13. Assessment of the Rougheye and Blackspotted Rockfish stock complex in the Gulf of Alaska

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Executive Summary

Rockfish are assessed on a biennial stock assessment schedule to coincide with the availability of new survey data. For Gulf of Alaska rockfish in on-cycle (odd) years, we present a full stock assessment document with updated assessment and projection model results to recommend harvest levels for the next two years. However, due to the 2013 government shutdown, we present an executive summary similar to an off-cycle year for Gulf of Alaska rougheye and blackspotted (RE/BS) rockfish. There was a large amount of new and updated data available for this stock complex (not just the most recent year) and there was not sufficient time for performing model evaluation and sensitivity analyses of this information. We present a short discussion of this new or updated data anticipated for the next full assessment in the *Research Priorities* section at the end of this document. Please refer to the last full stock assessment report presented in 2011 for further information regarding the assessment model (Shotwell et al., 2011, available online at http://www.afsc.noaa.gov/REFM/docs/2011/GOArougheye.pdf). A full stock assessment document with updated assessment and projection model results will be presented in next year's SAFE report.

We use a statistical age-structured model as the primary assessment tool for the Gulf of Alaska rougheye and blackspotted rockfish stock complex which qualifies as a Tier 3 stock. For this update year, we do not re-run the assessment model, but do update the projection model with new catch information. This incorporates the most current catch information without re-estimating model parameters and biological reference points.

Summary of changes in Assessment Inputs

Changes in the input data: There were no changes made to the assessment model inputs. New data added to the projection model included final 2011 and 2012 catch and new estimated catches for 2013-2015.

Changes in assessment methodology: There were no changes in assessment methodology.

Summary of Results

New catch estimates for this year's projection model are final 2011 and 2012 catches of 545 t and 604 t, and estimated 2013-2015 catches of 611 t, 525 t, and 520 t, respectively. The 2013 catch was estimated by expanding the October 1, 2013 official catch by a factor of 1.02, which represents the average fraction of catch taken between October 1 and December 31 in the last three complete years (2010-2012). To estimate future catch, we updated the yield ratio (0.42), which was the average of the ratio of catch to ABC for the last three complete catch years (2010-2012). The projected ABCs for 2014 and 2015 from the 2011 assessment model were then multiplied by the updated yield ratio to generate catch for those years. The yield ratio and expansion factor were slightly higher than last year's values of 0.33 and 1.014, respectively.

For the 2014 fishery, we recommend the maximum allowable ABC of 1,244 t from the updated projection model. This ABC is slightly more than last year's ABC of 1,232 t and slightly less than last year's projected 2014 ABC of 1,254 t. Using the same apportionment percentages as in the 2012 and 2013 fishery results in recommended ABCs of 82 t for the Western area, 864 t for the Central area, and 298 t for the Eastern area. The 2014 Gulfwide OFL for RE/BS rockfish is 1,497 t.

Reference values for RE/BS rockfish are summarized in the following table, with the recommended ABC and OFL values in bold. The stock was not being subjected to overfishing last year, is not currently overfished, nor is it approaching a condition of being overfished.

Quantity	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
	2013	2014	2014	2015
M (natural mortality rate)	0.034	0.034	0.034	0.034
Tier	3a	3a	3a	3a
Projected total (ages 3+) biomass (t)	42,883	43,067	42,810	43,337
Female spawning biomass (t)				
Projected*				
Upper 95% confidence interval			N/A	N/A
Point Estimate	12,786	13,019	12,897	13,325
Lower 95% confidence interval			N/A	N/A
$B_{100\%}$	24,329	24,329	24,329	24,329
$B_{40\%}$	9,732	9,732	9,732	9,732
$B_{35\%}$	8,515	8,515	8,515	8,515
F_{OFL}	0.047	0.047	0.047	0.047
$maxF_{ABC}$	0.039	0.039	0.039	0.039
F_{ABC}	0.039	0.039	0.039	0.039
OFL (t)	1,482	1,508	**1,497**	1,518
maxABC (t)	1,232	1,254	1,244	1,262
ABC (t)	1,232	1,254	**1,244**	1,262
Status	As determined *last* year for:		As determined *this* year for:	
	2011	2012	2012	2013
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

*Projected upper and lower 95% confidence intervals for female spawning biomass are not available without a new model run as they are derived from the MCMC estimated posterior distribution.

Fishery Trends

Updated catch data (t) for RE/BS rockfish in the Gulf of Alaska as of October 1, 2013 (NMFS Alaska Regional Office Catch Accounting System via the Alaska Fisheries Information Network (AKFIN) database, http://www.akfin.org) are summarized in the following table.

