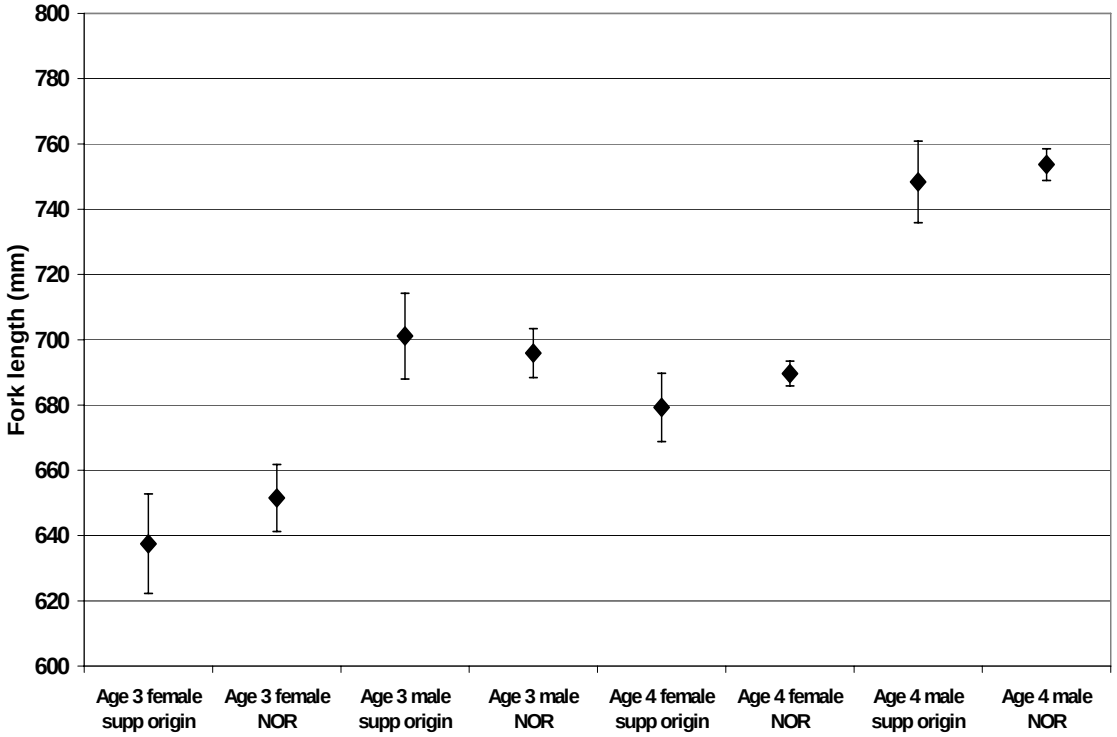


Figure AR3-9. Mean fork lengths (+/- 95% confidence intervals) by age and sex of summer chum salmon returning to Duckabush (2000-2004), supplementation-origin fish (strays) vs. natural-origin fish.

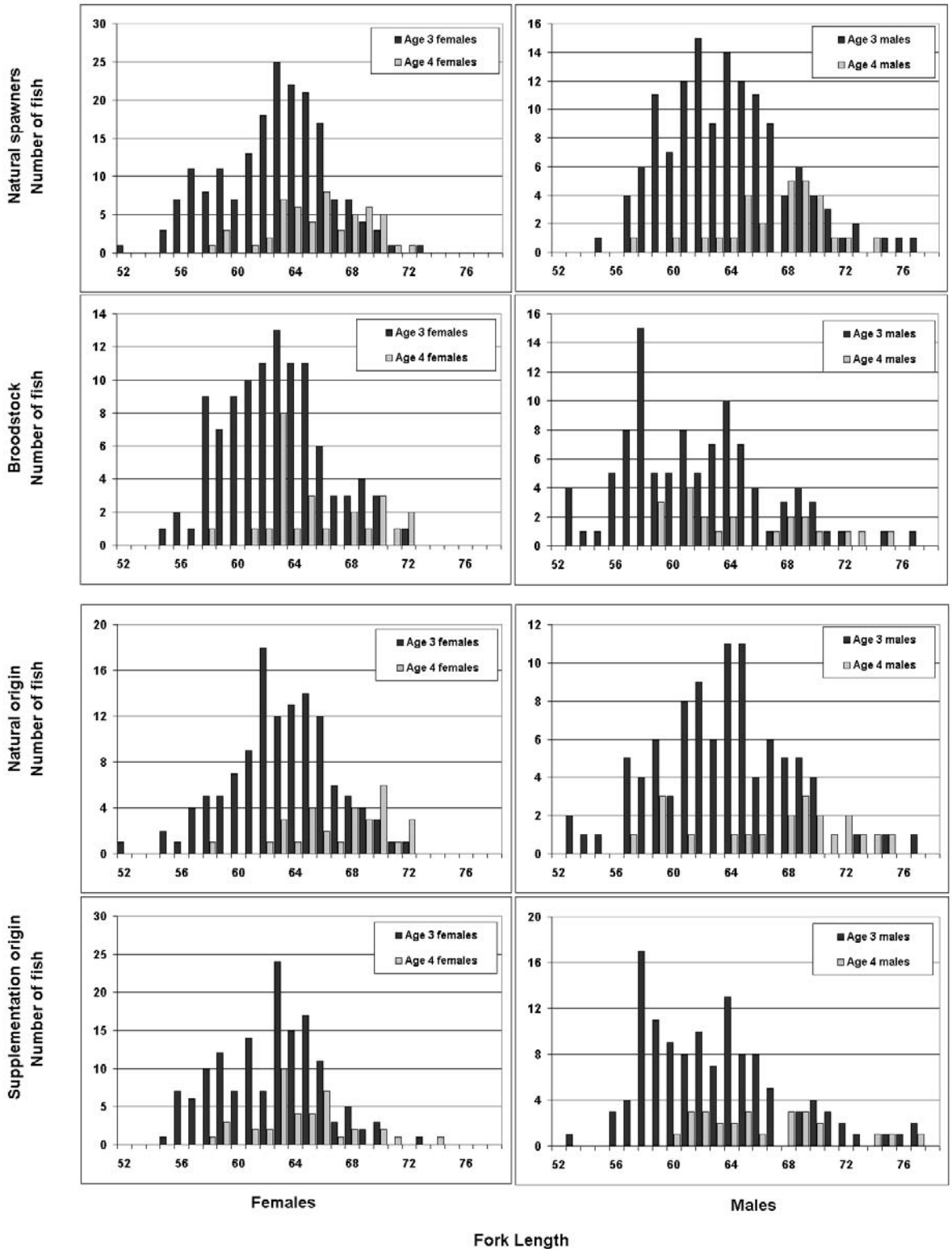


Figure AR3-10. Length Frequency histograms for summer chum salmon returning to Jimmycomelately (JCL) Creek, 1999-2004. Top 4 graphs compare fish spawning naturally to fish collected for broodstock, by age and sex. Bottom 4 graphs compare natural origin fish returning to JCL to all returning fish of JCL supplementation origin (including strays).

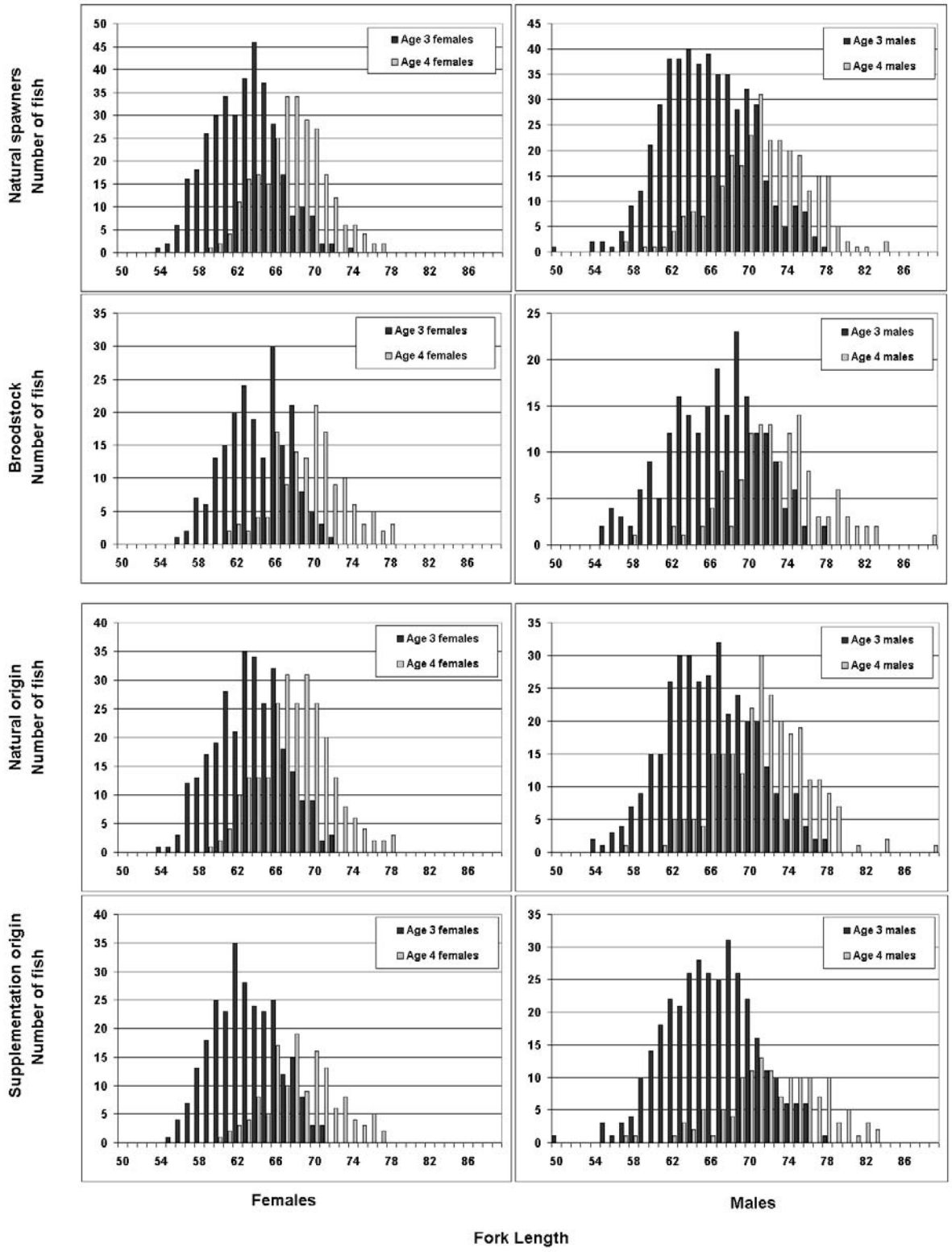


Figure AR3-11. Length-frequency histograms for summer chum salmon returning to Salmon Creek, 1998-2004.

