16. Assessment of the Other Rockfish stock complex in the Gulf of Alaska

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November 2013

Executive Summary

Rockfish are assessed on a biennial stock assessment schedule to coincide with the availability of new trawl survey data. However, for the 2013 assessment cycle, which would normally be a full assessment, a summary assessment is presented due to government shutdown and the abbreviated working period. Please refer to the last full stock assessment report for further information regarding the assessment calculations (Clausen and Echave 2011, available online at http://www.afsc.noaa.gov/refm/docs/2011/GOAorock.pdf). A full stock assessment document with updated assessment results will be presented in next year's SAFE report.

We average the biomass estimates from the three most recent Gulf of Alaska (GOA) trawl surveys to estimate exploitable biomass and determine the recommended ABC for the other rockfish stock complex. This complex consists of 25 species of rockfish, as defined in Tribuzio and Echave (2012; Table 16A.1, appended to this document). This complex is classified as a Tier 5 stock, with the exception of sharpchin rockfish, which qualifies as a Tier 4 stock.

Summary of Changes in Assessment Inputs

Changes in the input data:

1. Species composition was updated to include the seven Demersal Shelf Rockfish species when occurring outside of NMFS Area 650 (East Yakutat/Southeast).
2. Biomass estimates were updated to include the 2013 GOA biennial trawl survey.
3. Updated natural mortality and growth parameters.
4. Fishery catch from 2003 – 2013 has been updated (as of Oct 24, 2013).

The Demersal Shelf Rockfish complex (DSR) comprises seven species of rockfish (copper, rosethorn, quillback, China, tiger, canary and yelloweye rockfish).The DSR assessment applies only to those seven species occurring in NMFS Area 650. Catch of these seven species has been accounted for in the Other Rockfish group in Catch Accounting, but was not previously accounted for in the Other Rockfish (formerly the Other Slope Rockfish) assessments. An analysis of the inclusion of these seven species in the Other Rockfish assessment was presented at the September 2013 Plan Team meeting and is appended to this document. However, due to the government shut down and abbreviated timeline for work, the "split fractions" for the Eastern Gulf of Alaska (EGOA) have not been updated to include these seven species. These "split fractions" are calculated by the Resource Assessment and Conservation Engineering (RACE) division at the Alaska Fisheries Science Center as part of trawl survey biomass estimation procedures. This computation is used to account for Amendment 41 that prohibited trawling east of 140° W longitude in the EGOA. Thus, for 2014, we are only including these species in the Central GOA (CGOA) and Western GOA (WGOA).

Swept area biomass estimates were available from the 2013 GOA biennial trawl survey for Other Rockfish species and Tier 4 and 5 calculations were updated to incorporate new data. The exploitable biomass for the Other Rockfish complex is based on the average of the sum of the component species for the last three surveys (currently 2009, 2011 and 2013). Current exploitable biomass is 83,383 t (55,522 t – 111,243 t, 95% CI).

The 2013 survey had a reduced number of stations in all strata. In general the 2013 estimates for the six major species (the species that make up >90% of the estimated biomass: silvergray, sharpchin, harlequin,

redstripe, redbanded and yelloweye rockfish) were more uncertain than the 2011 estimates (i.e. higher CVs in 2013). Of the major species, the greatest change in biomass from the 2011 survey was the biomass estimate for silvergray rockfish. The silvergray estimate in 2011 (100,049 t, CV = 35%) was the highest on record and a large decrease was not unexpected in the 2013 estimate (19,239 t, CV = 38%). Harlequin rockfish biomass was over 2 times greater than the previous biomass estimate (2011 = 3,735 t, CV = 61% and 2013 = 7,485 t, CV = 71%). Redbanded and sharpchin rockfish biomass were also up from the previous assessment; redbanded went from 5,042 t (CV = 23%) in 2011 to 5,868 t (CV = 19%) in 2013 and sharpchin went from 8,041 t (CV = 63%) in 2011 to 14,920 t (CV = 50%) in 2013. Also of note, the biomass of redstripe rockfish decreased by about 47% from the previous estimate to 9,871 t (CV = 87%) in 2013. Of the minor species, there were substantial increases in the 2013 biomass estimates for greenstriped (1,337 t, CV = 50%) and splitnose rockfish (460 t, CV = 72%). Many of the "minor" species may be near the extent of their distributional ranges or may inhabit areas not adequately sampled by the survey (e.g. near shore, untrawlable, etc.).

While the ABC and OFL calculation methods have remained the same from previous assessments, the inputs have changed. Natural mortality was updated for darkblotched (from M = 0.060 to 0.070), sharpchin (from M = 0.050 to M = 0.058), and widow rockfish (from M = 0.060 to M = 0.050). Growth parameters were updated for sharpchin rockfish (from L_∞= 34.9, t_0 = -2.12 and k = 0.095 to L_∞ = 35.02, t_0 = -0.75 and k = 0.122), which resulted in $F_{40\%}$ = 0.065 (up from 0.053) and $F_{35\%}$ = 0.079 (up from 0.064). Further, the seven DSR species were added to the calculation. The ABCs and OFLs were calculated for each individual species and summed for the complex ABC and OFL. The resultant ABC and OFL for the complex is 4,079 t and 5,347 t, respectively. Despite the overall decrease in the Other Rockfish survey biomass, updates to parameters resulted in a small increase in ABC and OFL over what it would have been without these changes. Without these changes the ABC and OFL would have been 3,895 and 5,053 t, respectively.

The 2013 gulfwide catch estimates for the Other Rockfish complex (as of Oct 24, 2013) were down approximately 27% from the 2012 catch. Catch of Other Rockfish exceeded the ABC in the WGOA in 2013, but was below ABC in the other areas. The catch of Other Rockfish in the WGOA is composed primarily of harlequin rockfish, which is the most abundant of the Other Rockfish species in that region (based on trawl survey biomass estimates).

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

Summary of Results

For the 2014 fishery, we recommend the maximum allowable ABC of 4,079 t for the Other Rockfish stock complex. Reference values for the Other Rockfish stock complex 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.

Quantity	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
	2013	2014	2014	2015
M (natural mortality rate) [a]	0.05-0.10	0.05-0.10	0.02-0.10	0.02-0.10
Tier [b]	5 or 4	5 or 4	5 or 4	5 or 4
Biomass (t)				
Upper 95% CI	NA	NA	111,243	111,243
Point estimate	85,774[c]	85,774	83,383	83,383
Lower 95% CI	NA	NA	55,522	55,522
F_{OFL} [a]	0.05-0.10	0.05-0.10	0.02-0.10	0.02-0.10
$maxF_{ABC}$ [a]	0.0375-0.0750	0.0375-0.0750	0.0015-0.0750	0.0015-0.0750
F_{ABC} [a]	0.0375-0.0750	0.0375-0.0750	0.0015-0.0750	0.0015-0.0750
OFL (t)	5,305	5,305	**5,347**	**5,347**
maxABC (t)	4,045	4,045	4,079	4,079
ABC (t)	4,045	4,045	**4,079**	**4,079**
Status	As determined *last* year for:		As determined *this* year for	
	2011	2012	2012	2013
Overfishing	No	n/a	No	n/a

[a]Values represent a range among species.

[b]All species are Tier 5 except sharpchin rockfish is Tier 4.

[c]This biomass is what was reported in the 2012 full assessment, and does not include all of the species currently included in the Other Rockfish complex.

Updated catch data (t) for the Other Rockfish stock complex in the GOA are summarized in the following table. The ABC in the Western GOA management areas was exceeded in 2013. Source: NMFS Alaska Regional Office Catch Accounting System accessed through the Alaska Fisheries Information Network (AKFIN) database, http://www.akfin.org as of October 24, 2013.

Year	Western GOA	Central GOA	Eastern GOA		Gulfwide Total	Gulfwide ABC	Gulfwide TAC
			West Yakutat	E. Yak/ Southeast			
2012	255	723	37	24	1,039	4,045	1,080
2013	195	446	70	49	760	4,045	1,080

Area Apportionment

The following table shows the recommended apportionment for 2014. Please refer to the last full stock assessment report for information regarding the apportionment rationale for the Other Rockfish stock complex.

	Western GOA	Central GOA	Eastern GOA (74.7%)		Total
			West Yakutat[1]	E Yakutat/ Southeast[1]	
Area Apportionment	1%	24.3%	19%	81%	100%
Area ABC (t)	40	991	580	2,468	4,079
OFL (t)					5,347

[1]The West Yakutat and E Yakutat/Southeast values sum to the proportioned ABC of the Eastern GOA.

Summaries for Plan Team

Species	Year	Biomass[1]	OFL	ABC	TAC	Catch[2]
Other Rockfish	2012	85,774	5,305	4,045	1,080	1,039
	2013	85,774	5,305	4,045	1,080	760
	2014	83,383	5,347	4,079		
	2015	83,383	5,347	4,079		

Stock/ Assemblage	Area		2013				2014		2015	
			OFL	ABC	TAC	Catch[2]	OFL	ABC	OFL	ABC
Other Rockfish	WGOA			44	44	195		40		40
	CGOA			606	606	446		991		991
	EGOA	WY		230	230	70		580		580
		EY/SE		3,165	200	49		2,468		2,468
	Total		5,305	4,045	1,080	760	5,347	4,079	5,347	4,079

[1]Total biomass estimates from AFSC trawl surveys.

