SALMON TECHNICAL TEAM (STT) UPDATE ON ESTIMATED IMPACTS IMPACTS OF MARCH 2006 OPTIONS

Comments on the Effects of Escapements below the Floor on the Long Term Yield of Klamath Fall Chinook

The STT concludes that the failure to meet the spawning escapement floor for Klamath fall Chinook for the third consecutive year poses a significant risk of reducing the long-term yield from this stock.

The risks presented by fishing below the floor for Klamath fall Chinook are difficult to quantify, but are nonetheless apparent. While it is possible to construct quantitative probability models based on the distribution of variability around the spawner-recruit relationship, those calculations depend on the assumptions built into the spawner-recruit model, the distribution of deviations from that model, and there having been no fundamental changes in that relationship between the time period when the data were collected and the present.

In the past, spawning escapements below the floor have occurred. Some of these have resulted in the recruitment of strong year-classes, and some of these have resulted in recruitment of weak year classes. The differences between these outcomes have been the result of environmental conditions encountered by the adult spawners, the eggs, and juvenile salmon. Years that produced strong recruitments benefited from favorable conditions in the river for spawning and outmigration, and marine conditions favorable for survival and growth.

In addition to the natural escapement being forecast to be below the escapement floor, this year's age-3 ocean abundance forecast is the lowest on record. This is believed to be largely the result of extremely poor river conditions brought on by a combination of drought and water management decisions in the Klamath basin beginning in 2002 and persisting for several years. Additional ocean fishing mortality will not only further reduce the escapement this year, but will also reduce the abundance of age-4 and age-5 adults next year.

In 2005, river conditions were apparently a little better, and 2006 has the prospect of being better still. The 2004 brood migrated to sea in 2005 and would have benefited from the improved river conditions. However, in 2005 ocean conditions were poor, with warm water, a delayed spring transition, and apparent low productivity. There were numerous reports of seabird die-offs and breeding colony failures. Available information suggests that the 2006 ocean conditions appear to be at least as unfavorable as they were in 2005, and may have deteriorated. We cannot forecast what conditions will be like for the 2006 spawning run, and their progeny. However, given the recent history of this stock and unfavorable indicators of ocean productivity, it would not be prudent to expect a strong year-class to recruit from low escapement this year.

The long-term impacts of current depressed abundance of Klamath River fall Chinook are exacerbated by the distribution of natural spawning escapement. Although for fishery management purposes naturally spawning Klamath fall Chinook are treated as a single stock,

Klamath fall Chinook are actually comprised of many discrete populations in the mainstems and tributaries of the Klamath and Trinity rivers. Genetic evidence indicates that these populations are genetically distinct, and thus are demographically independent.

In 2005, escapement to the Klamath basin was 56,200 adult spawners. Of this number, 49% or 27,800 adults returned to the two hatcheries in the basin. Of the remaining 28,400 adults that spawned in natural areas, 83% or 23,500 spawned in Bogus Creek, the mainstem Klamath River above the Shasta River, and the mainstem Trinity River above the Willow Creek weir. These are all areas adjacent to the hatcheries and receive substantial numbers of hatchery strays. Natural spawning areas that are relatively free of hatchery influence accounted for only an estimated 4,900 spawners (17% of the natural spawning escapement or 9% of the total escapement). Of these distinct natural spawning areas, only the Shasta River had an escapement of more than 1,000 adult spawners. As total natural spawning escapement is further reduced below the 35,000 floor, the risk increases of extirpation of some of these independent populations. If any of these distinct local populations are lost, the productive capacity of the basin would be reduced until locally adapted populations could be re-established.

Methods Considered by the STT to Model Effects of Landing Limits on the Harvest of Klamath River Fall Chinook.

At the Council's March meeting, the STT was asked to evaluate the effectiveness of weekly landing limits as a management measure to reduce impacts in fisheries south of Cape Falcon on Klamath fall Chinook. In Options I and II, adopted for public comment at the March meeting, fisheries south of Cape Falcon contain a mix of landing limits that include: 50, 75, and 100 fish per boat per week (or open period).