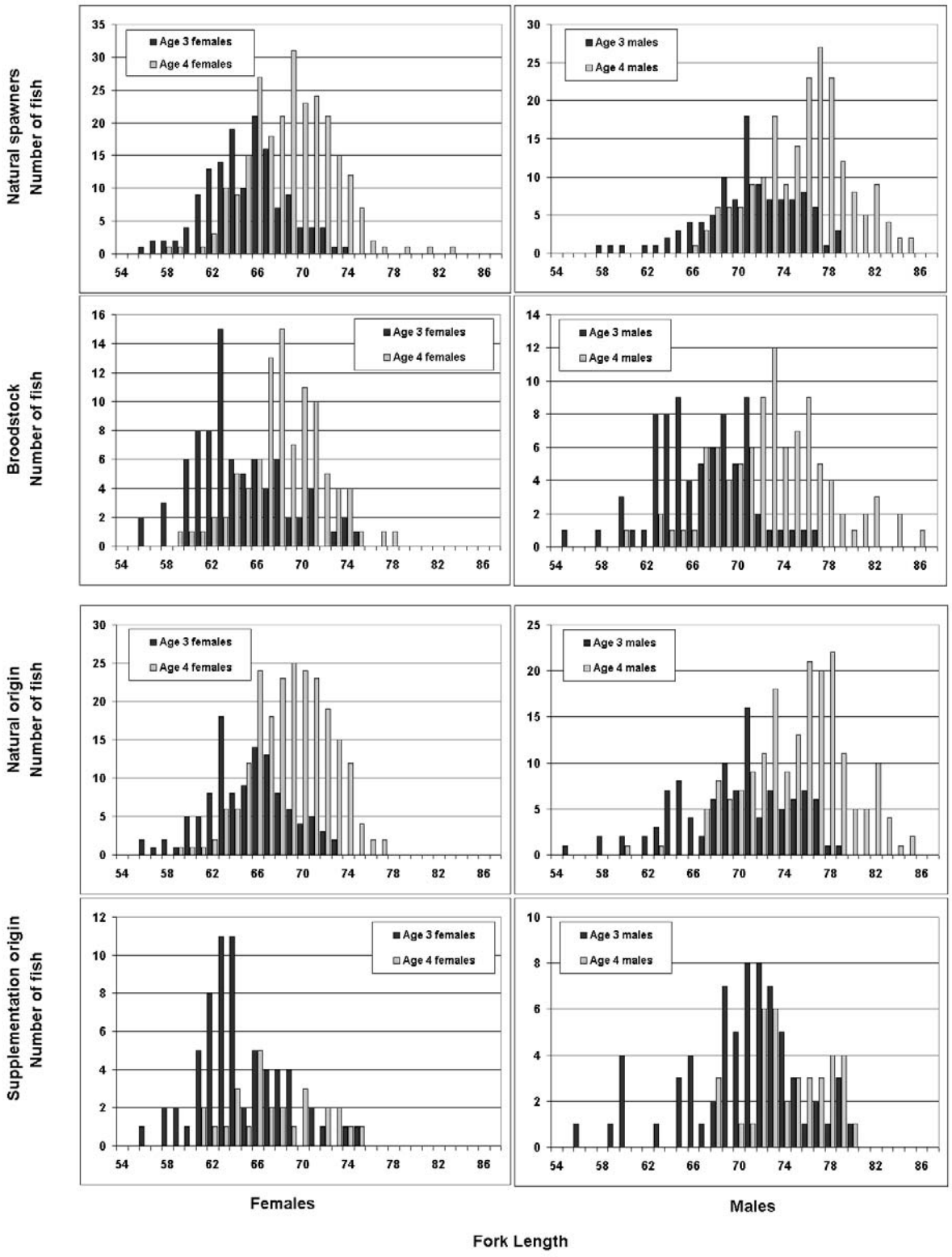


Figure AR3-12. Length-frequency histograms for summer chum returning to Hamma Hamma River, 1998-2004.

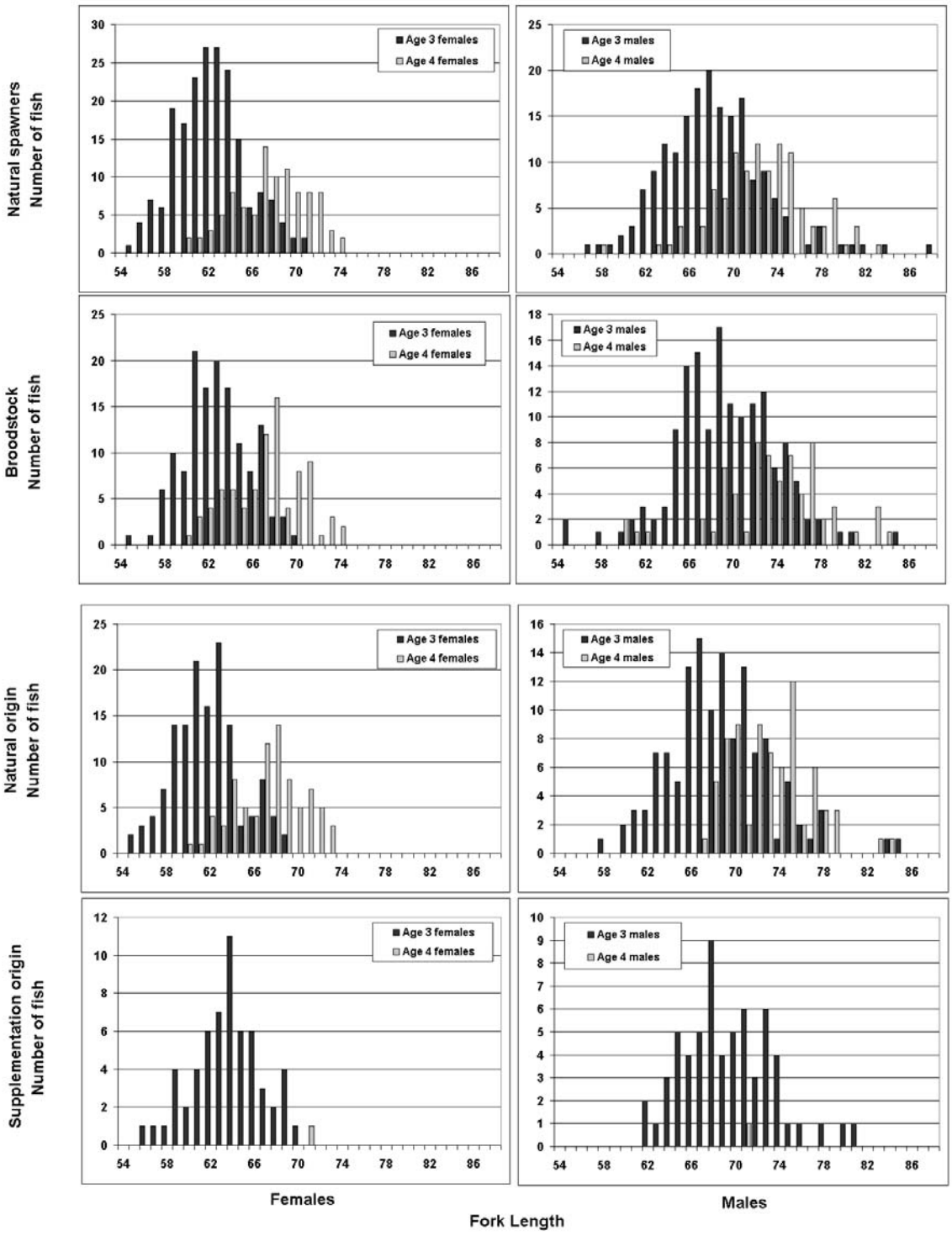


Figure AR3-13. Length-frequency histograms for summer chum returning to Union River, 2000-2004.

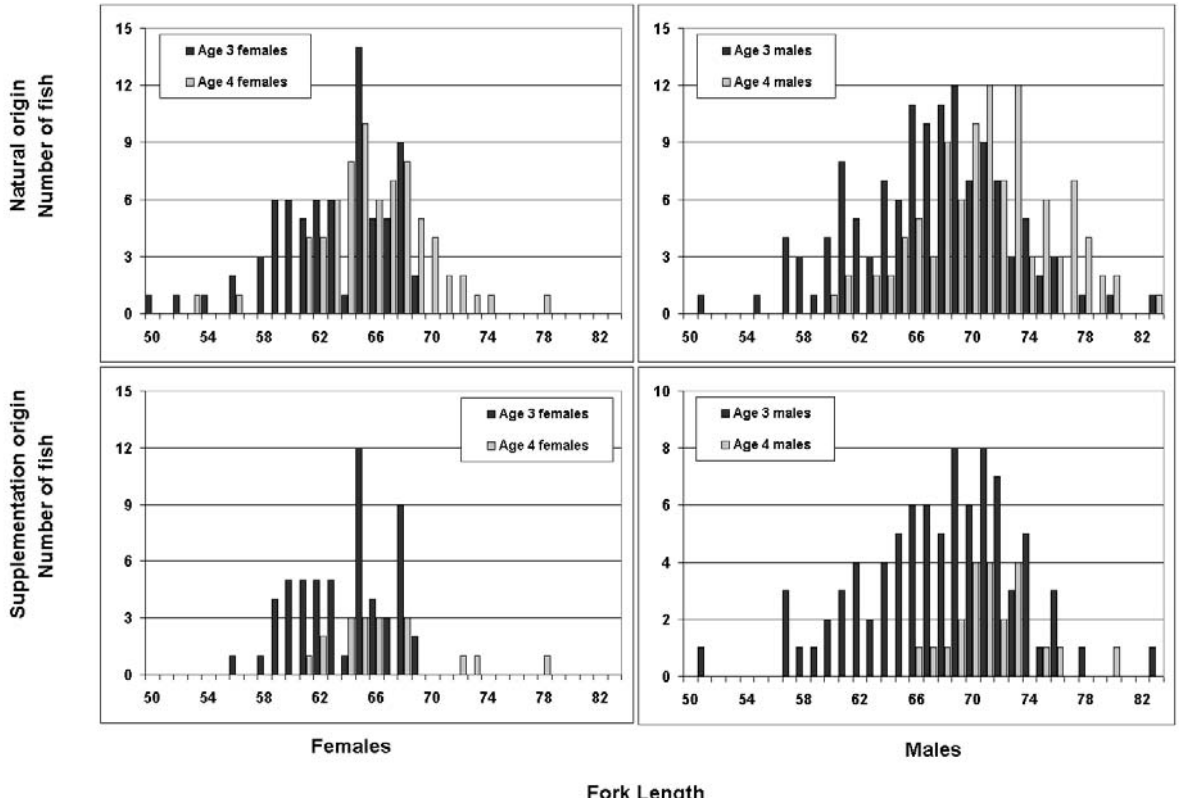


Figure AR3-14. Length-frequency histograms for natural-origin summer chum returning to Chimacum Creek, and returning fish of Chimacum supplementation origin (including strays) 2002-2004.

