Pacific Fishery Management Council

7700 NE Ambassador Place, Suite 101, Portland, OR 97220-1384
Phone 503-820-2280 | Toll free 866-806-7204 | Fax 503-820-2299 | www.pcouncil.org
Mark Cedergreen, Chairman   Donald O. McIsaac, Executive Director

September 24, 2010

Washington State and Tribal Co-Managers

Dear Co-manager:

The Pacific Fishery Management Council (Council) is currently developing a fishery management plan (FMP) amendment (Amendment 16) to implement changes required by the Magnuson-Stevens Reauthorization Act (Act). To ensure consistency with the Council's evaluation of "overfished" stocks and "overfishing," the Act requires specification of annual catch limits (ACL) and, to be consistent with the National Standard 1 Guidelines, the specification of quantifiable status determination criteria (SDC). The Act allows an exception to the ACL requirement for stocks managed under an international agreement, such as the Pacific Salmon Treaty. Alternatives currently under consideration by the Council invoke this exception for coho stocks from Puget Sound and Washington coast, but these stocks would still require SDC. The SDC must include a minimum stock size threshold (MSST) defined in terms of spawner abundance, and the National Standard 1 Guidelines recommend that the MSST be greater than or equal to one half of maximum sustainable yield spawning escapement (S_{MSY}). The SDC also must include specification of a maximum fishing mortality threshold (MFMT) that is less than the maximum sustainable yield exploitation rate (F_{MSY}).

The National Marine Fisheries Service is required to report stock status in its annual Report to Congress on the Status of Fisheries. For this purpose the Council would conclude that overfishing had occurred if the fishing mortality rate exceeded the MFMT (in a single year), and the Council would classify a stock as "overfished" if spawner abundance fell below the MSST (either in a single year or as a mean of three years; both alternatives are being considered). If a stock is classified as "overfished," the Council would presumably initiate an assessment of factors contributing to that status and would consider adopting a rebuilding plan, analogous to the current process when an overfishing concern is triggered (e.g., Queets coho in 2009).

The Council's Salmon Technical Team (STT) has developed alternative methods for defining SDC for Washington coast coho stocks. The STT originally proposed to use the midpoint of the escapement goal range as an S_{MSY} proxy, and one half of that as the MSST. The midpoint was proposed because the Pacific Salmon Commission uses that reference point to determine categorical status for evaluating compliance with the Pacific Salmon Treaty's Southern Coho Management Plan (Annex IV, Chapter 5, December, 2008). Estimates of F_{MSY} have not been defined for coastal coho stocks by the tribal and state co-managers. The STT developed direct estimates of both F_{MSY} and S_{MSY} from spawner-recruit analysis using escapement data for coastal coho stocks and ocean recruits derived from backward Fishery Regulation Assessment Model

runs (see attached appendix from the Amendment 16 Draft Environmental Assessment). The same method was used for the Queets and western Strait of Juan de Fuca coho overfishing reviews last year. The STT is considering recommending the F_{MSY} estimates as the basis for defining MFMTs, and recommending use of the S_{MSY} estimates to calculate the MSSTs for coastal coho stocks.

For Puget Sound coho stocks, the STT recommended using the "normal" fishing mortality ceilings as estimates of F_{MSY} to develop MFMTs. Options for MSSTs include the escapement associated with the "low/critical" abundance breakpoint and the "low" harvest rate ceiling, or half of the escapement associated with the "normal/low" breakpoint and the "normal" harvest rate ceiling.

It is important that the Council hear from the co-managers regarding these STT proposals. The Council adopted alternatives for Amendment 16 to release for public review last week, which include some of the reference points described above, which in turn will affect the analysis of impacts from the alternatives. It is important for the analysis to reflect appropriate assumptions so that the Council can make informed decisions, and constituents can contribute relevant comments. If the co-managers have preferences or other recommendations for SDC, the Council would greatly appreciate receiving those recommendations as soon as possible.

