

LOWER COLUMBIA NATURAL COHO WORKGROUP REPORT ON THE LOWER COLUMBIA RIVER COHO HARVEST MATRIX

The Lower Columbia River Natural Coho Workgroup (LRC Workgroup) met with the Salmon Advisory Subpanel (SAS) in Portland, Oregon on October 15, 2014 to further refine the analyses and alternatives in support of potentially recommending revisions to the current harvest policy for Lower Columbia River natural (LCN) coho. Working together, the LRC Workgroup and SAS revised and narrowed the alternatives discussed at the September 2014 Council meeting and recommends a focused consideration of the alternatives presented herein. The SAS is scheduled to meet at the November Council meeting in Costa Mesa, California to develop their final recommendations to the Council.

Additionally, this report provides two summary analyses requested by the SAS, one regarding the relationship between marine survival and Lower Columbia River coho abundance and another regarding a retrospective comparison of allowable exploitation rates under the current harvest matrix and the alternatives discussed on October 15th.

HARVEST MATRIX ALTERNATIVES

Model 5b

Concentrates frequencies in the 15-20% exploitation rate range while allowing occasional exploitation rates up to 30%.

	Marine Survival Index				
	Very Low ≤0.059%	Low ≤0.109%	Medium ≤0.23%	High ≤0.28%	Very High >0.28%
Exploitation rate	10%	15%	20%	25%	30%
<i>(Frequency of occurrence)</i>	<i>(10%)</i>	<i>(35%)</i>	<i>(45%)</i>	<i>(5%)</i>	<i>(5%)</i>
<i>Coho ocean abundance (thousands)</i>	<i><300</i>	<i>300-500</i>	<i>500-950</i>	<i>950-1,200</i>	<i>>1,200</i>

Model 5e

Concentrates frequencies in the 18-20% exploitation rate range while limiting the maximum exploitation rate to 23%.

	Marine Survival Index				
	Very Low ≤0.06%	Low ≤0.0755%	Medium ≤0.127%	High ≤0.23%	Very High >0.23%
Exploitation rate	10%	15%	18%	20%	23%
<i>(Frequency of occurrence)</i>	<i>(10%)</i>	<i>(10%)</i>	<i>(36%)</i>	<i>(34%)</i>	<i>(10%)</i>
<i>Coho ocean abundance (thousands)</i>	<i><300</i>	<i>300-400</i>	<i>400-600</i>	<i>600-1,000</i>	<i>>1,000</i>

Model 5f

Concentrates frequencies in the 18-20% exploitation rate range while allowing occasional exploitation rates up to 30%.

	Marine Survival Index				
	Very Low	Low	Medium	High	Very High
	≤0.06%	≤0.0755%	≤0.23%	≤0.28%	>0.28%
Exploitation rate	10%	15%	18%	20%	30%
<i>(Frequency of occurrence)</i>	<i>(10%)</i>	<i>(10%)</i>	<i>(46%)</i>	<i>(29%)</i>	<i>(5%)</i>
<i>Coho ocean abundance (thousands)</i>	<i><300</i>	<i>300-400</i>	<i>400-1,000</i>	<i>1,000-1,200</i>	<i>>1,200</i>

Model 5g

Concentrates frequencies in the 18-23% exploitation rate range while allowing for exploitation rates up to 30% in the event that very high marine survival occurs.

	Marine Survival Index				
	Very Low	Low	Medium	High	Very High
	≤0.06%	≤0.078%	≤0.174%	≤0.40%	>0.40%
Exploitation rate	10%	15%	18%	23%	30%
<i>(Frequency of occurrence)</i>	<i>(10%)</i>	<i>(12%)</i>	<i>(55%)</i>	<i>(21%)</i>	<i>(1%)</i>
<i>Coho ocean abundance (thousands)</i>	<i><300</i>	<i>300-400</i>	<i>400-700</i>	<i>700-1,600</i>	<i>>1,600</i>