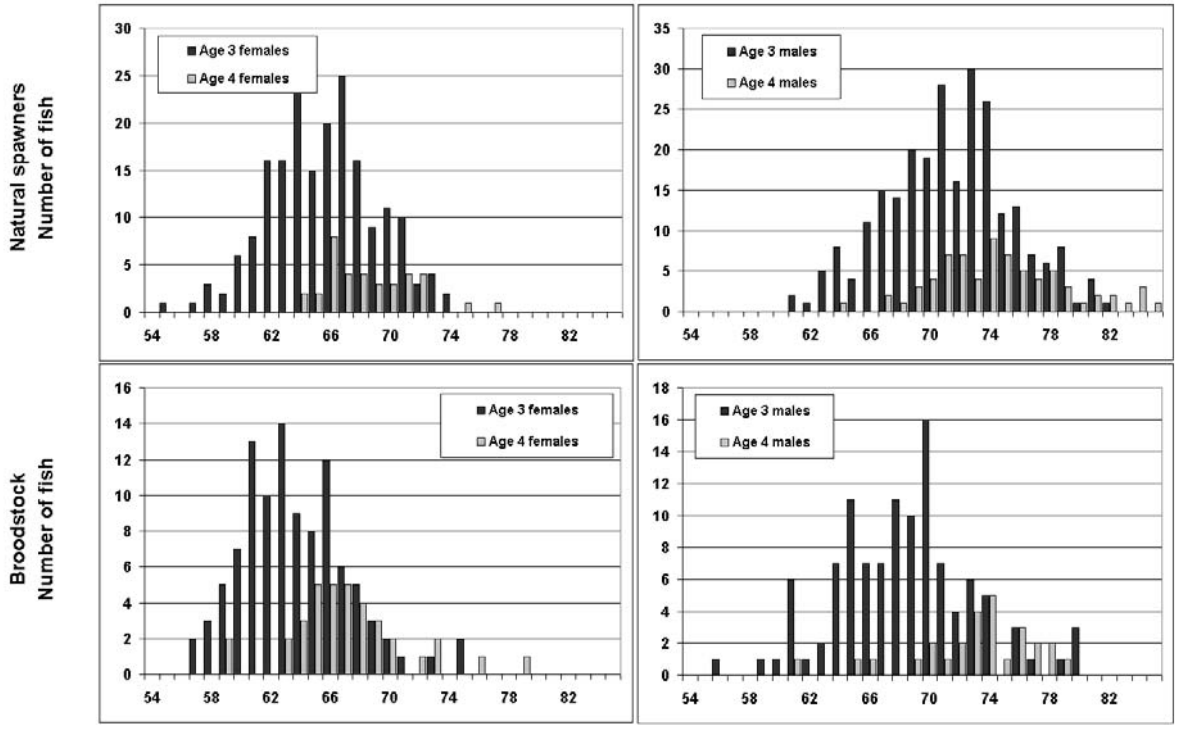


Figure AR3-15. Length-frequency histograms for summer chum returning to Big Beef Creek, 2001-2004.

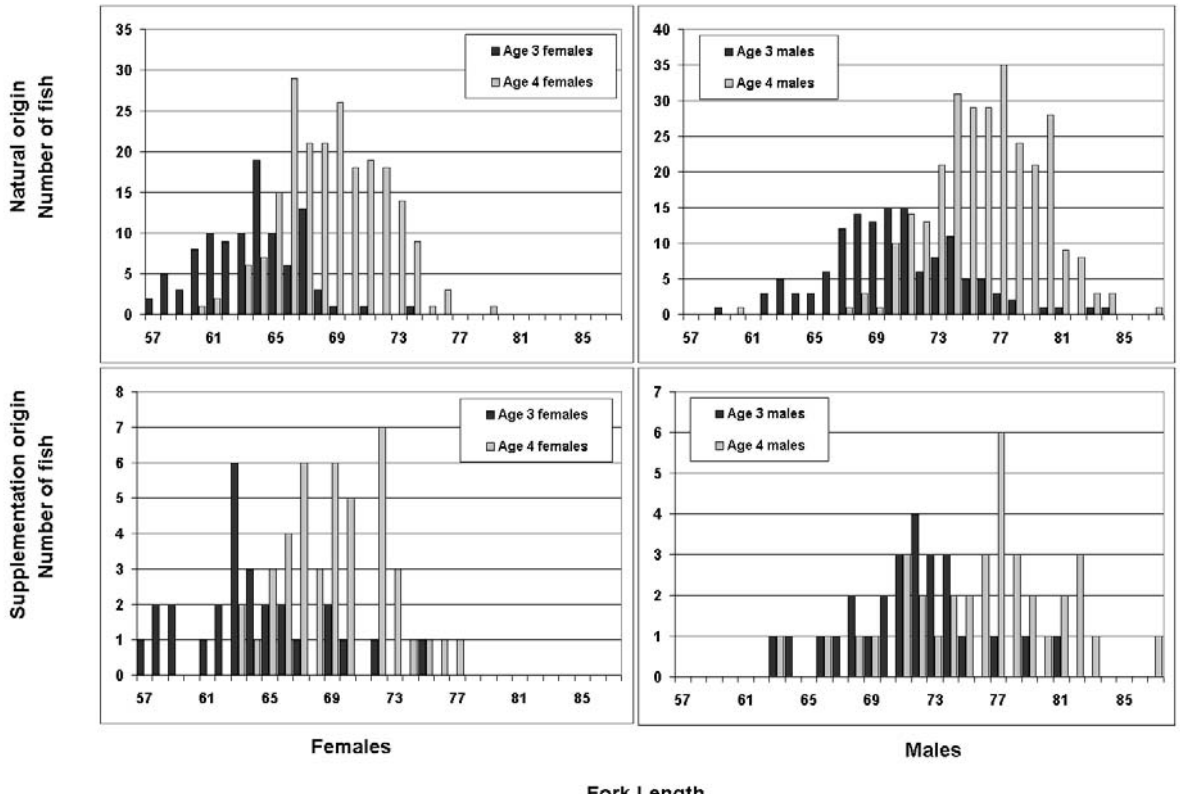


Figure AR3-16. Length-frequency histograms for summer chum returning to Dosewallips River, 2002-2004.

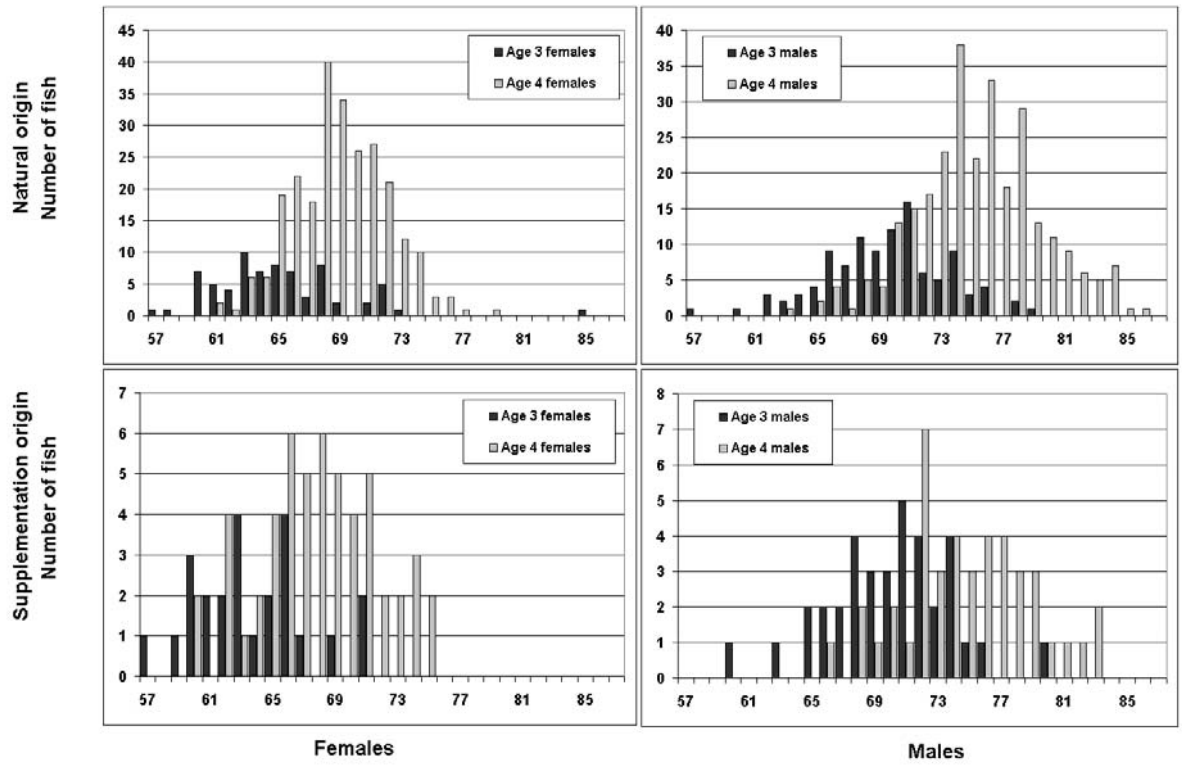


Figure AR3-17. Length-frequency histograms for summer chum returning to Duckabush River, 2002-2004.

