

Comparison of Coho FRAM Base Period Averages

by

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Abstract

This report describes the results from averaging different sets of Cohort analyses for years used in calculation of the “base” data inputs for Coho salmon for the Fishery Regulation Assessment Model (FRAM). The Cohort analyses used in this project were developed using the Mixed Stock Model (MSM-VB) by the Pacific Salmon Commission Coho Technical Committee (TCCOHO, 2007). The current Coho FRAM base period was developed using the Cohort analyses for the 1986-1991 catch years which were estimated using an older set of software programs. The newer Cohort analyses were estimated with an integrated system and have estimates for 1986-1997 catch years.

The base period averages that are compared in this report include 1986-1991, 1986-1997, 1992-1997, 1986-1992, 1986-1991 without 1986 Upper Fraser, 1986-1992 without 1986 Upper Fraser, 1986-1997 without Upper Fraser, and years with and without Strait of Georgia outside migration. The comparisons focus mainly on the stocks of interest for the 2002 PSC Coho Agreement using the base runs for each of the different averages and the 2007 preseason Coho FRAM command file parameters with each of the base periods. Other Puget Sound stocks have also been included for assessments by regional and tribal biologists. The 2007 run comparisons show what the fishery and stock assessment analyses would have been for each of the base periods if that base period had been selected.

The comparisons show that most stocks had a slightly higher total exploitation rate for both the base period runs and the 2007 runs, but the differences were not large enough to have affected management decisions or most fishery regulations. Conservation concerns for Upper Fraser River (Thompson River) and Oregon Coast Natural (OCN) Coho stocks play a major role in the fishery regulation processes for both Canada and the United States. Some substantial differences were noted for both these stocks. The differences were due to updated escapement and distribution data and reflect the best data available for each stock.

The recommendation for selecting a new Coho FRAM base period average is to use the 1986-1992 without Upper Fraser 1986 because of the small differences noted, the suitability of the 1992 data compared to the 1986-1991 data, and the poor quality of the 1986 Upper Fraser data.

Methods

The Coho FRAM base period averages calculated for this report use the Pacific Salmon Commission (PSC) Coho Technical Committee (CoTC) Mixed Stock Model (MSM) Cohort analyses for the years 1986-1997 (TCCOHO, 2007). The averages were made using the Coho Base Period (CoBASE) program. CoBASE is a MS-Visual Basic program that allows the user to select and process any combination of years available. The output is a Coho FRAM base period file that contains initial Cohort sizes, exploitation rates, fishery-induced mortality rates, and natural mortality rates.

The base period averages calculated for this report include 1986-1991, 1986-1997, 1986-1992, 1986-1991 without 1986 Upper Fraser, 1986-1997 without 1986 Upper Fraser, 1986-1992 without 1986 Upper Fraser, and years with and without Strait of Georgia outside migration. Each of these base period files was run using base command files where all stock and fishery scalars are set to a default value of one and modified versions of the 2007 Coho FRAM command. The stock scalar values for each 2007 command file run were changed to reflect the different base period initial Cohort sizes. The command file fishery scalar values were not changed. Each of the command files was run using Terminal Area Management Module (TAMM) inputs as was done for the 2007 management process. The Coho FRAM output report "PSC Exploitation Rates" was produced for all runs for comparison and summarized in Tables 1-20.

Results

The exploitation rates for the stocks reviewed were very similar both the base period runs and the 2007 command file runs when compared to the results using the current Coho FRAM base period average. There were some significant differences for individual years and stocks, but generally the new base period and 2007 command file runs were within 5-10% of the current base period estimates. Some exceptions were noted for Queets River, Strait of Georgia, and Oregon Coast Natural stocks.

The initial Cohort sizes by stock for both the individual years and base period averages are also listed in Tables 1-20. There are many significant differences comparing the old base period estimates with the new estimates by year. This result was expected and reflects the new methodology for initializing the production expansion factors (PEF's) used in the Mixed Stock Model (MSM) Cohort analysis. The comparison of the final PEF values from the old base period with the new MSM analysis showed many of the original PEF values were unlikely. There were no data available for comparison when the old base period was developed to determine if the original PEF values were plausible estimates. The consistent methodology applied to the new MSM analyses for this study should result in better estimates.

The Puget Sound natural stocks of interest for PSC (Skagit, Stillaguamish, Snohomish, Hood Canal, and Strait of Juan de Fuca) showed consistent results compared to the current base period estimates of Cohort size and exploitation rates. The major differences

noted were for Stillaguamish and Snohomish Cohort sizes. The original PEF values were significantly higher than the estimates for the new analysis. The CWT recovery distribution for these stocks is very similar to the other Puget Sound stocks. The original MSM analysis tended to overestimate the Stillaguamish/Snohomish PEF values to get a better fit across all fisheries because many of the other Puget Sound PEF values were user-defined values. The new PEF estimates are closer to expansions expected from the RRTERM and smolt release estimates used in the new analysis.

The Washington coastal stocks of interest for PSC (Quillayute, Hoh, Queets, and Grays Harbor) also showed consistent results with the original base period estimates except for Queets. The 1986-1988 original PEF estimates for the Queets stock were much lower than those for the new analysis. The number of CWT fish released did not support the lower estimates for the original analysis. The non-local catch estimates (i.e. out-of-basin stock catches) for the Queets River net fishery were also lower in the new analysis.

The Columbia River stocks (Early, Late, and Young's Bay) had very consistent results when compared to the original analysis. This group of stocks is the largest component of the Washington and Oregon coastal regions, has consistently high CWT tagging rates, and contributes to ocean fisheries that are well sampled.

The Oregon Coastal Natural (OCN) stocks did not have results as consistent as other southern stocks in this analysis. The Cohort sizes and exploitation rates were higher for most years. The exploitation rates were significantly different for some of the Pacific Fishery Management Council (PFMC) fisheries in most of the years. The original PEF values for this stock were also very low compared to the new estimates. The OCN catch distribution is very similar to the Columbia River Early stock and the original MSM PEF estimates were easily confounded with the OCN estimates. The new PEF estimates better reflect the CWT release numbers but might require further analysis.

The Canadian stocks of interest for PSC (Lower Fraser, Upper Fraser, Georgia Strait Mainland, and Georgia Strait Vancouver Island) have significantly different Cohort sizes but very similar exploitation rates compared to the original analysis. The Upper Fraser stock differences are a result of new estimates of escapement and exploitation rates (Interior Fraser Coho Recovery Team. 2004). The new escapement estimates for 1986-1988 were substantially different from the original analysis. The PEF values for this stock were estimated using the escapement estimates and CWT recoveries so that the Cohort analysis matched the values from the recovery team report. The other stocks in this group significantly modified to match the expected total run sizes from each region. The escapement estimates for all of the Canadian stocks were calculated using index CWT exploitation rates which were applied to the MSM estimates of total catch. This was done because total production region escapement estimates are not available.

The other Canadian stocks (Southwest Vancouver Island, Northwest Vancouver Island, Johnstone Strait, Central Coast, and North Coast) showed the same general pattern of significantly different Cohort sizes and similar exploitation rates compared to the original analysis.

The results of the FRAM runs using the catch parameters from the 2007 PFMC final run with recalculated for stock scalars for each base period average were very similar to the results using the original base period average. The total exploitation rate estimates for the 1986-1991, 1986-1992, 1986-1991 without 1986 Upper Fraser, and 1986-1992 without 1986 Upper Fraser base period averages were lower for the southern United States stocks except for Skagit, Hood Canal, Queets, and Oregon Coast. All of the rates were within 5% of the final 2007 PFMC run. The results for the Canadian stocks were slightly higher and were within 2-3% of the final 2007 PFMC run. The results using the 1986-1997, 1992-1997, and 1986-1997 without 1986 Upper Fraser were generally higher than the other base period averages except for the Columbia River and Oregon Coast stocks. The differences were within 3-4% of the other averages. The final set of averages using the “inside” and “outside” migration years for Strait of Georgia stocks showed mixed results. These averages produced the largest differences compared to the original base period average. The “outside” average used the years with the lowest number of total CWT recoveries. These years also had the lowest Cohort sizes across all stocks and had limited fisheries compared to the other years. The results for the 1992-1997 and the “inside” and “outside” base runs are not shown in Tables 1-20 because of space requirements for the tables.

The MSM methodology is based on estimated CWT recoveries aggregated across stock groups and fisheries. The total number of estimated CWT recoveries by stock group and year for all fisheries are shown in Figure 1. The average number of recoveries by year for 1986-1991 is 250,404 and the average for 1992-1997 is 130,295. When 1992 is added to the first group the averages are 245,052 and 113,765. This large drop in recoveries is due to reduced fisheries because of management concerns for stocks with reduced abundance. Figures 2-6 show the total catch by selected fishery grouping for 1986-1997. All of the figures show significant drop in numbers across the years. The most dramatic differences were for Oregon Coastal Troll and Sport shown in Figure 2, Lower Columbia River Net and Sport shown in Figure 4, and Canadian Juan de Fuca Net shown in Figure 6. The catch years 1995-1997 have very low catch and CWT recovery information across all fisheries.

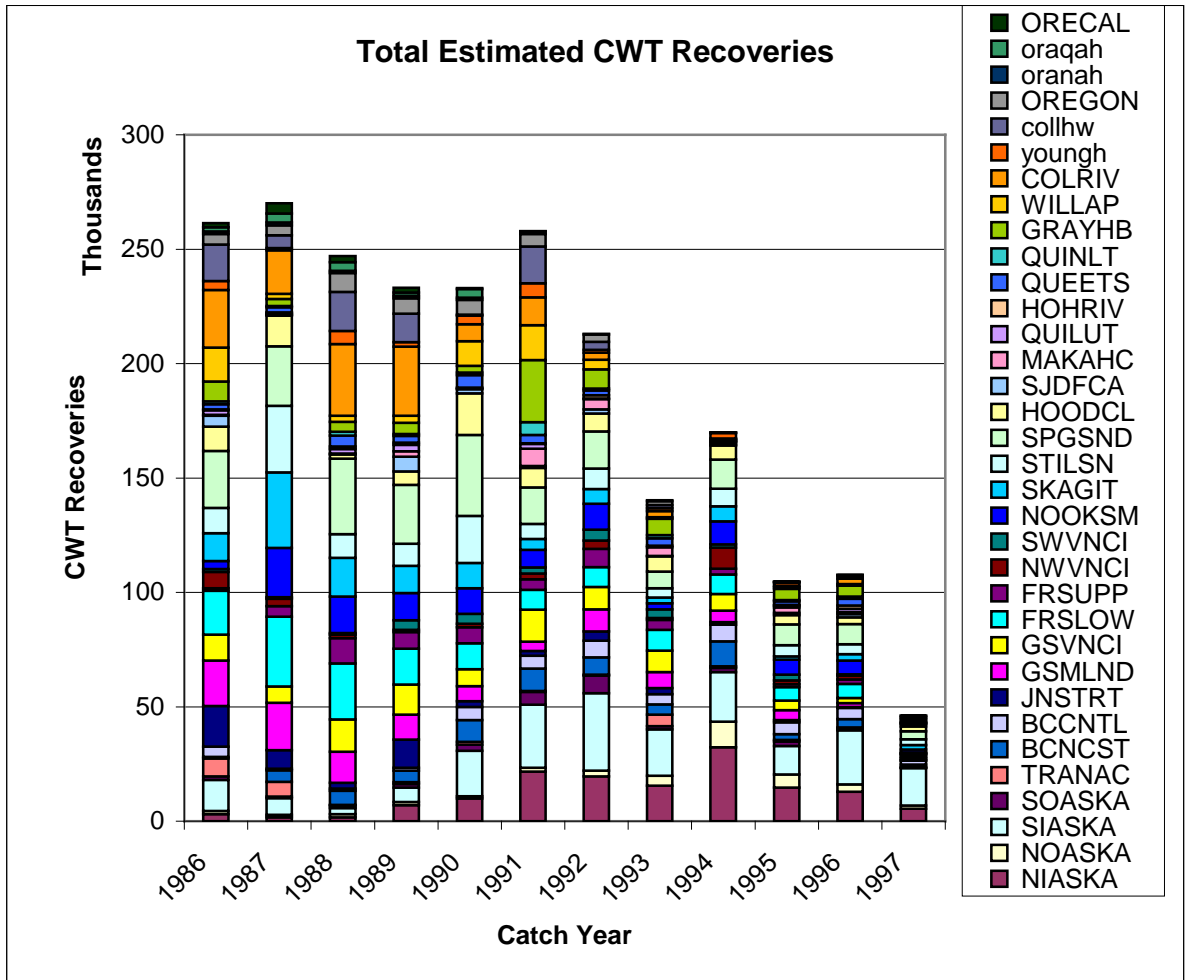


Figure 1. Total estimated coded-wire tag recoveries by stock groups for 1986-1997.