1. The above alternatives were identified for further considerations – these were variations on Model 5b which was identified as one of four examples for further discussion at September Council meeting.
2. Exploitation rates identified in these alternatives include Council fisheries in the ocean and lower Columbia River mainstem downstream from Bonneville Dam. They do not include mainstem fisheries upstream from Bonneville Dam or in lower Columbia River tributaries.
3. An exploitation rate range of 10% to 30% was determined to provide for a reasonable range of fishing opportunities under current conditions including management and other stock constraints.
4. The discussion focused on a 1x5 matrix structure. The 1x4 was not conducive to allowing for a full range of fishing rate alternatives without large steps between increments. The continuous alternative did not provide a substantial advantage over a 1x5 strategy when increments between the steps was not that great.
5. All four alternatives produce the desired effective exploitation rate 18.0%. Thus, each produces approximately equivalent conservation risks.
6. Projected frequencies of occurrence in each exploitation rate category are based on historical marine survival patterns from 1974-2009.
7. Approximate coho run sizes are identified for each marine survival range based on historical numbers during a period of comparable hatchery production (see pg. 3 for additional details). Actual ranges in each category will be due to normal unpredictability of coho returns.

Seeding Level Option

1. The LRC Workgroup recognized the value of including seeding level in the harvest control rule as a contingency in the event of very low escapements
2. This view is consistent with recommendations by the SSC and STT that seeding level should be included in the harvest control rule.
3. Analyses of stock-recruitment data for wild coho indicate that production and abundance is most sensitive to spawning escapements at very low seeding levels and is less sensitive to spawner abundance under moderate to high marine survival conditions.
4. Therefore, the LRC Workgroup recommends that harvest control rule contingencies for very low seeding should reduce coho exploitation rates during very low to low marine survival periods in order to avoid risks due to compounding the negative effects of low escapement and low marine survival. Very low seeding levels should be accompanied by more conservative management of the corresponding brood year during periods of low marine survival.
5. The LRC Workgroup identified the following condition for inclusion with any of the alternative fishing control rules/models identified above.

** In the event that lower Columbia River natural coho average spawning escapements fall below 30% of full seeding when considered as an average of the ten reference populations, the Council shall:*

- a. under conditions of very low marine survival as defined by the harvest control rule, work to the extent possible to minimize LCN coho exploitation rates on adult returns from the corresponding brood year, and in no case exceed 10%.*
- b. under conditions of low marine survival as defined by the harvest control rule, work to the extent possible to minimize LCN coho exploitation rates on adult returns from the corresponding brood year, and in no case exceed 15%.*

Note that this approach is effectively equivalent to adding a second row to the harvest control rule matrix as follows based on Model 5g:

Parental Escapement (% of full seeding)	Marine Survival Index				
	Very Low ≤0.06%	Low ≤0.08%	Medium ≤0.17%	High ≤0.40%	Very High >0.40%
Normal	10%	15%	18%	23%	30%
Very Low	<10%	<15%	18%	23%	30%

This approach is similar in structure to Model 7 alternatives reviewed by the Council in September.

Inclusion of this condition does not affect model-predicted risk because the seeding level trigger is a contingency for lower escapements than are projected by the population model.

MARINE SURVIVAL INDEX VS. OCEAN ABUNDANCE OF LCR COHO

1. Additional information on this relationship was requested by the SAS in order to place marine survival indices and frequencies of occurrence of various fishing rates described by alternatives in context of how many coho were available for harvest at various fishing levels.
2. The figure below describes this relationship based on recent information. This relationship was the basis for coho run size numbers identified for each matrix cell on page 2.