Table AR3- 1. Means, standard deviations, sample sizes, and 95% confidence intervals for fork lengths (mm) of summer chum sampled by program, age, and sex, for broodstock vs. natural spawners, and supplementation-origin vs. natural-origin fish.

Jimmycomelately Creek

	Age 3 female broodstock	Age 3 female wild spawner	Age 3 male broodstock	Age 3 male wild spawner	Age 4 female broodstock	Age 4 female wild spawner	Age 4 male broodstock	Age 4 male wild spawner
Mean FL (mm)	627	628	617	639	656	657	651	671
Stdev	35	42	49	42	38	33	50	37
N	105	188	100	134	25	53	21	28
95% CI	627 +/- 6.7	628 +/- 6	617 +/- 9.7	639 +/- 7.2	656 +/- 15.6	657 +/- 9.1	651 +/- 22.6	671 +/- 14.3

	Age 3 female supp origin	Age 3 female NOR	Age 3 male supp origin	Age 3 male NOR	Age 4 female supp origin	Age 4 female NOR	Age 4 male supp origin	Age 4 male NOR
Mean FL (mm)	624	634	628	635	644	673	667	671
Stdev	36	43	48	45	33	34	53	54
N	145	124	123	94	40	30	27	21
95% CI	624 +/- 5.8	634 +/- 7.6	628 +/- 8.6	635 +/- 9.3	644 +/- 10.7	673 +/- 12.8	667 +/- 21	671 +/- 24.7

Salmon Creek

	Age 3 female broodstock	Age 3 female wild spawner	Age 3 male broodstock	Age 3 male wild spawner	Age 4 female broodstock	Age 4 female wild spawner	Age 4 male broodstock	Age 4 male wild spawner
Mean FL (mm)	642	628	667	659	696	677	727	712
Stdev	33	35	48	46	36	34	47	47
N	203	360	219	481	144	264	130	285
95% CI	642 +/- 5.2	628 +/- 4.2	667 +/- 7.3	659 +/- 4.7	696 +/- 6.8	677 +/- 4.7	727 +/- 9.4	712 +/- 6.2

	Age 3 female supp origin	Age 3 female NOR	Age 3 male supp origin	Age 3 male NOR	Age 4 female supp origin	Age 4 female NOR	Age 4 male supp origin	Age 4 male NOR
Mean FL (mm)	630	634	661	660	687	680	726	714
Stdev	34	36	46	47	37	36	50	45
N	267	297	337	356	135	254	136	253
95% CI	630 +/- 4.6	634 +/- 4.7	661 +/- 5.6	660 +/- 5.6	687 +/- 7.2	680 +/- 5.1	726 +/- 9.7	714 +/- 6.4

Table AR3- 1, continued. Means, standard deviations, sample sizes, and 95% confidence intervals for fork lengths (mm) of summer chum sampled by program, age, and sex, for broodstock vs. natural spawners, and supplementation-origin vs. natural-origin fish.

Hamma Hamma River

	Age 3 female broodstock	Age 3 female wild spawner	Age 3 male broodstock	Age 3 male wild spawner	Age 4 female broodstock	Age 4 female wild spawner	Age 4 male broodstock	Age 4 male wild spawner
Mean FL (mm)	647	650	672	712	688	690	734	757
Stdev	41	35	41	43	35	37	49	40
N	81	143	76	106	94	245	96	197
95% CI	647 +/- 9	650 +/- 5.7	672 +/- 9.4	712 +/- 8.2	688 +/- 7.2	690 +/- 4.6	734 +/- 9.9	757 +/- 5.6

	Age 3 female supp. origin	Age 3 female NOR	Age 3 male supp. origin	Age 3 male NOR	Age 4 female supp. origin	Age 4 female NOR	Age 4 male supp. origin	Age 4 male NOR
Mean FL (mm)	642	653	705	699	676	691	745	754
Stdev	38	36	46	48	39	33	33	43
N	69	113	68	106	27	220	37	189
95% CI	642 +/- 9.2	653 +/- 6.8	705 +/- 11.1	699 +/- 9.3	676 +/- 15.5	691 +/- 4.4	745 +/- 11.1	754 +/- 6.2

Lilliwaup Creek

	Age 3 female broodstock	Age 3 female wild spawner	Age 3 male broodstock	Age 3 male wild spawner	Age 4 female broodstock	Age 4 female wild spawner	Age 4 male broodstock	Age 4 male wild spawner
Mean FL (mm)	641	650	693	709	672	677	735	737
Stdev	38	35	52	43	38	32	55	35
N	117	87	126	142	30	38	40	55
95% CI	641 +/- 6.9	650 +/- 7.4	693 +/- 9.3	709 +/- 7.1	672 +/- 14.1	677 +/- 10.5	735 +/- 17.7	737 +/- 9.5

	Age 3 female supp origin	Age 3 female NOR	Age 3 male supp origin	Age 3 male NOR	Age 4 female supp origin	Age 4 female NOR	Age 4 male supp origin	Age 4 male NOR
Mean FL (mm)	647	631	658	715	680	677	726	748
Stdev	17	37	58	68	18	29	41	48
N	5	20	6	29	3	18	8	22
95% CI	647 +/- 21.3	631 +/- 17.1	658 +/- 61.3	715 +/- 25.9	680 +/- 43.8	677 +/- 14.4	726 +/- 34.6	748 +/- 21.2

Table AR3- 1, continued. Means, standard deviations, sample sizes, and 95% confidence intervals for fork lengths (mm)of summer chum sampled by program, age, and sex, for broodstock vs. natural spawners (where applicable), and supplementation-origin vs. natural-origin fish.

Union River

	Age 3 female broodstock	Age 3 female wild spawner	Age 3 male broodstock	Age 3 male wild spawner	Age 4 female broodstock	Age 4 female wild spawner	Age 4 male broodstock	Age 4 male wild spawner
Mean FL (mm)	630	624	695	684	673	676	734	726
Stdev	29	32	46	46	33	33	50	42
N	140	199	148	184	85	95	67	108
95% CI	630 +/- 4.8	624 +/- 4.4	695 +/- 7.5	684 +/- 6.7	673 +/- 7.1	676 +/- 6.8	734 +/- 12.2	726 +/- 8

	Age 3 female supp origin	Age 3 female NOR	Age 3 male supp origin	Age 3 male NOR	Age 4 female supp origin	Age 4 female NOR	Age 4 male supp origin	Age 4 male NOR
Mean FL (mm)	637	619	695	686	710	674	710	731
Stdev	31	30	41	45	N/A	31	N/A	36
N	59	139	62	130	1	80	1	75
95% CI	637 +/- 8.1	619 +/- 5	695 +/- 10.4	686 +/- 7.9	N/A	674 +/- 6.9	N/A	731 +/- 8.3

Chimacum Creek

Broodstock collection for Chimacum project was at Salmon Creek. See Salmon Creek table for comparison.

	Age 3 female supp origin	Age 3 female NOR	Age 3 male supp origin	Age 3 male NOR	Age 4 female supp origin	Age 4 female NOR	Age 4 male supp origin	Age 4 male NOR
Mean FL (mm)	616	638	669	678	668	665	706	714
Stdev	31	33	35	54	37	43	52	31
N	20	57	34	86	19	18	32	22
95% CI	616 +/- 14.5	638 +/- 8.7	669 +/- 12.3	678 +/- 11.6	668 +/- 17.9	665 +/- 21.2	706 +/- 18.6	714 +/- 13.7

Table AR3- 1, continued. Means, standard deviations, sample sizes, and 95% confidence intervals for fork lengths (mm) of summer chum sampled by program, age, and sex, for broodstock vs. natural spawners (where applicable), and supplementation-origin vs. natural-origin fish.

Big Beef Creek

	Age 3 female broodstock	Age 3 female wild spawner	Age 3 male broodstock	Age 3 male wild spawner	Age 4 female broodstock	Age 4 female wild spawner	Age 4 male broodstock	Age 4 male wild spawner
Mean	641	656	687	714	673	685	732	747
Stdev	36	35	45	42	40	30	41	45
N	103	194	111	251	36	36	27	72
95% CI	641 +/- 7	656 +/- 5	687 +/- 8.4	714 +/- 5.2	673 +/- 13.5	685 +/- 10.2	732 +/- 16.4	747 +/- 10.5

Insufficient Natural-origin returns to Big Beef for comparison of natural- vs supplementation-origin lengths.

Dosewallips

	Age 3 female supp origin	Age 3 female NOR	Age 3 male supp origin	Age 3 male NOR	Age 4 female supp origin	Age 4 female NOR	Age 4 male supp origin	Age 4 male NOR
Mean	641	635	715	702	692	687	759	761
Stdev	43	31	41	43	34	32	50	35
N	27	101	26	134	44	211	36	285
95% CI	641 +/- 17.1	635 +/- 6.1	715 +/- 16.8	702 +/- 7.3	692 +/- 10.3	687 +/- 4.4	759 +/- 17	761 +/- 4.1

Duckabush

	Age 3 female supp origin	Age 3 female NOR	Age 3 male supp origin	Age 3 male NOR	Age 4 female supp origin	Age 4 female NOR	Age 4 male supp origin	Age 4 male NOR
Mean	638	652	701	696	679	690	748	754
Stdev	36	44	39	39	38	31	41	41
N	24	72	36	108	53	252	43	279
95% CI	638 +/- 15.3	652 +/- 10.3	701 +/- 13.2	696 +/- 7.5	679 +/- 10.5	690 +/- 3.8	748 +/- 12.5	754 +/- 4.9

APPENDIX REPORT 4

Summer Chum Harvest Management Performance Assessments for Individual Management Units

Table AR4-1. Estimated versus actual abundances, escapements, and exploitation rates for Hood Canal summer chum from the Sequim Bay Management Unit, 2000 through 2004.

