CHAPTER 14

# Assessment of Blackspotted and Rougheye Rockfish Stock Complex in the Bering Sea/Aleutian Islands

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## Introduction

In 2005, BSAI rockfish were moved to a biennial assessment schedule to coincide with the frequency of trawl surveys in the Aleutian Islands (AI) and the eastern Bering Sea (EBS) slope. These surveys occur in even years, and for these years a full assessment of blackspotted and rougheye rockfish in the BSAI area will be conducted. The 2010 full assessment can be found at http://www.afsc.noaa.gov/REFM/docs/2010/BSAIrougheye.pdf. In years without a scheduled Aleutian Islands survey, an "update" is produced by revising the recent catch data and re-running the projection model using the results from the previous full assessment as a starting point. Therefore, this update was produced by running the projection model with a revised catch for 2010 and a new catch estimate for 2011.

## Updated ABC, OFL, Catch and Projection

The blackspotted/rougheye complex is currently assessed by combining an age-structured population model applied to the fishery and survey data from the AI management area with an average of recent survey biomass estimates in the EBS management area. For the AI portion of the population, the new information for this update is the final estimate of 2010 AI catch and a revised estimate of the 2011 catch. The 2010 AI catch was 221 t, a 1.6% decrease from the estimate of 225 t that was used in the 2010 projection. The 2011 BSAI catch through October 8$^{th}$, 2011 was 146 t, with 127 t in the AI subarea. The estimated 2011 catch of 162 t is obtained by summing the total 2011 catch through September (126 t) and the average catch from Oct-Dec from 2007 – 2010 (36 t). The 2012 and 2013 catches were set to the average annual catch from 2007-2010, which was 190 t. The revised summary for the AI portion of the population is shown below.

| **Quantity** | As estimated or *specified last* year for: 2011 | 2012 | As estimated or *recommended this* year for: 2012 | 2013 |
|---|---|---|---|---|
| *M* (natural mortality rate) | 0.033 | 0.033 | 0.033 | 0.033 |
| Tier | 3a | 3a | 3a | 3a |
| Projected total (age 3+) biomass | 22,670 | 23,177 | 23,443 | 24,157 |
| Female spawning biomass (t) | | | | |
| Projected | 5800 | 5943 | 6070 | 6398 |
| $B_{100\%}$ | 11,847 | 11,847 | 11,847 | 11,847 |
| $B_{40\%}$ | 4,739 | 4,739 | 4,739 | 4,739 |
| $B_{35\%}$ | 4,146 | 4,146 | 4,146 | 4,146 |
| $F_{OFL}$ | 0.041 | 0.041 | 0.041 | 0.041 |
| $maxF_{ABC}$ | 0.034 | 0.034 | 0.034 | 0.034 |
| $F_{ABC}$ | 0.034 | 0.034 | 0.034 | 0.034 |
| OFL (t) | 504 | 518 | 527 | 556 |
| maxABC (t) | 420 | 431 | 438 | 462 |
| ABC (t) | 420 | 431 | 438 | 462 |
| **Status** | As determined *last* year 2009 | 2010 | As determined *this* year 2010 | 2011 |
| Overfishing | No | n/a | No | n/a |
| Overfished | n/a | No | n/a | No |
| Approaching overfished | n/a | No | n/a | No |

The available survey biomass estimates for EBS blackspotted/rougheye rockfish includes the southern Bering Sea portion of the AI survey and the EBS slope survey estimates. For each area, weighted averages of the three most recent surveys are used to give increased weight to more recent surveys. The estimates of ABC and OFL for the EBS rougheye/blackspotted rockfish differ slightly from the 2010 values due to the use of the model estimate of natural mortality (0.033), rather than a fixed value of 0.03, for the proxy for $F_{abc}$. The revised summary for the EBS portion of the population is shown below.

| Quantity | As estimated or *specified last* year for: 2011 | 2012 | As estimated or *recommended this* year for: 2012 | 2013 |
|---|---|---|---|---|
| *M* (natural mortality rate) | 0.03 | 0.03 | 0.033 | 0.033 |
| Tier | 5 | 5 | 5 | 5 |
| Biomass (t) | 1500 | 1500 | 1500 | 1500 |
| $F_{OFL}$ | 0.03 | 0.03 | 0.033 | 0.033 |
| $maxF_{ABC}$ | 0.0225 | 0.0225 | 0.0248 | 0.0248 |
| $F_{ABC}$ | 0.0225 | 0.0225 | 0.0248 | 0.0248 |
| OFL (t) | 45 | 45 | 49 | 49 |
| maxABC (t) | 34 | 34 | 37 | 37 |
| ABC (t) | 34 | 34 | 37 | 37 |
| **Status** | As determined *last* year 2009 | 2010 | As determined *this* year 2010 | 2011 |
| Overfishing | No | n/a | No | n/a |

