Salmon Technical Team Report on Queets Coho Overfishing Assessment

Executive Summary

In 2006, 2007, and 2008 the Queets River coho stock failed to meet the spawning escapement objective in the Pacific Coast Salmon Plan (FMP) of an MSY escapement range of 5,800-14,500 fish. The spawning escapement of naturally produced coho in the Queets River was 5,626 in 2006; 4,642 in 2007, and 4,629 in 2008. In 2009, the Salmon Technical Team (STT) was instructed by the Pacific Fishery Management Council (Council) to complete a stock assessment of Queets coho and evaluate the fishery management and stock productivity factors that contributed to not achieving the spawning escapement objective in the FMP.

The STT evaluated the degree to which various factors (freshwater production, marine survival, and harvest) may have contributed to the low spawning escapements in 2006 through 2008. Available information indicates that for all years fishing contributed to not achieving the spawning escapement objective or, in other words, in the absence of fishing the spawning escapement objective would have been achieved. Ocean fishery impacts, as measured by exploitation rates, were similar between preseason and postseason assessments. Council area fisheries comprised less than 30 percent of the total exploitation in all fisheries. Exploitation rates in terminal net and sport fisheries were higher than preseason estimates in 2008, comprising about two-thirds of the total fishery exploitation in that year. However, in every year the preseason forecasts for Queets coho were overestimated, most likely due to lower marine survival than the estimate used for preseason forecasting.

The STT concludes that because there was sufficient abundance in each year to meet the minimum escapement objective, but fishing reduced spawning escapement below the minimum escapement goal, overfishing of Queets coho occurred, and that Queets coho were overfished. However, a review of preseason forecasting methods and terminal runsize assessment procedures could help in substantially improving the abundance projections and achieving the FMP management objectives for natural escapement. The STT does not believe that the stock abundance levels in these three years is significantly depressed and would represent a concern for producing maximum sustainable yield on a continuing basis. Pending a review of the preseason and terminal abundance methodologies, the STT believes the automatic rebuilding feature of the FMP is sufficient, and development of a separate rebuilding plan is not warranted at this time. Overfishing should be considered ended when the stock meets its MSY escapement goal, and the stock should then be considered rebuilt.

Introduction

In 2009, the Salmon Technical Team (STT) was instructed by the Pacific Fishery Management Council (Council) to complete a stock assessment of Queets coho in response to the application of overfishing criteria as defined in Section 3.2 of Pacific Coast Salmon Plan (Framework Management Plan (FMP)). The STT is responsible for determining the status of Queets coho and developing recommendations for any management changes to rebuild the stock for application beginning in 2010 if the stock is determined to be overfished. The Council's criteria for an overfishing concern are met if, in three consecutive years, the postseason estimates indicate a natural stock has fallen short of its conservation objective (MSY, MSP, or spawner floor as noted for some harvest rate objectives) in Table 3-1 of the FMP. It is possible that this situation could represent normal variation, as has been seen in the past for several salmon stocks. However, the occurrence of three consecutive years of reduced stock size or spawner escapements, depending on the magnitude of the short-fall, could signal the beginning of a critical downward trend (e.g., Oregon coastal coho) which may result in fishing that jeopardizes the capacity of the stock to produce MSY over the long term if appropriate actions are not taken to ensure the automatic rebuilding feature of the conservation objectives is achieved.

Under Amendment 12 and 14 of the FMP, the management objective for Queets River coho salmon was to provide 5,800 to 14,500 natural spawners each year, a range that was expected to provide maximum sustainable yield (MSY). The natural spawning escapements in 2006 through 2008 were below 5,800, prompting this review of the status of Queets River coho.

Background

The following is an excerpt on Overfishing as described in the Pacific Coast Salmon Plan (FMP Section 3.2).

"Any fishery management plan . . . shall . . . specify objective and measurable criteria for identifying when the fishery . . . is overfished . . . and, . . . contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;"
Magnuson-Stevens Act, § 303(a)(10)

"The terms overfishing and overfished mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis."
Magnuson-Stevens Act, § 3(29)

3.2.3.1 Criteria

3.2.3.2 Assessment

When an overfishing concern is triggered, the Council will direct its STT to work with state and tribal fishery managers to complete an assessment of the stock within one year (generally, between April and the March Council meeting of the following year). The assessment will appraise the actual level and source of fishing impacts on the stock, consider if excessive fishing has been inadvertently allowed by estimation errors or other factors, identify any other pertinent factors leading to the overfishing concern, and assess the overall significance of the present stock depression with regard to achieving MSY on a continuing basis. Depending on its findings, the STT will recommend any needed adjustments to annual management measures to assure the conservation objective is met, or recommend adjustments to the conservation objective which may more closely reflect the MSY or ensure rebuilding to that level. Within the constraints

> presented by the biology of the stock, variations in environmental conditions, and the needs of the fishing communities, the STT recommendations should identify actions that will recover the stock in as short a time as possible, preferably within ten years or less, and provide criteria for identifying stock recovery and the end of the overfishing concern. The STT recommendations should cover harvest management, potential enhancement activities, hatchery practices, and any needed research. The STT may identify the need for special programs or analyses by experts outside the Council advisors to assure the long-term recovery of the salmon population in question. Due to a lack of data for some stocks, environmental variation, economic and social impacts, and habitat losses or problems beyond the control or management authority of the Council, it is likely that recovery of depressed stocks in some cases could take much longer than ten years.