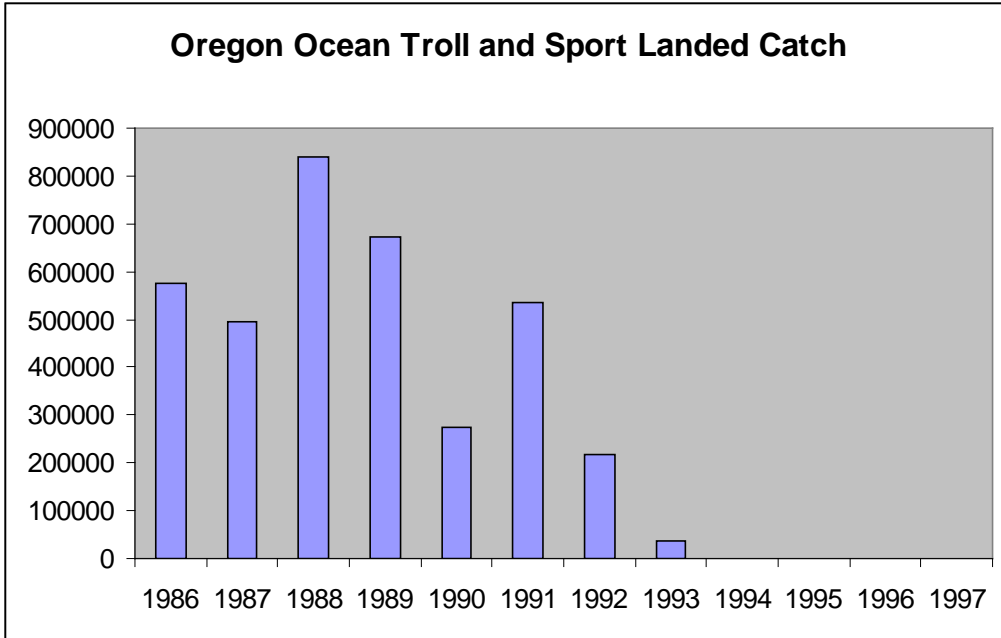


Figure 2. Total landed catch for Oregon coastal troll and sport fisheries, 1986-1997.

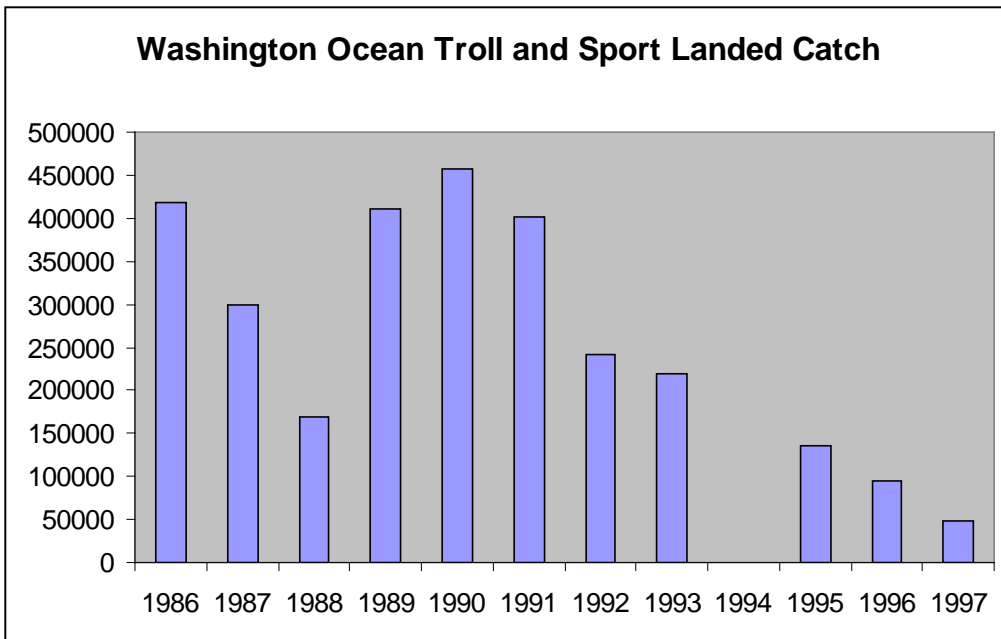


Figure 3. Total landed catch for Washington coastal troll and sport fisheries, 1986-1997.

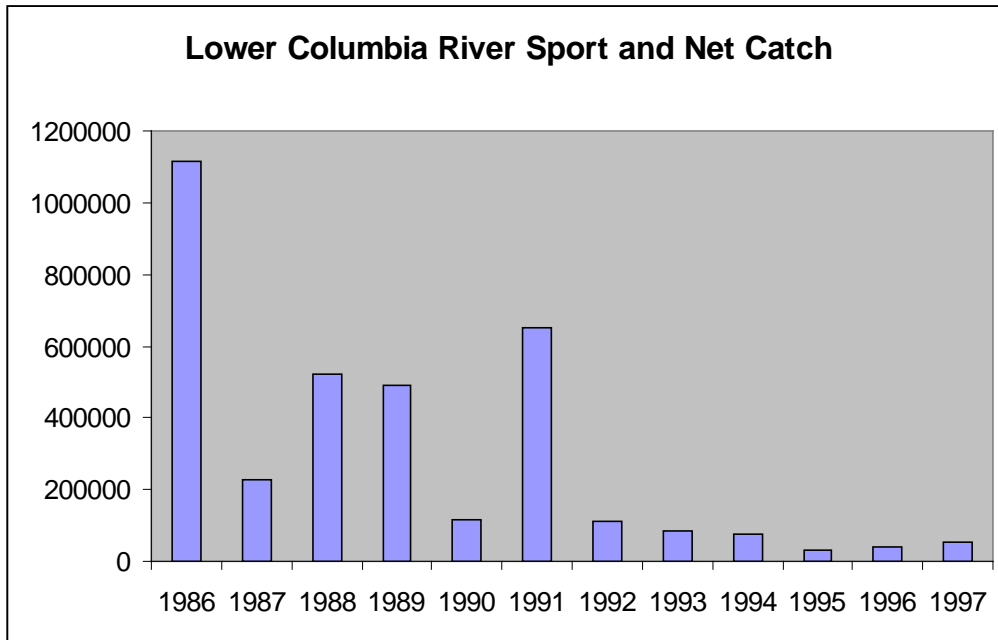


Figure 4. Total landed catch for lower Columbia River net and sport fisheries, 1986-1997.

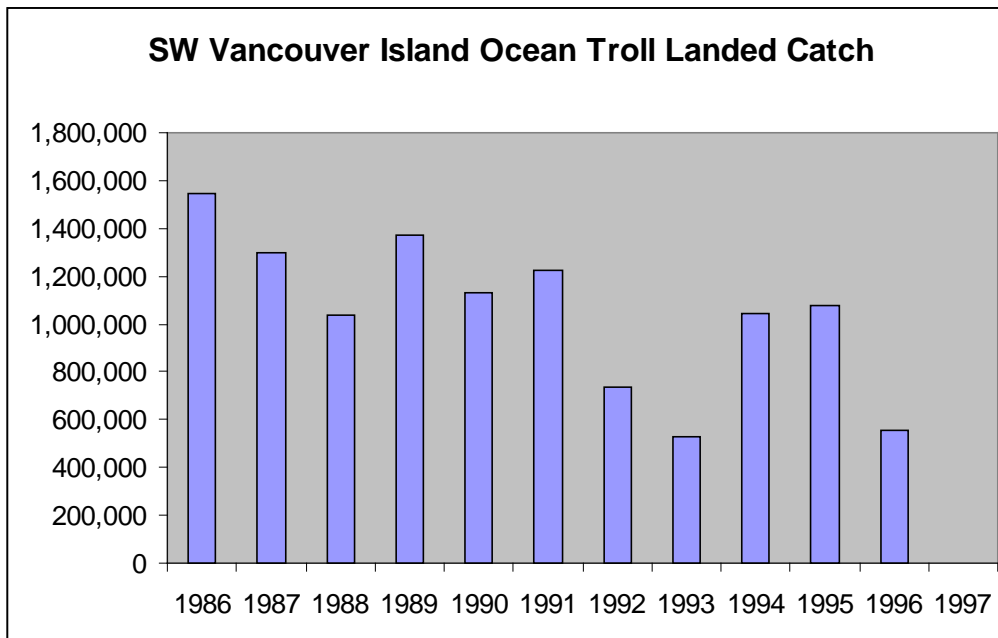


Figure 5. Total landed catch for SW Vancouver Island coastal troll fisheries, 1986-1997.

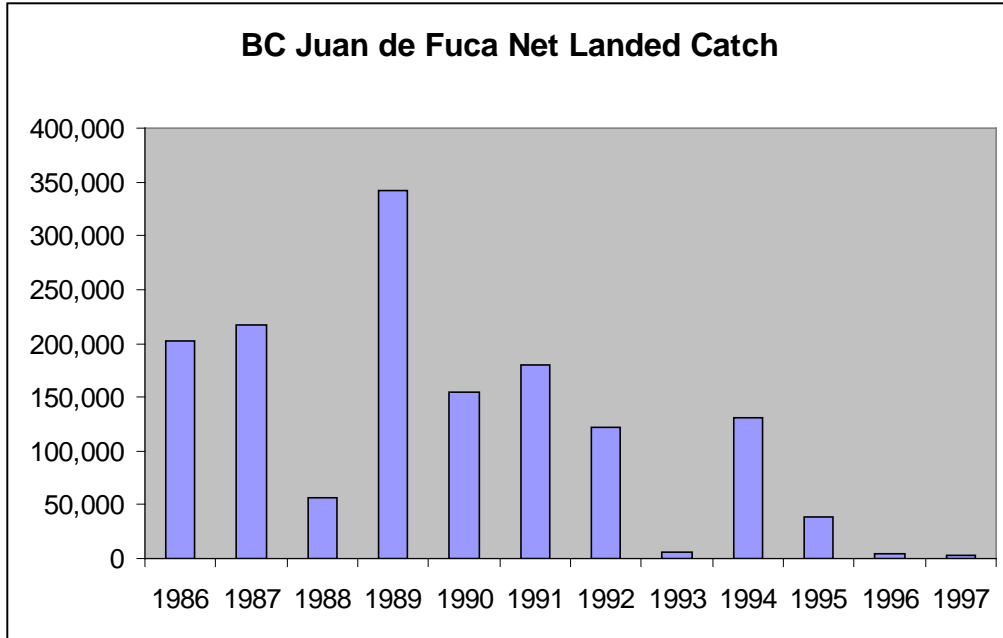


Figure 6. Total landed catch for Canadian Strait of Juan de Fuca net fisheries, 1986-1997.

Discussion

The purpose of this investigation was to determine if any significant errors existed in the original Coho FRAM base period average and to select a new average from the new data that were made available. The general pattern across all the comparisons is that the results were very consistent. The new MSM Cohort analyses had some significant changes for CWT recovery and catch-sample data, which resulted in important differences for some stocks and fisheries. These differences and base period average comparisons do not support a conclusion that one analysis or base period average is significantly better than any other. There are significant differences in total catch by fishery, total CWT recoveries, and cohort sizes by stock between the years. Using an arbitrary minimum criteria of 200,000 estimated CWT recoveries per year would exclude the 1993-1997 years from the base period average. The selection of 1986-1992 as the average is also supported by the coverage for most major fisheries during this period compared to the excluded years. This is especially true for the Washington, Oregon, and Columbia River fisheries as shown in Figures 2-4.

The stocks with current conservation concerns include Upper Fraser/Thompson and Oregon Coast Natural (OCN). Both of these stocks had significant data changes for the new analyses. The Upper Fraser stock used new escapement and ocean exploitation rate estimates. These changes could potentially affect management decisions for many PSC southern boundary fishery regulations because of the conservation constraints from the

2002 PSC Coho agreement. The changes were a result of an intensive investigation by Canada and should be incorporated into the base period average used for the Coho FRAM. The 1986 Upper Fraser data should be excluded because of the number of CWT recoveries compared to other years. The estimated number of CWT recoveries for 1986 was 1,071 compared to the range of 4,597 to 11,178 for 1987-1992 (TCCOHO, 2007). The OCN stock data changes were directly related to the MSM PEF estimation process and reflect the consistent approach taken for the new analyses.

The new Coho FRAM base period average should follow the guidelines listed above and use the 1986-1992 average without Upper Fraser 1986. This recommendation is a result of the small differences in exploitation rates between the base runs using the current agreement (1986-1991 w/o UF86) and this proposal as shown in Tables 1-20.

The recommendation for the long-term selection of a new base period average is to develop new selection criteria for the years available in the cohort analyses. The criteria could be developed in conjunction with a Coho FRAM validation project. The validation project would use the results from post-season FRAM command file runs that could be directly compared to the individual cohort analyses by year. Each of the proposed base period averages would be compared against all the years that have complete MSM cohort analyses. A statistical measure could be developed to show how well each proposed base period average performed across all stock and fisheries. Intuitively it would seem that the base year averages using years with more information would give the best fit. However the question of whether a base average that is radically different from the current management regimes can accurately estimate impacts is still unknown.

Because Coho FRAM is used for southern U.S.A. domestic fishery management (PFMC) purposes, substantial changes have to be accepted by the Treaty Tribes of Washington State and reviewed by PFMC's Salmon Technical Team and Scientific and Statistical Committee. A series of meetings with Treaty Tribes and regional staff from WDFW, ODFW, and DFO to review the information used for all stocks and fisheries from each region has been completed. The regional recommendations and data changes are currently being entered into the MSM and RRTERM systems. General acceptance has been given by all parties pending the outcome of the proposed data changes. Most of the changes have been for the RRTERM data (escapement and terminal catch) except for Skagit. The Skagit PEF values have been modified using target exploitation rates as the guidelines instead of smolt outmigrant estimates.

The difference between inside and outside distributions for Strait of Georgia and Fraser stocks has been of particular interest for Canadian fishery managers. Impacts of fisheries on stocks of interest will differ depending on whether the fish are distributed inside or outside of Vancouver Island. The MSM procedure, however, does not indicate appreciable change in the stock composition of the outside fisheries, probably due to the number of stocks that contribute to the ocean fisheries. The large number of stocks would dampen the effect of abundance changes for the Strait of Georgia stocks. The major effect between inside and outside years is the small catch numbers for the Strait of Georgia fisheries in outside years. Instead of changing base period data to reflect

inside/outside distributions, an alternative approach might be feasible - lower the expected catch levels Strait of Georgia fisheries in Coho FRAM runs when outside distributions are predicted.