The revised overall BSAI ABC and OFL are shown below.

| Quantity/Status | **Last year** 2011 | 2012 | **This year** 2012 | 2013 |
|---|---|---|---|---|
| OFL (t) | 549 | 563 | 576 | 605 |
| ABC (t) | 454 | 465 | 475 | 499 |

For 2011, we recommend a maximum permissible ABC of 475 t based upon the updated projection, which is slightly larger than the 2010 projection for 2012 (465 t). The increase results from the assumption in the 2010 projection that the ABC (partitioned to the AI area) would be harvested in 2011. The BSAI blackspotted/rougheye rockfish stock complex was not subjected to overfishing in 2010. Based upon the age-structured model for the AI portion of the stock, BSAI blackspotted/rougheye rockfish is not overfished nor approaching an overfished condition.

**Area Apportionment**

In 2010, subareas ABCs were assigned to the combination of the western and central Aleutian Islands subarea, and the combination of the eastern Aleutian Islands and the EBS. The partitioning of the ABC among subareas in the AI was based on the proportion of weighted averages of recent survey biomass estimates, which were:

| | Area | | |
|---|---|---|---|
| | WAI | CAI | EAI |
| Weighted average biomass | 1,172 | 4,220 | 4,275 |
| Proportion of biomass | 12.1% | 43.7% | 44.2% |

Applying these proportions yields the following subarea ABCs for 2012 and 2013:

| Area | 2012 ABC | 2013 ABC |
|---|---|---|
| WAI+CAI | 244 t | 258 t |
| EAI+EBS | 231 t | 241 t |

**Responses to the comments of the Scientific and Statistical Committee**

General SSC comments from the December, 2010, meeting

*For assessments with multiple models, the SSC requests that status determination criteria (Tier, two-year biomass projections, ABC's, and OFL's) be arrayed by stock assessment authors in a table in the assessment chapter so that the Plan Team and SSC can consider choosing alternative models. If the number of models being presented is very large, the authors may use their discretion to select a subset of desirable models for this summary.*

*For greater consistency in the way the terminal year catch is specified, the SSC requests that authors incorporate their best estimate of total landings that will occur for the entire year. This information will be used to generate projections and should be incorporated into BSAI and GOA specification tables.*

*The request for a table summarizing multiple model runs will be addressed in the 2012 full assessment. A slightly altered methodology was used in this update to improve estimates of terminal year catch.*

There were no specific SSC comments for the BSAI blackspotted/rougheye complex.

**Data Gaps and Research Priorities**

Little information is known regarding most aspects of the biology of blackspotted and rougheye rockfish, particularly in the Aleutian Islands. In areas where both species are commonly found, such as the EBS slope, distinguishing blackspotted rockfish from rougheye rockfish in the field is a pressing issue. Further studies to examine the distribution and movement of early life-history stages are needed. Given the results of recent genetic work, further information on the population structure associated with distinctive oceanographic features such as Aleutian Island passes is needed. Finally, given the relatively unusual reproductive biology of rockfish and its importance in establishing management reference points, data on reproductive capacity should be collected on a periodic basis.

## Summaries for the Plan Team

| Year | Biomass[1] | OFL | ABC |
|---|---|---|---|
| 2010 | 21,178 | 669 | 547 |
| 2011 | 24,170 | 549 | 454 |
| 2012 | 24,943 | 576 | 475 |
| 2013 | 25,657 | 605 | 499 |

[1] Total biomass from AI age-structured projection model, and survey biomass estimates from EBS.

| | BSAI | WAI+CAI | EAI+EBS | Total |
|---|---|---|---|---|
| OFL (2010) | 669 | | | 669 |
| ABC (2010) | 547 | | | 547 |
| TAC (2010) | 547 | | | 547 |
| Catch (2010) | 255 | | | 255 |
| | | | | |
| OFL (2011) | | | | 549 |
| ABC (2011) | | 234 | 220 | 254 |
| TAC (2011) | | 234 | 220 | 254 |
| Catch (2011)[1] | | 77 | 69 | 146 |
| | | | | |
| OFL (2012) | | | | 576 |
| ABC (2012) | | 244 | 231 | 475 |
| | | | | |
| OFL (2013) | | | | 605 |
| ABC (2013) | | 258 | 241 | 499 |

[1] BSAI catch as of October 8, 2011.

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