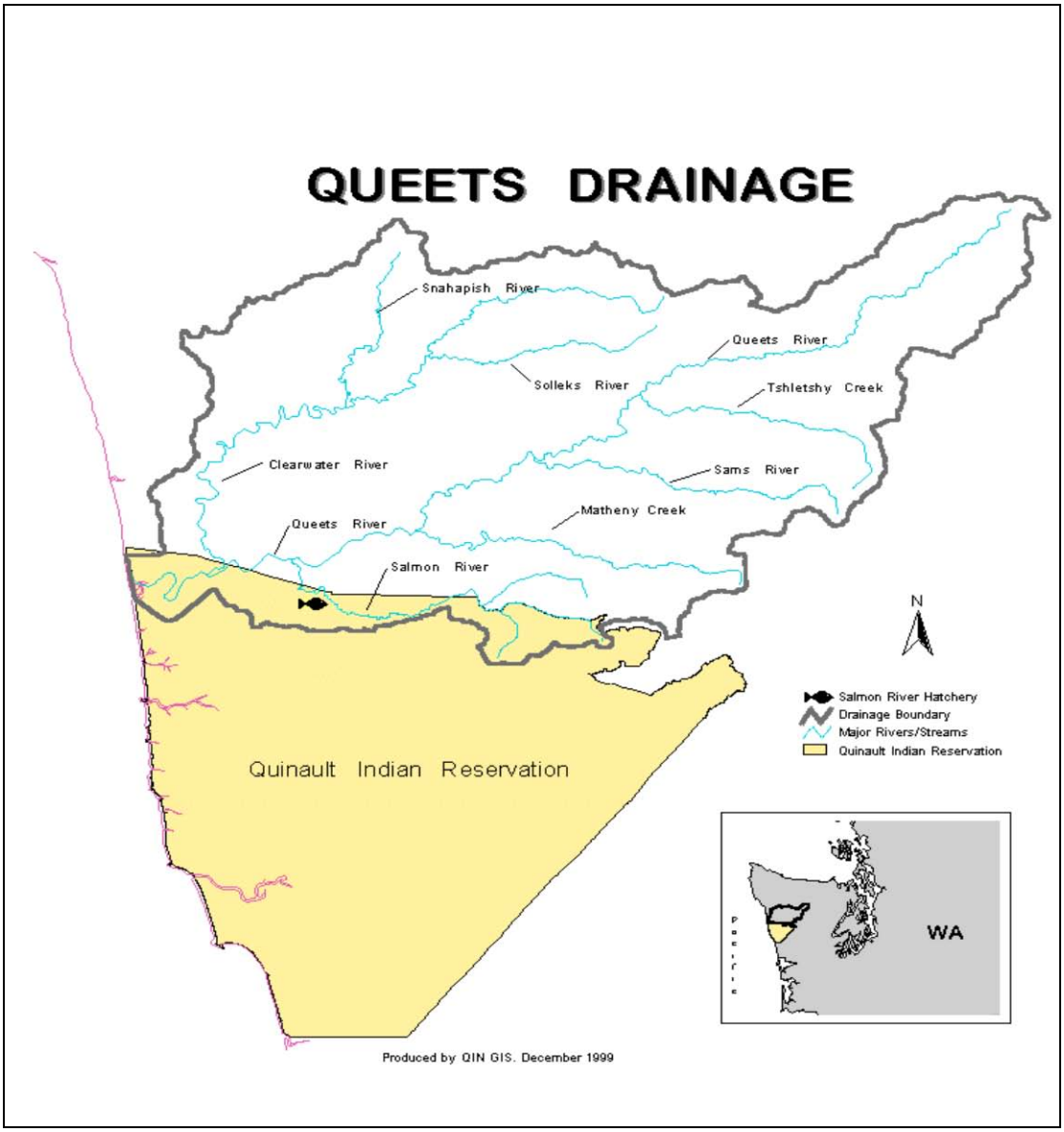
For the purposes of this report, the STT defines "overfishing" as fishery impacts in excess of those authorized by the FMP, and "overfished" as failure to achieve the conservation objective in three consecutive years as a result of overfishing. In the case of the Queets River coho, the level of fishing authorized is not to exceed the impacts that would provide at least 5,800 natural origin coho spawners, or other levels agreed to annually by the co-managers, as long as the escapement does not fall below 5,800 natural origin spawners in three consecutive years.

Stock/Ecosystem Description

Location & Geography

The Queets River originates at the foot of the Humes Glacier on Mount Olympus located on the Olympic Peninsula of western Washington. It flows generally southwest and enters the Pacific Ocean near the village of Queets within the Quinault Indian Nation (QIN). This western Washington river system is 82.7 km long and drains a watershed of 1,152 square km. The Queets River watershed is also shared by several tributaries including the Clearwater River, Salmon River, Matheny Creek, Sams River, and Tshletshty Creek. Of these, the Clearwater River is the largest tributary that supports a watershed of nearly 400 square km. The Queets River is a large river that flows through a relatively low gradient, heavily forested alluvial valley.

Figure 1. Location of the Queets River watershed.