The change in distribution and exploitation rates for the Upper Fraser stock has been of particular interest for U.S.A. fishery managers. The 10% exploitation rate constraint established for Southern U.S. fisheries on Canadian management units in low status was negotiated using the existing 1986-1991 base period data which indicated that a minimum exploitation rate of 10% on Interior Fraser coho was required to enable the U.S. to access more abundant stocks and species such as chum and sockeye. Alteration of FRAM base period data, either as the result of revising current estimates of 1986-1991 exploitation rates or altering the years included in the base period in expectation of inside/outside distribution patterns, could make the ability to plan U.S. fisheries to stay within the 10% constraint problematic. If adjustments to the FRAM base period data are to be made annually, then some consideration may be warranted regarding flexibility in application of exploitation rate constraints (i.e., whether or not exploitation rates should be evaluated within the context of inter-annual variability in distribution patterns).

Table 1. Skagit River natural Coho exploitation rates and Cohort sizes.

Skagit Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.030	0.219	0.001	0.250	0.231	0.029	0.045	0.305	0.555	291,526
	1987	0.044	0.191	0.000	0.235	0.245	0.036	0.076	0.357	0.592	348,344
	1988	0.059	0.176	0.002	0.237	0.251	0.078	0.046	0.375	0.612	206,766
	1989	0.031	0.119	0.000	0.150	0.204	0.034	0.088	0.327	0.477	151,950
	1990	0.045	0.292	0.000	0.336	0.285	0.033	0.068	0.385	0.722	139,384
	1991	0.040	0.204	0.003	0.247	0.246	0.000	0.062	0.308	0.555	66,222
	86-91 Avg	0.041	0.200	0.001	0.243	0.244	0.035	0.064	0.343	0.585	200,699
	87-91 Avg	0.044	0.196	0.001	0.241	0.246	0.036	0.068	0.350	0.591	182,533
CoTC Estimates Under Review	1986	0.023	0.230	0.000	0.253	0.158	0.023	0.038	0.219	0.471	255,164
	1987	0.056	0.224	0.000	0.281	0.272	0.034	0.092	0.398	0.679	453,074
	1988	0.040	0.185	0.001	0.225	0.228	0.068	0.033	0.328	0.553	185,492
	1989	0.041	0.150	0.000	0.191	0.209	0.033	0.113	0.355	0.547	179,150
	1990	0.035	0.251	0.000	0.285	0.197	0.039	0.050	0.285	0.571	94,198
	1991	0.062	0.228	0.002	0.291	0.310	0.001	0.079	0.390	0.682	94,708
	1992	0.044	0.148	0.000	0.192	0.230	0.060	0.104	0.394	0.587	83,848
	1993	0.023	0.056	0.000	0.079	0.149	0.153	0.055	0.357	0.436	78,224
	1994	0.000	0.040	0.000	0.040	0.312	0.015	0.068	0.395	0.436	116,400
	1995	0.032	0.109	0.000	0.141	0.233	0.000	0.038	0.271	0.412	90,812
	1996	0.042	0.096	0.000	0.138	0.311	0.001	0.069	0.381	0.519	69,434
	1997	0.015	0.273	0.000	0.288	0.003	0.001	0.039	0.043	0.330	73,458
	86-91 Avg	0.043	0.211	0.001	0.255	0.229	0.033	0.067	0.329	0.584	210,298
87-91 Avg	0.047	0.208	0.001	0.255	0.243	0.035	0.073	0.351	0.606	201,324	
Base Period Run	Current (86-91 w/o UF86)	0.044	0.194	0.001	0.239	0.277	0.035	0.078	0.390	0.628	200,700
	1986-91	0.046	0.211	0.001	0.257	0.238	0.033	0.077	0.348	0.605	210,298
	1986-91 w/o UF86	0.046	0.211	0.001	0.257	0.238	0.033	0.077	0.348	0.605	210,298
	1986-97	0.045	0.184	0.000	0.230	0.241	0.041	0.077	0.359	0.588	147,830
	1986-97 w/o UF86	0.045	0.184	0.000	0.230	0.241	0.041	0.077	0.359	0.588	147,830
	1986-92	0.046	0.207	0.001	0.254	0.237	0.037	0.084	0.358	0.612	192,234
	1986-92 w/o UF86	0.046	0.207	0.001	0.254	0.237	0.037	0.084	0.358	0.612	192,234
2007 Planned	Current (86-91 w/o UF86)	0.036	0.290	0.000	0.326	0.005	0.000	0.001	0.006	0.332	33,007
	1986-91	0.037	0.291	0.000	0.328	0.004	0.000	0.002	0.006	0.334	33,007
	1986-91 w/o UF86	0.037	0.291	0.000	0.328	0.004	0.000	0.002	0.006	0.334	33,007
	1986-97	0.039	0.291	0.000	0.330	0.004	0.000	0.002	0.006	0.336	33,007
	1986-97 w/o UF86	0.039	0.291	0.000	0.330	0.004	0.000	0.002	0.006	0.336	33,007
	1986-92	0.038	0.305	0.000	0.343	0.004	0.000	0.002	0.006	0.349	33,007
	1986-92 w/o UF86	0.038	0.305	0.000	0.343	0.004	0.000	0.002	0.006	0.349	33,007

Table 2. Stillaguamish River natural Coho exploitation rates and Cohort sizes.

Stillaguamish Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.047	0.304	0.001	0.352	0.362	0.006	0.065	0.433	0.785	139,536
	1987	0.044	0.400	0.000	0.444	0.273	0.002	0.044	0.319	0.763	75,700
	1988	0.073	0.250	0.003	0.326	0.437	0.017	0.034	0.489	0.815	93,514
	1989	0.045	0.238	0.000	0.283	0.432	0.002	0.102	0.536	0.819	46,380
	1990	0.051	0.309	0.000	0.360	0.298	0.002	0.055	0.355	0.715	75,672
	1991	0.051	0.263	0.000	0.313	0.458	0.001	0.077	0.535	0.848	47,812
	86-91 Avg	0.052	0.294	0.001	0.346	0.377	0.005	0.063	0.445	0.791	79,769
	87-91 Avg	0.053	0.292	0.001	0.345	0.380	0.005	0.062	0.447	0.792	67,816
CoTC Estimates Under Review	1986	0.030	0.378	0.000	0.408	0.199	0.002	0.040	0.242	0.650	91,204
	1987	0.044	0.388	0.000	0.432	0.229	0.001	0.040	0.271	0.702	64,168
	1988	0.042	0.303	0.001	0.347	0.286	0.008	0.023	0.317	0.663	54,750
	1989	0.028	0.310	0.000	0.338	0.234	0.001	0.065	0.300	0.638	24,586
	1990	0.051	0.308	0.000	0.359	0.256	0.002	0.052	0.311	0.670	68,686
	1991	0.031	0.361	0.000	0.392	0.234	0.000	0.040	0.274	0.667	23,184
	1992	0.030	0.322	0.001	0.353	0.180	0.002	0.027	0.209	0.562	38,316
	1993	0.045	0.192	0.000	0.237	0.268	0.010	0.069	0.346	0.583	30,882
	1994	0.000	0.161	0.000	0.162	0.227	0.001	0.029	0.257	0.418	55,976
	1995	0.022	0.200	0.000	0.223	0.198	0.000	0.012	0.210	0.433	50,018
	1996	0.034	0.222	0.000	0.257	0.209	0.000	0.042	0.251	0.507	26,208
	1997	0.023	0.372	0.000	0.395	0.004	0.000	0.027	0.031	0.426	23,896
	86-91 Avg	0.038	0.341	0.000	0.379	0.240	0.003	0.043	0.286	0.665	54,430
87-91 Avg	0.039	0.334	0.000	0.374	0.248	0.003	0.044	0.294	0.668	47,075	
Base Period Run	Current (86-91 w/o UF86)	0.055	0.270	0.001	0.326	0.414	0.005	0.075	0.494	0.820	79,770
	1986-91	0.041	0.340	0.000	0.381	0.246	0.003	0.047	0.296	0.677	54,430
	1986-91 w/o UF86	0.041	0.340	0.000	0.381	0.246	0.003	0.047	0.296	0.677	54,430
	1986-97	0.043	0.300	0.000	0.343	0.233	0.003	0.045	0.280	0.624	45,990
	1986-97 w/o UF86	0.043	0.300	0.000	0.343	0.233	0.003	0.045	0.280	0.624	45,990
	1986-92	0.040	0.342	0.001	0.383	0.237	0.003	0.046	0.286	0.669	52,128
	1986-92 w/o UF86	0.040	0.342	0.001	0.383	0.237	0.003	0.046	0.286	0.669	52,128
2007 Planned	Current (86-91 w/o UF86)	0.049	0.328	0.000	0.377	0.008	0.000	0.001	0.009	0.385	85,234
	1986-91	0.031	0.302	0.000	0.334	0.004	0.000	0.001	0.004	0.338	85,234
	1986-91 w/o UF86	0.031	0.302	0.000	0.334	0.004	0.000	0.001	0.004	0.338	85,234
	1986-97	0.032	0.314	0.000	0.346	0.003	0.000	0.001	0.004	0.350	85,234
	1986-97 w/o UF86	0.032	0.314	0.000	0.346	0.003	0.000	0.001	0.004	0.350	85,234
	1986-92	0.030	0.310	0.000	0.340	0.003	0.000	0.000	0.004	0.343	85,234
	1986-92 w/o UF86	0.030	0.310	0.000	0.340	0.003	0.000	0.000	0.004	0.343	85,234

Table 3. Snohomish River natural Coho exploitation rates and Cohort sizes.

Snohomish Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.047	0.255	0.001	0.303	0.362	0.006	0.065	0.434	0.737	532,044
	1987	0.044	0.306	0.000	0.350	0.273	0.002	0.044	0.319	0.669	339,768
	1988	0.073	0.222	0.003	0.298	0.437	0.017	0.034	0.489	0.787	424,342
	1989	0.045	0.178	0.000	0.223	0.433	0.002	0.103	0.537	0.760	471,850
	1990	0.051	0.288	0.000	0.339	0.299	0.002	0.055	0.355	0.694	356,090
	1991	0.051	0.235	0.000	0.286	0.458	0.001	0.077	0.535	0.821	290,742
	86-91 Avg	0.052	0.247	0.001	0.300	0.377	0.005	0.063	0.445	0.745	402,473
	87-91 Avg	0.053	0.246	0.001	0.299	0.380	0.005	0.062	0.447	0.746	376,558
CoTC Estimates Under Review	1986	0.030	0.304	0.000	0.334	0.199	0.002	0.040	0.242	0.576	348,006
	1987	0.044	0.278	0.000	0.322	0.230	0.001	0.040	0.271	0.593	288,228
	1988	0.042	0.255	0.001	0.298	0.286	0.008	0.023	0.317	0.615	248,224
	1989	0.029	0.197	0.000	0.226	0.235	0.001	0.065	0.300	0.526	249,552
	1990	0.051	0.309	0.000	0.361	0.257	0.002	0.052	0.311	0.672	346,868
	1991	0.031	0.304	0.000	0.335	0.234	0.000	0.040	0.275	0.610	140,926
	1992	0.030	0.308	0.001	0.340	0.180	0.002	0.027	0.209	0.549	208,142
	1993	0.045	0.186	0.000	0.232	0.268	0.010	0.069	0.346	0.578	150,100
	1994	0.000	0.169	0.000	0.169	0.227	0.001	0.029	0.256	0.426	310,144
	1995	0.022	0.209	0.000	0.231	0.198	0.000	0.012	0.210	0.442	246,388
	1996	0.034	0.240	0.000	0.274	0.208	0.000	0.042	0.250	0.524	138,702
	1997	0.023	0.403	0.000	0.426	0.004	0.000	0.027	0.031	0.457	134,890
	86-91 Avg	0.038	0.275	0.000	0.313	0.240	0.003	0.043	0.286	0.599	270,301
87-91 Avg	0.039	0.269	0.000	0.308	0.248	0.003	0.044	0.295	0.603	254,760	
Base Period Run	Current (86-91 w/o UF86)	0.055	0.230	0.001	0.286	0.415	0.005	0.075	0.495	0.781	402,472
	1986-91	0.041	0.277	0.000	0.319	0.247	0.003	0.047	0.297	0.615	270,300
	1986-91 w/o UF86	0.041	0.277	0.000	0.319	0.247	0.003	0.047	0.297	0.615	270,300
	1986-97	0.043	0.271	0.000	0.314	0.233	0.003	0.045	0.281	0.595	234,180
	1986-97 w/o UF86	0.043	0.271	0.000	0.314	0.233	0.003	0.045	0.281	0.595	234,180
	1986-92	0.040	0.287	0.001	0.328	0.237	0.003	0.046	0.287	0.615	261,420
	1986-92 w/o UF86	0.040	0.287	0.001	0.328	0.237	0.003	0.046	0.287	0.615	261,420
2007 Planned	Current (86-91 w/o UF86)	0.049	0.333	0.000	0.382	0.008	0.000	0.001	0.009	0.390	121,808
	1986-91	0.031	0.308	0.000	0.339	0.004	0.000	0.001	0.004	0.343	121,808
	1986-91 w/o UF86	0.031	0.308	0.000	0.339	0.004	0.000	0.001	0.004	0.343	121,808
	1986-97	0.032	0.316	0.000	0.348	0.003	0.000	0.001	0.004	0.352	121,808
	1986-97 w/o UF86	0.032	0.316	0.000	0.348	0.003	0.000	0.001	0.004	0.352	121,808
	1986-92	0.030	0.315	0.000	0.345	0.003	0.000	0.000	0.004	0.349	121,808
	1986-92 w/o UF86	0.030	0.315	0.000	0.345	0.003	0.000	0.000	0.004	0.349	121,808

Table 4. Hood Canal natural Coho exploitation rates and Cohort sizes.