[2]Current as of October 24, 2013. Source: NMFS Alaska Regional Office Catch Accounting System via the Alaska Fisheries Information Network (AKFIN) database (http://www.akfin.org).

Note: all values include northern rockfish in the eastern Gulf of Alaska.

SSC and Plan Team Comments on Assessments in General

"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)

"The Plan Teams recommend that assessment authors retain status quo assessment approaches for the November 2012 SAFE report but also apply the Kalman filter or random effects survey averaging methods for Tier 5 stocks and summarize the analytical results for comparison purposes only. ADMB code for implementing the random effects method will be made available." (Plan Team, September 2012)

SSC and Plan Team Comments Specific to this Assessment

"The Team discussed a recommendation in the 2010 GOA Plan Team minutes to apply a productivity-susceptibility analysis, and clarified that this analysis is to be applied to the newly-formed other rockfish complex to evaluate the degree to which the species within the complex have similar life-history parameters and vulnerabilities to fishing pressure… As part of this analysis, the Team requests information on which target fisheries catch other rockfish, and how this may differ between GOA subareas." (Plan Team, November 2011)

"The SSC supports the Plan Team request for a productivity-susceptibility analysis for the Other Rockfish complex. The SSC also encourages the authors to examine the relationship between environmental conditions and the distribution and abundance of silvergray rockfish and harlequin rockfish because the

trawl survey data suggests that these stocks may move in and out of the GOA in response to changing conditions." (SSC, December 2011)

Responses to comments and Research Priorities for Full Assessment

Due to the government shutdown, and hence an abbreviated working period, responses to the previously listed SSC and Plan Team Comments will be provided in next year's full stock assessment report. To address several of these comments, we plan to follow the recommendations listed in the various working group reports (e.g. the methods for averaging surveys report) submitted to the Plan Team in September 2012. Evaluation of methods to estimate model parameters, uncertainty, and projections as well as recommendations or prioritizations for future research to improve the assessments will likely be part of this process.

Literature Cited

Clausen, D.M. and K.B. Echave. 2011. Assessment of the "Other Rockfish" Stock Complex in the Gulf of Alaska. *In* Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska for 2011. North Pacific Fishery Management Council, 605 W 4th Ave, Suite 306, Anchorage, AK 99501. Pgs. 1239 – 1280.

16A. Other Rockfish stock complex in the Gulf of Alaska

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September 2013

Executive Summary

Two issues were put forth by the Gulf of Alaska (GOA) plan team to be examined by the Other Rockfish assessment authors: 1) examine the catch and survey data for the DSR (demersal shelf rockfish complex) species outside of the Southeast management area and investigate whether a separate OFL and ABC can be established for DSR species outside of the Southeast management area; and 2) examine the fishery catch records in more detail to determine which areas, species and target fisheries are contributing to the higher catch levels of harlequin rockfish. This document details responses to both issues.

Issue #1 DSR species included in the Other Rockfish complex

The other rockfish complex was formed in 2012, from the combination of the Other Slope Rockfish and the widow and yellowtail rockfish from the former Pelagic Shelf Rockfish category. This created a complex consisting of 18 species (see Clausen and Echave 2011 SAFE report). Note that northern rockfish are only included in this complex in the Eastern GOA region, which is the West Yakutat and Southeast sub areas. There are also species that have been accounted for in the Alaska Regional Offices Catch Accounting System in the Other Rockfish group, which were not previously included in the stock assessment. These are the seven species of demersal shelf rockfish (canary, china, copper, quillback, rosethorn, tiger, and yelloweye rockfish) but only when occurring outside of the Southeast management area (i.e. NMFS areas 610-640, the Western and Central GOA and the West Yakutat portion of the Eastern GOA). In this document, the DSR species included in the Other Rockfish group will be called WDSR (Western DSR), to avoid confusion with the DSR assessment. Therefore, the other rockfish complex consists of 25 species in total (Table 16A.1).

The catch of the WDSR species has been included in the total catch of the complex. However, the estimated biomass of these species has not been included in ABC calculations for the complex. The purpose of this document is to inform the plan team of how the inclusion of these seven species in the stock assessment will change the assessment in 2013, and to address questions concerning the creation of a separate ABC/OFL for the WDSR species.

Prior to 2012, catches of the Other Slope Rockfish group which contained most of the Other Rockfish group, were reported (Clausen and Echave 2011). Table 16A.2 shows the catch time series for the complex. The historical time series of catch for each of the component species of the Other Rockfish complex was estimated from either previous stock assessments or data queried from the Catch Accounting System (Table 16A.3).

The composition of the Other Rockfish species caught by commercial fisheries varies by area and gear. The primary species caught overall are: harlequin (35%), redbanded (17%), sharpchin (13%), yelloweye (12%), redstripe (9%), and silvergray (6%). During 1991 - 2012, these species comprised 94% (SD = 10.87%) of the catch of Other Rockfish (Table 16A.4). Harlequin rockfish are the dominant species caught in both the Western GOA, Central GOA and West Yakutat areas, with decreasing importance in the more easterly areas. Redbanded rockfish are the most common species the Southeast area. Yelloweye rockfish are the dominant species caught on fixed gear, while harlequin are the dominant species caught in trawl gear.

Total biomass estimates are provided by the GOA triennial/biennial trawl survey conducted by the Resource Assessment and Conservation Ecology (RACE) program (Table 16A.5). There are four species that do not have biomass estimates created for them by the RACE survey program: blackgill rockfish, chilipepper rockfish, china rockfish, and stripetail rockfish. Three other species (copper, tiger and vermillion rockfish) have biomass estimates calculated, but the estimates are zero. These species are not included in the biomass discussion. Biomass of the individual species are presented in Table 16A.6. Over the last three surveys, the primary species by biomass in the GOA have been: silvergray rockfish (53%), sharpchin (15%), redstripe (12%), redbanded (7%), yellowtail (5%) and harlequin (4%). It is likely that the biomass of some species is underrepresented by the trawl survey due to a species preference for untrawlable areas or low vulnerability to trawl gear. In general, the biomass estimates for these species have high coefficients of variation (CVs), ranging from an average of 32% (redbanded) to 82% (yellowtail) for the primary species and as high as 100% for the minor species.

Acceptable biological catch (ABC) and overfishing levels (OFLs) were calculated for the Other Rockfish complex and the component species (Table 16A.7). All of the species are classified as Tier 5 except for sharpchin rockfish, which is Tier 4. There are some minor differences in the calculations from previous assessments. The parameters used in the calculation for sharpchin rockfish were updated (i.e. natural mortality, growth) from Malecha et al. 2007, which resulted in a 160 t increase in the ABC for the species. Also, natural mortality estimates were updated for the minor species and ABCs and OFLs were calculated for each species as opposed to the minor species being grouped, which resulted in an approximate 8 t increase in ABC. Including the seven WDSR species in the ABC and OFL calculations increased the ABC by 68 t and the OFL by 91 t.

The ABC apportionment was calculated similar to previous assessments (Table 16A.8). The resultant ABCs were Western GOA = 52 t (up 8 t), Central GOA = 708 t (up 102 t), and Eastern GOA = 3,521 t (up 126 t). In the full assessment, the Eastern GOA will be further subdivided into West Yakutat and Southeast but the data was not available during the writing of this document to calculate the split (see Clausen and Echave 2011 for example of previous West Yakutat/Southeast splits). The Plan Team requested an examination of the possibility of having a separate ABC/OFL set for the WDSR species outside of the Southeast management area. The authors contacted in-season managers to discuss this option with the Alaska Regional Office. Based on this analysis, and using the Tier 5 approach, the total ABC for the WDSR species would be 68 t (OFL = 91 t). There are challenges associated with managing an ABC of that size. The catch history of these species exceeds these catch limits (average catch 2003 – 2012 = 162 t), thus these levels of ABC and OFL would require a separate WDSR group to be prohibited to retention. Therefore a separate ABC and OFL is not recommended for the WDSR group outside of the Southeast management area.

Issue #2 Detailed examination of harlequin rockfish catch

The ABC for the Other Rockfish (formerly Other Slope Rockfish) has been exceeded in the Western GOA consistently since 2009 (Table 16A.9). During this period harlequin rockfish was, on average, 77% of the Other Rockfish catch in the Western GOA (Figure 16A.1). In 2012 the ABC was similarly exceeded (although by a substantially smaller margin) in the Central GOA as well, and harlequin was 52% of the Other Rockfish catch.

