14: ASSESSMENT OF THE DEMERSAL SHELF ROCKFISH STOCK COMPLEX IN THE SOUTHEAST OUTSIDE DISTRICT OF THE GULF OF ALASKA

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Executive Summary

The Demersal Shelf Rockfish (DSR) assemblage (yelloweye, quillback, copper, rosethorn, canary, China, and tiger rockfish) is assessed on a biennial cycle, with full stock assessments conducted in odd calendar years to coincide with new survey data. This year (even year), an executive summary is presented but it should be noted that the last submersible survey was in 2009. See Brylinsky et al. 2009 for the last full stock assessment (ftp://ftp.afsc.noaa.gov/afsc/public/Plan_Team/Nov2009/GOAdsr.pdf). Since 2009, the submersible has not been available as a survey tool. After exploring several non-extractive alternative survey options, we decided to use a remotely operated vehicle (ROV) to conduct a pilot survey in 2012 because 1) ROVs are a low cost, and versatile tool increasingly being used to study marine habitats and organisms, and 2) we have the opportunity to utilize the expertise of Alaska Department of Fish and Game (ADF&G) staff in the Central Region, who have successfully conducted ROV surveys for nearshore rockfish and lingcod populations since 2002. We are also closely following the yelloweye rockfish assessment work conducted by other agencies which include rockfish ROV surveys in Puget Sound by the Washington Department of Fish and Wildlife, and rockfish ROV surveys in Georgia Strait by the Department of Fisheries and Oceans Canada (Bob Pacunski, Lynne Yamanaka pers. comm.). These agencies are quantifying yelloweye rockfish densities based on ROV video data, as well as potential yelloweye rockfish habitat. The eventual goal of using the ROV in Southeast Alaska is to generate a density estimate for yelloweye rockfish as we have produced with the submersible. The objectives of the 2012 pilot study were to trial the ROV as a research tool in the outside waters of the Eastern Gulf of Alaska, to evaluate whether line transects are an appropriate ROV survey technique to quantify DSR, and to collect sufficient data with which to improve the methods and survey design for future ROV surveys. This past August we conducted 46 line transects in rock habitat during an 11 day survey in the Central Southeast Outside (CSEO) management area within the Southeast Outside (SEO) Subdistrict. All line transects were filmed from the ROV using a stereo camera system. DSR video data analyses will commence this winter. In addition, we continue to work on the age structured assessment (ASA) model for yelloweye rockfish and hope to document the ASA methods in writing for the November 2013 Plan Team meeting.

Summary of Changes in Assessment Inputs

Changes in the input data:
Catch information and average weights for yelloweye rockfish catch from the commercial fishery were updated for 2012.

Changes in the assessment methodology data:
There were no changes in the assessment methodology as this is an off-cycle year.

Summary of Results

Total yelloweye rockfish biomass is estimated for each management area in the SEO Subdistrict as the product of density, mean fish weight, and area estimates of DSR habitat. Yelloweye rockfish density is derived using line transects conducted from the most recent submersible surveys in each area. Average weights are from incidental catch of yelloweye rockfish in the commercial halibut fishery, and when available, in the directed DSR commercial fishery. Area estimates of DSR habitat are a combination of National Oceanic Survey data, sidescan and multibeam data and fishermen logbook data. The changes in

average weights in each management area (4.35 kg to 4.36 kg in East Yakutat (EYKT), 3.22 kg to 3.33 kg in CSEO, 3.43 to 3.24 kg in Northern Southeast Outside (NSEO) and 3.51 kg to 3.68 in SSEO) resulted in small changes to the biomass estimate for each management area (4,756 mt to 4,770 in EYKT, 3,914 mt to 4,051 mt in CSEO, 1,385 mt to 1,305 mt in NSEO and 4,252 mt to 4,461 mt in SSEO). The overall yelloweye rockfish biomass estimate for 2012 is 14,588 mt; an increase from 14,307 mt in 2012.