Hood Canal Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.050	0.349	0.000	0.400	0.393	0.004	0.050	0.447	0.847	314,054
	1987	0.062	0.389	0.000	0.452	0.416	0.001	0.066	0.483	0.935	337,580
	1988	0.085	0.349	0.001	0.436	0.316	0.013	0.019	0.348	0.783	65,716
	1989	0.038	0.350	0.000	0.387	0.308	0.000	0.104	0.412	0.800	94,988
	1990	0.037	0.486	0.000	0.523	0.313	0.003	0.051	0.367	0.890	76,972
	1991	0.040	0.308	0.000	0.348	0.323	0.002	0.073	0.398	0.746	63,262
	86-91 Avg	0.052	0.372	0.000	0.424	0.345	0.004	0.061	0.409	0.834	158,762
	87-91 Avg	0.053	0.376	0.000	0.429	0.335	0.004	0.063	0.402	0.831	127,704
CoTC Estimates Under Review	1986	0.043	0.389	0.000	0.432	0.303	0.002	0.046	0.351	0.783	237,842
	1987	0.053	0.475	0.000	0.529	0.309	0.001	0.052	0.362	0.891	227,226
	1988	0.074	0.357	0.000	0.432	0.315	0.010	0.020	0.345	0.776	66,574
	1989	0.042	0.349	0.000	0.391	0.293	0.000	0.137	0.430	0.821	111,264
	1990	0.055	0.384	0.000	0.440	0.411	0.004	0.076	0.491	0.930	130,092
	1991	0.059	0.286	0.000	0.345	0.310	0.000	0.063	0.373	0.718	58,834
	1992	0.069	0.232	0.001	0.302	0.505	0.006	0.117	0.628	0.930	333,308
	1993	0.064	0.163	0.000	0.226	0.351	0.019	0.073	0.442	0.668	82,590
	1994	0.000	0.184	0.000	0.184	0.300	0.001	0.064	0.364	0.548	154,742
	1995	0.025	0.123	0.000	0.149	0.228	0.001	0.018	0.247	0.396	84,450
	1996	0.020	0.106	0.000	0.126	0.182	0.001	0.035	0.218	0.344	83,058
	1997	0.018	0.134	0.000	0.152	0.005	0.000	0.031	0.036	0.188	148,294
	86-91 Avg	0.055	0.373	0.000	0.428	0.324	0.003	0.066	0.392	0.820	138,639
87-91 Avg	0.057	0.370	0.000	0.427	0.328	0.003	0.070	0.400	0.827	118,798	
Base Period Run	Current (86-91 w/o UF86)	0.055	0.350	0.000	0.405	0.374	0.004	0.073	0.451	0.856	158,764
	1986-91	0.058	0.369	0.000	0.427	0.334	0.003	0.072	0.409	0.836	138,638
	1986-91 w/o UF86	0.058	0.369	0.000	0.427	0.334	0.003	0.072	0.409	0.836	138,638
	1986-97	0.060	0.302	0.000	0.362	0.329	0.004	0.072	0.406	0.768	143,188
	1986-97 w/o UF86	0.060	0.302	0.000	0.362	0.329	0.004	0.072	0.406	0.768	143,188
	1986-92	0.061	0.342	0.001	0.404	0.370	0.003	0.082	0.456	0.860	166,446
	1986-92 w/o UF86	0.061	0.342	0.001	0.404	0.370	0.003	0.082	0.456	0.860	166,446
2007 Planned	Current (86-91 w/o UF86)	0.038	0.410	0.000	0.449	0.010	0.000	0.001	0.011	0.459	52,637
	1986-91	0.047	0.423	0.000	0.469	0.005	0.000	0.001	0.006	0.475	52,637
	1986-91 w/o UF86	0.047	0.423	0.000	0.469	0.005	0.000	0.001	0.006	0.475	52,637
	1986-97	0.046	0.448	0.000	0.494	0.005	0.000	0.001	0.006	0.500	52,637
	1986-97 w/o UF86	0.046	0.448	0.000	0.494	0.005	0.000	0.001	0.006	0.500	52,637
	1986-92	0.049	0.455	0.000	0.503	0.006	0.000	0.001	0.007	0.511	52,637
	1986-92 w/o UF86	0.049	0.455	0.000	0.504	0.006	0.000	0.001	0.007	0.511	52,637

Table 5. Strait of Juan de Fuca natural Coho exploitation rates and Cohort sizes.

US JDF Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.028	0.092	0.001	0.121	0.440	0.002	0.030	0.472	0.593	41,448
	1987	0.075	0.169	0.015	0.260	0.398	0.000	0.027	0.424	0.684	41,116
	1988	0.108	0.106	0.000	0.214	0.419	0.010	0.033	0.461	0.675	22,710
	1989	0.040	0.134	0.001	0.175	0.394	0.002	0.077	0.474	0.649	32,954
	1990	0.048	0.095	0.000	0.142	0.483	0.006	0.031	0.520	0.662	18,002
	1991	0.053	0.174	0.000	0.227	0.388	0.000	0.019	0.407	0.634	17,472
	86-91 Avg	0.059	0.128	0.003	0.190	0.420	0.003	0.036	0.460	0.650	28,950
	87-91 Avg	0.065	0.136	0.003	0.204	0.416	0.004	0.037	0.457	0.661	26,451
CoTC Estimates Under Review	1986	0.035	0.130	0.001	0.166	0.518	0.002	0.042	0.561	0.728	63,026
	1987	0.013	0.050	0.000	0.063	0.058	0.000	0.004	0.062	0.125	15,618
	1988	0.113	0.127	0.000	0.240	0.482	0.009	0.037	0.527	0.768	32,372
	1989	0.042	0.134	0.000	0.176	0.312	0.002	0.066	0.380	0.556	26,676
	1990	0.059	0.127	0.000	0.186	0.547	0.007	0.025	0.579	0.765	26,400
	1991	0.072	0.210	0.000	0.282	0.312	0.000	0.062	0.374	0.656	19,080
	1992	0.060	0.059	0.003	0.122	0.499	0.001	0.052	0.553	0.675	25,270
	1993	0.021	0.035	0.000	0.056	0.194	0.000	0.021	0.215	0.271	6,594
	1994	0.000	0.005	0.000	0.006	0.425	0.000	0.082	0.507	0.513	7,818
	1995	0.035	0.037	0.000	0.071	0.334	0.000	0.016	0.350	0.421	14,488
	1996	0.035	0.052	0.000	0.087	0.349	0.000	0.044	0.393	0.480	13,892
	1997	0.027	0.261	0.000	0.288	0.018	0.000	0.076	0.095	0.382	17,976
	86-91 Avg	0.056	0.130	0.000	0.186	0.371	0.003	0.040	0.414	0.599	30,529
87-91 Avg	0.060	0.130	0.000	0.189	0.342	0.003	0.039	0.384	0.574	24,029	
Base Period Run	Current (86-91 w/o UF86)	0.061	0.119	0.002	0.183	0.459	0.003	0.041	0.502	0.685	28,952
	1986-91	0.061	0.142	0.000	0.203	0.401	0.003	0.043	0.447	0.651	30,530
	1986-91 w/o UF86	0.061	0.142	0.000	0.203	0.401	0.003	0.043	0.447	0.651	30,530
	1986-97	0.059	0.120	0.000	0.179	0.387	0.002	0.049	0.438	0.617	22,436
	1986-97 w/o UF86	0.059	0.120	0.000	0.179	0.387	0.002	0.049	0.438	0.617	22,436
	1986-92	0.062	0.134	0.001	0.196	0.420	0.003	0.046	0.469	0.665	29,778
	1986-92 w/o UF86	0.062	0.134	0.001	0.196	0.420	0.003	0.046	0.469	0.665	29,778
2007 Planned	Current (86-91 w/o UF86)	0.037	0.069	0.006	0.112	0.010	0.000	0.001	0.011	0.123	41,661
	1986-91	0.043	0.080	0.000	0.124	0.005	0.000	0.001	0.006	0.130	41,661
	1986-91 w/o UF86	0.043	0.081	0.000	0.124	0.005	0.000	0.001	0.006	0.130	41,661
	1986-97	0.043	0.089	0.000	0.131	0.006	0.000	0.001	0.008	0.139	41,661
	1986-97 w/o UF86	0.043	0.089	0.000	0.131	0.006	0.000	0.001	0.008	0.139	41,661
	1986-92	0.047	0.079	0.000	0.126	0.007	0.000	0.001	0.009	0.134	41,661
	1986-92 w/o UF86	0.047	0.079	0.000	0.126	0.007	0.000	0.001	0.009	0.134	41,661

Table 6. Quillayute River natural Coho exploitation rates and Cohort sizes.

Quillayute Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.076	0.006	0.182	0.264	0.385	0.000	0.007	0.392	0.655	40,220
	1987	0.124	0.013	0.290	0.426	0.347	0.000	0.007	0.355	0.781	66,550
	1988	0.189	0.009	0.078	0.275	0.328	0.000	0.003	0.332	0.607	24,726
	1989	0.145	0.019	0.089	0.253	0.387	0.001	0.025	0.414	0.667	35,822
	1990	0.171	0.033	0.137	0.341	0.436	0.000	0.037	0.473	0.814	38,226
	1991	0.233	0.057	0.028	0.318	0.431	0.000	0.052	0.483	0.801	62,792
	86-91 Avg	0.156	0.023	0.134	0.313	0.386	0.000	0.022	0.408	0.721	44,723
	87-91 Avg	0.172	0.026	0.124	0.323	0.386	0.000	0.025	0.411	0.734	45,623
CoTC Estimates Under Review	1986	0.104	0.010	0.198	0.311	0.457	0.000	0.009	0.466	0.777	64,724
	1987	0.068	0.009	0.411	0.488	0.181	0.000	0.004	0.185	0.673	47,978
	1988	0.128	0.008	0.089	0.225	0.267	0.000	0.002	0.269	0.494	19,946
	1989	0.144	0.015	0.118	0.276	0.229	0.001	0.017	0.247	0.523	26,050
	1990	0.047	0.008	0.331	0.386	0.106	0.000	0.010	0.115	0.501	15,378
	1991	0.185	0.047	0.077	0.308	0.296	0.000	0.032	0.329	0.637	35,918
	1992	0.034	0.003	0.339	0.376	0.068	0.001	0.005	0.075	0.451	21,280
	1993	0.151	0.000	0.063	0.214	0.395	0.000	0.000	0.395	0.609	13,980
	1994	0.002	0.000	0.190	0.192	0.204	0.000	0.029	0.233	0.425	12,222
	1995	0.082	0.004	0.240	0.326	0.153	0.000	0.000	0.153	0.479	27,102
	1996	0.079	0.004	0.161	0.244	0.211	0.000	0.000	0.211	0.455	26,564
	1997	0.092	0.015	0.052	0.160	0.040	0.000	0.009	0.048	0.208	8,532
	86-91 Avg	0.112	0.016	0.204	0.333	0.256	0.000	0.012	0.268	0.601	34,999
87-91 Avg	0.114	0.017	0.205	0.337	0.216	0.000	0.013	0.229	0.566	29,054	
Base Period Run	Current (86-91 w/o UF86)	0.164	0.023	0.115	0.302	0.426	0.000	0.027	0.453	0.755	44,722
	1986-91	0.120	0.017	0.185	0.321	0.276	0.000	0.014	0.291	0.612	35,000
	1986-91 w/o UF86	0.120	0.017	0.185	0.321	0.276	0.000	0.014	0.291	0.612	35,000
	1986-97	0.132	0.013	0.170	0.316	0.248	0.000	0.012	0.260	0.575	26,638
	1986-97 w/o UF86	0.132	0.013	0.170	0.316	0.248	0.000	0.012	0.260	0.575	26,638
	1986-92	0.111	0.016	0.199	0.325	0.249	0.000	0.014	0.263	0.588	33,040
	1986-92 w/o UF86	0.111	0.016	0.199	0.325	0.249	0.000	0.014	0.263	0.588	33,040
2007 Planned	Current (86-91 w/o UF86)	0.084	0.006	0.286	0.377	0.010	0.000	0.001	0.011	0.388	14,599
	1986-91	0.052	0.004	0.292	0.348	0.004	0.000	0.001	0.004	0.353	14,599
	1986-91 w/o UF86	0.052	0.004	0.292	0.348	0.004	0.000	0.001	0.004	0.353	14,599
	1986-97	0.068	0.004	0.312	0.385	0.006	0.000	0.000	0.006	0.391	14,599
	1986-97 w/o UF86	0.068	0.004	0.312	0.385	0.006	0.000	0.000	0.006	0.391	14,599
	1986-92	0.048	0.004	0.303	0.355	0.003	0.000	0.000	0.004	0.359	14,599
	1986-92 w/o UF86	0.048	0.004	0.303	0.355	0.003	0.000	0.000	0.004	0.359	14,599

Table 7. Hoh River natural Coho exploitation rates and Cohort sizes.