The ABCs for harlequin rockfish (and thus the Other Rockfish complex) are based on the NMFS biennial survey swept area biomass estimates. The estimated biomass for harlequin rockfish is substantially lower than other species in the Other Rockfish complex. This species is caught across the entire GOA primarily along the continental shelf break, however, most of the hauls have low catches with a few hauls catching relatively high volumes. Harlequin rockfish are caught in 7% of survey hauls, on average, in the Central GOA and 4% of hauls in the Western GOA. Catch per haul is generally low (average of 26 kgs, st. dev. = 148 kgs), with 91% of the hauls being below that average.

This is in stark comparison to the commercial catch, where harlequin rockfish is the primary Other Rockfish caught. The commercial catch of the species occurs primarily along the continental shelf break (Figure 16A.2). Harlequin rockfish are caught almost exclusively in the rockfish fishery (AKRO Catch Accounting System). In the Western GOA, on average, 99% of the harlequin catch is taken in the rockfish fishery, and 98% in the Central GOA. However, this species is not a target of the rockfish fishery. Harlequin rockfish generally make up <1% of the catch in a haul, with a small number of large hauls catching most of the catch for the species (Figure 16A.3). On average, harlequin rockfish are 4.2% of the total catch in a haul (2003 – 2012, data queried from the North Pacific Observer Program database). The species is often caught in conjunction with dusky or northern rockfish or Pacific ocean perch.

Since the ABCs/OFLs are based on the trawl survey biomass estimates, the accuracy of those estimates has been under scrutiny. The assessment methods for all of the rockfish species was most recently examined at a review conducted by the Center for Independent Experts (April 2013). The primary concern is the issue of survey trawlable and untrawlable grounds, and that some species may tend to inhabit areas untrawlable by survey gear. Harlequin rockfish are known to inhabit high relief and rocky substrates, which can be deemed untrawlable (Jones et al. 2012), and thus may not be sampled well by the NOAA groundfish bottom trawl survey. Evidence of this is the high survey CVs, which for harlequin rockfish average 49%, but also the unreasonable changes in biomass estimates between surveys. For example, the 9 fold increase in biomass from the 2003 to the 2005 surveys is biologically unreasonable for a species that is slow growing and long lived. This suggests that the survey may not be sampling the species adequately. Extensive research has been done and is still ongoing on the issue of survey trawlable and untrawlable habitats. Jones et al. (2012) found that harlequin rockfish were considerably more dense over the untrawlable habitat and also closer to the bottom (<2 m off bottom), than in neighboring habitats that could be considered trawlable. Because of the apparent habitat preferences for untrawlable areas, it is likely that the biomass used for computing the ABC is underestimated for harlequin rockfish and the catch of harlequin rockfish may not be a conservation concern.

The trawl fleet in the WGOA has taken measures to attempt to reduce the incidental catch of harlequin rockfish. The species is not targeted, or used for "topping off". For the 2013 rockfish fishery, the industry used historical data to identify areas of high harlequin rockfish catch and tried to avoid those areas in an effort to reduce catch. These measures were unsuccessful. However, the effort should be commended.

The authors propose the following options or items for discussion and further investigation:

1) Combining the ABC for WGOA and CGOA.
2) Examine the off-bottom depth of fishing activities and see if fishing > 2 m off the bottom decreases catch of harlequin rockfish.
3) Investigate fishery CPUE differences (if any) between survey trawlable and untrawlable habitats and the potential for estimating catchability (q) to apply to the survey biomass.

Literature Cited

Clausen, D.M. and K.B. Echave. 2011. Assessment of the "Other Rockfish" stock complex in the Gulf of Alaska. *In* Stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea and Aleutian Islands for 2003. North Pacific Fishery Management Council, 605 W. 4th Ave., Suite 306, Anchorage, AK 99501. Pgs. 1239-1280.

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Jones, D.T., C.D. Wilson, A. De Roberts, C.N. Rooper, T.C. Weber and J.L. Butler. 2012. Evaluation of rockfish abundance in untrawlable habitat: combining acoustic and complimentary sampling tools. Fishery Bulletin. 110:332-343.

Table 16A.1. Species comprising the "Other Rockfish" management category in the Gulf of Alaska

Common name	Scientific name	Former (pre-2012) Management Category
Blackgill rockfish	*Sebastes melanostomus*	Other Slope Rockfish
Bocaccio	*S. paucispinis*	Other Slope Rockfish
Canary rockfish[a]	*S. pinniger*	Other Rockfish
Chilipepper	*S. goodei*	Other Slope Rockfish
China rockfish[a]	*S. nebulosus*	Other Rockfish
Copper rockfish[a]	*S. caurinus*	Other Rockfish
Darkblotched rockfish	*S. crameri*	Other Slope Rockfish
Greenstriped rockfish	*S. elongatus*	Other Slope Rockfish
Harlequin rockfish	*S. variegatus*	Other Slope Rockfish
Northern rockfish[b]	*S. polyspinis*	Other Slope Rockfish
Pygmy rockfish	*S. wilsoni*	Other Slope Rockfish
Quillback rockfish[a]	*S. maliger*	Other Rockfish
Redbanded rockfish	*S. babcocki*	Other Slope Rockfish
Redstripe rockfish	*S. proriger*	Other Slope Rockfish
Rosethorn rockfish[a]	*S. helvomaculatus*	Other Rockfish
Sharpchin rockfish	*S. zacentrus*	Other Slope Rockfish
Silvergray rockfish	*S. brevispinis*	Other Slope Rockfish
Splitnose rockfish	*S. diploproa*	Other Slope Rockfish
Stripetail rockfish	*S. saxicola*	Other Slope Rockfish
Tiger rockfish[a]	*S. nigrocinctus*	Other Rockfish
Vermilion rockfish	*S. miniatus*	Other Slope Rockfish
Widow rockfish	*S. entomelas*	Other Slope Rockfish
Yelloweye rockfish[a]	*S. ruberrimus*	Other Rockfish
Yellowmouth rockfish	*S. reedi*	Other Slope Rockfish
Yellowtail rockfish	*S. flavidus*	Other Slope Rockfish

[a]Only in the WGOA, CGOA and W. Yakutat management areas, otherwise in the Demersal Shelf Rockfish assessment.
[b]Only in the W. Yakutat and Southeast management areas (i.e. EGOA), otherwise in the Northern Rockfish assessment.

Table 16A.2**.** Commercial catch (t) of fish in the "Other Rockfish" management category in the Gulf of Alaska, with Gulfwide values of acceptable biological catch (ABC) and total allowable catch (TAC), 1991-2012.

	Area of Gulf					Gulfwide				
				Eastern						
Year	West	Central	East	West Yakutat	Southeast	Total	ABC	TAC	Management Category	Source
1991	n.a.	n.a.	n.a.			278[a]	10,100[b]	10,100[b]	Other Slope Rockfish	Clausen and Echave 2011
1992	76[a]	854[a]	745[a]			1,674[a]	14,060[b]	14,060[b]		
1993	342	2,423	2,658			5,423	8,300	5,383		
1994	101	715	797			1,613	8,300	2,235		
1995	31	883	483			1,397	7,110	2,235		
1996	19	618	244			881	7,110	2,020		
1997	68	941	208			1,217	5,260	2,170		
1998	46	701	114			861	5,260	2,170		
1999	39	614	135			788	5,270	5,270		
2000	49	363	165			577	4,900	4,900		
2001	25	318	216			559	4,900	1,010		
2002	223	481	70			774	5,040	990		
2003	183	701	249	227	22	1,133	5,050	990		AKRO Catch Accounting System
2004	245	536	106	78	28	888	3,900	670		
2005	92	517	118	71	47	727	3,900	670		
2006	303	607	207	136	71	1,117	4,152	1,480		
2007	251	338	101	51	50	690	4,154	1,482		
2008	301	442	78	51	28	821	4,297	1,730		
2009	403	397	96	82	14	896	4,297	1,730		
2010	364	418	164	128	36	946	3,749	1,192		
2011	300	355	219	187	32	874	3,749	1,192		
2012	255	723	61	37	24	1,039	4,045	1,080	Other Rockfish	

NA = data unavailable

[a]Catch estimated based on data from the Groundfish Observer Program.

[b]Includes northern rockfish in all areas of the GOA, which were part of the "other slope rockfish" group in these years.

Table 16A.3. Estimated commercial catch (t) by species for the species in the "Other Rockfish" management category in the Gulf of Alaska, 1991-2012. The individual species listed comprise on average >94% of the catch for the entire complex, the remaining species are combined.