In response to the Council's request, the STT considered several methods of modeling weekly landing limits, including:

I. Empirical estimates

The KOHM could be used to forecast Klamath impacts as a direct function of weekly landing limits, if methods could be found to quantify the effect of such limits on Klamath contact rates per effort and on the amount of effort expected per day open. This method would require a means to generate new base-period values for contact-rates and a means to project effort under a weekly landing limit. The California troll fishery has not operated under weekly landing limits so historical data are not available.

Some landing data are available for areas and periods when daily landing limits were in effect. However, these data were not collected under controlled conditions, may be confounded with other factors, and would be of very limited value for use in projecting either catch or effort under weekly landing limit restrictions. The only fishery south of Cape Falcon since 2000 with landing limits was in Fort Bragg in July, 2003. That month Fort Bragg had a 150 fish trip limit from the 3rd-14th and unrestricted fishing from the 18th - 31st. Both of these fisheries were sampled at a rate of about 20% of the pounds landed. During the first half of the month with a trip limit, 34,500 fish were landed and 86 Klamath CWT's were recovered. During the unrestricted fishery, 36,000 fish were landed and 77 Klamath CWT's were recovered. The trip limits appear to have had no effect on total landings or on Klamath impacts. The lack of observed effects may have occurred because the trip limits were relatively high and there were no restrictions on the number of landings that individual vessels could make during the open period.

We concluded that the data required to implement this method simply do not exist.

II. Historical fish-ticket data.

Oregon provided an analysis of fish ticket data from 2003, 2004, and 2005 in a report titled "Effects of Weekly Landing Limits on the Oregon Troll Fishery" by Eric Schindler dated March 20, 2006 . Using the landing dates and pounds of Chinook landed by individual vessels, Schindler estimated the number of Chinook landed each week by each boat that made landings. He then calculated the percentage of vessel-weeks that would have been affected by weekly landing limits in each year, and the reduction in numbers of fish landed in each year. Weekly landing limits evaluated included 50, 75, 100, 150, 200, and 250.

Calculating reductions in this manner assumes that weekly landing limits do not affect the number or behavior of the boats that participate in the fishery. It also depends on the catch rates observed during 2003-2005 which are influenced by Chinook abundance and distribution. Schindler also asserted that if landing limits were imposed, some boats would elect not to participate in the fishery and the savings would be somewhat greater than he calculated in the base period.

California DFG conducted a similar analysis of fish ticket data and considered the effects of landing limits of 50 and 100 fish per week. The effect of weekly landing limits was analyzed using sample and landings data for fisheries in California during 2003, 2004, and 2005. Catch per vessel day by boat week and port was estimated from fishing effort, total landing weight, average weight per fish, and average days fished per delivery. The estimated catch by each vessel during any week in the absence of landing restrictions was then computed. For a given vessel, if the observed catch during a week exceeded the weekly landing limit, then the difference could be interpreted as inferred savings. This procedure was completed for each KOHM area, month, and year (2003-2005) using weekly landing limits of 50 and 100 fish per vessel. Under a 50 fish per week restriction, inferred savings in fish and effort was 59% and 26%, respectively. For the 100 fish per week restriction, inferred savings in fish and effort was 37% and 14%, respectively.

The DFG analysis directly estimated reductions in effort while the the ODFW analysis estimated the percentage of trips that would have been affected by trip limits. The percentage of trips affected by trip limits cannot be directly used in the KOHM, but presumably inferred reductions in effort could be estimated for Oregon as well.

Concerns with the application of this method include:

1) Inability to predict effort response to landing limit restrictions – Neither method addresses the need to forecast effort response. To avoid effort transfer between ports, landing limits would have to be applied uniformly to all ports.
2) Changes in fleet structure – The historical data from which the relationship between days open and days fished was collected in the absence of weekly landing limits. Such limits would not affect all boats uniformly, so the fleet structure would be expected to change, but how is unknown.
3) Latent effort – Landing limits could affect the market price of fish. There is a large number of boats that fish very little or not at all. If the price of fish were to increase in response to limitation of supply due to landing limits, there could be a substantial increase in the number of boats participating in the fishery or the number of days fished by these boats relative to the 2003 through 2005 open seasons.
4) Monitoring and Enforcement - Weekly catch limits will tend to encourage unreported landings and increase the difficulty of monitoring and enforcement. With limited catch, and more time in port, there would be less incentive for fishermen to deliver their catches to buyers, and greater incentive for direct retail sales. This could make it harder to collect reliable CWT recovery data essential for Council management.