Hoh Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.150	0.000	0.211	0.361	0.366	0.000	0.000	0.366	0.727	18,720
	1987	0.123	0.010	0.314	0.447	0.319	0.000	0.000	0.319	0.767	18,104
	1988	0.164	0.017	0.042	0.223	0.485	0.004	0.030	0.519	0.742	10,828
	1989	0.175	0.013	0.165	0.353	0.356	0.000	0.028	0.383	0.736	15,130
	1990	0.238	0.000	0.187	0.425	0.395	0.000	0.000	0.395	0.820	13,880
	1991	0.102	0.063	0.121	0.286	0.299	0.000	0.031	0.330	0.616	12,950
	86-91 Avg	0.159	0.017	0.174	0.349	0.370	0.001	0.015	0.385	0.735	14,935
	87-91 Avg	0.160	0.020	0.166	0.347	0.371	0.001	0.018	0.389	0.736	14,178
CoTC Estimates Under Review	1986	0.185	0.000	0.174	0.359	0.400	0.000	0.000	0.400	0.758	22,256
	1987	0.127	0.015	0.321	0.462	0.273	0.000	0.000	0.273	0.735	17,212
	1988	0.185	0.020	0.021	0.226	0.645	0.005	0.009	0.659	0.885	24,848
	1989	0.155	0.011	0.207	0.374	0.244	0.000	0.022	0.266	0.640	11,662
	1990	0.207	0.000	0.242	0.448	0.299	0.000	0.000	0.299	0.748	10,644
	1991	0.128	0.075	0.109	0.312	0.294	0.000	0.030	0.323	0.635	14,122
	1992	0.298	0.015	0.110	0.423	0.262	0.004	0.016	0.282	0.706	17,110
	1993	0.058	0.000	0.239	0.297	0.298	0.000	0.000	0.298	0.595	4,220
	1994	0.000	0.000	0.128	0.128	0.345	0.000	0.000	0.345	0.473	2,758
	1995	0.144	0.000	0.074	0.219	0.305	0.000	0.000	0.305	0.524	12,294
	1996	0.040	0.002	0.156	0.198	0.105	0.000	0.000	0.105	0.303	8,836
	1997	0.382	0.064	0.026	0.471	0.164	0.000	0.036	0.200	0.672	5,188
	86-91 Avg	0.164	0.020	0.179	0.363	0.359	0.001	0.010	0.370	0.734	16,791
87-91 Avg	0.160	0.024	0.180	0.364	0.351	0.001	0.012	0.364	0.729	15,698	
Base Period Run	Current (86-91 w/o UF86)	0.171	0.015	0.151	0.338	0.402	0.001	0.014	0.417	0.755	14,936
	1986-91	0.176	0.023	0.149	0.348	0.385	0.001	0.010	0.396	0.744	16,790
	1986-91 w/o UF86	0.176	0.023	0.149	0.348	0.385	0.001	0.010	0.396	0.744	16,790
	1986-97	0.211	0.021	0.124	0.356	0.331	0.001	0.010	0.342	0.698	12,596
	1986-97 w/o UF86	0.211	0.021	0.124	0.356	0.331	0.001	0.010	0.342	0.698	12,596
	1986-92	0.196	0.022	0.142	0.361	0.369	0.001	0.011	0.382	0.743	16,836
	1986-92 w/o UF86	0.196	0.022	0.142	0.361	0.369	0.001	0.011	0.382	0.743	16,836
2007 Planned	Current (86-91 w/o UF86)	0.103	0.006	0.328	0.437	0.011	0.000	0.003	0.014	0.451	6,658
	1986-91	0.095	0.009	0.358	0.463	0.008	0.000	0.003	0.011	0.473	6,658
	1986-91 w/o UF86	0.095	0.009	0.358	0.463	0.008	0.000	0.003	0.011	0.473	6,658
	1986-97	0.123	0.010	0.364	0.497	0.012	0.000	0.002	0.013	0.510	6,658
	1986-97 w/o UF86	0.123	0.010	0.364	0.497	0.012	0.000	0.002	0.013	0.510	6,658
	1986-92	0.110	0.012	0.362	0.485	0.008	0.000	0.002	0.010	0.495	6,658
	1986-92 w/o UF86	0.110	0.012	0.362	0.485	0.008	0.000	0.002	0.010	0.495	6,658

Table 8. Queets River natural Coho exploitation rates and Cohort sizes.

Queets Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.099	0.012	0.086	0.197	0.369	0.000	0.006	0.375	0.572	14,544
	1987	0.143	0.019	0.102	0.264	0.238	0.000	0.014	0.253	0.516	11,724
	1988	0.264	0.005	0.076	0.345	0.245	0.001	0.001	0.247	0.592	12,626
	1989	0.112	0.014	0.086	0.212	0.404	0.001	0.034	0.439	0.651	15,500
	1990	0.189	0.012	0.143	0.345	0.399	0.000	0.015	0.414	0.759	25,682
	1991	0.226	0.024	0.140	0.390	0.300	0.000	0.024	0.325	0.714	27,226
	86-91 Avg	0.172	0.015	0.105	0.292	0.326	0.000	0.016	0.342	0.634	17,884
	87-91 Avg	0.187	0.015	0.109	0.311	0.317	0.001	0.018	0.336	0.647	18,552
CoTC Estimates Under Review	1986	0.145	0.014	0.136	0.296	0.499	0.000	0.008	0.506	0.802	32,280
	1987	0.147	0.018	0.293	0.458	0.231	0.000	0.013	0.244	0.702	20,066
	1988	0.320	0.008	0.083	0.410	0.357	0.001	0.001	0.360	0.770	22,998
	1989	0.143	0.015	0.100	0.258	0.345	0.001	0.031	0.378	0.636	15,252
	1990	0.247	0.013	0.136	0.397	0.395	0.000	0.013	0.407	0.804	33,228
	1991	0.252	0.028	0.158	0.438	0.287	0.000	0.023	0.310	0.748	32,156
	1992	0.286	0.016	0.120	0.422	0.217	0.000	0.016	0.233	0.656	22,460
	1993	0.213	0.005	0.116	0.334	0.287	0.000	0.007	0.294	0.628	16,452
	1994	0.000	0.000	0.424	0.424	0.200	0.000	0.009	0.209	0.633	3,640
	1995	0.088	0.001	0.268	0.357	0.175	0.001	0.002	0.177	0.534	15,362
	1996	0.063	0.004	0.457	0.523	0.116	0.000	0.002	0.119	0.642	32,004
	1997	0.062	0.013	0.415	0.490	0.003	0.000	0.004	0.007	0.497	3,702
	86-91 Avg	0.209	0.016	0.151	0.376	0.352	0.000	0.015	0.368	0.744	25,997
87-91 Avg	0.222	0.017	0.154	0.392	0.323	0.001	0.016	0.340	0.732	24,740	
Base Period Run	Current (86-91 w/o UF86)	0.187	0.014	0.103	0.304	0.349	0.000	0.017	0.367	0.671	17,884
	1986-91	0.227	0.016	0.140	0.382	0.365	0.000	0.015	0.380	0.762	25,996
	1986-91 w/o UF86	0.227	0.016	0.140	0.382	0.365	0.000	0.015	0.380	0.762	25,996
	1986-97	0.238	0.013	0.190	0.442	0.284	0.000	0.012	0.297	0.738	20,800
	1986-97 w/o UF86	0.238	0.013	0.190	0.442	0.284	0.000	0.012	0.297	0.738	20,800
	1986-92	0.238	0.016	0.147	0.401	0.344	0.000	0.015	0.360	0.761	25,492
	1986-92 w/o UF86	0.238	0.016	0.147	0.401	0.344	0.000	0.015	0.360	0.761	25,492
2007 Planned	Current (86-91 w/o UF86)	0.085	0.008	0.276	0.369	0.011	0.000	0.001	0.012	0.381	16,690
	1986-91	0.103	0.009	0.417	0.529	0.009	0.000	0.001	0.010	0.539	16,690
	1986-91 w/o UF86	0.103	0.009	0.417	0.529	0.009	0.000	0.001	0.010	0.539	16,690
	1986-97	0.111	0.008	0.416	0.535	0.007	0.000	0.001	0.008	0.543	16,690
	1986-97 w/o UF86	0.111	0.008	0.416	0.535	0.007	0.000	0.001	0.008	0.543	16,690
	1986-92	0.111	0.009	0.384	0.504	0.009	0.000	0.001	0.010	0.513	16,690
1986-92 w/o UF86	0.111	0.009	0.384	0.504	0.009	0.000	0.001	0.010	0.513	16,690	

Table 9. Grays Harbor natural Coho exploitation rates and Cohort sizes.

Grays Harbor Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.077	0.004	0.295	0.376	0.428	0.000	0.002	0.431	0.807	181,788
	1987	0.062	0.005	0.403	0.470	0.276	0.000	0.021	0.297	0.767	101,890
	1988	0.103	0.006	0.141	0.250	0.229	0.000	0.002	0.231	0.481	132,888
	1989	0.095	0.008	0.146	0.248	0.348	0.001	0.017	0.366	0.614	162,598
	1990	0.136	0.006	0.292	0.434	0.137	0.000	0.004	0.141	0.575	117,210
	1991	0.070	0.025	0.336	0.431	0.195	0.000	0.018	0.213	0.644	189,864
	86-91 Avg	0.090	0.009	0.269	0.368	0.269	0.000	0.011	0.280	0.648	147,706
	87-91 Avg	0.093	0.010	0.264	0.367	0.237	0.000	0.012	0.250	0.616	140,890
CoTC Estimates Under Review	1986	0.075	0.004	0.329	0.408	0.341	0.000	0.003	0.344	0.752	153,694
	1987	0.039	0.004	0.471	0.514	0.162	0.000	0.008	0.170	0.684	82,582
	1988	0.081	0.005	0.107	0.194	0.220	0.000	0.002	0.222	0.416	121,754
	1989	0.105	0.010	0.138	0.253	0.331	0.001	0.018	0.350	0.604	164,014
	1990	0.144	0.006	0.282	0.432	0.124	0.000	0.004	0.128	0.560	119,204
	1991	0.063	0.019	0.366	0.449	0.127	0.000	0.010	0.137	0.586	173,824
	1992	0.160	0.003	0.239	0.402	0.131	0.002	0.010	0.144	0.546	71,966
	1993	0.144	0.004	0.250	0.398	0.227	0.000	0.004	0.231	0.629	74,924
	1994	0.005	0.000	0.355	0.360	0.048	0.000	0.005	0.053	0.413	18,804
	1995	0.053	0.001	0.397	0.452	0.095	0.000	0.002	0.097	0.549	100,312
	1996	0.033	0.001	0.361	0.395	0.053	0.000	0.000	0.053	0.448	122,122
	1997	0.032	0.000	0.224	0.257	0.001	0.000	0.000	0.001	0.258	27,942
	86-91 Avg	0.085	0.008	0.282	0.375	0.218	0.000	0.007	0.225	0.600	135,845
87-91 Avg	0.086	0.009	0.273	0.368	0.193	0.000	0.008	0.201	0.570	132,276	
Base Period Run	Current (86-91 w/o UF86)	0.098	0.008	0.259	0.366	0.298	0.000	0.011	0.309	0.675	147,706
	1986-91	0.101	0.008	0.273	0.381	0.228	0.000	0.008	0.236	0.617	135,846
	1986-91 w/o UF86	0.101	0.008	0.273	0.381	0.228	0.000	0.008	0.236	0.617	135,846
	1986-97	0.114	0.006	0.306	0.425	0.177	0.000	0.007	0.184	0.609	102,596
	1986-97 w/o UF86	0.114	0.006	0.306	0.425	0.177	0.000	0.007	0.184	0.609	102,596
	1986-92	0.114	0.008	0.271	0.393	0.217	0.001	0.009	0.226	0.619	126,718
	1986-92 w/o UF86	0.114	0.008	0.271	0.393	0.217	0.001	0.009	0.226	0.619	126,718
2007 Planned	Current (86-91 w/o UF86)	0.053	0.003	0.339	0.395	0.013	0.000	0.001	0.014	0.409	71,776
	1986-91	0.051	0.003	0.342	0.396	0.007	0.000	0.001	0.007	0.403	71,776
	1986-91 w/o UF86	0.051	0.003	0.342	0.396	0.007	0.000	0.001	0.007	0.403	71,776
	1986-97	0.057	0.003	0.338	0.398	0.006	0.000	0.000	0.006	0.405	71,776
	1986-97 w/o UF86	0.057	0.003	0.338	0.398	0.006	0.000	0.000	0.006	0.405	71,776
	1986-92	0.058	0.003	0.338	0.399	0.007	0.000	0.001	0.007	0.406	71,776
	1986-92 w/o UF86	0.058	0.003	0.338	0.399	0.007	0.000	0.001	0.007	0.406	71,776

Table 10. Lower Fraser River natural Coho exploitation rates and Cohort sizes.