		Gulf of Alaska Areas				
				Eastern		
Species Name	Year	Western	Central	West Yakutat	Southeast	Gulfwide Total
Harlequin Rockfish	1991	9.80	59.68	7.59	1.47	78.53
	1992	65.36	519.19	67.52	1.81	653.88
	1993	288.31	1,121.74	192.87	394.10	1,997.02
	1994	96.31	500.84	92.63	31.98	721.75
	1995	21.51	542.06	69.18	0.93	633.67
	1996	11.39	310.32	17.43	0.35	339.47
	1997	13.56	412.65	31.95	2.45	460.62
	1998	31.56	355.79	31.04	0	418.39
	1999	16.13	293.02	52.91	0	362.06
	2000	38.68	91.85	27.29	0	157.81
	2001	5.12	150.12	99.35	0	254.60
	2002	91.99	234.08	20.34	0	346.41
	2003	85.80	256.61	167.30	0	509.70
	2004	145.68	275.48	49.03	0	470.19
	2005	31.68	402.48	41.01	0	475.17
	2006	201.51	349.04	63.66	0.01	614.22
	2007	205.23	119.63	4.07	0	328.93
	2008	175.66	190.74	2.91	0	369.31
	2009	329.17	168.54	19.08	0	516.79
	2010	277.26	132.41	30.61	0	440.28
	2011	220.99	137.21	6.36	0	364.55
	2012	190.43	377.22	0	0	567.64
Red Banded Rockfish	1991	0.95	5.34	1.14	0.19	7.63
	1992	1.08	7.42	6.30	0.48	15.28
	1993	3.37	25.38	3.03	11.60	43.39
	1994	0.48	15.56	1.11	5.49	22.65
	1995	3.71	10.04	6.08	3.25	23.08
	1996	1.10	14.14	10.85	0.66	26.75
	1997	2.06	7.02	2.44	4.06	15.58
	1998	1.49	14.91	2.21	4.71	23.32
	1999	0.54	15.99	1.89	1.72	20.13
	2000	0.96	16.11	1.05	22.82	40.95
	2001	0.38	17.91	12.24	46.36	76.89
	2002	4.45	29.79	1.30	24.28	59.83
	2003	2.47	27.86	3.65	16.03	50.00
	2004	1.33	19.80	2.50	22.42	46.05
	2005	0.99	15.65	1.43	44.66	62.73
	2006	3.44	17.62	8.22	61.94	91.22
	2007	2.01	19.37	4.09	43.82	69.30
	2008	2.73	26.02	1.60	22.21	52.57
	2009	4.68	26.73	3.21	11.47	46.09
	2010	3.69	16.30	9.65	32.42	62.06
	2011	1.25	29.35	6.00	29.86	66.46
	2012	1.88	16.74	1.80	17.18	37.61
Sharpchin Rockfish	1991	0.23	2.32	3.46	0.08	6.09
	1992	3.62	162.34	222.33	5.00	393.29
	1993	5.57	558.83	192.75	571.06	1,328.21
	1994	1.62	71.38	132.76	68.04	273.79
	1995	1.79	221.84	92.32	7.41	323.36
	1996	3.09	172.90	118.59	4.99	299.57
	1997	22.50	241.43	25.87	18.03	307.82
	1998	10.26	284.95	0.03	0	295.24
	1999	2.17	129.48	18.59	0	150.24

Table 16A.3. Cont'd

		Gulf of Alaska Areas				
				Eastern		
Species Name	Year	Western	Central	West Yakutat	Southeast	Gulfwide Total
	2000	0	195.49	26.16	0	221.65
	2001	6.10	94.61	21.52	0	122.24
	2002	100.77	137.01	4.87	0	242.64
	2003	4.09	246.41	0	0	250.49
	2004	20.65	134.11	0.05	0	154.80
	2005	8.74	31.96	10.74	0	51.43
	2006	7.88	64.36	25.27	0	97.51
	2007	14.35	80.08	2.29	0	96.72
	2008	18.70	59.43	0.17	0	78.30
	2009	12.44	67.65	3.83	0	83.92
	2010	24.85	77.07	17.28	0	119.20
	2011	9.27	24.85	56.36	0	90.48
	2012	5.37	93.56	0.21	0	99.13
Yelloweye Rockfish	1991	6.05	69.27	6.14	NA	81.47
	1992	4.00	61.14	40.99	NA	106.12
	1993	26.31	58.97	45.87	NA	131.15
	1994	2.46	23.34	20.88	NA	46.68
	1995	0.50	30.38	7.98	NA	38.87
	1996	2.13	20.52	7.33	NA	29.98
	1997	5.88	22.03	15.23	NA	43.14
	1998	2.45	18.13	8.63	NA	29.21
	1999	3.18	111.81	14.97	NA	129.96
	2000	6.61	13.00	15.84	NA	35.44
	2001	5.78	18.32	4.67	NA	28.77
	2002	5.72	12.19	2.78	NA	20.70
	2003	38.30	84.14	26.50	NA	148.94
	2004	35.23	74.64	20.51	NA	130.38
	2005	18.34	58.85	11.76	NA	88.94
	2006	45.87	69.14	28.37	NA	143.38
	2007	20.51	77.41	25.44	NA	123.36
	2008	45.73	129.87	25.45	NA	201.06
	2009	41.48	97.53	26.69	NA	165.70
	2010	52.32	109.56	33.76	NA	195.65
	2011	55.63	96.65	19.04	NA	171.33
	2012	51.35	132.02	14.57	NA	197.94
Redstripe Rockfish	1991	1.96	19.82	41.38	0.13	63.29
	1992	0	66.57	60.60	4.28	131.46
	1993	17.59	588.27	150.97	636.78	1,393.60
	1994	0	22.96	128.63	39.66	191.25
	1995	0.00	54.95	117.29	3.69	175.93
	1996	1.14	87.76	47.39	2.20	138.49
	1997	23.02	241.41	10.48	4.16	279.07
	1998	0.23	7.96	44.59	0	52.78
	1999	8.28	55.37	14.31	0	77.97
	2000	0.34	22.82	35.45	1.06	59.67
	2001	3.88	18.58	19.14	0	41.60
	2002	0.37	9.27	5.70	0	15.34
	2003	1.38	38.86	1.04	0.05	41.33
	2004	30.99	8.89	0	0.10	39.97
	2005	2.60	5.18	1.95	0.17	9.89
	2006	9.25	53.17	0.97	1.20	64.59
	2007	7.02	31.80	0.50	0.05	39.37
	2008	4.19	25.54	0.73	0.02	30.48
	2009	3.67	18.38	11.97	0.01	34.03
	2010	3.01	62.74	9.96	0.03	75.74
	2011	10.47	40.09	27.97	0.03	78.55
	2012	3.59	37.91	19.23	0.05	60.77

Table 16A.3. Cont'd

		Gulf of Alaska Areas				
				Eastern		
Species Name	Year	Western	Central	West Yakutat	Southeast	Gulfwide Total
Silvergray Rockfish	1991	0.15	2.02	2.41	0.12	4.70
	1992	0.42	3.71	212.05	0.50	216.68
	1993	0.01	52.94	66.26	200.50	319.70
	1994	0	4.62	138.84	61.57	205.04
	1995	0	1.39	100.50	2.81	104.70
	1996	0	3.53	5.84	1.48	10.84
	1997	0	13.43	12.75	8.12	34.30
	1998	<0.01	4.26	3.21	0	7.47
	1999	0	5.24	10.00	0.09	15.34
	2000	0	8.44	12.40	4.10	24.94
	2001	0	10.72	4.46	0.47	15.65
	2002	0	52.27	4.00	0.74	57.01
	2003	0	14.04	5.70	5.96	25.70
	2004	5.83	7.96	1.90	5.64	21.32
	2005	0.81	0.82	0.54	2.08	4.25
	2006	0	0.88	4.19	7.14	12.21
	2007	0.04	1.67	6.74	3.80	12.25
	2008	2.22	1.99	1.16	4.34	9.71
	2009	1.41	3.01	16.37	1.90	22.69
	2010	1.90	5.45	24.38	3.36	35.09
	2011	0.17	20.78	69.04	2.05	92.04
	2012	0.03	36.73	0.16	3.62	40.54
Northern Rockfish	1991	NA	NA	11.10	0	11.10
	1992	NA	NA	112.35	<0.01	112.35
	1993	NA	NA	81.25	0	81.25
	1994	NA	NA	43.75	0	43.75
	1995	NA	NA	46.83	4.90	51.72
	1996	NA	NA	17.49	0.01	17.50
	1997	NA	NA	22.10	0.01	22.11
	1998	NA	NA	12.56	0	12.56
	1999	NA	NA	11.41	0	11.41
	2000	NA	NA	13.73	0	13.73
	2001	NA	NA	5.75	0	5.75
	2002	NA	NA	5.47	0	5.47
	2003	NA	NA	13.23	<0.01	13.23
	2004	NA	NA	3.41	0.01	3.41
	2005	NA	NA	2.77	0	2.77
	2006	NA	NA	3.97	0	3.97
	2007	NA	NA	5.38	1.13	6.51
	2008	NA	NA	16.46	0	16.46
	2009	NA	NA	0.47	0.01	0.47
	2010	NA	NA	0.49	<0.01	0.49
	2011	NA	NA	1.19	0	1.19
	2012	NA	NA	0.01	0	0.01
Remaining Species	1991	0.86	16.43	7.84	0.08	25.21
	1992	1.53	33.63	8.44	2.33	45.94
	1993	0.84	16.87	2.38	108.58	128.67
	1994	0.13	76.30	5.66	25.99	108.09
	1995	3.49	22.35	19.80	0.03	45.67
	1996	0.15	8.84	8.55	0.86	18.39
	1997	0.98	3.02	1.83	48.53	54.36
	1998	0	15.00	5.41	1.62	22.02
	1999	8.70	3.08	1.08	8.03	20.89
	2000	2.42	15.29	0.34	4.76	22.81
	2001	3.74	7.73	2.03	0	13.50
	2002	19.70	6.39	0.51	0	26.59
	2003	0.74	15.32	9.16	4.18	29.39