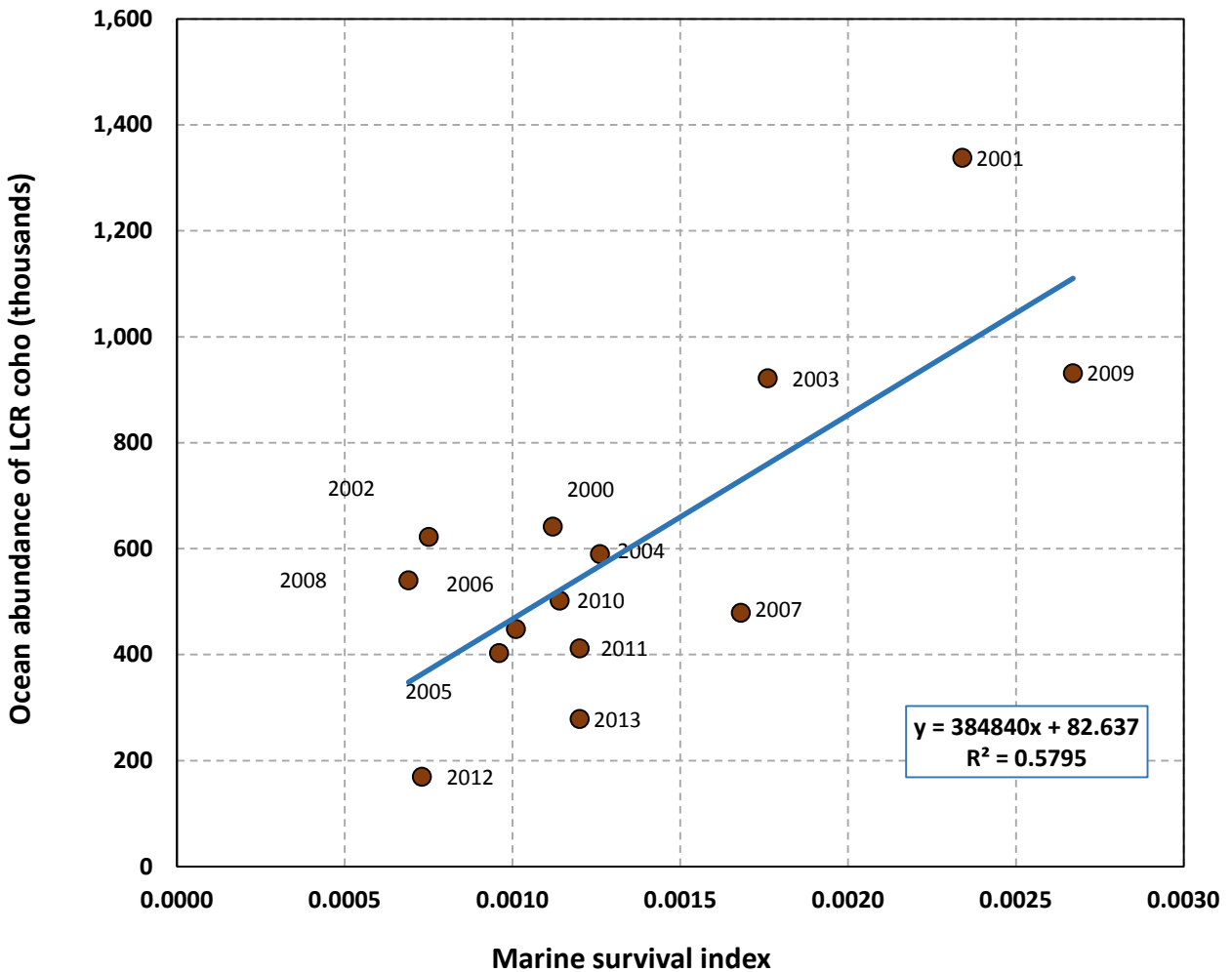


Figure 1. Relationship between marine survival index and ocean abundance of lower Columbia River coho for 2000—2013. The index and abundance are both predominately hatchery-origin fish.

RETROSPECTIVE ANALYSIS

- This analysis shows how recent LCN coho limits would have changed under alternative matrices.
- These years represent a small sample of conditions that might be expected to occur over the longer term. The 2005-2010 brood year average was slightly below the 1974-2010 average (0.131%) and lower and higher MSI's observed in the long term dataset did not occur in 2005-2010.
- Actual LCN rates and fisheries in those years would, of course, have been dependent on a combination of objectives for other stocks.

Table 1. Retrospective analysis of effects on exploitation rate limits for LCN coho under the old and several alternative harvest control rules. Differences in rates from the old matrix are highlighted.

Year	MSI	LCR coho abundance		Old Matrix	New alternatives			
		Ocean	Col R		5b	5e	5f	5g
2005	0.096%	403	355	15%	15%	18%	18%	18%
2006	0.101%	449	410	15%	15%	18%	18%	18%
2007	0.168%	479	349	20%	20%	20%	18%	18%
2008	0.069%	541	520	8%	15%	15%	15%	15%
2009	0.267%	931	759	20%	25%	23%	20%	23%
2010	0.114%	502	471	15%	20%	18%	18%	18%
2011	0.120%	412	383	15%	20%	18%	18%	18%
2012	0.073%	170	144	15%	15%	15%	15%	15%
2013	0.120%	279	243	15%	20%	18%	18%	18%
<i>Avg.</i>	<i>0.125%</i>	<i>463</i>	<i>404</i>	<i>15.3%</i>	<i>18.3%</i>	<i>18.1%</i>	<i>17.6%</i>	<i>17.9%</i>

PFMC
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