

Reclassifying Other Rockfish and Demersal Shelf Rockfish Species Groupings

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Executive Summary

The authors of the Other Rockfish (OR) and Demersal Shelf Rockfish (DSR) assessments put forth options to move seven species out of the OR group and into the DSR group during the 2015 assessment cycle. This document follows up on those options and continues the discussion of altering the complex compositions. The DSR complex covers seven species of rockfish, in the East Yakutat/Southeast (EY/SEO) management area (i.e., Gulf of Alaska (GOA) areas east of the 140° W longitude, NMFS area 650). These seven species are included in the OR complex, along with 18 other species, in all areas west of EY/SEO (Figure 1). The change in the complex compositions discussed in this document would effectively create a GOA wide DSR complex.

Investigating management alternatives for DSR GOA – wide required consultations between assessment authors, Alaska Department of Fish and Game Southeast and Southcentral region staff and the Alaska Regional Office. Multiple management alternatives were discussed, and the authors both the OR and DSR assessments recommend moving the seven DSR species which occur in the OR complex (i.e., those occurring to the west of EY/SEO) into the DSR assessment and expanding the DSR assessment to be GOA – wide. This option would not require regulatory or FMP level changes, but would enable managers to monitor the catch of these species more appropriately.

This document is updated from that presented in the 2015 assessment to include updated catch data and to incorporate comments brought forth by the SSC and Plan Team.

SSC and Plan Team Comments Specific to this topic

“The Team recommends further evaluation of the author preferred Alternative 3 in coordination with the Council’s process for determining spatial management.” – GOA PT September 2015

The authors request further explanation of the PT’s desired analysis in the above comment.

“The SSC advises that additional consideration should be given to Alternative 2 as well. For example, if all these species are combined, would this result in grouping species of divergent life history characteristics?” – SSC October 2015

We have included further discussion of Alternative 2. The authors examined life history characteristics with regards to the complex groupings and presented results in the 2015 OR assessment. Results are included here as well and included in discussions of Alternative 2. However, due to problems with managing the Alternative 2 options, it is not a viable option.

“The SSC suggests that this analysis should not be rushed. The prospects for developing a GOA-wide DSR assessment should consider that the survey information is best developed for Southeast Alaska, and that future funding for those surveys is uncertain. Also, for the various alternatives, assemblage membership should be carefully re-examined to make sure that species in the assemblage share some common characteristics. Alternative combinations of species should be considered. The SSC also encourages involvement of industry members in the process of alternative development so that alternatives are developed mindful of fishery and management complexity.” – SSC October 2015

We have included text regarding the survey disparity and uncertainty. See above comment for responses regarding species composition. We have communicated with industry to obtain suggestions and feedback on the proposed changes.

Introduction

The SSC expressed concerns regarding the appropriateness of the current management grouping for the DSR species. The DSR complex covers seven species of rockfish, in the East Yakutat/Southeast (EY/SEO) management area (i.e., Gulf of Alaska (GOA) areas east of the 140° W longitude, NMFS area 650). These seven species are included in the OR complex, along with 18 other species, in all areas west of EY/SEO (Figure 1). The primary question is if a GOA-wide assessment would be more appropriate for these species. To address these concerns the OR and DSR assessment authors have worked together to provide a discussion of catch, the available survey data from both state and federal surveys and estimated ABC and OFLs for potential management alternatives.

Life History

The SSC requested examination of the species groupings with regards to the species life histories. Previously, the complexes were grouped based on habitat and distribution (NPFMC 2016). Life history data are limited for most OR/DSR species, and generally based on studies in waters in lower latitudes (British Columbia and further south). Life history data collected in Alaska waters are available for sharpchin, harlequin, redstripe, yelloweye, and silvergray rockfish. All species of rockfish are ovoviviparous, with fertilization, embryonic development, and larval hatching occurring inside the female. Life history information was summarized in the stock structure document attached to the last full assessment (Table 16B.3 in Tribuzio and Echave 2015).

The species in these two complexes span a wide range of life history characteristics (Figure 2). Below is discussion of the life history characteristics and how the species in the group relate to one another. In general, the DSR species tend to be longer lived and grow more slowly than the OR species, with the exception of copper rockfish. They also tend to be associated with high relief rock habitat, while the OR species tend to be more pelagic or over lower relief.