Table 16A.3. Cont'd

		Gulf of Alaska Areas				
				Eastern		
Species Name	Year	Western	Central	West Yakutat	Southeast	Gulfwide Total
	2004	35.35	65.22	0.54	2.40	103.52
	2005	1.41	1.32	0.71	1.04	4.48
	2006	11.00	44.51	1.35	1.42	58.28
	2007	0.12	4.25	2.47	1.48	8.33
	2008	2.21	7.59	2.17	2.78	14.74
	2009	10.40	18.74	1.07	0.94	31.15
	2010	1.06	24.10	1.65	1.33	28.15
	2011	0.51	12.92	1.41	0.94	15.78
	2012	1.78	28.92	0.59	1.46	32.74

Table 16A.4. Mean composition of the catch for the primary species in the Other Rockfish group by area in the Gulf of Alaska and gear type (1991-2012). Source: AKFIN, August 15, 2013.

	Gulf of Alaska Area				
			Eastern		Gulfwide
	Western	Central	W. Yak	SE	Total
Harlequin	63%	48%	27%	3%	35%
Red Banded	2%	4%	6%	58%	17%
Sharpchin	10%	22%	14%	9%	13%
Yelloweye	16%	13%	18%		12%
Redstripe	5%	8%	14%	6%	9%
Silvergray	10%	2%	10%	11%	6%
Northern			8%	1%	2%

	Gear Type		
	HAL	Pot	Trawl
Harlequin	2%	<1%	53%
Red Banded	26%	1%	3%
Sharpchin	0%	<1%	21%
Yelloweye	62%	71%	6%
Redstripe	1%	3%	9%
Silvergray	1%	6%	4%
Northern	<1%	0%	1%

Table 16A.5. Total biomass estimates (t) for the "Other Rockfish" complex by area for 1984 – 2011. The 2001 survey did not sample the Eastern GOA (the West Yakutat and Southeast areas).

		Gulf of Alaska Area				
				Eastern		
				West		
Year	Group	Western	Central	Yakutat	Southeast	Total
1984	Total O. Rocks	87	3,836	5,366	13,916	23,205
	WDSR portion	22	217	613		852
1987	Total O. Rocks	12,324	23,587	42,335	112,074	190,319
	WDSR portion	73	492	1,671		2,237
1990	Total O. Rocks	132	18,224	14,567	71,767	104,690
	WDSR portion	0	759	308		1,067
1993	Total O. Rocks	190	18,406	8,652	64,397	91,645
	WDSR portion	14	1,720	391		2,125
1996	Total O. Rocks	1,102	7,199	27,367	97,666	133,334
	WDSR portion	44	479	1,509		2,032
1999	Total O. Rocks	126	21,104	25,809	63,629	110,668
	WDSR portion	0	2,323	1,344		3,667
2001	Total O. Rocks	3,196	9,398			12,595
	WDSR portion	122	1,706			1,828
2003	Total O. Rocks	133	3,937	7,039	66,353	77,462
	WDSR portion	46	907	583		1,536
2005	Total O. Rocks	30,629	28,636	23,920	43,446	126,632
	WDSR portion	911	988	1,008		2,907
2007	Total O. Rocks	1,341	8,894	17,192	49,526	76,953
	WDSR portion	384	717	1,334		2,435
2009	Total O. Rocks	105	4,796	9,852	24,350	39,103
	WDSR portion	11	857	704		1,572
2011	Total O. Rocks	2,423	32,299	11,609	103,175	149,506
	WDSR portion	174	3,615	445		4,233

Table 16A.6. Detailed biomass estimates (t) for the "Other Rockfish" species in the Gulf of Alaska, by statistical area, based on bottom trawl surveys conducted between 1984 and 2011. Gulfwide 95% confidence bounds, variance, and coefficient of variation (CV) are also shown for each year. Zeros indicate an estimated biomass of zero, while blanks indicate that data was not available for biomass estimates. Northern rockfish are only included in the Eastern GOA, thus only biomass estimates for W. Yakutat and Southeast are presented. Similarly, canary, copper, quillback, rosethorn, tiger and yelloweye rockfish are only included in the Western and Central GOA and the W. Yakutat portion of the Eastern GOA. Other rockfish species that are not included in this list do not have biomass estimates. The 2001 survey did not sample the Eastern GOA (Yakutat and Southeastern areas). Substitute estimates of biomass for these areas in 2001 were obtained by averaging the Yakutat and Southeastern biomass in the 1993, 1996, and 1999 surveys. These Eastern GOA estimates have been included in the 2001 biomass estimates, confidence bounds, biomass variances, and biomass CVs listed in this table.

		Gulf of Alaska Areas							
				Eastern			95% Confidence Bounds		
Species	Year	WGOA	CGOA	W Yak	Southeast	Total	Lower	Upper	CV (%)
Bocaccio	1984	0	0	17	488	505	0	1,208	68
	1987	0	36	0	0	36	0	112	100
	1990	0	0	0	173	173	0	535	100
	1993	0	0	0	106	106	0	271	72
	1996	0	0	0	137	137	0	304	59
	1999	0	0	0	0	0			
	2001	0	0	0	81	81	0	244	102
	2003	0	0	0	132	132	0	321	69
	2005	0	0	0	0	0			
	2007	0	0	0	104	104	0	256	68
	2009	0	0	0	0	0			
	2011	0	0	0	0	0			
Canary	1984	0	0	0		0			
	1987	0	8	0		8	0	25	99
	1990	0	0	0		0			
	1993	0	0	0		0			
	1996	0	0	0		0			
	1999	0	0	0		0			
	2001	81	0	0		81	0	239	100
	2003	0	0	0		0			
	2005	0	0	0		0			
	2007	56	0	0		56	0	171	100
	2009	0	0	0		0			
	2011	0	42	0		42	0	132	87
Darkblotched	1984	0	0	7	0	7	0	24	100
	1987	3	4	30	0	37	0	87	62
	1990	0	0	10	163	174	0	864	93
	1993	3	0	178	109	291	111	470	30
	1996	0	0	57	64	121	0	309	71
	1999	0	0	16	255	272	0	553	49
	2001	0	0	84	143	227	0	523	67
	2003	0	0	0	91	91	0	229	64
	2005	0	0	222	10	232	62	402	36
	2007	0	2	7	152	161	0	364	59
	2009	0	5	0	1,116	1,121	19	2,223	43
	2011	0	0	0	71	71	12	130	36
Greenstripe	1984	0	0	8	5	14	0	31	63
	1987	0	0	0	65	65	0	140	57
	1990	0	0	13	161	174	54	294	33
	1993	0	0	11	256	268	0	543	49
	1996	0	0	0	352	352	103	600	35
	1999	0	0	12	455	467	21	913	45

Table 16A.6. Cont'd

Species	Year	Gulf of Alaska Areas WGOA	CGOA	Eastern W Yak	Southeast	Total	95% Confidence Bounds Lower	Upper	CV (%)
	2001	0	0	8	354	362	137	587	32
	2003	0	0	17	405	423	86	759	39
	2005	0	0	0	392	392	129	654	33
	2007	0	0	55	621	676	270	1,083	29
	2009	0	0	0	356	356	94	617	36
	2011	0	0	6	325	331	80	583	37
Harlequin	1984	65	1,314	555	692	2,625	972	4,277	31
	1987	7,491	20,249	15,233	29,433	72,405	28,945	115,865	29
	1990	125	13,584	1,141	2,814	17,664	0	36,735	51
	1993	84	8,529	384	284	9,281	301	18,260	47
	1996	773	2,883	2,073	14,298	20,026	0	46,293	64
	1999	7	8,563	1,046	261	9,877	1313	18,440	42
	2001	2,987	5,378	1,167	4,948	14,480	0	34,638	71
	2003	25	1,498	1,097	924	3,545	313	6,776	45
	2005	26,668	1,930	4,408	119	33,125	0	77,144	64
	2007	834	1,902	307	1,014	4,057	384	7,730	45
	2009	44	840	716	1,086	2,686	274	5,099	43
	2011	2,238	1,082	400	15	3,735	0	8,409	61
Northern	1984		0	5	0	5	0	16	100
	1987		0	500	0	500	0	1,537	98
	1990		0	343	0	343	0	772	60
	1993		0	41	0	41	0	87	53
	1996		0	192	0	192	50	334	34
	1999		0	118	0	118	6	231	47
	2003		0	5	0	5	0	17	100
	2005		0	160	0	160	0	369	59
	2007		0	38	0	38	0	86	61
	2009		0	70	0	70	0	150	54
	2011		0	28	0	28	0	73	72
Pygmy	1984	0	0	0	0	0			
	1987	0	187	20	199	406	0	981	67
	1990	0	3	4	81	88	0	239	80
	1993	0	0	3	0	3	0	9	99
	1996	0	44	221	18	283	0	780	78
	1999	0	6	128	54	187	0	389	52
	2001	0	0	117	24	141	0	397	93
	2003	0	114	11	1	127	0	360	90
	2005	0	1	110	27	137	0	312	60
	2007	0	13	98	26	137	0	331	62
	2009	0	228	0	38	266	0	738	87
	2011	0	16	9	7	32	0	71	59
Quillback	1984	0	115	0		115	0	425	84
	1987	0	130	47		177	0	591	73
	1990	0	446	58		504	0	1,151	51
	1993	0	1,132	44		1,177	0	3,727	66
	1996	0	0	0		0			
	1999	0	42	233		275	0	622	52
	2001	0	197	92		290	0	659	65
	2003	0	25	0		25	0	82	100
	2005	0	0	195		195	0	493	71
	2007	0	63	0		63	0	172	78
	2009	11	77	134		221	0	711	70
	2011	0	1,229	244		1,473	0	4,158	69
Redbanded	1984	0	169	727	534	1,430	531	2,330	31
	1987	21	604	762	435	1,822	600	3,044	33
	1990	0	220	1,420	1,646	3,285	887	5,683	35
	1993	11	434	1,084	2,147	3,675	1,513	5,837	29