The acceptable biological catch (ABC) for DSR is set using Tier 4 definitions with F=M=0.02 and adjusting for the other species landed in the assemblage. For 2013, the recommended ABC for DSR is calculated by increasing the ABC for yelloweye rockfish by 4% (this percentage is based on the previous year's commercial harvest species assemblage). The overfishing level was set using $F_{35\%}$=0.032 and adjusting 4% for the other species landed. We recommend a 2013 ABC of 303 mt, an increase from the 2012 ABC of 293 mt. Per the 2009 Board of Fisheries (BOF) decision, subsistence DSR removals are deducted off the ABC prior to the allocation of the TAC between the commercial and sport fisheries. For 2013, 7 mt was deducted from the ABC for DSR caught in the subsistence fisheries. This equates to a total DSR TAC of 296 mt. In 2006 the BOF allocated the SEO DSR Total Allowable Catch (TAC) in the following manner: 84% to the commercial fishery and 16% to the sport fishery, thus 47 mt is allocated to sport fisheries and 249 mt is allocated to commercial fisheries for 2012.

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

	Last year		**This year**	
Quantity	2012	2013	2013	2014
M (natural mortality)	0.02	0.02	0.02	0.02
Tier	4	4	4	4
Yelloweye Biomass (t)	14,307		14,588	
Female spawning biomass (t)				
Projected	N/A		N/A	
$B_{100\%}$	N/A		N/A	
$B_{40\%}$	N/A		N/A	
$B_{35\%}$	N/A		N/A	
$F_{OFL}=F_{35\%}$	0.032	0.032	0.032	0.032
$maxF_{ABC}$ (maximum allowable = $F_{40\%}$)	0.026	0.026	0.026	0.026
Specified/recommended F_{ABC}	0.020	0.020	0.020	0.020
Total DSR ABC (Yelloweye ABC/0.96) (t)	293[1]		**303**	
Total DSR OFL (Yelloweye OFL/0.96) (t)	467[1]		**487**	
Status	As determined last year for:		As determined this year for:	
	2010	2011	2011	2012
Is the stock being subjected to overfishing?	No	n/a	No	n/a
Is the stock currently overfished?	n/a	No	n/a	No
Is the stock approaching a condition of being overfished?	n/a	No	n/a	No

[1] Last year, the DSR ABC/OFL were increased by 0.98 as the previous year's commercial catch is used to determine the percentage of non-yelloweye DSR. This year, the DSR ABC/OFL was increased by 0.96.

Area Apportionment

The ABC and OFL for DSR are for the SEO Subdistrict. The State of Alaska manages State registered vessels fishing for DSR in the Eastern regulatory area with Council oversight and any further apportionment within the SEO Subdistrict is at the discretion of the State.

Summaries for Plan Team

Species	Year	Biomass	OFL	ABC	TAC[1]	Catch[1]
DSR	2011	14,395	479	300	247	87
	2012	14,307	467	293	240	176[2]
	2013	14,588	487	303	249	
	2014	14,588	487	303		

[1] TAC and Catch are for the commercial fishery only.

[2]Updated commercial catch data (mt) for demersal shelf rockfish in the Southern Outside District as of October 15, 2012.

Responses to SSC and Plan Team Comments on Assessments in General

Only general assessment comments that were relevant to Tier 4–6 stocks were included.

"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)

Full retention is required for DSR in the halibut fishery, so HFICE estimates are unnecessary to account for DSR incidental catch in the halibut fishery.

"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)

The DSR stock assessment has historically included other removals and included these removals in the estimation of the ABC and OFL.

Responses to SSC and Plan Team Comments Specific to this Assessment

"The SSC wishes to thank the stock assessment authors for the additional information provided in this year's SAFE regarding the confidence intervals for catches in the recreational fisheries.
The SSC is encouraged to hear that a new survey is planned for 2012, and expresses its concern that adequate resources be devoted to assessing the stock on an ongoing basis so as to maintain a consistent series of densities in future years. We are also encouraged that there will be a comparison of the submersible survey with an ROV survey to potentially enable a less expensive and readily available alternative to the submersible survey. An optimal situation for this assessment would be to periodically conduct a district-wide survey in a single assessment year to help inform density estimates in specific subdistricts in other assessment years." (SSC, December 2011)

Since 2010 we have been faced with two major obstacles to conducting a DSR stock assessment: 1) lack of federal funding and 2) unavailability of the *Delta* submersible (our survey vehicle since 1989). In 2012,

we applied for and received additional funding for DSR research in FY13 from the Alaska State Legislature. We had hoped to do a ROV/submersible comparison study in 2012, but learned that the submersible was not available again for 2012, and will likely not be available in the future, thus limiting our options for any future side by side study. We did successfully complete a ROV pilot survey in August 2012 and are currently reviewing the video data from the survey. We will conduct analyses of those data to determine if the ROV could be used as a survey tool for collecting density estimates for stock assessment in the future. While we recognize that it would be an excellent idea to survey all of the SEO Subdistrict in the same year, the large size of this area would require either multiple vessels and multiple ROV vehicles, or a single extended survey (>2 months), thus making this option cost- and time-prohibitive.