Coho Production

The Queets watershed consists of a wide range of land use stakeholders and historically, has been almost entirely forested with a large majority of the Queets mainstem running predominantly within the protected old growth forest of the Olympic National Park. The Clearwater River watershed has been subjected to intensive logging by the Washington State Department of Natural Resources (DNR) and private timber companies. The Salmon River is contained almost entirely within the boundaries of the Quinault Reservation and is subject to varying degrees of land use practices. In addition, Sams River and Matheny Creek run mostly through land managed by the United States Forest Service and have also been subject to various logging practices over time.

Coho salmon spawn throughout the Queets system. Naturally produced smolts have been trapped annually since 1979, and coded-wire-tagged (CWT) since 1981. In response to chronic production problems in the Queets basin, a supplementation program was initiated with the 1984 brood year. This program was initiated as a joint Washington Department of Fish and Wildlife (WDFW) and QIN program and changed over time. By the 1990 nearly all of the work was being conducted by QIN. The supplementation program involved capturing broodstock from the natural run, spawning them in the hatchery, and rearing the progeny in ponds located throughout the basin with volitional release. All of the production from the supplementation program was CWT'd. This program was discontinued after the 2002 brood.

In addition, QIN operates a fish culture facility at river mile 4 on the Salmon River, a tributary to the lower Queets. The hatchery rears an early-timed stock from the Quinault National Fish Hatchery. The early run timing facilitates targeting hatchery production in terminal fisheries and the run time and location of the hatchery, on a lower basin tributary, reduce interaction between hatchery and naturally produced coho.

Assessment of Stock Status

Adult abundance/escapement

The Queets system has had a history of depressed escapement. Through the 1980 and much of the 1990s, coho spawning escapement was below the bottom end of the escapement goal range most of the time (Figure 2). It only exceeded the upper end of the range in 2001 and 2002 (Table 1). Adult spawning escapement in the brood years of 2003 through 2005, which produced the broods returning in 2006 through 2008, was within the goal range and above average every year.

Figure 2. Spawning escapement of natural origin coho in the Queets River system relative to the minimum escapement goal.

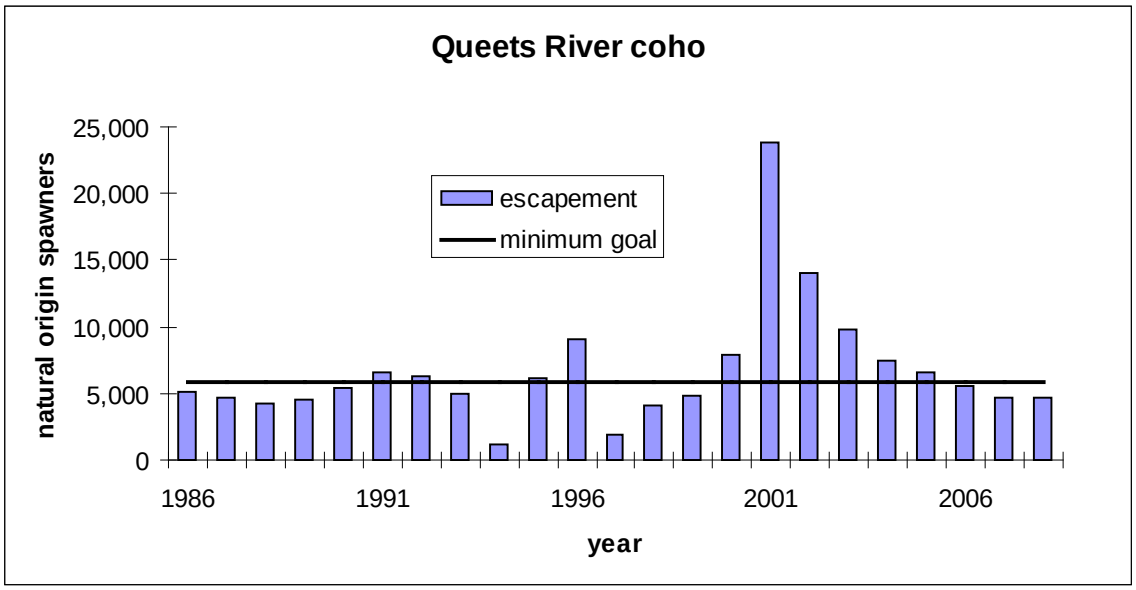


Table 1. Estimated terminal run size, catch, and escapement for Queets River coho in numbers of fish.