Table 16A.6. Cont'd

Species	Year	Gulf of Alaska Areas WGOA	CGOA	Eastern W Yak	Southeast	Total	95% Confidence Bounds Lower	Upper	CV (%)
	1996	61	200	1,497	2,836	4,594	1,476	7,711	34
	1999	118	403	1,344	9,076	10,941	1,350	20,532	41
	2001	61	354	1,308	4,686	6,409	0	15,063	69
	2003	19	889	548	1,984	3,441	1,907	4,974	22
	2005	41	1,010	2,211	2,405	5,667	3,051	8,283	21
	2007	52	1,164	2,772	3,211	7,198	3,315	11,081	25
	2009	34	2,020	1,249	3,139	6,442	4,215	8,669	17
	2011	12	1,304	876	2,850	5,042	2,655	7,428	23
Redstripe	1984	0	139	9	5,216	5,364	922	9,806	41
	1987	1,263	1,820	1,785	21,651	26,519	0	53,639	47
	1990	0	15	3,147	23,903	27,064	0	56,675	52
	1993	5	112	2	29,500	29,619	0	64,739	55
	1996	152	91	13	14,709	14,964	0	31,716	54
	1999	0	139	40	8,047	8,226	0	16,618	49
	2001	3	124	18	17,419	17,564		42,415	72
	2003	5	175	0	7,845	8,025	2,109	13,942	36
	2005	2,796	12,827	137	5,931	21,691	0	51,372	58
	2007	15	656	0	10,830	11,501	0	26,535	61
	2009	1	48	0	1,542	1,592	47	3,136	46
	2011	0	499	506	17,740	18,745	0	54,603	87
Rosethorn	1984	0	5	408		412	133	698	31
	1987	0	0	821		821	16	1,626	46
	1990	0	0	8		8	0	19	67
	1993	0	9	90		98	1	205	43
	1996	0	0	1,457		1,457	0	4,347	88
	1999	0	0	871		871	0	1,828	53
	2001	0	0	806		806	0	2,358	98
	2003	0	3	324		327	0	838	73
	2005	7	1	115		123	0	302	63
	2007	2	0	529		530	0	1,116	49
	2009	0	4	154		158	0	353	54
	2011	0	0	200		200	0	637	96
Sharpchin	1984	0	1,945	2,332	2,334	6,612	1,693	11,531	36
	1987	3,366	43	20,367	56,663	80,439	13,859	147,018	39
	1990	2	3,363	2,706	32,263	38,334	9,326	67,341	37
	1993	74	7,047	5,314	11,241	23,676	8,063	39,289	32
	1996	72	1,921	18,871	43,705	64,570	23,139	106,001	32
	1999	0	2,856	15,125	2,860	20,841	0	54,401	66
	2001	23	1,774	13,103	19,269	34,169	0	85,559	77
	2003	38	290	1,638	5,128	7,094	0	14,338	46
	2005	195	10,757	4,827	5,413	21,193	7,442	34,943	32
	2007	53	4,048	3,826	11,111	19,037	5,792	32,282	34
	2009	15	655	2,763	9,061	12,493	3,006	21,979	35
	2011	0	538	5,461	2,042	8,041	0	19,965	63
Silvergray	1984	0	52	1,071	3,693	4,817	1,336	8,298	28
	1987	37	149	1,917	3,322	5,426	858	9,994	40
	1990	0	280	5,178	8,691	14,149	1,996	26,301	42
	1993	0	544	1,244	17,191	18,979	6,682	31,276	31
	1996	0	1,553	2,934	19,641	24,127	10,958	37,297	27
	1999	0	6,745	6,456	24,440	37,641	12,371	62,911	33
	2001	0	63	3,545	20,424	24,032	13,742	34,321	22
	2003	0	65	3,067	48,784	51,915	0	130,981	73
	2005	18	1,073	10,834	27,912	39,837	8,250	71,424	39
	2007	0	359	8,754	20,685	29,798	13,588	46,007	26
	2009	0	94	4,229	5,528	9,851	939	18,763	43
	2011	0	24,110	3,879	72,061	100,049	29,458	170,641	35
Splitnose	1984	0	0	0	0	0			

Table 16A.6. Cont'd

Species	Year	Gulf of Alaska Areas WGOA	CGOA	Eastern W Yak	Southeast	Total	95% Confidence Bounds Lower	Upper	CV (%)
	1987	0	0	0	3	3	0	9	99
	1990	0	0	0	3	3	0	11	79
	1993	0	0	0	0	0			
	1996	0	0	0	0	0	0	0	53
	1999	0	0	2	5	7	0	17	69
	2001	0	0	1	2	2	0	10	158
	2003	0	0	0	5	5	0	13	83
	2005	0	0	2	40	42	0	117	86
	2007	4	0	2	0	6	0	14	70
	2009	0	0	11	9	20	0	45	59
	2011	0	0	0	0	0			
Tiger	1984	0	0	0		0			
	1987	0	5	0		5	0	14	77
	1990	0	4	0		4	0	13	99
	1993	0	0	0		0			
	1996	0	0	0		0			
	1999	0	0	0		0			
	2001	0	0	0		0			
	2003	0	20	0		20	0	61	100
	2005	0	0	0		0			
	2007	0	0	0		0			
	2009	0	0	0		0			
	2011	0	0	0		0			
Vermillion	1984	0	0	0	0	0			
	1987	0	0	0	0	0			
	1990	0	0	0	0	0			
	1993	0	20	0	0	20	0	61	100
	1996	0	0	0	0	0			
	1999	0	0	0	0	0			
	2001	0	0	0	0	0			
	2003	0	0	0	0	0			
	2005	0	0	0	0	0			
	2007	0	0	0	0	0			
	2009	0	0	0	0	0			
	2011	0	0	0	0	0			
Widow	1984	0	0	0	0	0			
	1987	0	0	50	116	166	0	418	71
	1990	0	0	298	0	298	0	804	81
	1993	0	0	0	0	0			
	1996	0	10	0	919	929	0	2,803	98
	1999	0	69	0	115	184	0	425	63
	2001	0	0	0	345	345	0	1,478	168
	2003	0	0	0	32	32	0	79	69
	2005	0	51	0	77	128	0	273	57
	2007	0	16	0	220	236	0	504	53
	2009	0	18	78	14	110	0	286	74
	2011	0	0	0	88	88	0	244	81
Yelloweye	1984	22	97	205		324	0	937	64
	1987	73	349	804		1,227	91	2,627	42
	1990	0	309	242		551	38	1,172	37
	1993	14	580	257		850	166	1,854	37
	1996	44	479	53		576	0	1,366	44
	1999	0	2,281	240		2,521	98	5,086	42
	2001	42	1,508	183		1,733	191	3,275	45
	2003	46	858	260		1,164	0	2,904	42
	2005	905	987	698		2,589	0	5,675	32
	2007	326	655	806		1,786	0	3,913	32

