

Response to the request by John Wood to estimate the effect that Proposal 282 would have had on the sockeye salmon harvest in 2021 using the methods applied in RC 018.

3/27/2022

John Wood's request: To apply the methods used in RC 018 to estimate the loss of sockeye salmon harvest to the Shumagin Island June and Post-June fisheries and the gain of sockeye salmon harvest to the Chignik Management Area if Proposal 282 had been in force during 2021.

The methods used in RC 018 were developed by Denby Lloyd and applied to the harvests during the WASSIP years (2006-2008) to estimate the loss of sockeye salmon harvest to the Shumagin Island June and Post-June Fisheries and to estimate the gain of sockeye salmon harvest to the Chignik Management Area (CMA) had Proposal 282 been in force during the three years of the WASSIP study. This RC extends these methods to 2021 (Table 1).

Description of the calculations:

- Loss of sockeye salmon harvest to the Shumagin Island fishery: For each year and for each June and post-June fishery,
 1. to estimate the proportion of harvest time remaining under Proposal 282 relative to current regulations: divide [the number of hours allowed under Proposal 282] by [the number of hours allowed under current regulations];
 2. to estimate the reduced proportion of fishing time: subtract [the proportion of time remaining] from 1;
 3. to calculate the loss of harvest in the Shumagin Islands: multiply [the proportion of time lost] by [the Shumagin Islands fishery harvests in each year].
- Gain of sockeye salmon to the CMA: For each year and for or each June and post-June fishery,
 1. to estimate the new harvest rate of the Shumagin Island fisheries on Chignik: multiply [the reduced proportion of fishing time (as described above)] by [the Shumagin Island original harvest rates on Chignik sockeye stocks];
 2. to calculate the gain in sockeye salmon to the Chignik run: take the difference between [the original harvest rate] and [the reduced harvest rate] and multiply that by [the Chignik sockeye salmon run size].
 3. to calculate the gain of sockeye salmon harvest to the CMA: multiply [the gain of sockeye salmon the Chignik run] by [the CMA harvest rate on Chignik stocks].

Expanding these calculations to non-WASSIP years:

To expand to non-WASSIP years, we used the range of harvest rates of Chignik stocks in the Shumagin Island fishery harvests during the WASSIP years. We chose to use these because we do not have the data to calculate harvest rates in this fishery for non-WASSIP years. As stated in SP 12-24: *Some caution must be exercised when extrapolating the results to years not analyzed because changes in relative*

abundance among reporting groups, prosecution of the fisheries, or migratory behavior due to ocean conditions might affect distribution of stock-specific harvests among fisheries.

Assumptions:

1. For WASSIP years and for 2021 estimates:

- a. The loss in fish harvest in the two Shumagin Island fisheries is exactly proportional to the reduced fishing time allowed by the change in regulation.
- b. An increased return to the CMA will not change the harvest rate of Chignik fish in the CMA.

2. For 2021 estimates:

- a. Changes in relative abundance among reporting groups will not affect results. We know that relative abundances were vastly different in 2018-2021. Bristol Bay had huge runs while Chignik had poor ones relative to the WASSIP years. However, these changes are somewhat mitigated by the use of harvest rates (rather than stock proportions) in these calculations.
- b. Changes in the prosecution of the fisheries will not affect results. This assumption may not be valid because the South Peninsula fisheries have undergone significant change since WASSIP specific to reducing Chignik harvest.
- c. There have been no changes in migratory behavior that would change stock-specific harvests among fisheries. We don't have any hard data on changes to migration patterns, but ocean conditions in the North Pacific and Bering Sea have not been static since the WASSIP years.