Lower Fraser Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.012	0.070	0.000	0.082	0.271	0.275	0.115	0.662	0.744	241,330
	1987	0.010	0.043	0.000	0.054	0.225	0.348	0.104	0.677	0.731	195,452
	1988	0.006	0.038	0.000	0.045	0.132	0.516	0.110	0.758	0.802	244,392
	1989	0.021	0.076	0.000	0.097	0.250	0.265	0.130	0.645	0.742	70,524
	1990	0.016	0.053	0.000	0.070	0.251	0.307	0.121	0.679	0.749	405,344
	1991	0.037	0.077	0.001	0.115	0.469	0.015	0.143	0.626	0.741	222,956
	86-91 Avg	0.017	0.060	0.000	0.077	0.266	0.288	0.120	0.675	0.752	230,000
	87-91 Avg	0.018	0.058	0.000	0.076	0.265	0.290	0.121	0.677	0.753	227,734
CoTC Estimates Under Review	1986	0.019	0.087	0.000	0.106	0.359	0.254	0.098	0.711	0.817	379,140
	1987	0.015	0.025	0.000	0.041	0.272	0.362	0.112	0.746	0.787	94,822
	1988	0.008	0.014	0.000	0.021	0.181	0.537	0.091	0.809	0.830	197,888
	1989	0.024	0.088	0.000	0.112	0.245	0.231	0.174	0.650	0.762	106,446
	1990	0.021	0.036	0.000	0.057	0.300	0.334	0.142	0.776	0.833	164,744
	1991	0.046	0.092	0.001	0.139	0.513	0.011	0.137	0.660	0.799	332,532
	1992	0.015	0.025	0.001	0.041	0.280	0.342	0.100	0.722	0.763	220,662
	1993	0.012	0.010	0.000	0.022	0.093	0.488	0.082	0.664	0.685	548,676
	1994	0.001	0.010	0.000	0.011	0.504	0.119	0.119	0.742	0.753	186,148
	1995	0.034	0.031	0.000	0.065	0.515	0.001	0.061	0.578	0.643	420,214
	1996	0.039	0.023	0.000	0.062	0.550	0.019	0.085	0.654	0.716	237,478
	1997	0.022	0.074	0.000	0.096	0.011	0.002	0.185	0.199	0.294	78,504
	86-91 Avg	0.022	0.057	0.000	0.079	0.311	0.288	0.126	0.725	0.805	212,595
87-91 Avg	0.023	0.051	0.000	0.074	0.302	0.295	0.131	0.728	0.802	179,286	
Base Period Run	Current (86-91 w/o UF86)	0.017	0.055	0.000	0.072	0.289	0.294	0.124	0.707	0.779	230,000
	1986-91	0.022	0.058	0.000	0.080	0.320	0.300	0.127	0.747	0.827	212,596
	1986-91 w/o UF86	0.022	0.058	0.000	0.080	0.320	0.300	0.127	0.747	0.827	212,596
	1986-97	0.024	0.047	0.000	0.072	0.346	0.268	0.122	0.736	0.808	247,272
	1986-97 w/o UF86	0.024	0.047	0.000	0.072	0.346	0.268	0.122	0.736	0.808	247,272
	1986-92	0.022	0.054	0.000	0.076	0.314	0.306	0.126	0.746	0.822	213,748
	1986-92 w/o UF86	0.022	0.054	0.000	0.076	0.314	0.306	0.126	0.746	0.822	213,748
2007 Planned	Current (86-91 w/o UF86)	0.021	0.071	0.000	0.092	0.010	0.001	0.007	0.019	0.111	6,900
	1986-91	0.028	0.097	0.000	0.125	0.009	0.001	0.010	0.021	0.146	6,900
	1986-91 w/o UF86	0.028	0.099	0.000	0.127	0.009	0.001	0.010	0.021	0.147	6,900
	1986-97	0.032	0.096	0.000	0.128	0.009	0.001	0.009	0.018	0.147	6,900
	1986-97 w/o UF86	0.032	0.098	0.000	0.130	0.009	0.001	0.009	0.018	0.148	6,900
	1986-92	0.026	0.097	0.000	0.123	0.009	0.001	0.010	0.019	0.142	6,900
	1986-92 w/o UF86	0.026	0.098	0.000	0.124	0.009	0.001	0.010	0.019	0.144	6,900

Table 11. Upper Fraser River natural Coho exploitation rates and Cohort sizes.

Upper Fraser Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.033	0.122	0.000	0.155	0.305	0.094	0.134	0.534	0.688	544,280
	1987	0.031	0.057	0.001	0.089	0.254	0.137	0.103	0.494	0.583	278,628
	1988	0.060	0.059	0.003	0.122	0.270	0.255	0.104	0.628	0.750	553,890
	1989	0.039	0.121	0.000	0.161	0.287	0.086	0.145	0.517	0.678	216,726
	1990	0.040	0.069	0.000	0.109	0.331	0.187	0.132	0.650	0.758	223,518
	1991	0.047	0.116	0.001	0.163	0.415	0.008	0.137	0.560	0.724	96,058
	86-91 Avg	0.042	0.091	0.001	0.133	0.310	0.128	0.126	0.564	0.697	318,850
	87-91 Avg	0.043	0.084	0.001	0.129	0.311	0.135	0.124	0.570	0.699	273,764
CoTC Estimates Under Review	1986	0.039	0.122	0.000	0.161	0.320	0.066	0.169	0.556	0.716	293,940
	1987	0.041	0.029	0.001	0.071	0.278	0.132	0.092	0.501	0.573	222,598
	1988	0.058	0.044	0.002	0.104	0.300	0.213	0.143	0.656	0.760	479,810
	1989	0.045	0.117	0.000	0.162	0.280	0.074	0.146	0.499	0.661	233,286
	1990	0.049	0.057	0.000	0.106	0.352	0.175	0.115	0.642	0.747	233,408
	1991	0.049	0.110	0.001	0.160	0.380	0.005	0.151	0.537	0.697	147,152
	1992	0.039	0.034	0.002	0.076	0.468	0.204	0.074	0.746	0.821	337,544
	1993	0.032	0.064	0.000	0.096	0.246	0.424	0.113	0.783	0.879	350,462
	1994	0.000	0.002	0.000	0.002	0.317	0.044	0.079	0.440	0.442	78,370
	1995	0.063	0.033	0.000	0.096	0.430	0.003	0.044	0.476	0.572	57,568
	1996	0.033	0.068	0.000	0.102	0.638	0.006	0.093	0.737	0.839	53,550
	1997	0.038	0.146	0.000	0.184	0.005	0.001	0.220	0.226	0.410	28,716
	86-91 Avg	0.047	0.080	0.001	0.127	0.318	0.111	0.136	0.565	0.692	268,366
87-91 Avg	0.048	0.072	0.001	0.121	0.318	0.120	0.129	0.567	0.688	263,251	
Base Period Run	Current (86-91 w/o UF86)	0.046	0.078	0.001	0.125	0.341	0.136	0.127	0.604	0.729	273,764
	1986-91	0.049	0.083	0.001	0.133	0.329	0.113	0.141	0.583	0.715	268,366
	1986-91 w/o UF86	0.051	0.075	0.001	0.127	0.325	0.122	0.134	0.582	0.708	263,250
	1986-97	0.053	0.077	0.001	0.131	0.373	0.138	0.130	0.641	0.772	209,700
	1986-97 w/o UF86	0.054	0.074	0.001	0.128	0.371	0.146	0.126	0.643	0.772	202,042
	1986-92	0.050	0.076	0.001	0.127	0.356	0.127	0.133	0.616	0.743	278,248
	1986-92 w/o UF86	0.050	0.070	0.001	0.122	0.355	0.137	0.127	0.619	0.741	275,632
2007 Planned	Current (86-91 w/o UF86)	0.041	0.059	0.000	0.100	0.008	0.000	0.007	0.016	0.116	22,462
	1986-91	0.047	0.065	0.000	0.112	0.004	0.000	0.009	0.014	0.126	22,462
	1986-91 w/o UF86	0.047	0.048	0.000	0.095	0.004	0.000	0.010	0.015	0.109	22,462
	1986-97	0.052	0.067	0.000	0.120	0.007	0.001	0.007	0.014	0.134	22,462
	1986-97 w/o UF86	0.052	0.053	0.000	0.105	0.007	0.001	0.007	0.014	0.120	22,462
	1986-92	0.048	0.062	0.000	0.110	0.006	0.001	0.009	0.015	0.125	22,462
	1986-92 w/o UF86	0.049	0.046	0.000	0.095	0.006	0.001	0.009	0.015	0.110	22,462

Table 12. Georgia Strait Mainland natural Coho exploitation rates and Cohort sizes.

Geo St Mainland Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.011	0.076	0.000	0.088	0.136	0.433	0.085	0.654	0.742	467,482
	1987	0.011	0.047	0.000	0.058	0.154	0.476	0.082	0.712	0.770	311,556
	1988	0.005	0.031	0.001	0.037	0.064	0.624	0.033	0.721	0.758	317,066
	1989	0.005	0.061	0.000	0.066	0.140	0.332	0.127	0.598	0.664	180,664
	1990	0.012	0.041	0.000	0.054	0.132	0.433	0.094	0.659	0.713	354,998
	1991	0.038	0.056	0.000	0.095	0.313	0.081	0.159	0.552	0.647	138,130
	86-91 Avg	0.014	0.052	0.000	0.066	0.157	0.396	0.097	0.649	0.716	294,983
	87-91 Avg	0.014	0.047	0.000	0.062	0.161	0.389	0.099	0.649	0.710	260,483
CoTC Estimates Under Review	1986	0.016	0.093	0.000	0.109	0.160	0.366	0.098	0.624	0.733	374,534
	1987	0.017	0.026	0.000	0.042	0.218	0.525	0.095	0.838	0.880	95,674
	1988	0.007	0.015	0.000	0.023	0.089	0.638	0.036	0.764	0.787	191,474
	1989	0.006	0.073	0.000	0.079	0.154	0.320	0.150	0.624	0.703	202,912
	1990	0.015	0.028	0.000	0.043	0.165	0.443	0.102	0.710	0.753	197,588
	1991	0.051	0.068	0.001	0.119	0.385	0.064	0.162	0.611	0.730	150,846
	1992	0.013	0.020	0.000	0.033	0.142	0.528	0.104	0.773	0.806	117,712
	1993	0.016	0.004	0.000	0.020	0.072	0.630	0.061	0.763	0.783	187,182
	1994	0.018	0.027	0.000	0.044	0.283	0.308	0.109	0.699	0.743	86,194
	1995	0.035	0.038	0.000	0.072	0.392	0.015	0.085	0.492	0.565	272,788
	1996	0.068	0.017	0.000	0.084	0.369	0.072	0.175	0.615	0.699	75,542
	1997	0.034	0.144	0.000	0.177	0.039	0.021	0.392	0.452	0.629	23,068
	86-91 Avg	0.019	0.051	0.000	0.069	0.195	0.393	0.107	0.695	0.764	202,171
87-91 Avg	0.019	0.042	0.000	0.061	0.202	0.398	0.109	0.709	0.771	167,699	
Base Period Run	Current (86-91 w/o UF86)	0.014	0.050	0.000	0.064	0.170	0.404	0.101	0.675	0.738	294,984
	1986-91	0.018	0.051	0.000	0.070	0.197	0.408	0.107	0.712	0.782	202,172
	1986-91 w/o UF86	0.018	0.051	0.000	0.070	0.197	0.408	0.107	0.712	0.782	202,172
	1986-97	0.026	0.051	0.000	0.077	0.215	0.368	0.129	0.712	0.789	164,626
	1986-97 w/o UF86	0.026	0.051	0.000	0.077	0.215	0.368	0.129	0.712	0.789	164,626
	1986-92	0.018	0.047	0.000	0.065	0.189	0.426	0.108	0.724	0.789	190,106
	1986-92 w/o UF86	0.018	0.047	0.000	0.065	0.189	0.426	0.108	0.724	0.789	190,106
2007 Planned	Current (86-91 w/o UF86)	0.018	0.038	0.000	0.056	0.014	0.003	0.007	0.024	0.080	53,097
	1986-91	0.025	0.051	0.000	0.075	0.025	0.004	0.011	0.039	0.114	53,097
	1986-91 w/o UF86	0.025	0.051	0.000	0.076	0.025	0.004	0.011	0.039	0.115	53,097
	1986-97	0.035	0.053	0.000	0.088	0.016	0.004	0.012	0.031	0.119	53,097
	1986-97 w/o UF86	0.035	0.054	0.000	0.088	0.016	0.004	0.012	0.031	0.120	53,097
	1986-92	0.023	0.049	0.000	0.072	0.021	0.004	0.011	0.036	0.107	53,097
	1986-92 w/o UF86	0.023	0.049	0.000	0.072	0.021	0.004	0.011	0.036	0.108	53,097

Table 13. Georgia Strait Vancouver Island natural Coho exploitation rates and Cohort sizes.

Geo St Vanc Is Natural		Estimated Exploitation Rates								Initial Cohort Size	
Catch Yr		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC	Can Tot	Total	
Current FRAM Estimates	1986	0.004	0.016	0.000	0.020	0.365	0.223	0.134	0.722	0.742	291,826
	1987	0.001	0.012	0.000	0.013	0.263	0.354	0.139	0.755	0.769	94,270
	1988	0.005	0.016	0.000	0.021	0.209	0.391	0.135	0.734	0.756	563,948
	1989	0.004	0.035	0.000	0.039	0.222	0.246	0.153	0.621	0.660	466,286
	1990	0.005	0.014	0.000	0.019	0.245	0.281	0.167	0.693	0.712	485,908
	1991	0.013	0.052	0.000	0.066	0.381	0.044	0.156	0.582	0.647	756,782
	86-91 Avg	0.005	0.024	0.000	0.030	0.281	0.256	0.147	0.685	0.714	443,170
	87-91 Avg	0.006	0.026	0.000	0.032	0.264	0.263	0.150	0.677	0.709	473,439
CoTC Estimates Under Review	1986	0.016	0.022	0.000	0.038	0.396	0.187	0.104	0.688	0.726	853,640
	1987	0.002	0.006	0.000	0.008	0.307	0.368	0.117	0.792	0.800	242,130
	1988	0.006	0.010	0.000	0.016	0.267	0.384	0.101	0.753	0.769	573,534
	1989	0.005	0.044	0.000	0.048	0.232	0.243	0.157	0.632	0.681	449,162
	1990	0.006	0.012	0.000	0.018	0.273	0.290	0.157	0.720	0.738	360,772
	1991	0.018	0.066	0.000	0.085	0.450	0.044	0.149	0.643	0.728	490,196
	1992	0.016	0.010	0.000	0.026	0.352	0.289	0.158	0.799	0.825	216,200
	1993	0.017	0.008	0.000	0.025	0.079	0.609	0.121	0.809	0.833	259,344
	1994	0.008	0.007	0.000	0.015	0.459	0.163	0.165	0.787	0.802	171,450
	1995	0.075	0.017	0.000	0.093	0.440	0.008	0.068	0.516	0.609	521,630
	1996	0.051	0.011	0.000	0.062	0.502	0.042	0.122	0.666	0.728	217,478
	1997	0.020	0.063	0.000	0.083	0.057	0.019	0.393	0.468	0.551	59,406
	86-91 Avg	0.009	0.027	0.000	0.036	0.321	0.253	0.131	0.705	0.740	494,906
87-91 Avg	0.007	0.028	0.000	0.035	0.306	0.266	0.136	0.708	0.743	423,159	
Base Period Run	Current (86-91 w/o UF86)	0.005	0.022	0.000	0.027	0.304	0.260	0.149	0.714	0.741	443,170
	1986-91	0.007	0.027	0.000	0.034	0.336	0.258	0.131	0.725	0.758	494,906
	1986-91 w/o UF86	0.007	0.027	0.000	0.034	0.336	0.258	0.131	0.725	0.758	494,906
	1986-97	0.019	0.025	0.000	0.043	0.345	0.252	0.149	0.746	0.789	367,912
	1986-97 w/o UF86	0.019	0.025	0.000	0.043	0.345	0.252	0.149	0.746	0.789	367,912
	1986-92	0.009	0.025	0.000	0.034	0.342	0.262	0.135	0.740	0.773	455,090
	1986-92 w/o UF86	0.009	0.025	0.000	0.034	0.342	0.262	0.135	0.740	0.773	455,090
2007 Planned	Current (86-91 w/o UF86)	0.005	0.018	0.000	0.023	0.034	0.001	0.018	0.053	0.075	79,771
	1986-91	0.007	0.023	0.000	0.030	0.016	0.001	0.028	0.046	0.076	79,771
	1986-91 w/o UF86	0.007	0.024	0.000	0.031	0.016	0.001	0.028	0.045	0.076	79,771
	1986-97	0.018	0.028	0.000	0.046	0.018	0.002	0.028	0.048	0.094	79,771
	1986-97 w/o UF86	0.018	0.028	0.000	0.046	0.018	0.002	0.028	0.048	0.094	79,771
	1986-92	0.010	0.023	0.000	0.033	0.016	0.001	0.028	0.046	0.079	79,771
	1986-92 w/o UF86	0.010	0.024	0.000	0.034	0.016	0.001	0.028	0.046	0.079	79,771

Table 14. Columbia River early-timed Coho exploitation rates and Cohort sizes.