	2000	**2001**	**2002**	**2003**	**2004**
Preseason Abundance Forecast	82	56	112	92	202
Post Season Estimate of Abundance	55	262	42	450	1,665
Forecast Error (Percent over / under observed)	48.5%	-78.6%	165.7%	-79.5%	-87.9%
Preseason Escapement Rate Target	91.2%	91.2%	91.2%	91.2%	91.2%
Post Season Escapement Rate	99.6%	99.3%	99.6%	99.2%	99.8%
Preseason Expected Escapement	75	51	102	84	184
Post Season Escapement Estimate	55	260	42	446	1,662
Expected Preterminal & Terminal Exploitation	8.8%	8.8%	8.8%	8.8%	8.8%
Expected Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%
Estimated Preterminal and Terminal Exploitation	0.4%	0.7%	0.4%	0.8%	0.2%
Estimated Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%

Table AR4-2. Estimated versus actual abundances, escapements, and exploitation rates for Hood Canal summer chum from the Discovery Bay Management Unit, 2000 through 2004.

	2000	2001	2002	2003	2004
Preseason Abundance Forecast	710	885	1356	2573	3939
Post Season Estimate of Abundance	879	2,811	6,072	6,004	6,430
Forecast Error (Percent over / under observed)	-19.3%	-68.5%	-77.7%	-57.1%	-38.7%
Preseason Escapement Rate Target	91.2%	91.2%	91.2%	91.2%	91.2%
Post Season Escapement Rate	99.6%	99.3%	99.6%	99.2%	99.8%
Preseason Expected Escapement	648	807	1,237	2,347	3,592
Post Season Escapement Estimate	876	2,792	6,049	5,955	6,417
Expected Preterminal & Terminal Exploitation	8.8%	8.8%	8.8%	8.8%	8.8%
Expected Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%
Estimated Preterminal and Terminal Exploitation	0.4%	0.7%	0.4%	0.8%	0.2%
Estimated Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%

Table AR4-3. Estimated versus actual abundances, escapements, and exploitation rates for Hood Canal summer chum from the Port Townsend (Chimacum) Management Unit, 2000 through 2004.

	2000	2001	2002	2003	2004
Preseason Abundance Forecast	na	na	333	467	598
Post Season Estimate of Abundance	52	909	867	563	1,141
Forecast Error (Percent over / under observed)	na	na	-61.6%	-17.0%	-47.6%
Preseason Escapement Rate Target	91.2%	91.2%	91.2%	91.2%	91.2%
Post Season Escapement Rate	99.6%	99.3%	99.6%	99.2%	99.8%
Preseason Expected Escapement	na	na	304	426	545
Post Season Escapement Estimate	52	903	864	558	1,139
Expected Preterminal & Terminal Exploitation	8.8%	8.8%	8.8%	8.8%	8.8%
Expected Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%
Estimated Preterminal and Terminal Exploitation	0.4%	0.7%	0.4%	0.8%	0.2%
Estimated Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%

Table AR4-4. Estimated versus actual abundances, escapements, and exploitation rates for Hood Canal summer chum from the Quilcene/Dabob Bays Management Unit, 2000 through 2004.

	2000	2001	2002	2003	2004
Preseason Abundance Forecast	3,945	5,396	5,230	5,974	8,396
Post Season Estimate of Abundance	6,704	7,595	6,050	12,863	63,167
Forecast Error (Percent over / under observed)	-41.2%	-29.0%	-13.6%	-53.6%	-86.7%
Preseason Escapement Rate Target	67.4%	67.4%	67.4%	67.4%	67.4%
Post Season Escapement Rate	88.0%	83.9%	74.2%	99.0%	60.4%
Preseason Expected Escapement	2,657	3,634	3,522	4,023	5,655
Post Season Escapement Estimate	5,898	6,373	4,487	12,733	38,153
Expected Preterminal & Terminal Exploitation	10.2%	10.2%	10.2%	10.2%	10.2%
Expected Additional Extreme Terminal Exploitation	22.5%	22.5%	22.5%	22.5%	22.5%
Estimated Preterminal and Terminal Exploitation	1.5%	1.7%	2.0%	0.9%	0.2%
Estimated Additional Extreme Terminal Exploitation	10.5%	14.4%	23.8%	0.2%	39.6%

Table AR4-5. Estimated versus actual abundances, escapements, and exploitation rates for Hood Canal summer chum from the Mainstem Hood Canal Management Unit, 2000 through 2004.

	2000	2001	2002	2003	2004
Preseason Abundance Forecast	2,601	1,057	1,941	3,320	5,907
Post Season Estimate of Abundance	2,035	4,248	6,220	11,142	25,889
Forecast Error (Percent over / under observed)	27.8%	-75.1%	-68.8%	-70.2%	-77.2%
Preseason Escapement Rate Target	89.1%	89.1%	89.1%	89.1%	89.1%
Post Season Escapement Rate	98.5%	98.3%	98.0%	99.2%	99.8%
Preseason Expected Escapement	2,317	942	1,729	2,958	5,263
Post Season Escapement Estimate	2,005	4,177	6,095	11,047	25,834
Expected Preterminal & Terminal Exploitation	10.9%	10.9%	10.9%	10.9%	10.9%
Expected Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%
Estimated Preterminal and Terminal Exploitation	1.5%	1.7%	2.0%	0.8%	0.0%
Estimated Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.0%

Table AR4-6. Estimated versus actual abundances, escapements, and exploitation rates for Hood Canal summer chum from the Southeast Hood Canal Management Unit, 2000 through 2004.

	2000	2001	2002	2003	2004
Preseason Abundance Forecast	442	418	675	834	2,074
Post Season Estimate of Abundance	757	1,516	890	12,019	5,997
Forecast Error (Percent over / under observed)	-41.6%	-72.4%	-24.1%	-93.1%	-65.4%
Preseason Escapement Rate Target	87.4%	87.4%	87.4%	87.4%	87.4%
Post Season Escapement Rate	98.5%	98.3%	98.0%	99.2%	99.7%
Preseason Expected Escapement	386	365	590	729	1,813
Post Season Escapement Estimate	746	1,491	872	11,916	5,984
Expected Preterminal & Terminal Exploitation	10.9%	10.9%	10.9%	10.9%	10.9%
Expected Additional Extreme Terminal Exploitation	1.7%	1.7%	1.7%	1.7%	1.7%
Estimated Preterminal and Terminal Exploitation	1.5%	1.7%	2.0%	0.9%	0.0%
Estimated Additional Extreme Terminal Exploitation	0.0%	0.0%	0.0%	0.0%	0.2%

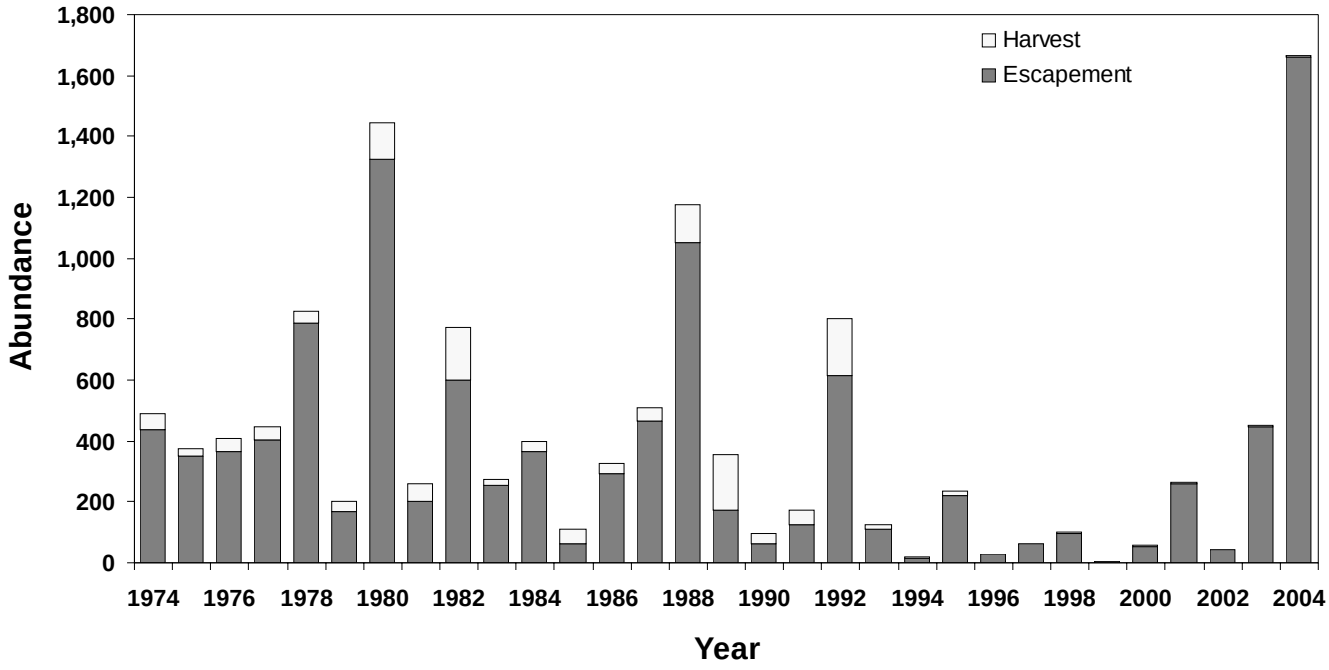


Figure AR4-1. Summer chum annual abundance (escapement + harvest) for the Sequim Bay management unit, 1974-2004.