Table 16A.6. Cont'd

		Gulf of Alaska Areas							
				Eastern			95% Confidence Bounds		
Species	Year	WGOA	CGOA	W Yak	Southeast	Total	Lower	Upper	CV (%)
	2009	0	777	416		1,193	208	2,422	34
	2011	174	2,345	0		2,518	0	5,459	44
Yellowmouth	1984	0	0	13	484	497	0	1,177	66
	1987	68	5	0	187	260	0	589	60
	1990	6	0	0	1,871	1,876	0	5,663	96
	1993	0	0	0	3,563	3,563	0	9,029	75
	1996	0	0	0	923	923	0	2,027	58
	1999	0	0	18	5,552	5,570	0	17,516	99
	2001	0	0	6	3,346	3,352	0	8,607	80
	2003	0	0	0	387	387	0	1,085	87
	2005	0	0	0	0	0			
	2007	0	0	0	475	475	0	1,216	73
	2009	0	0	0	43	43	0	106	66
	2011	0	0	0	0	0			
Yellowtail	1984	0	0	9	469	478	3	953	48
	1987	0	0	0	0	0			
	1990	0	0	0	0	0			
	1993	0	0	0	0	0			
	1996	0	20	0	65	85	0	191	62
	1999	0	0	162	12,509	12,671	0	37,470	91
	2001	0	0	54	4,192	4,245	0	20,550	196
	2003	0	0	71	635	705	0	1,730	69
	2005	0	0	0	1,121	1,121	0	2,859	76
	2007	0	17	0	1,079	1,096	0	2,268	47
	2009	0	30	33	2,419	2,481	0	5,713	61
	2011	0	1,136	0	7,976	9,112	0	26,230	88

Table 16A.7. Summary of computations of ABCs and overfishing levels for "other rockfish" in the Gulf of Alaska for 2012. Biomass and yields are in t. Since actual ABCs and overfishing levels for "other rockfish" are based on the overall management category, individual species are shown only for illustrative purposes. (Because of rounding, numbers may not add exactly to totals.).

			ABC		Overfishing	
Species	Tier	Exploitable biomass	F	Yield	F	Yield
Bocaccio	5	35	$F = 0.75M = 0.06$	2	$F = M = 0.06$	2
Canary	5	33	$F = 0.75M = 0.05$	1	$F = M = 0.05$	2
Darkblotched	5	451	$F = 0.75M = 0.07$	24	$F = M = 0.07$	32
Greenstripe	5	454	$F = 0.75M = 0.06$	20	$F = M = 0.06$	27
Harlequin	5	3,493	$F = 0.75M = 0.09$	241	$F = M = 0.09$	321
Northern	5	45	$F = 0.75M = 0.08$	3	$F = M = 0.08$	3
Pygmy	5	145	$F = 0.75M = 0.06$	7	$F = M = 0.06$	9
Quillback	5	586	$F = 0.75M = 0.06$	26	$F = M = 0.06$	35
Redbanded	5	6,227	$F = 0.75M = 0.06$	280	$F = M = 0.06$	374
Redstripe	5	10,612	$F = 0.75M = 0.1$	796	$F = M = 0.1$	1,061
Rosethorn	5	296	$F = 0.75M = 0.06$	13	$F = M = 0.06$	18
Sharpchin	4	13,190	$F_{40\%} = 0.065$	859	$F_{35\%} = 0.079$	1,043
Silvergray	5	46,566	$F = 0.75M = 0.05$	1,746	$F = M = 0.05$	2,328
Splitnose	5	9	$F = 0.75M = 0.06$	0	$F = M = 0.06$	1
Widow	5	145	$F = 0.75M = 0.05$	5	$F = M = 0.05$	7
Yelloweye	5	1,832	$F = 0.75M = 0.02$	27	$F = M = 0.02$	36
Yellowmouth	5	173	$F = 0.75M = 0.06$	8	$F = M = 0.06$	10
Yellowtail	5	4,230	$F = 0.75M = 0.07$	222	$F = M = 0.07$	296
Total Other Rockfish		88,521		4,281		5,606
Total for WDSR species		2,747		68		91
Total Other Rockfish (2012 SAFE)		85,774		4,045		5,305

Table 16A.8. Percentage of biomass by area for "other rockfish" based on the biomass estimates shown in Table 5 for Gulf of Alaska trawl surveys in 2007, 2009, and 2011. Weighted averages use weights of 4:6:9 for the 2007, 2009, and 2011 surveys, respectively. The West Yakutat and Southeast ABCs are calculated as subdivisions of the Eastern ABC. The "Old ABC" is from the 2012 SAFE which did not include the WDSR species: canary, china, copper, quillback, rosethorn, tiger or yelloweye rockfish in areas outside of SE. The Eastern GOA is further subdivided into West Yakutat and Southeast areas, but the data was not available at the writing of this document.

	Western	Central	Eastern
2007	1.74%	11.56%	86.70%
2009	0.27%	12.27%	87.47%
2011	1.62%	21.60%	76.78%
4:6:9 avg	1.22%	16.54%	82.24%
ABC	52	708	3,521
Old ABC	44	606	3,395

Table 16A.9. Estimated catches (t) of harlequin rockfish, the complex catch (either Other Slope Rockfish or Other Rockfish, depending on the year), the proportion of catch that is harlequin rockfish, the complex ABC and the proportion of catch that is over the ABC.

		Harlequin Catch (t)	Complex Catch (t)	% Harlequin	Complex ABC (t)	Overage %
Western GOA	2003	86	183	47%	90	103%
	2004	146	245	59%	40	513%
	2005	32	92	34%	40	131%
	2006	202	303	66%	577	
	2007	205	251	82%	577	
	2008	176	301	58%	357	
	2009	329	403	82%	357	13%
	2010	277	364	76%	212	72%
	2011	221	300	74%	212	42%
	2012	190	255	75%	44	480%
Central GOA	2003	257	701	37%	550	28%
	2004	275	536	51%	300	79%
	2005	402	517	78%	300	72%
	2006	349	607	58%	386	57%
	2007	120	338	35%	386	
	2008	191	442	43%	569	
	2009	169	397	42%	569	
	2010	132	418	32%	507	
	2011	137	355	39%	507	
	2012	377	723	52%	606	19%
West Yakutat	2003	167	227	74%	270	
	2004	49	78	63%	130	
	2005	41	71	58%	130	
	2006	64	136	47%	130	5%
	2007	4	51	8%	317	
	2008	3	51	6%	604	
	2009	19	82	23%	604	
	2010	31	128	24%	273	
	2011	6	187	3%	273	
	2012	0	37	0%	230	
Southeast	2003	0	22	0%	4,140	
	2004	0	28	0%	3,430	
	2005	0	47	0%	3,430	
	2006	<1	71	0%	2,872	
	2007	0	50	0%	2,872	
	2008	0	28	0%	2,767	
	2009	0	14	0%	2,767	
	2010	0	36	0%	2,757	
	2011	0	32	0%	2,757	
	2012	0	24	0%	3,165	

