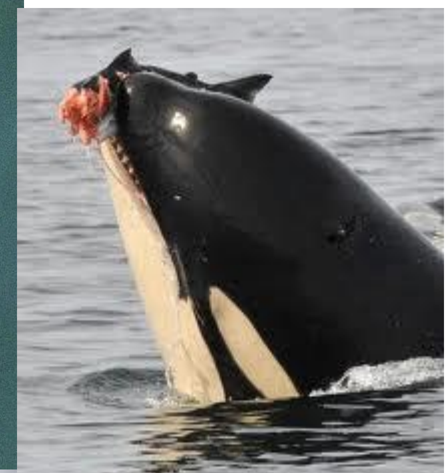
Review of salmon fisheries analyses



Pictures: D Durban, Van Ginneken, C. Emmons

Teresa Mongillo

Agenda Item C.2, May 23, 2019

OVERVIEW OF SRKW ANALYSIS

We evaluate potential effects from reduced prey availability (short-term and long-term) from an action based on best available scientific information.

Short-term (annual) effects analysis:

1) Estimate percent reduction in Chinook available (inland and coastal waters)
2) Chinook available (in kcal) is compared to metabolic needs

Long-term (over the period of the action) effects analysis:

1) Assess the likelihood for localized depletions and long-term implications for SRKW survival and recovery
2) Assess impacts on salmon recovery and survival
3) Consider conservation objectives for individual stocks (listed and non-listed Chinook) that aid in the recovery and survival of SRKWs

PREY REDUCTIONS FROM FISHERIES

Fisheries	Region	October-April	May-June	July-September
Canadian	Coastal	0.0%-1.7%	0.5%-4.9%	2.4%-19.0%
	Inland	0.1%-2.9%	1.3%-8.4%	7.2%-31.0%
Total U.S.[28]	Coastal	0.6%-2.7%	2.9%-13.4%	8.3%-30.2%
	Inland	0.7%-4.3%	2.5%-8.6%	7.7%-22.6%

SEAK	Coastal	0.1%-1.3%	0.8%-3.9%	2.5%-15.0%
	Inland	0.1%-0.5%	0.6%-1.5%	1.2%-2.8%
PFMC	Coastal	0.0%-2.2%	0.6%-11.9%	1.7%-26.2%
	Inland	0.0%-0.1%	0.1%-2.4%	0.5%-4.3%
Puget Sound	Coastal	0.0%-0.6%	0.1%-1.0%	0.3%-2.7%
	Inland	0.4%-3.8%	0.5%-5.9%	4.0%-17.7%

Supporting Doc: 2019 Puget Sound fisheries biological opinion

GENERAL ADVERSE AFFECTS TO SRKW

- Fisheries cause meaningful reductions in prey availability
- Not all fish caught would have been consumed by whales
- Reductions are highest in summer months
- Small reductions can lead to:
  - Reduced fitness
  - Increased foraging effort
  - Less energy acquired
  - Less socialization

Photo: J. Durban

PERCENT REDUCTIONS AND ABUNDANCE

Year	Region	Oct - April	May - June	July - Sept
1999	Inland	0.1%	0.4%	1.0%
	Coastal	0.5%	1.4%	5.0%
2000	Inland	0.5%	1.0%	2.0%
	Coastal	0.5%	1.1%	4.0%
2001	Inland	0.2%	0.6%	1.2%
	Coastal	0.2%	0.6%	2.4%
2002	Inland	0.2%	0.5%	1.6%
	Coastal	0.2%	0.6%	3.9%
2003	Inland	0.2%	0.5%	1.4%
	Coastal	0.4%	0.9%	4.3%
2004	Inland	0.3%	0.7%	1.8%
	Coastal	0.5%	1.3%	5.9%
2005	Inland	0.4%	0.9%	2.1%
	Coastal	0.6%	1.7%	7.1%
2006	Inland	0.3%	0.7%	1.7%
	Coastal	0.6%	1.5%	6.4%
2007	Inland	0.3%	0.9%	2.3%
	Coastal	1.1%	3.5%	12.9%
2008	Inland	0.1%	0.6%	1.5%
	Coastal	0.4%	1.6%	5.2%
2009	Inland	0.3%	1.0%	2.5%
	Coastal	0.5%	2.0%	7.9%
2010	Inland	0.3%	0.7%	1.4%
	Coastal	0.5%	1.1%	4.3%
2011	Inland	0.5%	1.0%	2.2%
	Coastal	0.9%	2.1%	7.4%
2012	Inland	0.4%	0.9%	1.9%
	Coastal	0.8%	1.8%	6.5%

Table 97 from 2019 SEAK biological opinion

- Larger percent reductions have occurred during low abundance years for SEAK and PS fisheries
  - Low abundance (red)- currently defined as in the lower quartile of abundance from the retrospective time period (1992-2016)
  - High abundance (green)- currently defined as in the upper quartile of abundance from the retrospective time period.
  - Large and small percent reductions are also defined by quartiles from the retrospective time period.