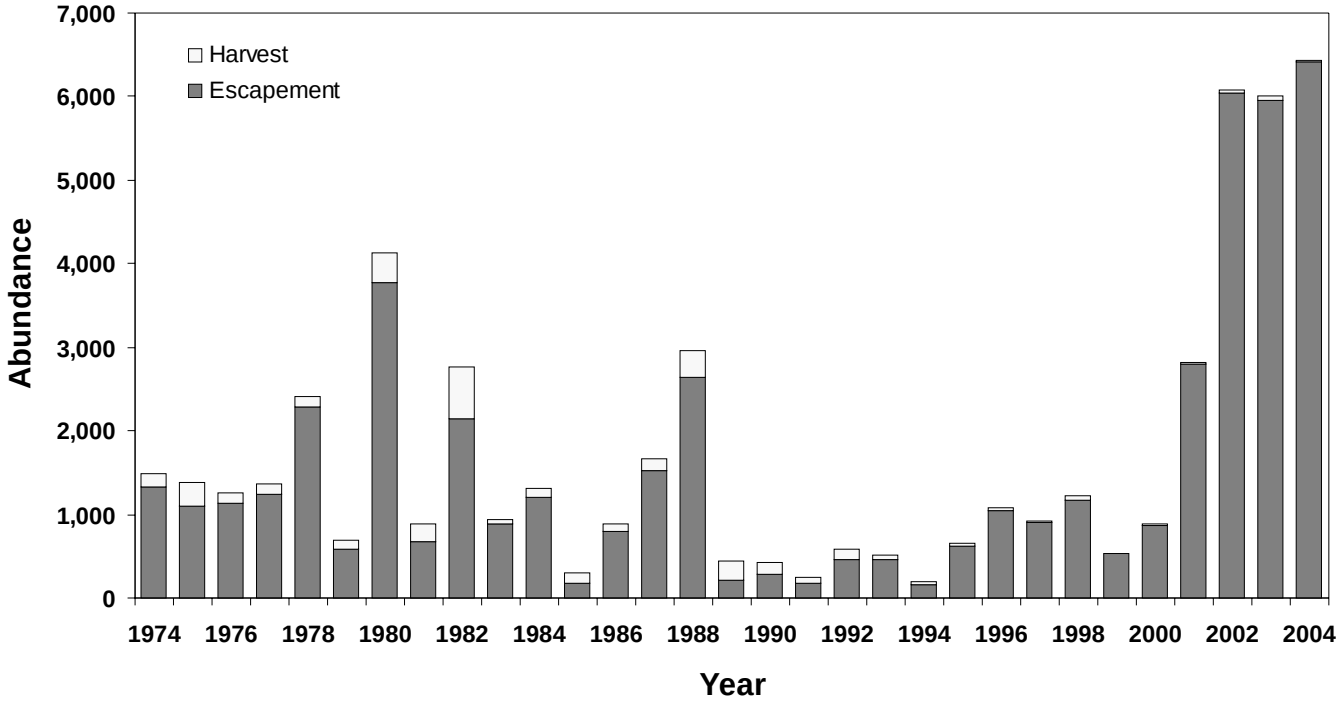


Figure AR4-2. Summer chum annual abundance (escapement + harvest) for the Discovery Bay management unit, 1974-2004.

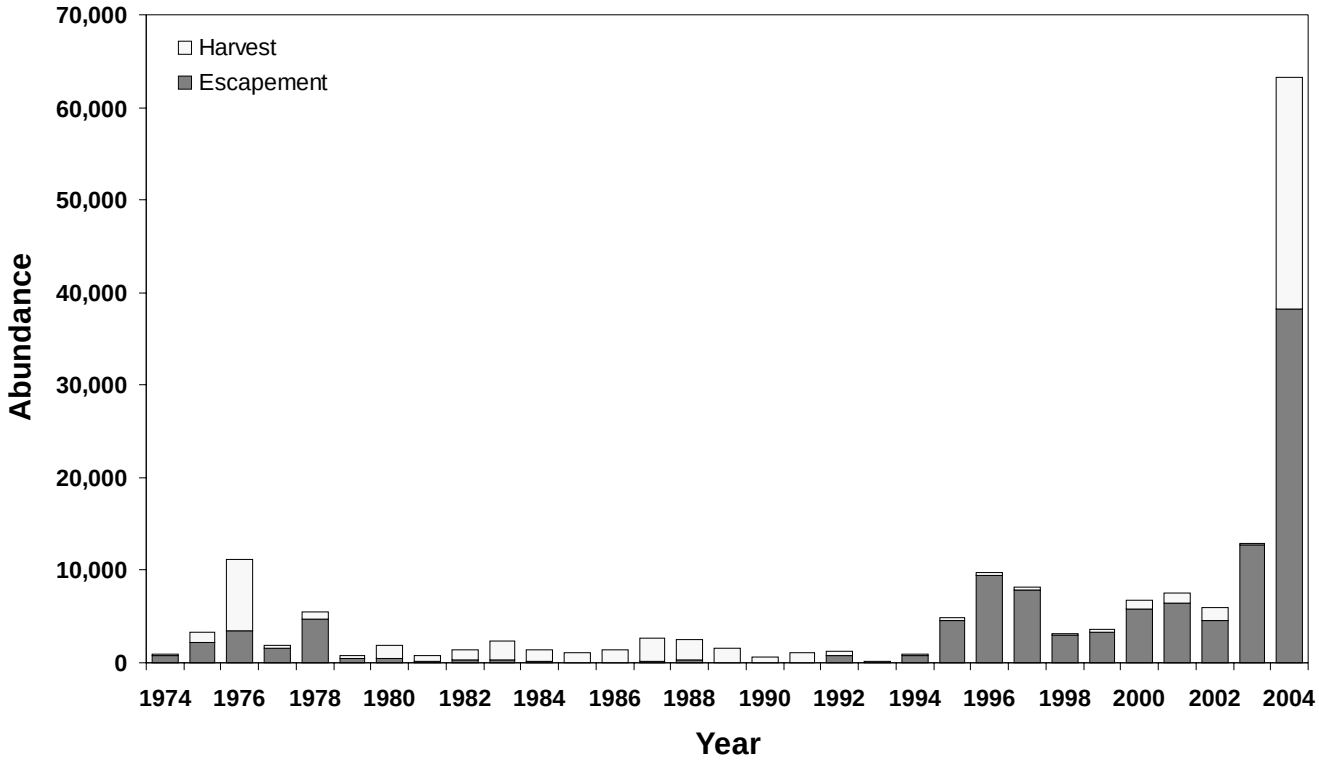


Figure AR4-3. Summer chum annual abundance (escapement + harvest) for the Quilcene/Dabob Bays management unit, 1974-2004.

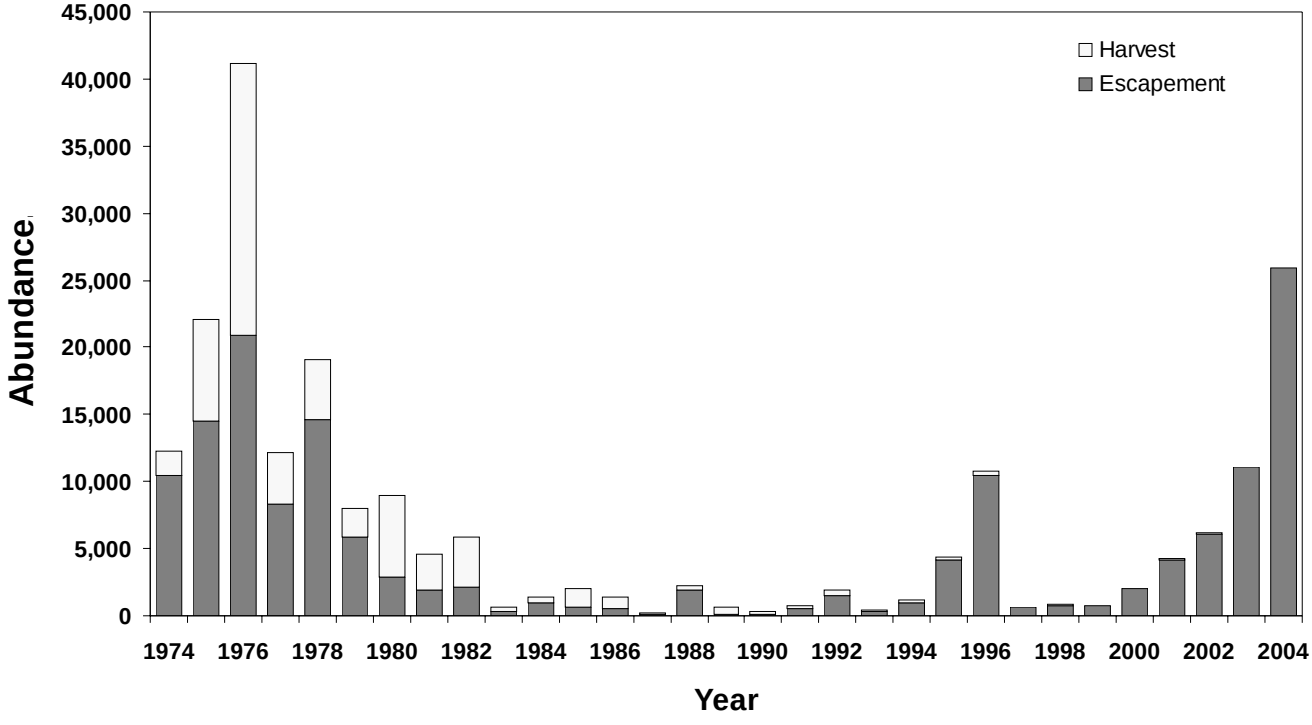


Figure AR4-4. Summer chum annual abundance (escapement + harvest) for the Mainstem Hood Canal management unit, 1974-2004