Catch of copper and splitnose rockfish are rare, with < 2 t caught total since 2003. Copper rockfish is a species closely associated with high relief rocky habitat, is found in shallow nearshore waters, and is a benthic feeder only caught on hook and line gear. Thus, even though it's growth characteristics place it with the OR species, it is appropriate to group it with the DSR species. Splitnose rockfish are primarily caught in the rockfish trawl fishery, and are appropriately grouped with the other OR species.

Rosethorn and canary rockfish are both in the DSR complex in EY/SEO. Both species feed on benthic prey (canary also feeds on pelagic prey), and observer data suggests both are primarily caught on the slope in trawl gear, but on hook and line gear in EY/SEO (trawling is not allowed in EY/SEO). GOA-wide, catches average < 2 t and < 1 t annually since 2003 (rosethorn and canary, respectively). Canary are primarily caught in the EY/SEO region, while rosethorn are primarily caught in the WY region. While these two species span characteristics of both complexes, their life history suggests they should be grouped with the other DSR species.

Silvergray rockfish were initially targeted as part of the DSR complex, and landings of silvergray rockfish still occur in the DSR fishery. When Amendment 21 of the GOA FMP went into effect, silvergray rockfish were moved out of DSR and into the then Other Slope Rockfish complex. The age and growth characteristics of silvergray rockfish would group them with DSR species; however, the species tends to school off bottom and while it is caught in hook and line fisheries, it is primarily caught in rockfish trawl fisheries, similar to the OR species.

Redbanded rockfish is the species which is most difficult to associate with either complex. Prior to the formation of the DSR complex, the redbanded rockfish were part of the "Slope Rockfish" group. When

the DSR complex was formed, Amendment 21 moved the species into DSR, but the species was moved back to the then Other Slope Rockfish group in 1997. The species appears to be long lived and presumably slow growing (only maximum age is available), is a benthic feeder, and tends to be non-schooling. It tends to be found inhabiting hard bottom habitats, which are subject to both trawl and hook and line gear and is caught in inshore and offshore waters.

While data is limited, the life history characteristics suggest that the current complex groupings are not appropriate for these species. The life history and ecology is divergent enough to suggest that the seven DSR species should be grouped together GOA – wide. The current grouping puts these species in with the OR species in all areas west of EY/SEO. Based on life history characteristics, the only reasonable alternative grouping not previously discussed would be to move redbanded rockfish back to the DSR group. We have included that as an option to the GOA – wide DSR complex, Alternative 3c below.

Catch of the DSR species GOA-wide

Catch of the seven DSR species is provided by the NMFS Alaska Regional Office Catch Accounting System for catch in federally managed fisheries and the Pacific Halibut IFQ fishery. Other estimates of catch are provided by the State of Alaska for the directed, subsistence, and sport fisheries in EY/SEO, as well as estimated bycatch from the Pacific Halibut fishery, prior to the 2013 observer restructuring. Considering the seven DSR species in a GOA-wide context, total catches do not exceed 500 t and yelloweye rockfish is the predominant species (Table 1). In the EY/SEO areas, retention of all seven DSR species has been required since 2005, thus recorded catches prior to 2005 may not be representative of total catch.

While most of the catch has historically occurred in the EY/SEO area, the proportion of the total catch originating in the CGOA has been increasing (Figure 3). The increase in the CGOA has not been previously investigated as the catch of DSR species within the larger OR complex is comparatively small (Table 1 and Table 2). Much of the catch occurs on hook and line vessels, primarily targeting Pacific cod and Pacific halibut. The increased catch is predominantly from quillback rockfish retention, suggesting a potential market demand. The GOA is believed to be at the northern edge of the ranges for the DSR species; therefore, the majority of the biomass is in the EY/SEO region. While the distribution of the catch appears to be expanding towards the west, the total catch of these seven DSR species is not increasing. Yelloweye rockfish comprises the majority of the catch composition of DSR species (Table 1 and Figure 3) in all regions.

The bycatch only fishery for the DSR species in Prince William Sound and the Cook Inlet is managed by the State of Alaska and is not subject to the GOA FMP. There is a directed rockfish fishery for Pelagic Shelf Rockfish (PSR: dark, dusky, widow, yellowtail, black and blue rockfish) in Cook Inlet; harvest for directed and bycatch both accrue towards the guideline harvest level (GHL). Cook Inlet and PWS have GHLs which apply to all rockfish species; the GHL is based on mean historical catch and is 68 t for each area. The average DSR catch from 2013 – 2016 in Prince William Sound was 30 tons, 38% of the total rockfish caught. This harvest was composed primarily of yelloweye rockfish with quillback rockfish being the second most common species caught. Most of the Cook Inlet rockfish catch from 2013 – 2016 has been PSR due to the directed fishery. From 2013 – 2016, the DSR catch in the Cook Inlet area comprised 35% of the total, 17 tons, caught as bycatch to other groundfish fisheries.