III. Maximum likely catch.

Fisheries north of Cape Falcon have used landing limits to reduce the rate of catch in fisheries operated under quotas or catch ceilings, where fisheries may need to be closed on short notice by inseason action. In these cases, WDFW has estimated the maximum likely catch by multiplying the number of vessels recently participating in the fishery by the daily catch limit to estimate daily catch. The STT considered using similar methodology to estimate the maximum likely catch under different weekly catch limits. This method estimates the maximum number of fish that would be expected to be landed under a given landing limit by assuming that there would be no change from last year in the number of boats participating in the fishery and that all boats would achieve their limit. This number would be compared the expected catch without landing limits and, if the maximum catch with a landing limit is less than the expected catch without a landing limit, the reduction in expected landings would be used to prorate the effort forecast in the KOHM.

This method is straightforward and could be easily implemented. Preliminary calculations indicate, however, that it would predict little, if any, reduction as a result of catch limits. In addition, it would still be subject to the same concerns outlined in method II above..

Recommendations

Our concern with the methods considered above is that untested assumptions must be made about participation in fisheries under landing limits and how relationships between effort and catch may change. An alternative approach is outlined below.

Catch guidelines or caps on total catch in a fishery can be used to control Klamath impacts. Although the precision of the estimate of the total catch level associated with any given level of Klamath impacts is reduced in areas where the ratio of Klamath stock catch to total catch is small, the total allowable catch in a cell can be directly modeled in the KOHM. Within a catch ceiling, landing limit and possession limits can be used in an attempt to reduce daily harvest. This balances the unknown risks associated with the implementation of catch limits noted above with the generally accepted idea that weekly landing and possession limits should in fact extend the time necessary to achieve a given catch level. If the Council imposes possession and landing limits on a catch ceiling fishery and they attain the ceiling sooner than expected, it would be necessary to take inseason action to close the fishery. The fishery would generate new data on contact rate per effort and effort per day open under catch and possession limits which could eventually lead to the development of data to base model impacts from the use of landing limits.

Update of Chinook Impacts From March Options

TABLE 5. Projected key stock escapements (thousands of fish) or management criteria for 2006 ocean fishery options adopted by the Council.[a/] (Page 1 of 3)