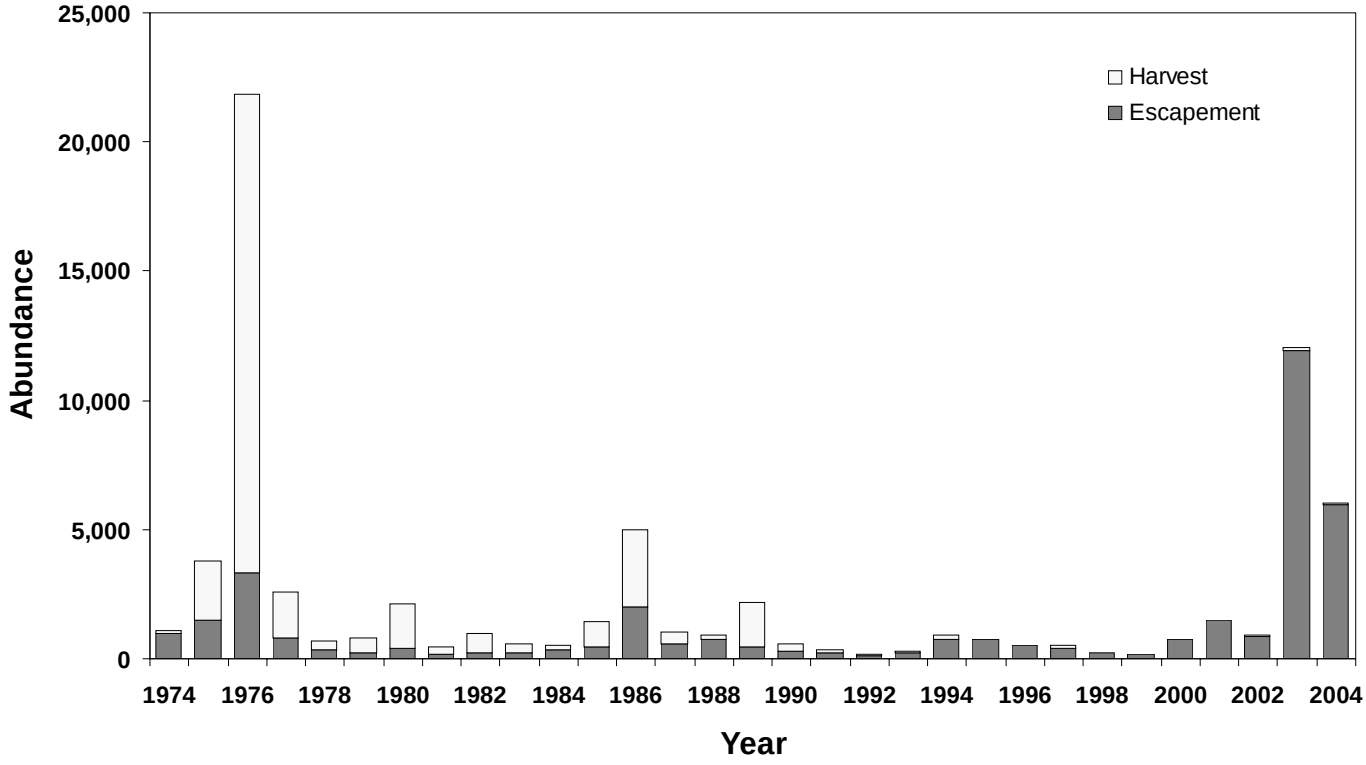


Figure AR4-5. Summer chum annual abundance (escapement + harvest) for the Southeast Hood Canal management unit, 1974-2004.

APPENDIX REPORT 5

Status of Artificial Production Programs in Meeting Specified Mitigation Measures to Reduce Risk of Negative Interactions With Summer Chum Salmon in 2003 and 2004

The Summer Chum Salmon Conservation Initiative (section 3.3.2.1) specifies risk aversion and monitoring/evaluation measures to be met by artificial production programs that have medium to high risk of hazards affecting summer chum. These mitigation measures are described in four categories: hatchery operations, predation, competition and behavior modification, and fish disease transfer. Following is a progress report on the status of the artificial production programs in meeting the mitigation measures in 2003 and 2004. Unless otherwise specified, the below comments on status apply to both years. The status of mitigation measures for years 1999 – 2000 and 2001 - 2002 was reported in Supplementation Reports Nos. 3 and 4, respectively (WDFW and PNPTT 2001, 2003).

The artificial production programs and mitigation measures are presented in the following format.

Species
Project
Sponsor
Release Class
Hazard Category
Mitigation Measures
Status

The order of artificial production programs (projects) and the specified mitigation measures follow the order of information shown in Table 5-1 that summarizes the status of mitigation measures in the main body of the present report. The risk aversion and monitoring/evaluation measures are represented by the abbreviations "r.a." and "m&e", respectively. The symbols "(**Y**)", "(**N**)", "(**Y/N**)" and "(**NA**)" are used in describing status of the mitigation measures and indicate (**Y**)es, (**N**)o , (**Y**)es and (**N**)o, or (**N**)ot (**A**)pplicable with respect to implementation of the measures. The (**Y/N**) designation means the measure was only partially implemented. Explanatory comments regarding implementation of the measures for the specific projects are provided in the following project status reports.

Fall Chinook Salmon

Project: Big Beef Creek Chinook
Sponsors: University of Washington (UW) and Hood Canal Salmon Enhancement Group (HCSEG) with WDFW
Release Class: Fingerling – Note: Following is applicable to release year 2003 only. Program was terminated and no further releases occurred after 2003.

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring
m&e #4: Recording of fish production (release data)
m&e #5: NPDES permit effluent monitoring

Status:

m&e #3: (**Y/N**) Certification of brood stocks conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**Y**) Fish production was recorded and reported to WDFW but report was delayed.
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**Y**) Fish production was recorded and reported to WDFW but report was delayed.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a #4: Capture 100% of returning fall chinook to reduce risk of spawning ground space competition with summer chum.
m&e #1: Monitor returning fall chinook that spawn naturally for impact on summer chum.

Status:

r.a #4: (**Y**) Report on disposition of Chinook provided to WDFW but report was delayed.
m&e #1: (**Y**) Monitoring completed and reported to WDFW but report was delayed.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.
r.a #2: Follow Co-managers' salmonid disease control policy.
r.a #3: Fish health certification before release.

Project: Big Beef Creek Chinook (cont.)

r.a #4: Release fish in healthy condition.
m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals (same as r.a #1).
m&e #2: Report fish health and condition.

Status:

r.a #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Skokomish R. Chinook (Enhancement Group)

Sponsors: HCSEG/WDFW/Long Live the Kings
Release Classes: Yearling

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring.
m&e #4: Recording of fish production (release data).
m&e #5: NPDES permit effluent monitoring.

Status:

m&e #3: (**Y**) Certification of brood stock conducted in WDFW Virology Lab. Yearling fish health checked prior to release.
m&e #4: (**Y**) Fish production recoded and reports submitted to WDFW.
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**Y**) Fish production recorded and reports submitted to WDFW.

Project: Skokomish R. Chinook (Enhancement Group) (cont.)

Competition and Behavior Modification:

Specified Mitigation Measure:

m&e #1: Monitor returning fall chinook that spawn naturally for impact on summer chum.

Status:

m&e #1: (**Y**) Potential effects require more information on status of Skokomish summer chum stock.

Disease Transfer

Specified Mitigation Measures:

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

m&e #2: Report fish health and condition.

Status:

m&e #1: (**Y**) Certification of brood stock conducted in WDFW Virology Lab. Yearling fish health checked prior to release.

m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Hamma Hamma R. Chinook

Sponsors: HCSEG/WDFW

Release Classes: Fingerling

Hatchery Operations

Specified Mitigation Measures:

r.a. #4: Handling and holding of brood stock minimized.

r.a. #6: Brood stocking and hatchery operations consistent with provisions of the SCSCI.

m&e #1: Daily recording of numbers captured , disposition and mortalities during adult trapping operations. Provide data reports to WDFW.

m&e #2: Record keeping of brood stocking. Provide reports to WDFW.

m&e #3: Fish health monitoring.

m&e #4: Recording of fish production (release data).

m&e #5: NPDES permit effluent monitoring.

Status:

r.a. #4: (**Y**) Trapping of returning adults was effective with low impact.

r.a. #6: (**Y**) Operations consistent with SCSCI.

m&e #1: (**Y**) Records kept and provided to WDFW.

m&e #2: (**Y**) Records kept and provided to WDFW.

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #4: (**Y**) Fish production recorded and reported to WDFW.

m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Project: Hamma Hamma R. Chinook (cont.)

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**Y**) Report submitted to WDFW.

Competition and Behavior Modification:

Specified Mitigation Measure:

m&e #1: Monitor returning fall chinook that spawn naturally for impact on summer chum.

Status:

m&e #1: (**Y**) Information submitted to WDFW.

Disease Transfer

Specified Mitigation Measures:

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

m&e #2: Report fish health and condition.

Status:

m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Dungeness Fish Hatchery Chinook

Sponsors: WDFW

Release Classes: Fingerling, Yearling

Predation

Specified Mitigation Measure:

m&e #2: Monitor chinook survival rates, distribution within stream and potential predation effects on summer chum.

Status:

m&e #2: (**Y**) Survival rates monitored by CWTs and or otolith marks. Distribution within river is assessed by fin clips and also through Jamestown S'Klallam Tribe's life history studies.

Potential predation effects require more information on status of Dungeness summer chum stock.

Coho Salmon

Project: Port Gamble Net Pens Coho
Sponsors: Port Gamble S'Klallam Tribe with WDFW and USFWS
Release Classes: Yearling
Competition and Behavior Modification:
Specified Mitigation Measure:
r.a. #7: Acclimate coho to release site.
Status:
r.a. #7: (**Y**) Coho were acclimated to the Port Gamble site for at least three months before release.

Project: Quilcene Net Pens Coho
Sponsors: Skokomish Tribe with WDFW and USFWS
Release Classes: Yearling
Competition and Behavior Modification:
Specified Mitigation Measure:
r.a. #7: Acclimate coho to release site.
Status:
r.a. #7: (**Y**) Coho were acclimated to the Quilcene Bay site for at least three months before release.

Project: Snow Creek Coho
Sponsor: WDFW
Release Classes: Unfed Fry, Pre-smolts
Predation
Specified Mitigation Measure:
m&e #2: Monitor coho survival rates, distribution within stream and potential predation effects on summer chum.
Status:
m&e #2: (**Y**) Survival rates monitored by CWTs and/or otolith marks. Fry releases from RSIs monitored for distribution in stream and at trap at RM 0.8 as smolts. Potential predation effects of coho smolts on summer chum not monitored, but presumed to be minimal due to differential outmigration timing of coho smolts (mid-April through May) vs. summer chum (March-April).
Competition and Behavior Modification:
Specified Mitigation Measure:
m&e #3: Monitor coho survival rates, distribution within stream and potential competition effects on summer chum.
Status:
m&e #3: (**Y**) Survival rates monitored by CWTs and/or otolith marks. Fry releases from RSIs monitored for distribution in stream and at trap at RM 0.8 as smolts. Potential predation effects of coho smolts on summer chum not monitored, but presumed to be minimal due to differential outmigration timing of coho smolts (mid-April through May) vs. summer chum (March-April).