PROPOSED ADAPTIVE FRAMEWORK- STEPS

One potential option for Puget Sound fisheries:

Step 1: Determine the status of coastal and inland Chinook salmon available (age 3-5) for the current year.

Year	Coastal Abundance (Oct-Apr)	Coastal Abundance (May-Jun)	Coastal Abundance (Jul-Sep)	Average Annual Coastal Status	Inland Abundance (Oct-Apr)	Inland Abundance (May-Jun)	Inland Abundance (Jul-Sep)	Average Annual Inland Status
1992	2,862,985	2,220,470	1,509,575		1,394,351	1,060,086	661,454	
1993	2,893,827	2,202,796	1,483,178		1,339,251	1,008,063	638,889	
1994	2,408,951	1,834,209	1,243,798		975,288	778,215	551,986	
1995	3,143,793	2,285,553	1,674,744		1,120,863	887,298	681,558	
1996	3,018,600	2,309,238	1,892,149		1,146,147	905,827	727,970	
1997	3,180,586	2,398,535	1,798,128		1,626,509	1,293,554	1,041,159	
1998	2,550,340	1,971,712	1,507,002		1,172,196	968,020	809,934	
1999	2,788,484	2,137,650	1,708,222		1,530,733	1,223,325	1,006,912	
2000	2,650,053	1,976,851	1,521,163		966,151	780,017	625,191	
2001	4,688,872	3,591,790	2,970,863		1,604,738	1,281,885	1,050,996	
2002	5,994,944	4,480,548	3,588,177		1,517,945	1,181,288	957,996	
2003	5,576,250	4,171,145	3,205,132		1,501,007	1,192,968	992,452	
2004	5,349,674	3,956,154	2,947,776		1,438,896	1,149,770	942,139	
2005	4,062,468	3,091,662	2,264,645		1,301,340	1,027,538	836,261	
2006	3,220,203	2,508,872	1,986,398		1,543,815	1,233,540	1,005,946	
2007	1,872,745	1,404,617	995,379		1,247,776	978,026	777,531	
2008	2,350,539	1,860,050	1,553,566		1,377,905	1,099,790	900,820	
2009	2,177,107	1,717,367	1,411,802		982,477	781,875	632,811	
2010	3,951,373	3,046,002	2,586,060		1,903,663	1,507,342	1,277,062	
2011	3,391,716	2,620,680	2,130,340		1,363,226	1,079,141	873,050	
2012	3,721,516	2,846,697	2,269,610		1,135,447	891,370	706,180	
2013	6,579,960	5,130,900	4,401,289		1,561,246	1,238,347	1,038,614	
2014	4,592,020	3,537,011	2,752,652		1,379,833	1,080,051	871,014	
2015	5,708,243	4,444,177	3,792,791		1,320,178	1,045,470	855,228	
2016	3,261,658	2,563,426	2,066,722		1,250,954	987,595	811,040	
Lower Quartile	2,788,484	2,137,650	1,521,163		1,172,196	968,020	706,180	
Median	3,220,203	2,508,872	1,986,398		1,363,226	1,060,086	855,228	
Upper Quartile	4,592,020	3,537,011	2,752,652		1,517,945	1,192,968	992,452	

PROPOSED ADAPTIVE FRAMEWORK- STEPS

One potential option for Puget Sound fisheries:

Step 1: Determine the status of coastal and inland Chinook salmon available (age 3-5) for the current year.

Step 2: Determine the annual SRKW status.

Step 3. Assign a weighted mortality proportion to each fishery.

WEIGHT	HARVEST MORTALITY	WEIGHTED MORTALITY
Fishery X = 0	Fishery X = 100	Fishery X = 0
Fishery Y = 1	Fishery Y = 50	Fishery Y = 50
Fishery Z = 0.3	Fishery Z = 1,000	Fishery Z = 300

PROPOSED ADAPTIVE FRAMEWORK- STEPS

One potential option for Puget Sound fisheries:

Step 1: Determine the status of coastal and inland Chinook salmon available (age 3-5) for the current year.