*"The Plan Team recommended that the author provide an expanded yelloweye executive summary at the November 2012 PT meeting which includes a summary of other yelloweye assessment work done by other agencies (DFO-Canada). The Plan Team also asked the author to develop a list of specific survey/assessment questions for an expanded yelloweye discussion at the November 2012 PT meeting. (*Plan Team, September 2012*)*

Please see the executive summary of this document. The author also plans to present a list of specific assessment questions at the November 2012 meeting.

The following are Plan Team and SSC comments specific to the ASA model:

"We note that the Plan Team had an initial look at and offered some recommendations to the assessment authors on an age structured model for this stock. The SSC looks forward to reviewing this model in the next assessment cycle, if available." (SSC, December 2011)

"The [Plan] Team had a few comments and recommendations on the model and input data:

1. *Survey biomass estimates for each year consist of the most recent survey estimate for each area. Therefore, the same survey data for each area are used in multiple consecutive years until that area is resurveyed which means the survey estimates for each year are not independent. The Team recommended only including survey "super years" after an entire cycle of area specific survey estimates becomes available. Another possibility would be to formulate a separate model for each area.*
2. *The "plus" age group was previously set to 47+. Because yelloweye are long lived, the 47+ group contained a relatively large number of fish. An apparent anomaly in the model predicts many more 46 year olds than are observed. Increasing the age of the plus group to 67+ did not resolve the problem, the model predicted too many 66 year olds relative to observed, and the 67+ still contained a relatively large number of fish. The Team suspects there is a problem in the model specification of aging error. In this case, an age error transition matrix smoothes errors out over age groups and complications can occur with a plus age group. For diagnostic purposes, the Team recommended not using the aging error process in the model and check if this eliminates the anomaly.*
3. *It may be useful to move the "plus" group out beyond 67 to allow a more complete expression of population dynamics.*
4. *An analysis should be conducted to reconcile area survey estimates biomass estimates with data from IPHC long line survey for the entire area.*" (Plan Team, November 2011)

Dave Carlile addressed the November 2011 Plan Team's recommendations (#1–4) above when he presented an updated ASA model at the September 2012 Plan Team meeting. The following comments below from the September 2012 Plan Team were in response to the updated ASA model.

The revised age structured model was presented with new options requested by the Plan Team last year. This included using more ages (out to 97+, an alternative age error matrix, area specific models versus an aggregate, "super year" model). Although the current age group is 97+, the plus group could be moved out even farther since yelloweye are such long lived fish. Dave Carlile recommended going with the area specific model. Progress has been made and issues related to the treatment of the "plus group" have been investigated. The Team noted that this is a problem with some other stocks. Interestingly, of the three approaches the "single survey" (aggregated over areas and years tier 5 estimate) fell within the two modeling configurations (area aggregated versus area-specific models). The Team encouraged:

1) Maintaining the area-specific models but to investigate using the same selectivity relationships for all models.
2) Investigate possible synchrony in recruitment among the three areas.
3) Improving the ASA model and writing a complete stock assessment report in near future.
*Since the last submersible derived estimates of biomass occurred in 2005, 2007, and 2009, it would also be worthwhile to compare the a retrospective ASA model run from 2005, 2007, and 2009 to see how the area specific model biomass compares to the area specific submersible biomass estimates for a matching year. (*Plan Team, September 2012*)*

The age-structured assessment model for yelloweye rockfish continues to be developed and the authors are responding to Plan Team and SSC feedback and guidance. The current ASA model author (Dave Carlile) is retiring this fall, so there will be a transition to a new ASA model author (Haixue Shen). We hope to write up the ASA model methods and results by November 2013 so that the Plan Team and SSC can evaluate a written document at that time.

Fishery

2012 Total DSR Removal

The total estimated DSR removal from 2012 is 215 mt (Table 2). This number includes all sport and commercial incidental and directed harvest, as well as estimated unreported discard mortality; however subsistence removal estimates are not included. Incidental commercial catch includes DSR caught in the lingcod, Pacific cod, halibut, and sablefish fisheries. Overages refer to DSR landed in excess of the allowed bycatch of DSR in the halibut fishery (equal to 10% of the target species).