Key Stock/Criteria	Projected Ocean Escapement[b/] or Other Criteria (Council Area Fisheries) Option I	Option II	Option III	Spawner Objective or Other Comparative Standard as Noted
CHINOOK				
Columbia Upriver Brights	248.8	250.1	251.0	57.3 Minimum ocean escapement to attain 46.0 adults over McNary Dam, with normal distribution and no mainstem harvest.
Mid-Columbia Brights	86.5	87.0	87.3	16.6 Minimum ocean escapement to attain 5.75 adults for Bonneville Hatchery and 2.0 for Little White Salmon Hatchery egg-take, assuming average conversion and no mainstem harvest.
Columbia Lower River Hatchery Tules	56.2	59.1	62.5	31.1 Minimum ocean escapement to attain 14.1 adults for hatchery egg-take, with average conversion and no lower river mainstem or tributary harvest.
Columbia Lower River Natural Tules[c/] (threatened)	49.4%	45.3%	40.2%	≤49.0% ESA guidance met by a total adult equivalent fishery exploitation rate on Coweeman tules (NMFS ESA consultation standard).
Columbia Lower River Wild (threatened)	16.6	16.7	16.8	5.7 MSY spawner goal for North Lewis River fall chinook (NMFS ESA consultation standard).
Spring Creek Hatchery Tules	50.7	55.3	58.9	11.1 Minimum ocean escapement to attain 7.0 adults for Spring Creek Hatchery egg-take, assuming average conversion and no mainstem harvest.
Snake River Fall (threatened) SRFI	72.1%	63.3%	51.8%	≤70.0% Of 1988-1993 base period exploitation rate for all ocean fisheries (NMFS ESA consultation standard).
Klamath River Fall	13.8	18.8	25.4	35.0 Minimum number of adult spawners to natural spawning areas.
Federally recognized tribal harvest	50.0%	50.0%	50.0%	50.0% Equals 16.6, 12.3, and 6.1 (thousand) adult fish for Yurok and Hoopa tribal fisheries.
Adult river mouth return	44.2	45.7	50.7	NA
Age 4 ocean harvest rate	17.0%	14.8%	6.7%	≤16.0% NMFS ESA consultation standard for threatened California coastal chinook.
KMZ sport fishery share	7.7%	5.9%	8.4%	17.0% 2006 KFMC recommendation.
CA:OR troll fishery share	55:45	50:50	19:81	50:50 2006 KFMC recommendation.
River recreational fishery allocation	15.0%	0.0%	0.0%	15.0% 2005 California Fish and Game Commission specification; none specified for 2006. Equals 2.5, 0.0, and 0.0 (thousand) adult fish for recreational inriver fisheries.
Sacramento River Winter (endangered)				Recreational season between Point Arena and Pigeon Point shall open no earlier than the first Saturday in April and close no later than the second Sunday in November; the recreational season between Pigeon Point and the U.S./Mexico Border shall open no earlier than the first Saturday in April and close no later than the first Sunday in October. The minimum size limit shall be at least 20 inches total length. Commercial seasons between Point Arena and the U.S./Mexico border shall open no earlier than May 1 and close no later than September 30, with the exception of an October season conducted Monday through Friday between Point Reyes and Point San Pedro, which shall end no later than October 15. The minimum size limit shall be at least 26 inches total length. (NMFS ESA consultation
Sacramento River Fall	385.3	440.1	550.3	122.0-180.0 Sacramento River fall natural and hatchery adult spawners.

TABLE 5. Projected key stock escapements (thousands of fish) or management criteria for 2006 ocean fishery options adopted by the Council.[a/] (Page 2 of 3)

Key Stock/Criteria	Projected Ocean Escapement or Other Criteria (Council Area Fisheries) Option I	Option II	Option III	Spawner Objective or Other Comparative Standard as Noted
COHO				
Interior Fraser (Thompson River)	9.2%(4.0%)	8.1%(3.0%)	7.3%(2.2%)	≤10.0% Total exploitation rate for all U.S. fisheries south of the U.S./Canada border based on 2002 PSC coho agreement.
Skagit	36%(4.5%)	35%(2.7%)	35%(2.0%)	≤60.0% 2006 total exploitation rate ceiling based on 2002 PSC coho agreement[c/]
	87.6	88.5	89.2	30.0 MSP level of adult spawners Identified in FMP.
Stillaguamish	41%(5.2%)	40%(3.9%)	37%(2.7%)	≤50.0% 2006 total exploitation rate ceiling based on 2002 PSC coho agreement[c/]
	32.4	33	33.4	17.0 MSP level of adult spawners Identified in FMP.
Snohomish	39%(5.2%)	38%(3.9%)	35%(2.7%)	≤60.0% 2006 total exploitation rate ceiling based on 2002 PSC coho agreement[c/]
	97.3	98.9	100.2	70.0 MSP level of adult spawners Identified in FMP.
Hood Canal	38%(3.2%)	37%(2.4%)	34%(1.9%)	≤65.0% 2006 total exploitation rate ceiling based on 2002 PSC coho agreement[c/]
	46.8	47.3	47.7	21.5 MSP level of adult spawners Identified in FMP.
Strait of Juan de Fuca	11%(3.7%)	10%(2.8%)	7%(1.7%)	≤40.0% 2006 total exploitation rate ceiling based on 2002 PSC coho agreement[c/]
	23.6	23.8	24.1	12.8 MSP level of adult spawners Identified in FMP.
Quillayute Fall	12.8	13.1	13.4	6.3-15.8 MSY adult spawner range (not annual target). Annual management objectives may be different and are subject to agreement between WDFW and the treaty tribes under U.S. District Court orders.
Hoh	5.4	5.6	5.7	2.0-5.0 MSY adult spawner range (not annual target). Annual management objectives may be different and are subject to agreement between WDFW and the treaty tribes under U.S. District Court orders.
Queets Wild	7.0	7.2	7.4	5.8-14.5 MSY adult spawner range (not annual target). Annual management objectives may be different and are subject to agreement between WDFW and the treaty tribes under U.S. District Court orders.
Grays Harbor	59.8	60.7	61.7	35.4 MSY adult spawner range (not annual target). Annual management objectives may be different and are subject to agreement between WDFW and the treaty tribes under U.S. District Court orders.
Lower Columbia River Natural (threatened)	14.0%	10.0%	5.9%	≤15.0% Marine and mainstem Columbia River fishery exploitation rate (NMFS ESA consultation standard). Value depicted is ocean fishery exploitation rate only.
Upper Columbia[g/]	>50%	>50%	>50%	50% Minimum percentage of the run to Bonneville Dam.
Columbia River Hatchery Early	162.2	184.4	210.4	38.7 Minimum ocean escapement to attain hatchery egg-take goal of 16.0 early adult coho, with average conversion and no mainstem or tributary fisheries.
Columbia River Hatchery Late	52.7	66.4	83.1	15.2 Minimum ocean escapement to attain hatchery egg-take goal of 9.7 late adult coho, with average conversion and no mainstem or tributary fisheries.
Oregon Coastal Natural	11.7%	8.0%	3.0%	≤15.0% Marine and freshwater fishery exploitation rate.
Northern California (threatened)	6.2%	2.3%	0.5%	≤13.0% Marine fishery exploitation rate for R/K hatchery coho (NMFS ESA consultation standard).