The Council will consider clarification of adopted alternatives and additional guidance to developing analysis of Amendment 16 at its November meeting. The briefing book deadline for the November Council meeting is October 15, and comments received by the briefing book deadline will be distributed to all Council members prior to the November meeting.

Thank you for your attention to these issues, and the Council looks forward to hearing from the co-managers. If you have questions or need any assistance with these issues, please call on Council staff officer Chuck Tracy.

Sincerely,

D. O. McIsaac, Ph.D.
Executive Director

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Attachment: Appendix E from the Draft Environmental Assessment for Amendment 16.

c: Council Members
        SAC
        Mr. Craig Bowhay
        Mr. Andy Rankis
        Ms. Sandy Zeiner

APPENDIX E: DEVELOPMENT OF REFERENCE POINTS FOR WASHINGTON COASTAL COHO STOCKS

Estimates of biological reference points (F_{MSY} and S_{MSY}) are lacking for Washington coastal coho stocks. These reference points are needed to develop needed to develop required status determination criteria (SDC) for Amendment 16 to the Salmon Fishery Management Plan. Required SDC include a maximum fishing mortality threshold (MFMT) and a minimum stock size threshold (MSST). One solution to this problem is to use a proxy value for F_{MSY} derived from other stocks to develop MFMTs and to develop MSSTs from the current conservation objectives for Washington coastal coho. However, data are available to derive stock specific estimates of the necessary reference points for Washington coastal stocks, eliminating the need for a proxy.

Methods

Spawning escapement estimates and reconstructed ocean abundance for natural coho stocks were extracted from outputs of backward coho FRAM runs for each individual year from 1986-2008. The initial ocean abundances were scaled by a factor of 0.812, which is the product of natural survival (1-natural mortality) over the 5 time periods used in the coho FRAM, and represents the probability of a fish at the beginning of the first time period surviving to spawn in the absence of fishing. This scales the initial ocean abundance to adult-equivalent (AEQ) recruits, with the result that exploitation rates are also in terms of AEQ.

Beverton-Holt (equation 1) and Ricker (equation 2) SRRs were fitted to the data for each stock. In the analyses done in support of current FMP reference points for Puget Sound stocks, Beverton-Holt SRRs were used. There is some evidence to support this form of relationship, but this SRR always produced higher intrinsic productivity than a Ricker SRR fitted to the same data, with a consequently higher estimate of F_{MSY}, and in some cases the best fit of a Beverton-Holt SRR was spawner independent (i.e., $F_{MSY} = 1.0$ and $S_{MSY} = 0$). For this reason, and the fact that Ricker SRRs were used in developing F_{MSY} values for Chinook, both forms were examined for coho.

$$R = \frac{aS}{(b+S)} \tag{1}$$

$$R = Se^{(\alpha - \beta S)} \tag{2}$$

Beverton-Holt SRRs were fitted by non-linear least-squares regression of recruits on spawning escapement. For the Beverton-Holt SRR S_{MSY} was calculated using equation (3).

$$S_{MSY} = \sqrt{ab} - b \tag{3}$$

F_{MSY} was calculated as $(R_{MSY}-S_{MSY})/R_{MSY}$, and R_{MSY} was calculated by substituting S_{MSY} from equation (3) into equation (1).

Ricker SRR were fitted using the procedures described in STT (2005), including correction for process error.

Results and Discussion

Fits of Beverton-Holt SRRs (Table E-1) do not appear to provide meaningful results. With the exception of the Skagit management unit, all estimates of S_{MSY} are below current goals (Tables E-2 and E-3) and all estimates of F_{MSY} are greater than 0.8. For the Snohomish, Big Beef Creek, and Quillayute fall stocks, the best fits are independent of spawning escapement and expected yield is maximized by harvesting 100% of

the abundance. For these reasons, results from fitting Beverton-Holt SRRs are excluded from further consideration.