Year or Average	Terminal Catch[a/]			Escapement			Terminal Run Size			
	Gillnet	Ceremonial & Subsistence	River Sport[b/]	Natural[c/]	Supplemental[d/]	Hatchery	Natural[c/]	Supplemental	Hatchery	Total
1976	2,900	NA	100	1,200	-	100	4,100	-	300	4,400
1977	1,000	NA	100	1,900	-	300	2,600	-	500	3,100
1978	2,400	NA	100	2,700	-	600	4,100	-	900	5,000
1979	2,700	100	200	6,800	-	1,600	8,700	-	2,100	10,800
1980	3,200	20	200	4,700	-	2,400	6,000	-	4,400	10,400
1981	4,200	NA	200	4,800	-	2,400	6,100	-	4,500	10,600
1982	1,610	NA	100	7,000	-	4,500	7,800	-	5,400	13,200
1983	1,017	20	20	2,282	-	1,100	2,438	-	1,800	4,238
1984	1,314	20	20	9,200	-	4,042	9,748	-	4,400	14,148
1985	3,782	20	180	4,001	-	1,228	5,984	-	2,868	8,852
1986	9,885	20	49	5,160	-	3,654	5,826	-	11,441	17,267
1987	12,413	20	140	4,747	-	2,401	8,892	-	9,774	18,666
1988	5,400	20	255	4,288	3,897	4,782	4,530	4,462	9,239	18,231
1989	5,900	20	247	4,501	693	1,872	5,416	876	6,821	13,113
1990	8,675	10	514	5,422	1,793	4,123	7,120	3,626	9,512	20,258
1991	10,345	20	638	6,525	d/	4,129	8,574	d/	12,441	21,015
1992	2,057	272	302	6,266	922	1,402	6,999	998	2,923	10,920
1993	3,897	556	306	5,020	2,208	5,938	5,350	2,482	9,663	17,495
1994	1,612	182	18	1,105	95	2,901	1,242	176	4,222	5,640
1995	4,203	396	103	6,181	592	2,385	7,273	794	5,311	13,378
1996	16,035	920	279	8,993	3,574	5,191	10,722	4,502	13,078	28,302
1997	3,087	222	106	1,851	d/	2,137	1,970	d/	5,029	6,999
1998	7,411	452	135	4,102	1,413	3,504	4,661	1,536	9,545	15,742
1999	3,974	381	119	4,791	521	3,551	5,054	529	7,388	12,971
2000	5,066	479	223	7,939	682	2,032	8,715	701	5,366	14,782
2001	13,722	1,287	1,554	23,769	851	6,508	28,368	2,293	14,193	44,854
2002	23,712	1,009	399	13,968	1,065	2,240	16,123	1,311	21,514	38,948
2003	12,693	921	743	9,846	1,081	7,002	13,224	1,343	15,544	30,111
2004[e/]	8,189	657	1,287	7,484	1,225	3,985	10,030	1,673	10,395	22,098
2005[e/]	20,810	989	873	6,539	432	7,843	9,658	542	26,304	36,504
2006[e/]	6,190	353	52	5,626	0	2,931	6,400	0	7,101	13,501
2007	2,261	304	153	4,680	0	1,874	6,066	0	2,779	8,845
2008[f/]	4,671	356	562	4,629	0	3,461	6,221	0	5,667	11,888
GOAL				5,800-14,500						

a/ Includes dip-in fish from other river systems.
b/ Recreational catch of adults (coho over 20 inches).
c/ Natural escapement and run sizes estimates include fish taken for hatchery brood stock.
d/ 1991 and 1997 supplemental was included in natural escapement and run size.
e/ Poor conditions during the coho spawner survey season precluded conduct of an independent spawner escapement estimate.
f/ Preliminary. In-season effort model used to scale run size to observed catch and effort, natural escapement, and actual hatchery rack escapement.

Smolt Production

In the Queets River estimates of smolt production are available from 1979 through the 2005 brood years (Table 2). Total production has ranged from 76,000 to 398,000 and averaged approximately 243,000 smolts, but has been relatively stable over time with no obvious trend in smolt production. The 2003 through 2005 brood years which produced the adult returns in 2006 thorough 2008, were all above average in terms of smolt production (Figure 3).

Table 2. Smolt production estimates in the Queets and Clearwater Basins.

	Queets River Smolt Production			
Brood Year	Smolt Year	Clearwater Basin Smolt Estimate	Queets Basin Smolt Estimate	Total Queets River Smolt Estimate
1979	1981	52,900	115,400	168,300
1980	1982	42,600	92,900	135,500
1981	1983	99,800	224,472	324,272
1982	1984	60,600	182,431	243,031
1983	1985	48,200	105,541	153,741
1984	1986	90,800	176,135	266,935
1985	1987	47,500	73,150	120,650
1986	1988	73,600	122,195	195,795
1987	1989	86,000	172,711	258,711
1988	1990	67,800	308,177	375,977
1989	1991	52,600	138,103	190,703
1990	1992	77,500	174,658	252,158
1991	1993	63,100	83,215	146,315
1992	1994	49,942	193,926	243,868
1993	1995	43,900	141,700	185,600
1994	1996	34,931	63,842	98,773
1995	1997	81,516	258,271	339,787
1996	1998	47,807	88,947	136,754
1997	1999	28,750	47,327	76,077
1998	2000	93,837	228,558	322,395
1999	2001	101,328	155,591	256,919
2000	2002	83,312	314,404	397,716
2001	2003	74,415	297,660	372,075
2002	2004	89,094	295,009	384,103
2003	2005	88,573	263,699	352,272
2004	2006	52,060	208,239	260,299
2005	2007	60,250	241,000	301,250
Mean		66,397	176,565	242,962

Figure 3. Production of natural origin coho smolts from the Queets River basin.