Data sources for each variable

• **WASSIP years:**

- Proportion of fishing time losses to the Shumagin Islands under Proposal 282
 - Proposal 282
- Shumagin Islands harvests
 - June: SP 12-24; Tables 24-26
 - Post-June: SP 12-24; Tables 36-38
- Chignik sockeye run sizes: SP 12-24; Tables 3-5
- Shumagin Island harvest rates on Chignik sockeye stocks
 - June: SP 12-24; Tables 24-26
 - Post-June: SP 12-24; Tables 36-38
- CMA harvest rates on Chignik stocks: SP 12-24; Tables 81-83

• **2021:**

- Proportion of fishing time losses to the Shumagin Islands under Proposal 282
 - Proposal 282
- Shumagin Islands harvests: RIR 4K22-01; Appendix B
- Chignik sockeye run size: FMR No. 22-04; Table 20
- Shumagin Island harvest rates on Chignik sockeye stocks (used the highest and lowest values from WASSIP years to produce a range of estimates)

- June: SP 12-24; Tables 24-26
 - Post-June: SP 12-24; Tables 36-38
- CMA harvest rates on Chignik stocks: FMR No. 22-04; Tables 19 and 20 (Divided the 2021 CMA harvest reported on Table 19 by the 2021 Chignik total run reported in Table 20)

References

- Fox, E. K. C., T. D. Lawson, and R. L. Renick. 2022. 2021 South Alaska Peninsula salmon annual management report and 2020 subsistence fisheries in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands management areas. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K22-01, Kodiak.
- Habicht, C., A. R. Munro, T. H. Dann, D. M. Eggers, W. D. Templin, M. J. Witteveen, T. T. Baker, K. G. Howard, J. R. Jasper, S. D. R. Olive, H. L. Liller, E. L. Chenoweth and E. C. Volk. 2012. Harvest and harvest rates of sockeye salmon stocks in fisheries of the Western Alaska Salmon Stock Identification Program (WASSIP), 2006-2008. Alaska Department of Fish and Game, Special Publication No. 12-24, Anchorage.
- Stratton, M. E., and R. H. Johnson. 2022. Chignik Management Area salmon annual management report, 2021. Alaska Department of Fish and Game, Fishery Management Report No. 22-04, Anchorage.

Table 1. Effects of time reduction outlined in Proposal 282 on Shumagin Island June and Post-June sockeye harvest on harvest losses in the Shumagin Islands and harvest gains in the Chignik Management Area (CMA). Yellow cells contain data from reports: original harvest rate ranges on Chignik sockeye stocks in the Shumagin Island fisheries were obtained from SP 12-24; Chignik stock run size and CMA harvests used to calculate CMA harvest rates on Chignik stocks were obtained from RIR 4K22-01. Methods to estimate the derived values (in white cells) were developed by Denby Lloyd (RC 018).

Year	High/low range of WASSIP Shumagin Island harvest rate on Chignik stocks	Shumigan June Harvest	Proportion of time remaining after time reduction to the Shumagin Island June Fishery	Sockeye harvest lost due to reduction	Sockeye harvest remaining after time reduction	Chignik sockeye run size	Shumagin Island June harvest rate on Chignik sockeye stocks (%)	Resulting Shumagin Island June harvest rate on Chignik sockeye stocks	"Gain" of sockeye to Chignik run	CMA harvest rate on Chignik stocks (%)	"Gain" of sockeye to CMA harvest
2021	High	1,168,998	0.5909	478,226	690,772	759,781	3.3	2.0	10,257	15.64	1,604
	Low	1,168,998	0.5909	478,226	690,772	759,781	1.4	0.8	4,351	15.64	681
			(208hr/352hr)								
Year	High/low range of WASSIP Shumagin Island harvest rate on Chignik stocks	Shumigan post-June Harvest	Proportion of time remaining after time reduction to the Shumagin Island post-June Fishery	Sockeye harvest lost due to reduction	Sockeye harvest remaining after time reduction	Chignik sockeye run size	Shumagin Island post-June harvest rate on Chignik sockeye stocks (%)	Resulting Shumagin Island post-June harvest rate on Chignik sockeye stocks	"Gain" of sockeye to Chignik run	CMA harvest rate on Chignik stocks (%)	"Gain" of sockeye to CMA harvest
2021	High	541,694	0.5060	267,584	274,110	759,781	4	2.0	15,013	15.64	2,348
	Low	541,694	0.5060	267,584	274,110	759,781	2.1	1.1	7,882	15.64	1,233