Step 2: Determine the annual SRKW status.

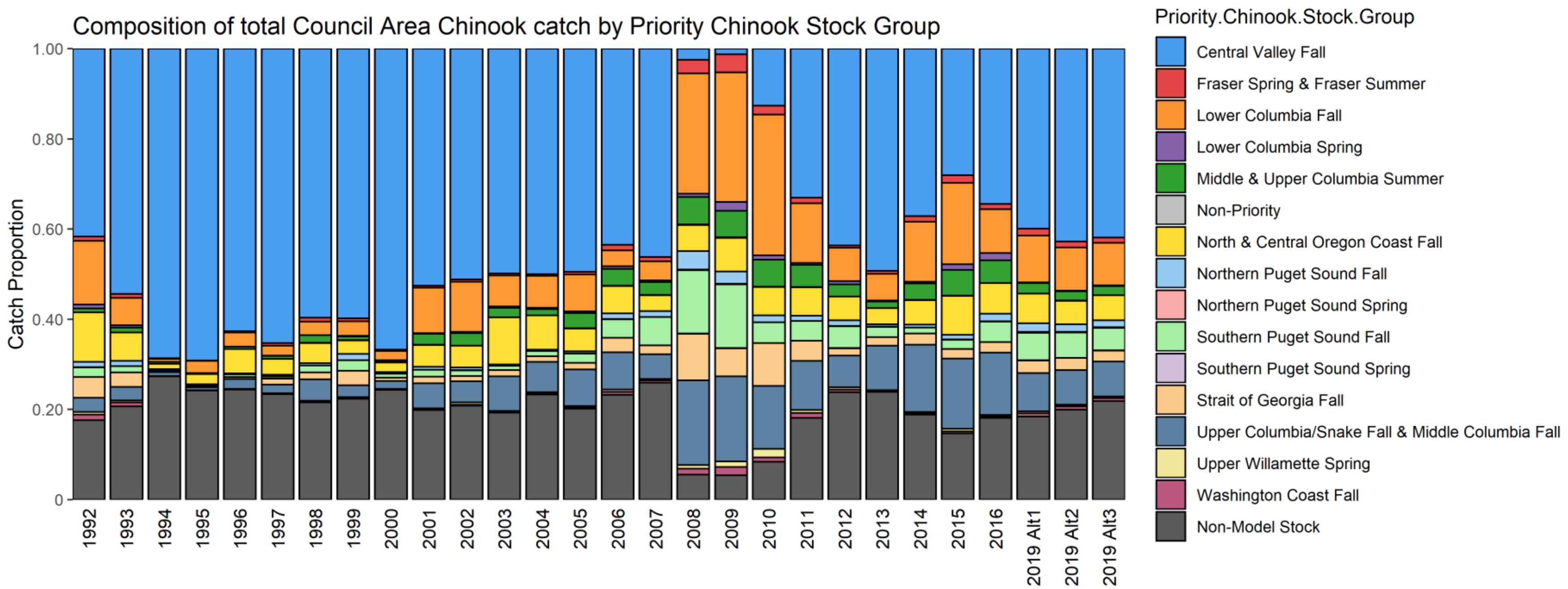
Step 3. Assign a weighted mortality proportion to each fishery.

Step 4. Determine the annual threshold for the weighted mortality proportion and assign Tier category.

Step 5: Compare the weighted mortality proportion threshold from step 4 to the current pre-season estimate of the weighted mortality proportion from step 3 above and make necessary fishery adjustments if exceedance occurs.

SUMMARY OF 2019 PFMC SALMON FISHERIES

- Evaluated the abundance and % reductions available and compared the composition of 2019 in terms of priority scores
- Evaluated the contribution of priority Chinook stocks in Council area Chinook salmon harvest retrospectively and compared this with 2019 alternatives



Note: 'Non-Model Stock' includes Klamath River Fall and Central Valley Winter, in addition to all other stocks identified as having no model representation in Table 1 of Supplemental STT Report 2 to Agenda Item D.8.a of the March 2019 PFMC Meeting

See Supporting Doc:

SUMMARY OF 2020+ PFMC SALMON FISHERIES

Pieces of an assessment:

1. Season and location of prey reduction
2. Percent reduction in prey available
3. Analysis of effects to listed and non-listed Chinook salmon in the action area (area where distribution of SRKWs and Chinook overlap)
4. Understanding of impacts to priority prey stocks under good and poor status conditions of both SRKWs and Chinook.