Table 2. Updated Sport and Commercial Catch from 2012.

2012 DSR Catch SEO (mt)	***Directed Commercial***	***Incidental Commercial[1]***	***Recreational Fisheries[2]***	***Total***
Landed	105	56	34	195
Estimated discard	0	0	5	5
Overages (halibut fishery) >10%	0	15	0	15
Total	105	71	39	215

[1] All commercial incidental landings through October 15, 2012 (halibut, lingcod, Pacific cod, sablefish).
[2] Sport landings are preliminary estimates for 2012.

2011–2012 Recreational Fishery Removals

The 2011 harvest biomass was estimated using a combination of Statewide Harvest Survey (SWHS), creel survey, and charter logbook data. The total removals were estimated as the sum of the mass of the harvest (retained catch) and release mortality (Brylinsky et al. 2009). Harvest biomass estimates were stratified by user group (charter, non-charter) to reduce potential bias caused by non-proportional sampling. Harvest from the EYKT (East Yakutat) portion of the Southeast Outside (SEO) area was also

included in the harvest estimation, although the harvest was less than 0.1 mt. Estimating the proportion of non-charter harvest that came from the SEO waters of each SWHS area continues to be problematic due to the lack of data from a comprehensive set of landing sites for non-charter harvest. This was addressed by applying the outside proportion calculated for the charter fleet from logbook data to the non-charter harvest as well. Non-charter removals accounted for 36% of the sport removals in 2011.

Because SWHS estimates are only available through 2011, preliminary estimates were provided for 2012. . Charter and non-charter harvest were projected separately. Charter harvest for each SWHS area was projected from mandatory charter logbook data through July 31 using linear regression. The only inseason data available for the non-charter sector is from creel survey interviews. Because the relationships between creel survey data and SWHS estimates were weak, non-charter harvest was projected using single or double exponential time series forecasts. The choice of method was based on minimization of mean squared deviations from retrospective forecasts for 2006–2011.

The 2012 release mortality biomass was also estimated using the same method as last year (Green et al. 2011). The release proportions from logbook data were applied specifically for yelloweye rockfish, and the release proportion for all other non-pelagic species was applied to the remaining DSR species. Efforts to improve harvest projections are ongoing, including further incorporation of logbook data in the charter projections. These efforts will also include methods to describe the uncertainty in the projections, which we cannot calculate for the methods used this year. Retrospective projections done in 2011 indicated large errors in some years due to high year-to-year variability in the harvest estimates.

Table 3. Final estimates of 2011 and preliminary estimates of 2012 recreational DSR removals (retained and discard mortality, mt) in the SEO portion of Southeast Alaska. Estimates were stratified user group (charter, non-charter) but combined for this table.

Type of Estimate		***2011***	***2012***
Retained Harvest	Estimate	32.1	33.5
	StdErr	1.7	--[b]
	95% CI[a]	28.7-35.5	--[b]
Discard Mortality	Estimate	3.5	4.9
	StdErr	0.2	--[b]
	95% CI[a]	3.0-3.9	--[b]
Total	**Estimate**	**35.6**	**38.4**
	StdErr	2.0	--[b]
	95% CI[a]	31.8-39.4	--[b]

[b] Methods to describe uncertainty of projections have not yet been developed.

Data Gaps and Research Priorities

The *Delta* submersible has been integral in the generation of a long (20+ year) time series of rockfish density data for stock assessment. The DSR stock assessment has been designed around the *Delta* as a survey tool, and now in its absence, we are tasked with coming up with an alternative, preferably non-extractive survey methodology. The priority for the coming year is to evaluate the ROV for use as a survey tool in the future for stock assessment work while improving the yelloweye rockfish ASA model.

Acknowledgements

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Literature Cited

Green, K., D. Carlile, M. Jaenicke, and S. Meyer. 2011. Assessment of the demersal shelf rockfish stock for 2011 in the southeast outside district of the Gulf of Alaska. Chapter 14 IN 2011 Stock Assessment and Fishery Evaluation Report for 2012. North Pacific Fishery Management Council, Anchorage, AK.

Brylinsky, C., J. Stahl and D. Carlile. 2009. Assessment of the demersal shelf rockfish stock for 2010 in the southeast outside district of the Gulf of Alaska. Chapter 15 IN 2010 Stock Assessment and Fishery Evaluation Report for 2010. North Pacific Fishery Management Council, Anchorage, AK.

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