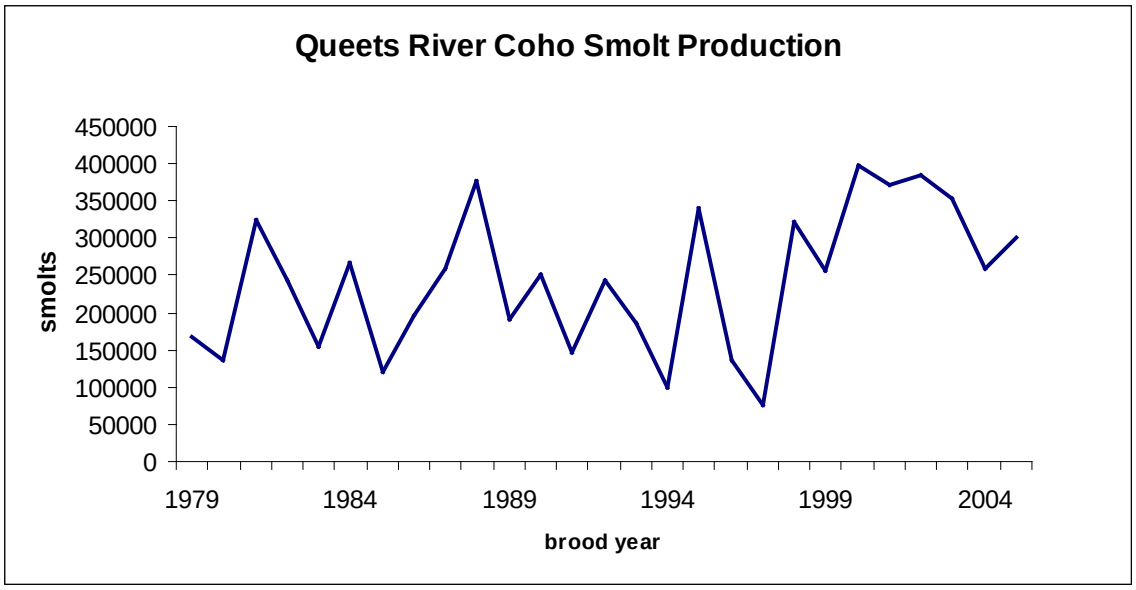
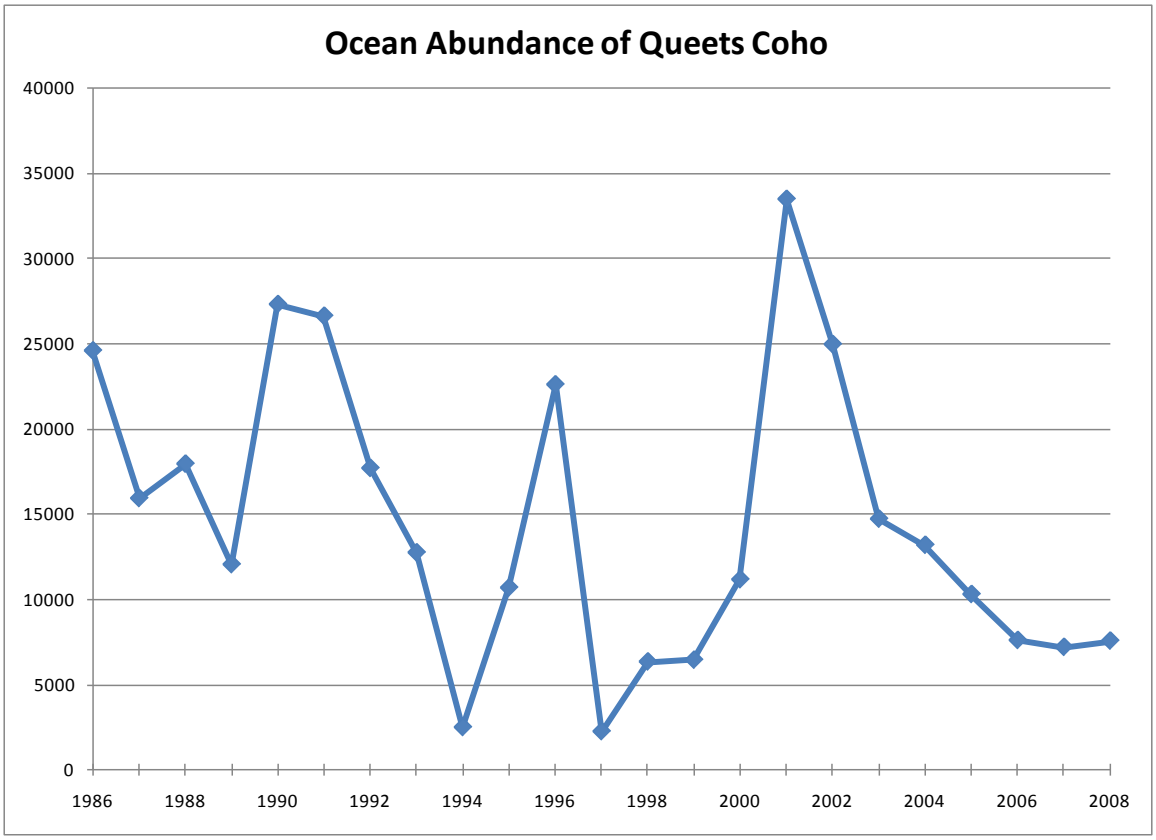


Figure 4. Pre-harvest ocean abundance of Queets River coho.