Pink Salmon

Project: Hoodsport Fish Hatchery Pink
Sponsor: WDFW
Release Classes: Fed Fry
Predation
Specified Mitigation Measure:
r.a. #4: Release pink fry after April 1 to reduce risk of predator attraction to summer chum fry in estuarine areas.
Status:
r.a #4: (**Y**) Pink fry released after April 1.
Competition and Behavior Modification:
Specified Mitigation Measure:
r.a.#1&#2: No pink release (fed or unfed fry) before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.
Status:
r.a. #1&#2: (**Y**) All pink fry released after April 1.

Fall Chum Salmon

Project: Hoodsport Fish Hatchery Fall Chum
Sponsor: WDFW
Release Classes: Fed Fry
Predation
Specified Mitigation Measure:
r.a. #4: Release fall chum fry after April 1 to reduce risk of predator attraction to summer chum fry in estuarine areas.
Status:
r.a #4: (**Y**) Fall chum fry released after April 1.
Competition and Behavior Modification:
Specified Mitigation Measures:
r.a.#1&#2: No fall chum release (fed or unfed fry) before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.
Status:
r.a. #1&#2: (**Y**) All fall chum fry released after April 1.

Project: McKernan Fish Hatchery Fall Chum
Sponsor: WDFW
Release Classes: Fed Fry
Predation
Specified Mitigation Measure:
r.a. #4: Release fall chum fry after April 1 to reduce risk of predator attraction to summer chum fry in estuarine areas.
Status:
r.a #4: (**Y**) Fall chum fry released after April 1.

Project: McKernan Fish Hatchery Fall Chum (cont.)

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a.#1&#2: No fall chum release (fed or unfed fry) before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

Status:

r.a. #1&#2: (**Y**) All fall chum fry released after April 1.

Project: Sweetwater Creek Fall Chum

Sponsor: HCSEG/WDFW

Release Classes: Unfed Fry

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring

m&e #4: Recording of fish production (release data)

m&e #5: NPDES permit effluent monitoring

Status:

m&e #3: (**Y/N**) Certification of brood stocks conducted in WDFW Virology Lab. Fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #4: (**Y**) Data recorded and report describing fish production provided to WDFW but was delayed.

m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**Y**) Data recorded and report describing fish production submitted to WDFW but was delayed.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a. #2: No fall chum release before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

m&e #2: Monitor timing of emergence and numbers of fry released

Status:

r.a. #2: (**Y**) All fall chum fry released after April 1.

m&e #2: (**Y**) Timing and numbers of fry released monitored and reported to WDFW but report was delayed.

Project: Sweetwater Creek Fall Chum (cont.)

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

r.a #2: Follow Co-managers' salmonid disease control policy.

r.a #3: Fish health certification before release.

r.a #4: Release fish in healthy condition.

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals (same as r.a #1).

m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Unnamed Creek 14.01xx near Union (Grimm) Fall Chum

Sponsor: HCSEG/WDFW

Release Classes: Unfed Fry

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring

m&e #4: Recording of fish production (release data)

m&e #5: NPDES permit effluent monitoring

Status:

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #4: (**Y**) Fish production recorded and reported to WDFW but report was delayed.

m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Project: Unnamed Creek 14.01xx near Union (Grimm) Fall Chum (cont.)

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**Y**) Fish production recorded and reported to WDFW but report was delayed.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a. #2: No fall chum release before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

m&e #2: Monitor timing of emergence and numbers of fry released

Status:

r.a. #2: (**Y**) All fall chum fry released after April 1.

m&e #2: (**Y**) Timing and numbers of fry released monitored and reported to WDFW but report was delayed.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

r.a #2: Follow Co-managers' salmonid disease control policy.

r.a #3: Fish health certification before release.

r.a #4: Release fish in healthy condition.

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals (same as r.a #1).

m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Unnamed Creek 14.01xx near Union (Mulberg) Fall Chum

Sponsor: HCSEG/WDFW

Release Classes: Unfed Fry

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring

m&e #4: Recording of fish production (release data)

m&e #5: NPDES permit effluent monitoring.

Status:

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #4: (**Y**) fish production recorded and report provided to WDFW but report was delayed.

m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**Y**) Fish production recorded and reported to WDFW but report was delayed.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a. #2: No fall chum release before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

m&e #2: Monitor timing of emergence and numbers of fry released

Status:

r.a. #2: (**Y**) All fall chum fry released after April 1.

m&e #2: (**Y**) Timing and numbers of fry released monitored and reported to WDFW but report was delayed.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of juvenile fish health by fish health professionals.

r.a #2: Follow Co-managers' salmonid disease control policy.

r.a #3: Fish health certification before release.

r.a #4: Release fish in healthy condition.

m&e #1: Monitoring and evaluation of juvenile fish health by fish health professionals (same as r.a #1).

m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

Project: Unnamed Creek 14.01xx near Union (Mulberg) Fall Chum (cont.)

r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.
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Project: Unnamed Creek 14.0136 (Hood Canal Schools) Fall Chum

Sponsor: HCSEG/WDFW
Release Classes: Unfed Fry

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring
m&e #4: Recording of fish production (release data)
m&e #5: NPDES permit effluent monitoring

Status:

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**Y**) Fish production recorded and reported WDFW but report was delayed.
m&e #5: **(NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**Y**) Fish production recorded and reported to WDFW but report was delayed.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a. #2: No fall chum release before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.
m&e #2: Monitor timing of emergence and numbers of fry released

Status:

r.a. #2: (**Y**) All fall chum fry released after April 1.
m&e #2: (**Y**) Timing and numbers of fry released monitored and reported to WDFW but report was delayed.

Project: Unnamed Creek 14.0136 (Hood Canal Schools) Fall Chum (cont.)

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

r.a #2: Follow Co-managers' salmonid disease control policy.

r.a #3: Fish health certification before release.

r.a #4: Release fish in healthy condition.

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals (same as r.a #1).

m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Steelhead

Project: Skokomish R. Steelhead

Sponsor: WDFW

Release Classes: Yearling Note: Program was terminated and no further releases occurred after 2004.

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.

r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.

r.a. #3: Volitionally-migrating and acclimated releases.

Status:

r.a. #1: (**Y**) Yearlings released after April 15.

r.a. #2: (**Y**) No fry, fingerlings or sub-yearlings released.

r.a. #3: (**Y**) Volitionally-migrating and acclimated yearlings released.

Project: Dosewallips R. Steelhead
Sponsor: WDFW
Release Classes: Yearling Note: Program was terminated and no further releases occurred after 2003

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.

r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.

r.a. #3: Volitionally-migrating and acclimated releases.

Status:

r.a. #1: (**Y**) Yearlings released after April 15.

r.a. #2: (**Y**) No fry, fingerlings or sub-yearlings released.

r.a. #3: (**Y/N**) Volitionally-migrating yearlings released. No facilities for acclimation exist.

Project: Duckabush R. Steelhead
Sponsor: WDFW
Release Classes: Yearling Note: Program was terminated and no further releases occurred after 2003

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.

r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.

r.a. #3: Volitionally-migrating and acclimated releases.

Status:

r.a. #1: (**Y**) Yearlings released after April 15.

r.a. #2: (**Y**) No fry, fingerlings or sub-yearlings released.

r.a. #3: (**Y/N**) Volitionally-migrating yearlings released. No facilities for acclimation exist.

Project Dungeness R. Steelhead
Sponsor: WDFW
Release Classes: Yearling

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.

r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.

r.a. #3: Volitionally-migrating and acclimated releases.

Project Dungeness R. Steelhead (cont)

Status:

r.a. #1: (**Y**) Yearlings released after April 15.
r.a. #2: (**Y**) No fry, fingerlings or sub-yearlings released.
r.a. #3: (**Y/N**) Volitionally-migrating yearlings released. No facilities for acclimation exist.

Project: Hamma Hamma R. Steelhead

Sponsors: HCSEG/Long Live the Kings/WDFW/NMFS

Release Classes: Two-year smolt – Releases from pond in John Cr. (trib. To Hamma Hamma R.) and from Lilliwaup Hatchery; releases occurred in 2003 but not 2004.

Hatchery Operations

Specified Mitigation Measures:

r.a. #4: Handling and holding of summer chum brood stock minimized.
r.a. #6: Brood stocking and hatchery operations consistent with provisions of the SCSCI.
m&e #1: Daily recording of numbers captured , disposition and mortalities during adult trapping operations. Provide data reports to WDFW.
m&e #2: Record keeping of brood stocking. Provide reports to WDFW.
m&e #3: Fish health monitoring
m&e #4: Recording of fish production (release data)
m&e #5: NPDES permit effluent monitoring

Status:

r.a. #4: (**Y**) Timing and approach (collecting portion of eggs from steelhead redds) does not affect summer chum.
r.a. #6: (**Y**) Operations consistent with SCSCI.
m&e #1: (**Y**) Records kept and provided to WDFW.
m&e #2: (**Y**) Records kept and provided to WDFW.
m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**Y**) Report submitted to WDFW.
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.
r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.
r.a. #3: Volitionally-migrating and acclimated releases.
m&e #1: Recording of fish production (release data)

Status:

r.a. #1: (**Y/N**) Two-year smolts were released after April 15. However, an estimated 80% of the smolts escaped early (March 2003) from the natural pond in John Creek (Berejikian et al. 2004).

Project: Hamma Hamma R. Steelhead (cont.)

r.a. #2: (**Y/N**) No fry, fingerlings or sub-yearlings were intended for release as part of program. However, an estimated 80% of the smolts escaped early (March 2003) from the natural pond in John Creek (Berejikian et al. 2004).

r.a. #3: (**Y**) Volitionally-migrating and acclimated yearlings released. However, as noted above, an estimated 80% of the smolts escaped early (March 2003) from the natural pond in John Creek.

m&e #1: (**Y**) Report submitted to WDFW.

Competition and Behavior Modification:

Specified Mitigation Measure:

m&e #3: Monitor smolts resulting from planting of indigenous fry and fingerlings for survival rates and for distribution within stream. Also, evaluate potential competition effects on summer chum.

Status:

m&e #3: (**NA**) No fry or fingerling steelhead intentionally released in stream.

Disease Transfer

Specified Mitigation Measures:

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

m&e #2: Report fish health and condition.

Status:

m&e #1: (**Y/N**) Certification of brood stocks conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.