Year	Western	Central	Eastern	Gulfwide Total	Gulfwide ABC	Gulfwide TAC
2011	28	368	149	545	1,312	1,312
2012	33	376	195	604	1,223	1,223
2013	20	387	192	599	1,232	1,232

Gulfwide catch of rougheye and blackspotted rockfish have remained relatively stable in all areas for the last three years. Some fluctuations occurred in the catches of RE/BS rockfish within different fisheries. In 2013, there were decreases in the flatfish and pollock fisheries, accompanied by increases in the halibut,

rockfish, and sablefish fisheries compared to 2012. The majority of the RE/BS rockfish catch remains in the rockfish and sablefish fisheries. For the rockfish fishery, the increase occurred primarily in the Central GOA as there was no directed Pacific ocean perch fishery in the Western GOA this year. The 2013 catch of RE/BS rockfish increased in all areas for the sablefish fishery. In 2013 the observer program restructuring began and the extent that this program affected perceived catches of RE/BS rockfish in the sablefish fishery (due to improved coverage) is uncertain. Understanding the potential for catch accounting biases due to shifts in observer coverage will require further study.

Survey Trends

Biomass estimates from the trawl and longline survey were not used for updating the 2013 projection model for RE/BS rockfish; however, we provide a brief description of the new survey estimates since the last full assessment for reference. The rougheye and blackspotted combined biomass estimate for the 2013 trawl survey was an all-time low for this time series. The decrease was 37% below the 2011 estimate and 40% below the mean biomass estimate for the time series. The estimates by area were not consistently down as there was a 66% decrease in the Central GOA with increases in the Western and Eastern GOA by 19% and 51%, respectively. The spatial distribution of hauls that encountered RE/BS rockfish seemed to be the opposite of the 2011 survey with many small catches throughout the Central GOA and a few relatively large catches in Southeastern GOA. This may be partially responsible for the 14% increase in the coefficient of variation (CV) on the 2013 estimate from the 2011 CV. However, there was also a reduction in survey effort this year. Similar to 2011, only 2 boats were chartered for the survey (usually 3 boats are used). This resulted in even fewer stations sampled compared to previous surveys: 550 stations in 2013 compared to 670 in 2011 and 823 in 2009. The 2013 sampling level (based on number of stations) is 30% lower than the long-term mean for this survey. We plan to look closer at this reduction in survey effort to determine if any survey design factors may have influenced the large decrease in the 2013 RE/BS rockfish trawl survey biomass estimate. However, the relative population weight (RPW) estimates from the longline survey for both 2012 and 2013 also decreased from the 2011 RPW by 25% and another 19%, respectively. With the exception of 2009, the time series appeared to be trending upward through 2011. The 2013 longline RPW estimate is 22% lower than the mean for the time series. Estimates by area were generally consistently down for both 2012 and 2013, with the exception of West Yakutat which increased in 2012 and then decreased in 2013. The agreement between the two surveys may be indicative of a decrease in the RE/BS rockfish biomass. However, the trajectories of the two surveys have diverged in the past and likely represent different parts of the RE/BS population. We plan to investigate differences in the two surveys to understand the different trends as per Plan Team and SSC recommendations.

Area Apportionment

The apportionment percentages are the same as in the 2011 full assessment. The following table shows the recommended apportionment for 2014. Please refer to the last full stock assessment report presented in 2011 for information regarding the apportionment rationale for RE/BS rockfish.

	Western	Central	Eastern	Total
Area Apportionment	6.60%	69.46%	23.94%	100%
Area ABC (t)	**82**	**864**	**298**	**1,244**
OFL (t)				**1,497**

Summaries for Plan Team

Species	Year	Biomass[1]	OFL	ABC	TAC	Catch[2]
RE/BS complex	2012	42,856	1,472	1,223	1,223	604
	2013	42,883	1,482	1,232	1,232	599

		2014	42,810		1,497	1,244			
		2015	43,337		1,518	1,262			
Stock/ Assemblage	**Area**	**2013 OFL**	**ABC**	**TAC**	**Catch[2]**	**2014 OFL**	**ABC**	**2015 OFL**	**ABC**
RE/BS complex	W		81	81	20		82		83
	C		856	856	387		864		877
	E		295	295	192		298		302
	Total	1,482	1,232	1,232	599	1,497	1,244	1,518	1,262

[1]Total biomass (ages 3+) from the age-structured model

[2]Current as of October 1, 2013. Source: NMFS Alaska Regional Office Catch Accounting System via the AKFIN database (http://www.akfin.org).

SSC and Plan Team Comments on Assessments in General

Because of the government shutdown, there was only sufficient time to compile SSC and Plan Team comments. For the next full assessment, we will respond to all comments listed below.