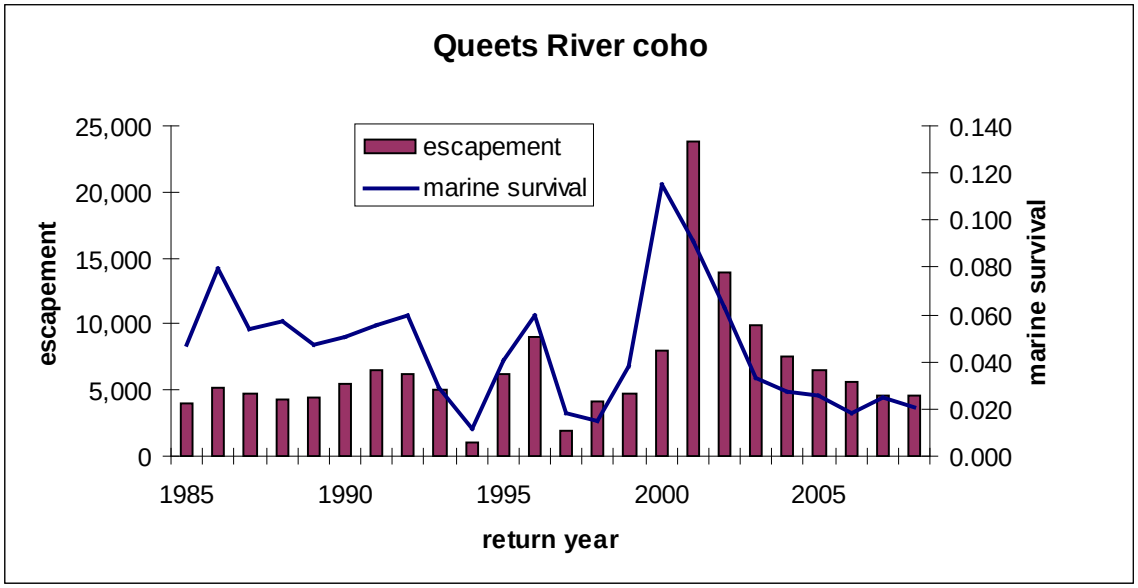


Marine Survival

Because we can reconstruct ocean abundance from escapement and fishery data, it is also possible to generate marine survival estimates for all broods for which we have smolt production data and ocean abundance. Marine survival estimates are presented for broods returning in 1985 through 2008 (Figure 5). It is readily apparent that survival has declined sharply since 2000, but has remained within the range of recent variability. The survival rates of the broods returning in the early 2000s may have been anomalously high and generated unrealistic expectations for adult returns.

The similarity of the pattern of marine survival and spawning escapement is also remarkable (Figure 5). It is clear that marine survival is driving the dynamics of this stock and probably other coho stocks. This should not be unexpected since there is no apparent trend in smolt production and the magnitude of variability in survival is greater than that of smolt production. The decline in exploitation rates is also readily apparent in this figure. Over the years, the escapement has increased relative to survival, while there has been no real commensurate increase in smolt production. As exploitation rates have declined, so has the ability of harvest management to ameliorate swings in marine survival.

Figure 5. Marine survival and natural origin spawning escapement of Queets River coho salmon.