Col Early		Estimated Exploitation Rates				Initial Cohort Size
Catch Yr		AK-BC	PFMC	Other US	US Tot	
Current FRAM Estimates	1986	0.021	0.271	0.429	0.721	1,218,138
	1987	0.033	0.537	0.297	0.867	484,942
	1988	0.014	0.428	0.276	0.718	470,356
	1989	0.042	0.476	0.277	0.795	791,450
	1990	0.054	0.621	0.110	0.785	367,908
	1991	0.018	0.406	0.313	0.737	962,896
	86-91 Avg	0.030	0.457	0.284	0.771	715,948
	87-91 Avg	0.032	0.494	0.255	0.780	615,510
CoTC Estimates Under Review	1986	0.016	0.202	0.452	0.670	1,180,026
	1987	0.034	0.494	0.323	0.851	475,134
	1988	0.024	0.565	0.235	0.824	702,218
	1989	0.050	0.543	0.231	0.824	993,254
	1990	0.048	0.635	0.109	0.792	404,398
	1991	0.013	0.291	0.337	0.641	834,948
	1992	0.010	0.339	0.186	0.535	203,376
	1993	0.015	0.279	0.248	0.542	117,040
	1994	0.013	0.000	0.092	0.105	177,584
	1995	0.028	0.150	0.106	0.284	91,446
	1996	0.009	0.047	0.193	0.249	109,782
	1997	0.000	0.014	0.253	0.267	124,466
	86-91 Avg	0.031	0.455	0.281	0.767	764,996
	87-91 Avg	0.034	0.506	0.247	0.786	681,990
Base Period Run	Current (86-91 w/o UF86)	0.035	0.511	0.248	0.794	715,948
	1986-91	0.033	0.502	0.255	0.790	764,996
	1986-91 w/o UF86	0.033	0.502	0.255	0.790	764,996
	1986-97	0.024	0.466	0.223	0.713	451,138
	1986-97 w/o UF86	0.024	0.466	0.223	0.713	451,138
	1986-92	0.030	0.509	0.245	0.784	684,764
	1986-92 w/o UF86	0.014	0.269	0.205	0.488	684,764
2007 Planned	Current (86-91 w/o UF86)	0.001	0.117	0.406	0.524	516,710
	1986-91	0.000	0.124	0.385	0.509	516,710
	1986-91 w/o UF86	0.000	0.124	0.385	0.509	516,710
	1986-97	0.000	0.110	0.251	0.361	516,710
	1986-97 w/o UF86	0.000	0.110	0.251	0.361	516,710
	1986-92	0.000	0.119	0.350	0.469	516,710
	1986-92 w/o UF86	0.000	0.119	0.350	0.469	516,710

Table 15. Columbia River late-timed Coho exploitation rates and Cohort sizes.

Col Late		Estimated Exploitation Rates				Initial Cohort Size
Catch Yr		AK-BC	PFMC	Other US	US Tot	
Current FRAM Estimates	1986	0.052	0.304	0.538	0.894	1,566,560
	1987	0.044	0.411	0.395	0.850	288,076
	1988	0.030	0.472	0.419	0.921	1,079,476
	1989	0.079	0.481	0.339	0.899	1,117,780
	1990	0.109	0.553	0.156	0.818	336,244
	1991	0.045	0.392	0.412	0.849	1,056,134
	86-91 Avg	0.060	0.436	0.377	0.872	907,378
	87-91 Avg	0.061	0.462	0.344	0.867	775,542
CoTC Estimates Under Review	1986	0.041	0.278	0.545	0.864	1,523,230
	1987	0.043	0.413	0.373	0.829	280,850
	1988	0.031	0.392	0.463	0.886	890,454
	1989	0.079	0.453	0.346	0.878	1,066,254
	1990	0.064	0.423	0.210	0.697	213,362
	1991	0.038	0.362	0.428	0.828	1,030,618
	1992	0.056	0.432	0.275	0.763	257,058
	1993	0.081	0.379	0.289	0.749	94,924
	1994	0.155	0.000	0.141	0.296	47,624
	1995	0.140	0.188	0.069	0.397	31,196
	1996	0.060	0.218	0.156	0.434	50,412
	1997	0.001	0.200	0.227	0.428	79,598
	86-91 Avg	0.049	0.387	0.394	0.830	834,128
87-91 Avg	0.051	0.409	0.364	0.824	696,308	
Base Period Run	Current (86-91 w/o UF86)	0.068	0.485	0.327	0.880	907,376
	1986-91	0.050	0.422	0.369	0.841	834,128
	1986-91 w/o UF86	0.050	0.422	0.369	0.841	834,128
	1986-97	0.066	0.429	0.278	0.773	463,798
	1986-97 w/o UF86	0.066	0.429	0.278	0.773	463,798
	1986-92	0.057	0.441	0.342	0.840	751,690
	1986-92 w/o UF86	0.080	0.375	0.198	0.653	751,690
2007 Planned	Current (86-91 w/o UF86)	0.001	0.178	0.568	0.747	169,852
	1986-91	0.000	0.141	0.567	0.708	169,852
	1986-91 w/o UF86	0.000	0.141	0.567	0.708	169,852
	1986-97	0.001	0.143	0.374	0.518	169,852
	1986-97 w/o UF86	0.001	0.143	0.374	0.518	169,852
	1986-92	0.001	0.143	0.535	0.679	169,852
1986-92 w/o UF86	0.001	0.143	0.535	0.679	169,852	

Table 16. Oregon Coast (middle-north stock) natural Coho exploitation rates and Cohort sizes.

OCN (OCN mid north used for ERs)		Estimated Exploitation Rates				Initial Cohort Size
Catch Yr		AK-BC	PFMC	Other US	US Tot	
Current FRAM Estimates	1986	0.034	0.396	0.068	0.498	135,360
	1987	0.010	0.522	0.046	0.578	77,266
	1988	0.015	0.598	0.065	0.678	180,908
	1989	0.029	0.678	0.043	0.750	192,472
	1990	0.032	0.732	0.026	0.790	119,476
	1991	0.018	0.551	0.078	0.647	135,658
	86-91 Avg	0.023	0.580	0.054	0.657	140,190
87-91 Avg	0.021	0.616	0.052	0.689	141,156	
CoTC Estimates Under Review	1986	0.058	0.521	0.052	0.631	188,902
	1987	0.017	0.749	0.029	0.795	161,078
	1988	0.015	0.541	0.066	0.622	160,224
	1989	0.028	0.620	0.045	0.693	163,702
	1990	0.040	0.781	0.020	0.841	161,968
	1991	0.026	0.682	0.058	0.766	209,776
	1992	0.018	0.599	0.064	0.681	176,674
	1993	0.018	0.270	0.102	0.390	113,018
	1994	0.051	0.001	0.005	0.057	58,436
	1995	0.015	0.065	0.004	0.084	74,142
	1996	0.009	0.031	0.028	0.068	98,110
	1997	0.000	0.032	0.135	0.167	31,480
	86-91 Avg	0.031	0.649	0.045	0.725	174,275
87-91 Avg	0.025	0.675	0.044	0.743	171,350	
Base Period Run	Current (86-91 w/o UF86)	0.024	0.665	0.043	0.732	140,190
	1986-91	0.032	0.683	0.042	0.757	174,276
	1986-91 w/o UF86	0.032	0.683	0.042	0.757	174,276
	1986-97	0.025	0.647	0.044	0.716	133,126
	1986-97 w/o UF86	0.025	0.647	0.044	0.716	133,126
	1986-92	0.028	0.663	0.043	0.734	174,616
	1986-92 w/o UF86	0.019	0.593	0.047	0.659	174,616
2007 Planned	Current (86-91 w/o UF86)	0.002	0.097	0.013	0.112	314,649
	1986-91	0.002	0.136	0.012	0.150	314,649
	1986-91 w/o UF86	0.002	0.136	0.012	0.150	314,649
	1986-97	0.001	0.127	0.012	0.140	314,649
	1986-97 w/o UF86	0.001	0.127	0.012	0.140	314,649
	1986-92	0.002	0.136	0.012	0.150	314,649
1986-92 w/o UF86	0.002	0.136	0.012	0.150	314,649	

Table 17. Nooksack Hatchery (Skookum Creek) Coho exploitation rates and Cohort sizes.

NOOKSACK-SKOOKUM CRK HATCHERY											
Catch Yr		Estimated Exploitation Rates							Total	Initial Cohort Size	
		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC			Can Tot
Current FRAM Estimates	1986	0.011	0.515	0.000	0.526	0.177	0.206	0.044	0.427	0.953	274,680
	1987	0.025	0.393	0.000	0.418	0.195	0.250	0.080	0.525	0.943	440,676
	1988	0.044	0.450	0.001	0.494	0.155	0.254	0.052	0.461	0.956	319,104
	1989	0.023	0.425	0.000	0.449	0.234	0.140	0.131	0.504	0.953	170,428
	1990	0.049	0.446	0.000	0.495	0.245	0.167	0.066	0.478	0.973	214,718
	1991	0.047	0.353	0.001	0.401	0.438	0.005	0.105	0.548	0.949	49,530
	86-91 Avg	0.033	0.430	0.000	0.464	0.241	0.170	0.080	0.491	0.954	244,856
	87-91 Avg	0.038	0.413	0.000	0.451	0.253	0.163	0.087	0.503	0.955	238,891
CoTC Estimates Under Review	1986	0.017	0.448	0.000	0.465	0.242	0.189	0.053	0.483	0.949	339,772
	1987	0.030	0.417	0.000	0.448	0.190	0.211	0.073	0.473	0.921	377,010
	1988	0.044	0.446	0.000	0.490	0.179	0.218	0.048	0.445	0.935	295,738
	1989	0.027	0.420	0.000	0.447	0.231	0.123	0.143	0.497	0.944	178,816
	1990	0.056	0.421	0.000	0.478	0.256	0.160	0.067	0.484	0.962	202,050
	1991	0.060	0.356	0.001	0.416	0.423	0.004	0.097	0.524	0.941	49,620
	1992	0.044	0.275	0.001	0.320	0.281	0.234	0.083	0.597	0.917	46,938
	1993	0.015	0.395	0.000	0.409	0.084	0.298	0.037	0.419	0.828	54,674
	1994	0.001	0.346	0.000	0.348	0.424	0.073	0.075	0.572	0.920	30,052
	1995	0.043	0.412	0.000	0.456	0.348	0.000	0.037	0.385	0.841	102,608
	1996	0.033	0.436	0.000	0.470	0.294	0.005	0.056	0.355	0.824	134,758
	1997	0.022	0.251	0.000	0.273	0.007	0.000	0.080	0.087	0.360	33,892
	86-91 Avg	0.039	0.418	0.000	0.457	0.254	0.151	0.080	0.485	0.942	240,501
87-91 Avg	0.043	0.412	0.000	0.456	0.256	0.143	0.086	0.485	0.941	220,647	
Base Period Run	Current (86-91 w/o UF86)	0.035	0.396	0.000	0.431	0.269	0.172	0.092	0.532	0.963	244,856
	1986-91	0.041	0.405	0.000	0.446	0.263	0.154	0.087	0.503	0.949	240,502
	1986-91 w/o UF86	0.041	0.405	0.000	0.446	0.263	0.154	0.087	0.503	0.949	240,502
	1986-97	0.041	0.370	0.000	0.412	0.268	0.145	0.081	0.495	0.907	153,828
	1986-97 w/o UF86	0.041	0.370	0.000	0.412	0.268	0.145	0.081	0.495	0.907	153,828
	1986-92	0.042	0.381	0.000	0.423	0.266	0.166	0.089	0.521	0.944	212,850
	1986-92 w/o UF86	0.042	0.381	0.000	0.423	0.266	0.166	0.089	0.521	0.944	212,850
2007 Planned	Current (86-91 w/o UF86)	0.037	0.581	0.006	0.623	0.005	0.001	0.003	0.009	0.633	25,330
	1986-91	0.041	0.582	0.000	0.623	0.005	0.001	0.004	0.010	0.633	25,330
	1986-91 w/o UF86	0.041	0.583	0.000	0.624	0.005	0.001	0.004	0.010	0.633	25,330
	1986-97	0.041	0.570	0.000	0.611	0.005	0.001	0.004	0.009	0.620	25,330
	1986-97 w/o UF86	0.041	0.571	0.000	0.612	0.005	0.001	0.004	0.009	0.621	25,330
	1986-92	0.043	0.575	0.000	0.619	0.005	0.001	0.004	0.010	0.629	25,330
	1986-92 w/o UF86	0.043	0.576	0.000	0.619	0.005	0.001	0.004	0.010	0.629	25,330

Table 18. Puyallup Hatchery (South Puget Sound) Coho exploitation rates and Cohort sizes.