TABLE 5. Projected key stock escapements (thousands of fish) or management criteria for preliminary analysis by the STT for ocean fishery options, 2006.[a/] (Page 3 of 3)

a/ Projections in the table are based on the 2006 allowable catch levels under the PST: Southeast Alaska 2006 ceiling of 346,800, North Coast BC 2006 ceiling of 223,200, and WCVI 2006 ceiling of 160,400.

b/ Ocean escapement is the number of salmon escaping ocean fisheries and entering freshwater with the following clarifications. Ocean escapement for Puget Sound stocks is the estimated number of salmon entering Area 4B that are available to U.S. net fisheries in Puget Sound and spawner escapement after impacts from the Canadian, U.S. ocean, and Puget Sound troll and recreational fisheries have been deducted. Numbers in parentheses represent Council area exploitation rates for Puget sound coho stocks. For Columbia River early and late coho stocks, ocean escapement represents the number of coho after the Buoy 10 fishery. Exploitation rates for OCN coho include impacts of freshwater fisheries.

c/ Annual management objectives may be different than FMP goals, and are subject to agreement between WDFW and the treaty tribes under U.S. District Court orders. Total exploitation rate includes Alaskan, Canadian, Council area, Puget Sound, and freshwater fisheries and is calculated as total fishing mortality divided by total fishing mortality plus spawning escapement. These total exploitation rates reflect the initial base package for inside fisheries developed by state and tribal comanagers. It is anticipated that total exploitation rates will be adjusted by state and tribal comanagers during the preseason planning process to comply with stock specific exploitation rate constraints.

d/ Includes minor contributions from East Fork Lewis River and Sandy River.

e/ The fisheries in this option will need to be restructured if negotiations in the North of Falcon forum or final preseason catch expectations for Canadian and Alaskan fisheries do not result in an SRFI at or below 0.700 as required by the NMFS ESA consultation standard.

f/ The fisheries in this option will need to be restructured if negotiations in the North of Falcon forum or final preseason catch expectations for Canadian and Alaskan fisheries do not result in a total exploitation rate for all U.S. fisheries south of the U.S./Canada border of no more than 10.0% as required by the 2002 PSC agreement.

g/ Includes projected impacts of inriver fisheries that have not yet been shaped, but have been reduced from 2005 preseason levels based on 2006 abundance.