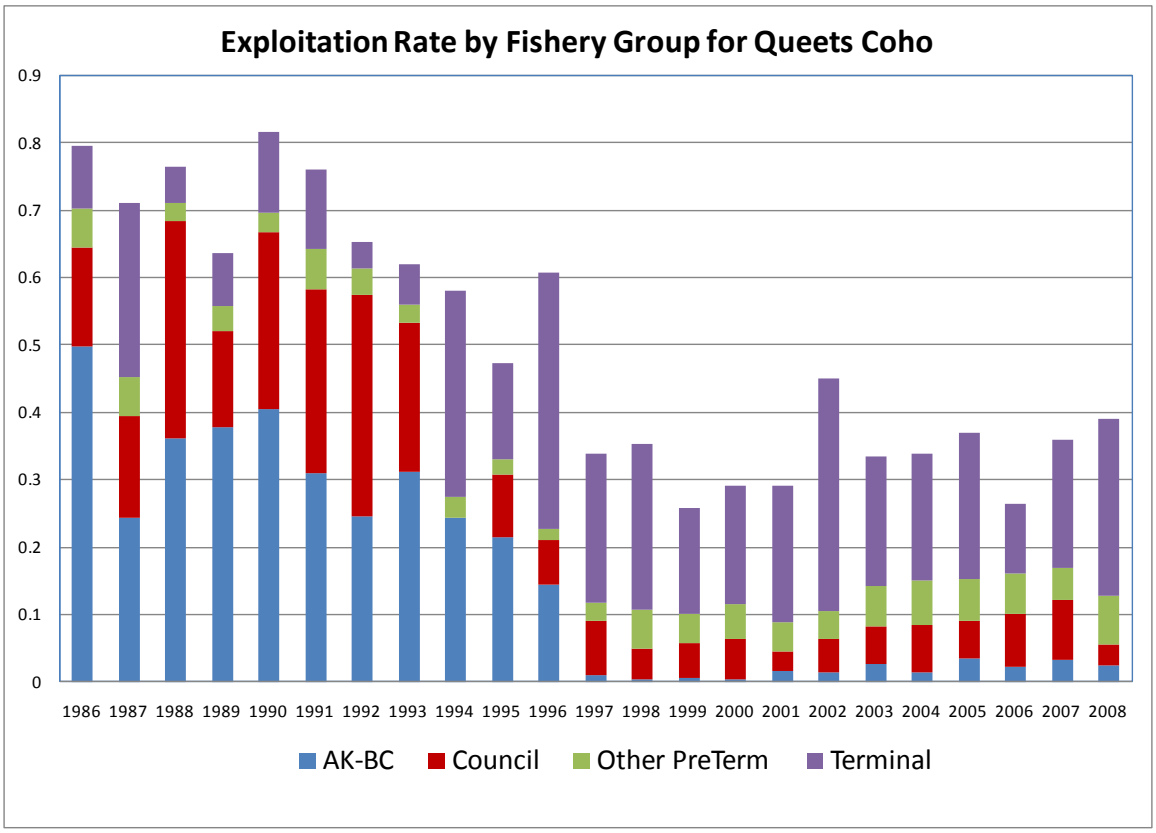
Harvest Impacts

Ocean Fishery Impacts

Queets coho migrate to the north and are more vulnerable to Canadian fisheries than they are to Council fisheries in U.S. waters. Beginning in 1997, Canada curtailed fisheries targeting coho salmon out of concern for depressed Canadian coho stocks. While there has been a general declining trend in ocean fishery impacts on wild Queets coho since the 1982 return year,

primarily due to restrictive management actions taken in U.S. fisheries, the coho conservation measures implemented by Canada are readily apparent as a dramatic decrease in ocean exploitation rates beginning in 1997 (Figure 6). Impacts in Canadian fisheries have remained low as the Canada has implemented a policy of maintaining impacts on critically depressed upper Fraser River coho as near to zero as possible. Queets wild coho are also caught in low levels in the Strait of Juan de Fuca, Puget Sound, and as preterminal "dip-ins" into other coastal river system fisheries.

Figure 6. Distribution of fishery impacts by fishery group.



Terminal Fishery Impacts

Terminal harvest impacts on Queets River coho salmon have been highly variable, , The terminal harvest rate on wild coho was restrained to well below 20 percent for all tribal fisheries and freshwater sport fisheries combined in the 1980's and early 1990's (Figure. 6). However, as ocean fishery impacts declined beginning in the mid-1990s, the harvest rate in terminal fisheries increased. The exploitation rate in terminal fisheries has exceeded 30 percent in some years, and the majority of fishery impacts has shifted to inriver fisheries since 1996.

Forecasting

The preseason expectation was for Queets wild coho to meet at least the low end of the range of 5,800 to 14,500 per the escapement objective in the FMP. Yet in 2006 through 2008, the stock failed to meet its objective. These escapement expectations were generated each year by beginning with an ocean abundance forecast, and accounting for the expected impacts in ocean and river fisheries. The forecast model can be arranged into a simple linear form as

Escapement = (Ocean Abundance)(1-ER) (1)

where ocean abundance and exploitation rate (ER) are both forecast quantities. The Queets River has substantial river fisheries and must be accounted for. So for the Queets River, Equation (1) becomes

Escapement = (Ocean Abundance)(1-Ocean ER)(1-River ER) (2)

In this form the expected escapement is a simple product of forecast terms, and the forecast quantities are directly comparable. Examination of the forecasts for each of these terms can help to pinpoint where the expectations went awry (Table 3).

In each of these years the predicted ocean abundance was overly optimistic and actual abundance was less than predicted. Impact rates in ocean fisheries were also greater than anticipated preseason, though the differences were very slight. Ocean fisheries in this case includes all pre-terminal fisheries including impacts in Alaska, Canada, Puget Sound, and Queets coho caught as dip-ins in other river systems, in addition to Council area fisheries. In 2008 the impact rates in Council area fisheries were less than predicted, but other fisheries had higher impacts than anticipated (Table 4). Impact rates in river net and sport fisheries were less than anticipated in 2006 and greater than anticipated in 2008. However, in each year the greatest error was the abundance forecast. Because preseason planning uses the abundance forecasts to determine what impacts are allowable in fisheries, it seems likely that more accurate abundance forecasts would have increased the probability of attaining the minimum escapement goal in at least one of the years. However, because Queets coho were not a constraining stock, this is very speculative.

Table 3. Queets River coho salmon preseason expectations and postseason estimates. In each yearly block of numbers, preseason forecast, the postseason estimate, and the ratio of post season estimate to preseason forecast is presented. Ratios less than 1.0 represent overestimates of preseason abundance, and underestimates of fishery impacts. For each year, the forecast escapement was expected to exceed the minimum goal of 5,800, while the postseason estimate was below the goal, and the forecast error with the largest contribution to the escapement shortfall is highlighted.

		Survival through fisheries		
	Ocean Abundance	**Ocean**	**River**	**Escapement**
2006				
Preseason	8,341	0.85	0.83	5,907
Postseason	7,591	0.84	0.88	5,626
Post/Pre	**0.91**	0.99	1.06	0.95
2007				
Preseason	13,551	0.85	0.79	9,078
Postseason	7,188	0.83	0.78	4,642
Post/Pre	**0.53**	0.98	0.99	0.51
2008				
Preseason	10,182	0.88	0.82	7,293
Postseason	7,555	0.86	0.71	4,629
Post/Pre	**0.74**	0.98	0.87	0.63

Table 4. Preseason and postseason distribution of fishery impacts.