PUYALLUP HATCHERY											
Catch Yr		Estimated Exploitation Rates							Total	Initial Cohort Size	
		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC			Can Tot
Current FRAM Estimates	1986	0.041	0.528	0.000	0.569	0.294	0.002	0.052	0.348	0.917	199,204
	1987	0.049	0.592	0.001	0.642	0.252	0.002	0.052	0.305	0.947	293,526
	1988	0.035	0.693	0.001	0.729	0.186	0.005	0.027	0.218	0.947	116,854
	1989	0.050	0.493	0.000	0.544	0.275	0.000	0.085	0.361	0.905	261,812
	1990	0.039	0.531	0.000	0.570	0.262	0.001	0.040	0.304	0.874	145,182
	1991	0.051	0.446	0.000	0.496	0.344	0.000	0.068	0.412	0.908	203,718
	86-91 Avg	0.044	0.547	0.000	0.592	0.269	0.002	0.054	0.325	0.916	203,383
	87-91 Avg	0.045	0.551	0.000	0.596	0.264	0.002	0.054	0.320	0.916	204,218
CoTC Estimates Under Review	1986	0.040	0.547	0.000	0.587	0.257	0.001	0.053	0.311	0.898	188,272
	1987	0.048	0.616	0.001	0.665	0.215	0.001	0.047	0.264	0.929	279,114
	1988	0.054	0.547	0.001	0.602	0.290	0.004	0.037	0.330	0.933	132,084
	1989	0.039	0.497	0.000	0.536	0.270	0.000	0.091	0.361	0.897	280,274
	1990	0.057	0.453	0.000	0.511	0.325	0.002	0.055	0.382	0.893	187,944
	1991	0.048	0.489	0.000	0.537	0.298	0.000	0.057	0.356	0.893	194,402
	1992	0.054	0.361	0.001	0.416	0.190	0.001	0.084	0.274	0.690	211,570
	1993	0.050	0.279	0.001	0.330	0.257	0.011	0.058	0.326	0.656	138,058
	1994	0.000	0.418	0.000	0.418	0.228	0.000	0.055	0.283	0.701	227,994
	1995	0.017	0.485	0.000	0.503	0.182	0.000	0.012	0.195	0.697	176,836
	1996	0.028	0.283	0.000	0.310	0.203	0.000	0.032	0.235	0.545	140,448
	1997	0.019	0.417	0.000	0.436	0.006	0.000	0.035	0.041	0.477	44,372
	86-91 Avg	0.048	0.525	0.000	0.573	0.276	0.002	0.057	0.334	0.907	210,348
87-91 Avg	0.049	0.520	0.000	0.570	0.280	0.002	0.058	0.339	0.909	214,764	
Base Period Run	Current (86-91 w/o UF86)	0.047	0.504	0.000	0.551	0.301	0.002	0.066	0.369	0.920	203,382
	1986-91	0.051	0.514	0.000	0.566	0.284	0.002	0.061	0.347	0.912	210,348
	1986-91 w/o UF86	0.051	0.514	0.000	0.566	0.284	0.002	0.061	0.347	0.912	210,348
	1986-97	0.051	0.451	0.000	0.503	0.250	0.002	0.059	0.311	0.813	183,448
	1986-97 w/o UF86	0.051	0.451	0.000	0.503	0.250	0.002	0.059	0.311	0.813	183,448
	1986-92	0.052	0.494	0.001	0.547	0.270	0.001	0.067	0.338	0.885	210,524
	1986-92 w/o UF86	0.052	0.494	0.001	0.547	0.270	0.001	0.067	0.338	0.885	210,524
2007 Planned	Current (86-91 w/o UF86)	0.038	0.709	0.006	0.752	0.006	0.000	0.001	0.007	0.759	48,944
	1986-91	0.039	0.727	0.000	0.765	0.003	0.000	0.001	0.004	0.769	48,944
	1986-91 w/o UF86	0.039	0.727	0.000	0.765	0.003	0.000	0.001	0.004	0.769	48,944
	1986-97	0.039	0.766	0.000	0.806	0.003	0.000	0.001	0.004	0.809	48,944
	1986-97 w/o UF86	0.039	0.766	0.000	0.806	0.003	0.000	0.001	0.004	0.809	48,944
	1986-92	0.040	0.740	0.000	0.780	0.003	0.000	0.001	0.004	0.784	48,944
	1986-92 w/o UF86	0.040	0.740	0.000	0.780	0.003	0.000	0.001	0.004	0.784	48,944

Table 19. Deschutes River (South Puget Sound) natural Coho exploitation rates and Cohort sizes..

DESCHUTES WILD											
Catch Yr		Estimated Exploitation Rates							Total	Initial Cohort Size	
		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC			Can Tot
Current FRAM Estimates	1986	0.041	0.383	0.000	0.424	0.294	0.002	0.052	0.349	0.773	22,970
	1987	0.049	0.301	0.001	0.351	0.253	0.002	0.052	0.307	0.659	36,634
	1988	0.059	0.410	0.002	0.470	0.273	0.005	0.035	0.313	0.783	41,380
	1989	0.040	0.383	0.000	0.423	0.344	0.001	0.098	0.443	0.866	7,780
	1990	0.039	0.508	0.000	0.547	0.262	0.001	0.040	0.304	0.851	23,158
	1991	0.051	0.371	0.000	0.422	0.343	0.000	0.068	0.411	0.833	14,122
	86-91 Avg	0.046	0.393	0.001	0.440	0.295	0.002	0.057	0.355	0.794	24,341
	87-91 Avg	0.048	0.395	0.001	0.443	0.295	0.002	0.059	0.356	0.798	24,615
CoTC Estimates Under Review	1986	0.040	0.398	0.000	0.438	0.257	0.001	0.053	0.312	0.750	22,080
	1987	0.048	0.312	0.001	0.361	0.216	0.001	0.048	0.265	0.626	34,946
	1988	0.054	0.345	0.001	0.400	0.291	0.004	0.037	0.332	0.732	35,760
	1989	0.039	0.427	0.000	0.466	0.270	0.000	0.091	0.362	0.828	6,592
	1990	0.057	0.436	0.000	0.494	0.325	0.002	0.056	0.382	0.876	29,986
	1991	0.048	0.404	0.000	0.452	0.298	0.000	0.057	0.356	0.808	13,022
	1992	0.054	0.653	0.001	0.708	0.190	0.001	0.083	0.274	0.982	55,432
	1993	0.050	0.359	0.001	0.410	0.256	0.011	0.058	0.326	0.735	3,132
	1994	0.000	0.693	0.000	0.693	0.228	0.000	0.055	0.284	0.977	203,880
	1995	0.017	0.764	0.000	0.782	0.183	0.000	0.012	0.195	0.977	50,910
	1996	0.028	0.717	0.000	0.744	0.202	0.000	0.032	0.234	0.979	15,468
	1997	0.018	0.910	0.000	0.929	0.006	0.000	0.035	0.041	0.969	67,054
	86-91 Avg	0.048	0.387	0.000	0.435	0.276	0.002	0.057	0.335	0.770	23,731
87-91 Avg	0.050	0.385	0.000	0.435	0.280	0.002	0.058	0.339	0.774	24,061	
Base Period Run	Current (86-91 w/o UF86)	0.049	0.371	0.000	0.420	0.326	0.002	0.067	0.395	0.815	24,340
	1986-91	0.051	0.392	0.000	0.444	0.284	0.002	0.062	0.347	0.791	23,730
	1986-91 w/o UF86	0.051	0.392	0.000	0.444	0.284	0.002	0.062	0.347	0.791	23,730
	1986-97	0.051	0.524	0.000	0.576	0.250	0.002	0.059	0.311	0.887	44,854
	1986-97 w/o UF86	0.051	0.524	0.000	0.576	0.250	0.002	0.059	0.311	0.887	44,854
	1986-92	0.052	0.443	0.001	0.496	0.270	0.001	0.067	0.339	0.835	28,260
	1986-92 w/o UF86	0.052	0.443	0.001	0.496	0.270	0.001	0.067	0.339	0.835	28,260
2007 Planned	Current (86-91 w/o UF86)	0.037	0.405	0.006	0.448	0.004	0.000	0.001	0.005	0.453	180
	1986-91	0.039	0.420	0.000	0.459	0.003	0.000	0.001	0.004	0.463	180
	1986-91 w/o UF86	0.039	0.420	0.000	0.459	0.003	0.000	0.001	0.004	0.463	180
	1986-97	0.039	0.767	0.000	0.806	0.003	0.000	0.001	0.004	0.810	180
	1986-97 w/o UF86	0.039	0.767	0.000	0.806	0.003	0.000	0.001	0.004	0.810	180
	1986-92	0.040	0.540	0.000	0.580	0.003	0.000	0.001	0.004	0.584	180
	1986-92 w/o UF86	0.040	0.540	0.000	0.580	0.003	0.000	0.001	0.004	0.584	180

Table 20. South Puget Sound Net Pen Coho exploitation rates and Cohort sizes.

SOUTH SOUND NET PENS											
Catch Yr		Estimated Exploitation Rates							Total	Initial Cohort Size	
		US Ocn	US PS	Other US	US Tot	BC Ocn	Geo Str	Other BC			Can Tot
Current FRAM Estimates	1986	0.041	0.610	0.000	0.651	0.293	0.002	0.052	0.348	0.999	557,612
	1987	0.049	0.645	0.001	0.694	0.251	0.002	0.051	0.305	1.000	842,838
	1988	0.059	0.627	0.002	0.688	0.272	0.005	0.035	0.312	0.999	926,848
	1989	0.040	0.517	0.000	0.557	0.344	0.001	0.097	0.442	0.999	515,326
	1990	0.039	0.657	0.000	0.695	0.262	0.001	0.040	0.303	0.999	487,666
	1991	0.051	0.535	0.000	0.585	0.343	0.000	0.067	0.411	0.996	149,090
	86-91 Avg	0.046	0.598	0.001	0.645	0.294	0.002	0.057	0.353	0.999	579,897
	87-91 Avg	0.047	0.596	0.001	0.644	0.294	0.002	0.058	0.354	0.998	584,354
CoTC Estimates Under Review	1986	0.040	0.635	0.000	0.675	0.257	0.001	0.053	0.311	0.986	535,580
	1987	0.048	0.671	0.001	0.720	0.215	0.001	0.047	0.264	0.984	798,140
	1988	0.054	0.593	0.001	0.648	0.289	0.004	0.037	0.330	0.978	833,594
	1989	0.039	0.584	0.000	0.623	0.270	0.000	0.091	0.361	0.984	435,428
	1990	0.057	0.553	0.000	0.611	0.325	0.002	0.056	0.382	0.993	624,572
	1991	0.048	0.585	0.000	0.633	0.298	0.000	0.057	0.356	0.989	135,568
	1992	0.054	0.664	0.001	0.719	0.190	0.001	0.083	0.274	0.993	129,704
	1993	0.050	0.611	0.001	0.662	0.256	0.011	0.058	0.325	0.986	57,744
	1994	0.000	0.710	0.000	0.710	0.229	0.000	0.055	0.284	0.994	107,978
	1995	0.017	0.778	0.000	0.795	0.183	0.000	0.012	0.195	0.990	94,006
	1996	0.028	0.721	0.000	0.749	0.202	0.000	0.032	0.234	0.983	72,042
	1997	0.018	0.910	0.000	0.928	0.006	0.000	0.035	0.041	0.969	44,238
	86-91 Avg	0.048	0.604	0.000	0.652	0.276	0.002	0.057	0.334	0.986	560,480
87-91 Avg	0.049	0.597	0.000	0.647	0.280	0.002	0.058	0.339	0.986	565,460	
Base Period Run	Current (86-91 w/o UF86)	0.049	0.559	0.000	0.609	0.324	0.002	0.068	0.394	1.002	579,896
	1986-91	0.051	0.594	0.000	0.646	0.284	0.002	0.062	0.347	0.993	560,480
	1986-91 w/o UF86	0.051	0.594	0.000	0.646	0.284	0.002	0.062	0.347	0.993	560,480
	1986-97	0.051	0.630	0.000	0.681	0.249	0.002	0.059	0.310	0.991	322,382
	1986-97 w/o UF86	0.051	0.630	0.000	0.681	0.249	0.002	0.059	0.310	0.991	322,382
	1986-92	0.052	0.602	0.001	0.655	0.270	0.001	0.067	0.338	0.993	498,942
	1986-92 w/o UF86	0.052	0.602	0.001	0.655	0.270	0.001	0.067	0.338	0.993	498,942
2007 Planned	Current (86-91 w/o UF86)	0.037	0.946	0.006	0.989	0.004	0.000	0.001	0.005	0.994	65,731
	1986-91	0.038	0.946	0.000	0.985	0.003	0.000	0.001	0.004	0.989	65,731
	1986-91 w/o UF86	0.038	0.946	0.000	0.985	0.003	0.000	0.001	0.004	0.989	65,731
	1986-97	0.039	0.946	0.000	0.985	0.003	0.000	0.001	0.004	0.989	65,731
	1986-97 w/o UF86	0.039	0.946	0.000	0.985	0.003	0.000	0.001	0.004	0.989	65,731
	1986-92	0.040	0.945	0.000	0.985	0.003	0.000	0.001	0.004	0.989	65,731
	1986-92 w/o UF86	0.040	0.945	0.000	0.985	0.003	0.000	0.001	0.004	0.989	65,731

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