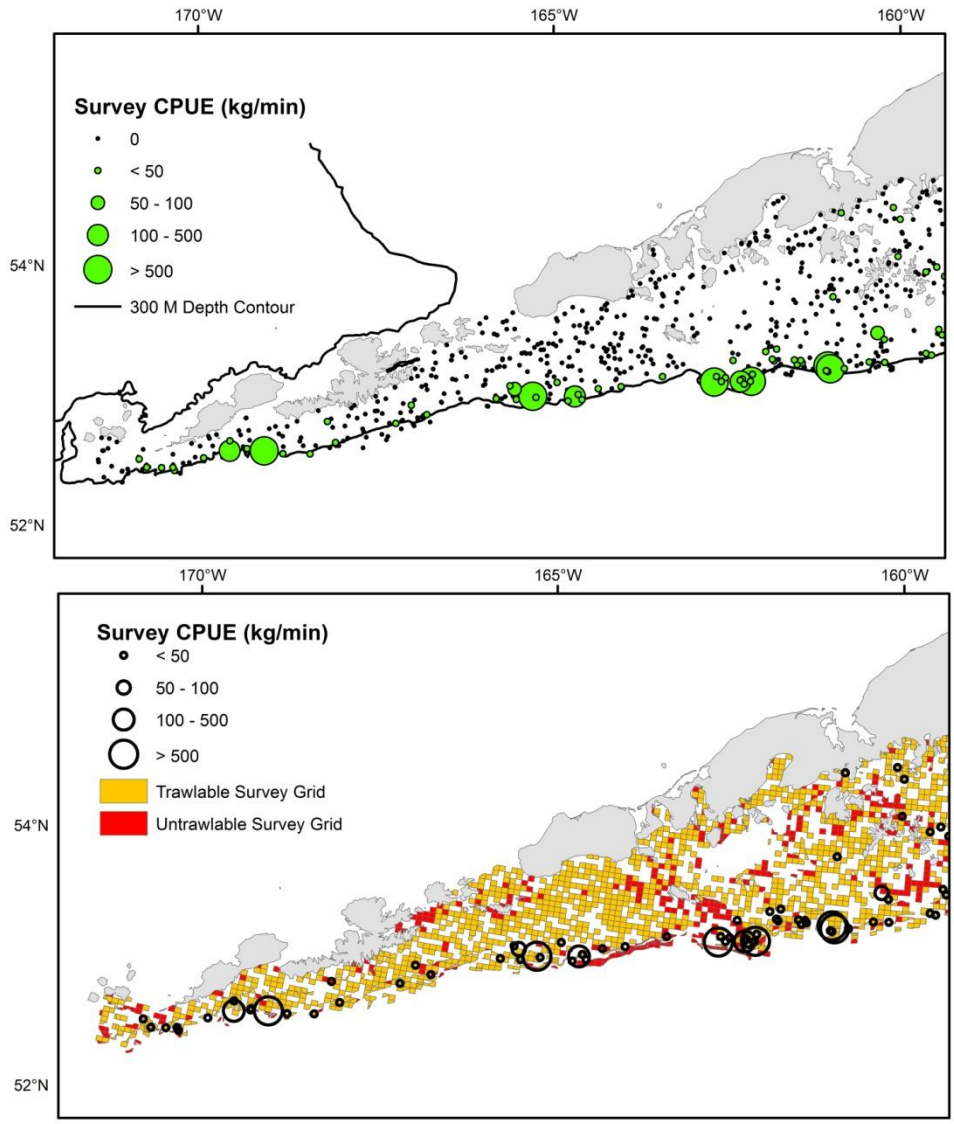

Figure 16A.1. Survey stations with harlequin rockfish catch during 1984 - 2011. In the top panel, the black dots represent survey stations with no harlequin rockfish catch, while the green circles represent the CPUE (kg/min) at survey station with harlequin rockfish catch. The bottom panel shows the survey stations with harlequin catch (open circles sized by CPUE as in the top panel) and the grid of untrawlable and trawlable habitat.

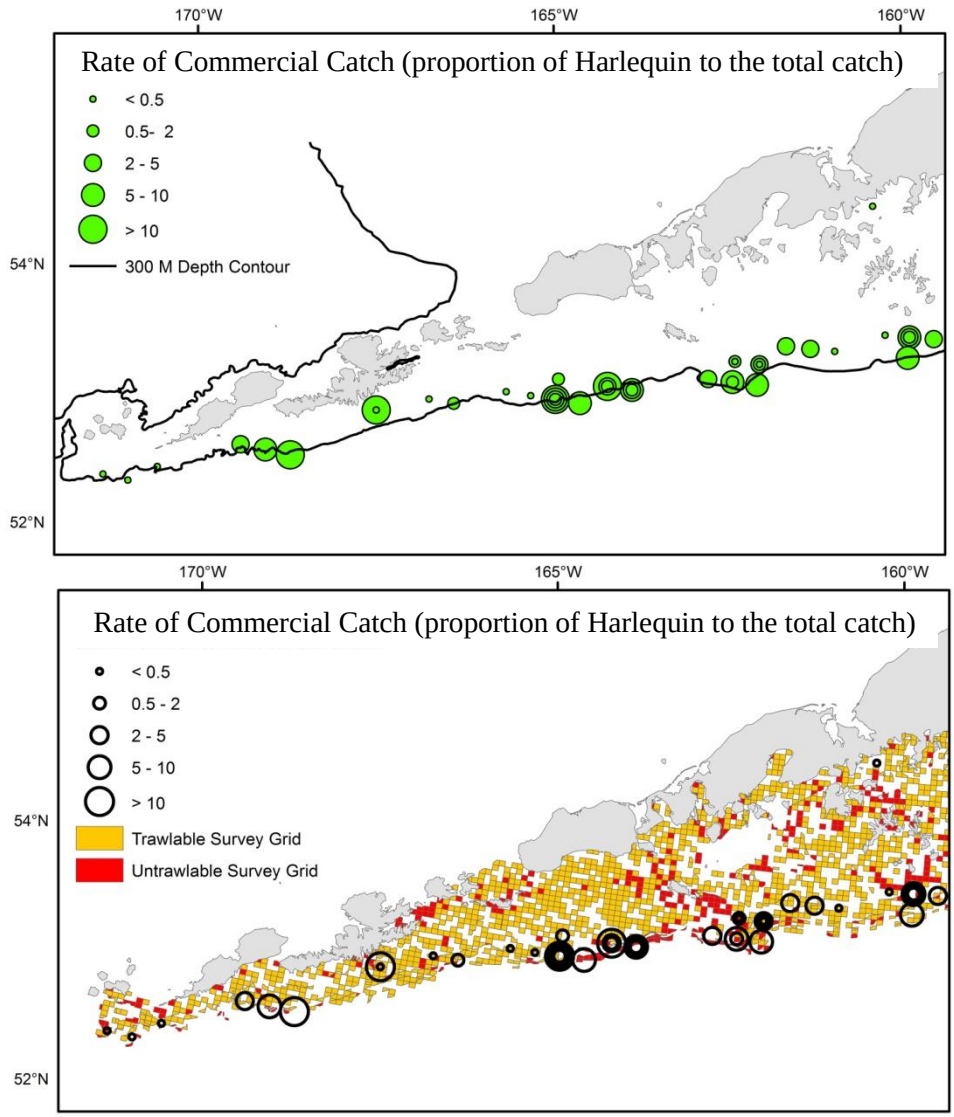

Figure 16A.2. Catch of harlequin rockfish in the Western GOA (NMFS Area 610). The top panel shows the rate of catch (defined as the proportion of species of interest to the total catch) during 2003 – 2012 in the green circles. The bottom panel shows the same catch information in the open circles with the trawl survey grid of untrawlable and trawlable habitats. Non-confidential catch data is from the Fisheries Monitoring and Analysis website (www.afsc.noaa.gov/FMA).

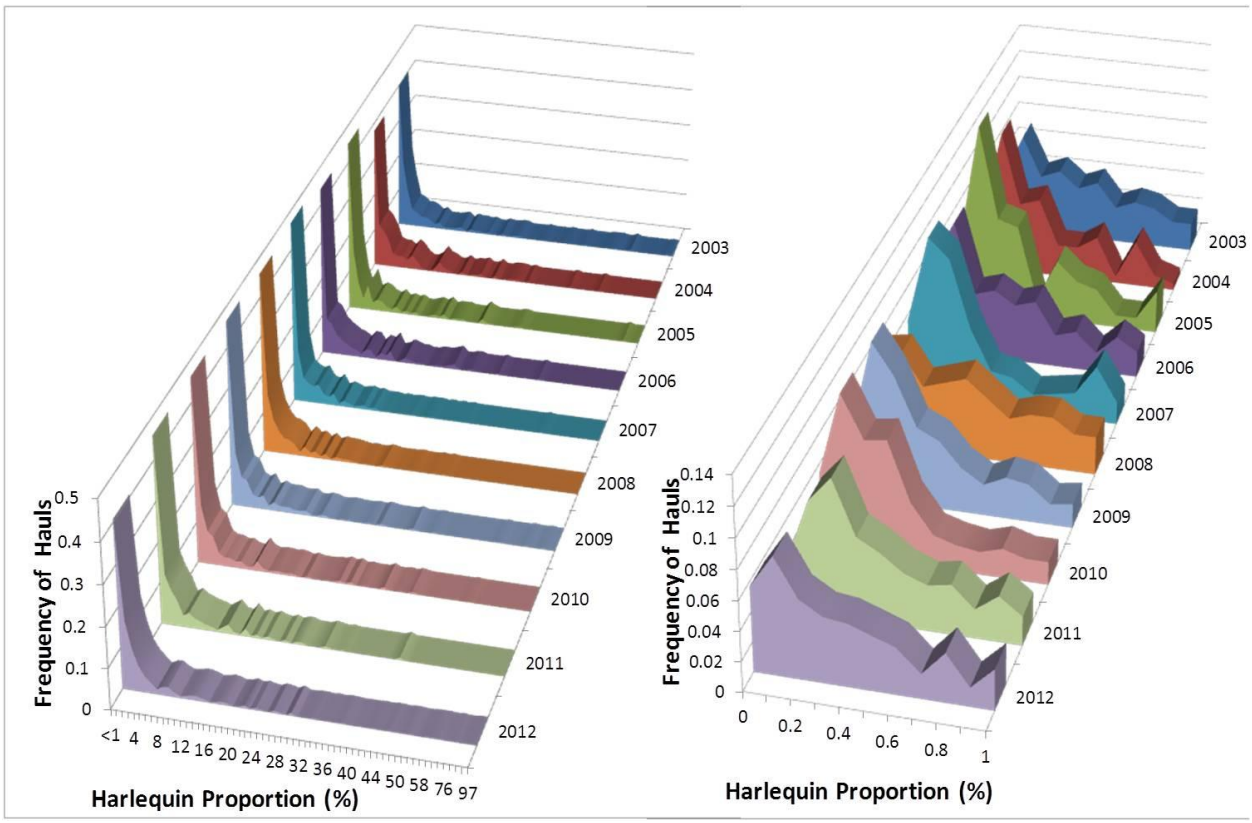

Figure 16A.3. The frequency of hauls with estimated proportions of harlequin rockfish catch in that haul. Left: from <1% up to 97% of the haul. Right: zoomed in to show the frequency of hauls with <1% of catch comprised of harlequin rockfish.

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