	2006		2007		2008	
FISHERY COMPONENT	**Preseason**	**Postseason**	**Preseason**	**Postseason**	**Preseason**	**Postseason**
Ocean Age 3 Abundance (Pre I)	8341	7591	13551	7188	10182	7555
Ocean Escapement	7121	6407	11534	5976	8934	6520
FMP Escapement Goal	5800	5800	5800	5800	5800	5800
Escapement after all fisheries	5907	5626	9078	4642	7293	4629
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Alaska-Canada	191	171	168	234	191	181
Council North of Falcon						
Treaty Troll	248	358	441	284	319	142
Nontreaty Troll	99	110	196	107	108	41
Sport	173	88	338	174	152	48
Council South of Falcon	55	36	189	88	36	7
Council Subtotal	575	592	1164	653	615	238
Preterminal Other	446	450	662	352	586	550
Terminal Net	861	760	1851	1217	1172	1541
Terminal Sport	354	38	606	149	469	459
Total Fishing Mortality	**2426**	**2011**	**4450**	**2605**	**3033**	**2969**

	2006		2007		2008	
FISHERY COMPONENT	**Preseason**	**Postseason**	**Preseason**	**Postseason**	**Preseason**	**Postseason**
Alaska-Canada	2.3%	2.2%	1.2%	3.2%	1.8%	2.4%
Council North of Falcon						
Treaty Troll	3.0%	4.7%	3.3%	3.9%	3.1%	1.9%
Nontreaty Troll	1.2%	1.4%	1.4%	1.5%	1.0%	0.5%
Sport	2.1%	1.2%	2.5%	2.4%	1.5%	0.6%
Council South of Falcon	0.7%	0.5%	1.4%	1.2%	0.3%	0.1%
Council Subtotal	6.9%	7.8%	8.6%	9.0%	6.0%	3.1%
Preterminal Other	5.4%	5.9%	4.9%	4.9%	5.7%	7.2%
Terminal Net	10.3%	10.0%	13.7%	16.8%	11.4%	20.3%
Terminal Sport	4.2%	0.5%	4.5%	2.1%	4.5%	6.0%
Total Exploitation Rate	**29.1%**	**26.3%**	**32.9%**	**35.9%**	**29.4%**	**39.1%**

Discussion

Queets River coho comprised one to three percent of the total coho mortality in Council-area fisheries between Cape Falcon and the U.S.-Canada border during 2006-2008. Council-area fisheries north of Cape Falcon are managed on quotas and have minimal impact on Queets wild coho; therefore, even when the preseason forecast is an overestimate,, the impact of these fisheries on Queets coho does not vary widely from preseason estimates. There appears to be little that the Council can do to manage its fisheries to mitigate overfishing.

Two factors that appear to contribute most to the risk of overfishing are accuracy of the preseason forecasts and accuracy of the modeled impacts of the terminal fisheries in the Queets River. Preseason forecasts were the largest contributor to difference between preseason

expectation and the actual outcome in 2006, 2007 and 2008. In 2007 and 2008, escapement was more than 1,100 fish (about 20 percent) below the lower end to the escapement goal range. Elimination of all ocean fishing would not have increased the terminal run by the amount of the shortfall in either year, so it is unlikely that more accurate forecasts would have resulted in restrictive enough management to meet the goal. However, adding a buffer to the preseason forecast may help mitigate its fluctuations and increase the likelihood of achieving the escapement goal range in the future.

Buffering or modifying management of the terminal fisheries would also likely improve the chances of achieving the escapement goal. The terminal net fishery is currently managed using historic catch-per-effort-day and an average effort-per-open-day from recent years. Buffering effort estimates or adjusting the number of open days inseason based on real-time effort counts would increase the likelihood of achieving the escapement objective.

Conclusions and Recommendations

The STT has the following summary comments regarding the status and overfishing assessment for Queets wild coho for 2006, 2007, and 2008.

- Although Council area fisheries have low impact on this stock (i.e., <10 percent ER), fishing (from various sectors) contributed to Queets wild coho not meeting the FMP conservation objective in each year during the 2006 through 2008 period. The STT therefore concludes that overfishing occurred, and that the Queets River coho stock was overfished.
- It appears that freshwater survival, as reflected by smolt production, was above average for the broods returning in 2006-2008. Marine survival rates were low but were within the range of recent year normal environmental variability.
- Improvements to forecasting methods and terminal fishery models could contribute toward ensuring the FMP conservation objectives will be met in the future. Though the accuracy of Queets coho forecasts have been relatively good compared to other salmon stocks, overprediction of the ocean abundance probably contributed to adopting regulations that allowed too much fishing to occur. This was exacerbated by greater impacts in fisheries than were predicted during preseason planning.
- The failure to meet the conservation objective during these years does not jeopardize the long term sustainability of the stock. Because the adult abundance prior to fishing was sufficient to meet the conservation objective in each year during this review period, and has remained so, development of a rebuilding plan, per se, is not warranted at this time.
- The stock should be considered to be rebuilt when it again meets its conservation objective. Because overfishing is defined in terms of fishing at a rate that prevents the stock from meeting its conservation objective, meeting the conservation objective would also be synonymous with ending overfishing, and ending overfishing is sufficient to rebuild the stock.
- To improve the probability of meeting the conservation objective, the Council should consider adopting forecast buffers, management buffers, or both.