"The SSC is pleased to see that many assessment authors have examined retrospective bias in the assessment and encourages the authors and Plan Teams to determine guidelines for how to best evaluate and present retrospective patterns associated with estimates of biomass and recruitment. We recommend that all assessment authors (Tier 3 and higher) bring retrospective analyses forward in next year's assessments." (SSC, December 2011)

"The SSC concurs with the Plan Teams' recommendation that the authors consider issues for sablefish where there may be overlap between the catch-in-areas and halibut fishery incidental catch estimation (HFICE) estimates. In general, for all species, it would be good to understand the unaccounted for catches and the degree of overlap between the CAS and HFICE estimates, and to discuss these at the Plan Team meetings next September." (SSC, December 2011)

"The Teams recommend that authors continue to include other removals in an appendix for 2013. Authors may apply those removals in estimating ABC and OFL; however, if this is done, results based on the approach used in the previous assessment must also be presented. The Teams recommend that the "other" removals data set continue to be compiled, and expanded to include all sources of removal." (Plan Team, September 2012)

"For the November 2012 SAFE report, the Teams recommend that authors conduct a retrospective analysis back 10 years (thus, back to 2002 for the 2012 assessments), and show the patterns for spawning biomass (both the time series of estimates and the time series of proportional changes relative to the 2012 run). This is consistent with a December 2011 NPFMC SSC request for stock assessment authors to conduct a retrospective analysis. The base model used for the retrospective analysis should be the author's recommended model, even if it differs from the accepted model from previous years." (Plan Team, September 2012)

"The Teams recommend that the whole time series of each category of 'other' catches be made available on the NMFS "dashboard," so that they may be listed in all SAFE chapters." (Plan Team, November 2012)

"The SSC recommends that the authors consider whether it is possible to estimate M with at least two significant digits in all future stock assessments to increase validity of the estimated OFL." (SSC, December 2012)

SSC and Plan Team Comments Specific to this Assessment

"The Team asks the [rockfish] *authors to investigate whether the conversion matrix has changed over time. Additionally, the Team requests that the criteria for omitting data in stock assessment models be based upon the quality of the data (e.g. bias, sampling methods, information content, redundancy with other data, etc.) rather than the effect of the data on modeled quantities."* (Plan Team, November 2011)

"The Team supports the author's suggestion to conduct sensitivity analysis on optimum plus group for age comps. The Team also supports the author's interest to explore selectivity patterns. The Team also encouraged the author to continue to investigate difference in the longline and trawl survey to help understand the different trends." (Plan Team, November 2011)

"SSC supports the Plan Team recommendation for the author to continue to investigate difference in the longline and trawl survey to help understand the different trends." (SSC, December 2011)

"In response to SSC comments the authors commented on the veracity of model based estimates of trawl survey catchability. The authors reported that the model based estimate of survey catchability is 1.42 compared with a submersible observations in a 2006 analysis and yielded a catchability of 0.85. The SSC encourages the author to report on the evidence to support the current model based estimate given the discrepancy between experimental and model based estimates of catchability." (SSC, December 2011)

Research Priorities

We anticipate a large amount of new or updated data for use in the RE/BS model for next year's full assessment. This includes updated catch for 2011-2014, updated fishery ages for 2009, new fishery ages for 2010 and 2012, new fishery sizes for 2011, new trawl survey estimate for 2013, new trawl survey ages for 2009 and 2011, and fully revised longline survey estimates for the time series of RPWs and length frequencies. There were several updates to the longline survey database since the 2011 assessment including updated growth parameters for all species (except sablefish), updated coding for shortraker and rougheye rockfish, and new area estimates for shallow strata from 150-200 m (Echave et al. 2013). We plan to investigate these new data to determine if the new shallow depth stratum should be used in the survey estimates for RE/BS rockfish and will consider this addition for the next full assessment.

New biological data on growth are also available for updating several parameters estimated outside of the assessment model. Specifically we plan to use the several new years of size-at-age and aging error data to update the conversion and error matrices as well as use the new weight-at-age data to update parameter estimates following methods used for the longline survey. Incorporation of this new information will likely lead to conducting sensitivity analyses on the optimum plus group for age compositions and exploring different selectivity patterns to resolve marginal fits in composition data. New information on maturity of rougheye and blackspotted rockfish may also be included, when available, from the special projects initiated through the RACE Division and Auke Bay Laboratories. Future assessment priorities include 1) a synthesis of previous studies on rockfish catchability using submersibles to develop informative prior distributions on catchability, 2) assessment of RE/BS rockfish density between trawlable and untrawlable grounds, 3) analyses of fishery spatial patterns and behavior given the observer restructuring, and 4) examining potential age and growth differences between rougheye and blackspotted rockfish to help develop a rational for a two-species model.

Finally, many of the comments specific to the RE/BS rockfish assessment during the 2013 Center for Independent Experts (CIE) Alaska rockfish scientific peer review may also be incorporated in next year's full assessment. Please refer to the Summary and response to the 2013 CIE review of AFSC rockfish document presented to the September 2013 Plan Team for further details.

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