The Ricker SRRs appear to be much more reasonable fits of the data than those of the Beverton-Holt (Figure E-1). For Quillayute fall, Queets, and Hoh stocks, all estimates of S_{MSY} (Table E-4) are within the range of estimates used to develop current management objectives (Table E-3) (Lestelle, et al. 1984). Estimates of F_{MSY} range from 0.59 for Quillayute fall coho to 0.69 for the Hoh and Grays Harbor.

Recommendations

In light of these results, we recommend that reference points in Table E-4 be used as SDC for Washington Coastal stocks with MFMT = F_{MSY} and MSST = $0.5*S_{MSY}$.

F-fishing mortality rate; MFMT-maximum fishery mortality threshold; MSST-minimum stock size threshold; MSY-maximum sustainable yield; NS1Gs-National Standard 1 Guidelines; OFL-overfishing limit; S-spawning escapement; SDC-status determination criteria

Table E-1. Parameters and associated reference points from fitting Beverton-Holt SRRs to Puget Sound and Washington coast coho stocks, and MSST calculated as $0.5*S_{MSY}$. Big Beef Creek, Dungeness, and Chehalis do not encompass the entire management unit, so the S_{MSY} and MSST are not applicable to the FMP stock.

Stock	a	b	F_{MSY}	S_{MSY}	MSST
Skagit	146286	41734.4	0.47	36,401	18,201
Stillaguamish	39568	700.5	0.87	4,564	2,282
Snohomish	185475	0.0	1.00	0	0
Big Beef Creek (Hood Canal)	34523	0.0	1.00	0	0
Dungeness (Strait of Juan de Fuca)	3291	87.2	0.84	448	224
Quillayute Fall	14592	0.0	1.00	0	0
Hoh	7421	107.6	0.88	786	393
Queets	14647	254.8	0.87	1,677	839
Chehalis (Grays Harbor)	67623	1792.4	0.84	9,217	4,609

Table E-2. Current proposed FMP reference points for Puget Sound Management units.

Management Unit	MFMT	S_{MSY}	MSST
Skagit	0.60	25,000	14,857
Stillaguamish	0.50	10,000	6,100
Snohomish	0.60	50,000	31,000
Hood Canal	0.65	14,362	10,217
Strait of Juan de Fuca	0.60	11,000	7,007

Table E-3. Current proposed reference points for Washington coastal coho stocks.

Management Unit	MFMT	Escapement goal	S_{MSY}
Quillayute fall	F_{MSY} proxy	6,300-15,800	4,700-9,600
Hoh	F_{MSY} proxy	2,000-5,000	1,500-3,100
Queets	F_{MSY} proxy	5,800-14,500	4,200-9,400
Grays Harbor	F_{MSY} proxy	35,400	-

F-fishing mortality rate; MFMT-maximum fishery mortality threshold; MSST-minimum stock size threshold; MSY-maximum sustainable yield; NS1Gs-National Standard 1 Guidelines; OFL-overfishing limit; S-spawning escapement; SDC-status determination criteria

Table E-4. Parameters and associated reference points from fitting Ricker SRRs to Washington Coast coho stocks. Chehalis does not encompass the entire management unit, so the S_{MSY} and MSST are not applicable to the FMP stock.

Stock	α'	β	F_{MSY}	S_{MSY}	MSST
Quillayute Fall	4.36	0.0000987	0.59	5,873	2,937
Hoh	6.34	0.0002729	0.69	2,520	1,260
Queets	6.10	0.0001232	0.68	5,500	2,750
Chehalis (Grays Harbor)	6.43	0.0000303	0.69	22,802	11,401

F-fishing mortality rate; MFMT-maximum fishery mortality threshold; MSST-minimum stock size threshold; MSY-maximum sustainable yield; NS1Gs-National Standard 1 Guidelines; OFL-overfishing limit; S-spawning escapement; SDC-status determination criteria