Surveys available for the DSR species

There are three main surveys conducted regularly across the entire GOA: the NMFS biennial trawl survey, the NMFS annual longline survey, and the IPHC annual longline survey. The seven DSR species are not sampled well by trawl surveys due to their affinity for high relief rocky habitats; thus, the trawl survey provides limited useful information for these species. Further, beginning in the 2016 fishery, ABCs for the seven species were calculated using Tier 6 methods (catch history) as opposed to the former Tier 5 methods (trawl survey biomass). As described above, the IPHC survey data may be useful as an

indicator of trends for three of the DSR species (Figure 4, redbanded rockfish is also included for the purposes of this document). The NMFS annual longline survey also provides RPNs for yelloweye rockfish, however this survey often samples deeper waters than preferred habitat for the DSR species and so catch of yelloweye rockfish is variable and abundance estimates are likely more uncertain than those from the IPHC survey. The RPNs provided by these two longline surveys may be useful as model inputs to estimate biomass used to calculate ABCs. However, in areas where the catch of the species of interest is irregular or rare, the RPN index may not be representative of the population and should be used with caution.

In the EY/SEO region, the ADFG has operated manned submersibles (biennially 1988 – 2009) and remotely operated vehicles (ROV, annual 2012 – present) surveys for yelloweye rockfish that are rotated among 4 different ADF&G management areas with each area typically being surveyed once every 4 years. ADF&G management areas for the DSR complex within the EY/SEO region include: East Yakutat (EYKT), Northern Southeast Outside (NSEO), Central Southeast Outside (CSEO), Southern Southeast Outside (SSEO) Sections. Data collected during these surveys are used to calculate the yelloweye biomass estimate for the DSR complex. There are large mesh trawl surveys operating in the WGOA, PWS, and Cook Inlet that provide CPUE and length data. However, these surveys are designed to target crab habitat and sample few DSR; furthermore, the surveys are subject to funding availability. Thus, these trawl surveys may not be useful for a GOA-wide assessment. The State of Alaska has also operated an ROV survey in PWS that provides a presence/absence index used for assessment of yelloweye rockfish in the state managed fishery in PWS. The future of the PWS survey is uncertain due to lack of funding.

Alternative Management Options

In September 2015 we proposed and discussed three potential management options: 1) status quo; 2) move all of the EY/SEO DSR species to the GOA - wide OR assessment; and 3) remove all seven of the DSR species from the OR assessment, place them in the DSR complex assessment and make the DSR assessment GOA - wide rather than specific to EY/SEO. No action was taken at that time, however, both the SSC and PT requested further discussion, of Alternative 3 in particular. The below text and tables are similar to that presented in 2015, but updated with recent catch data and inclusive of feedback from industry, the SSC and PTs. The ABC/OFLs presented here were calculated for each scenario based on data available through the end of 2016, noting that biennial trawl survey data for the Tier 4/5 species in the OR complex is currently only available through 2015.

Alternative 1: Status Quo

Retain existing OR/DSR complex structures. The DSR complex assessment includes the seven DSR species in EY/SEO (NMFS area 650). The OR complex assessment consists of the DSR complex species and the OR complex species in the WGOA, CGOA and WY portion of the Eastern GOA, and only the OR complex species in EY/SEO

Alternative 2: Bring DSR into the OR complex

Alternative 2 would merge the EY/SEO DSR complex and the GOA OR complex assessment and dissolve the EY/SEO DSR complex. The biennial NMFS trawl survey does not provide a reliable biomass estimate for the DSR species in any area, thus if DSR were included in the OR assessment, ABC/OFLs would be calculated using either Tier 6 or the existing Tier 4 methods for yelloweye rockfish in EY/SEO only. We present three potential scenarios for calculating the OR complex ABC/OFL in Alternative 2.

- Alternative 2, Scenario a) Place the DSR species in Tier 6 with ABC and OFL estimates based on the historical time series of catch calculated by species for each region and added to the apportioned ABC/total OFL for the OR complex.
- Alternative 2, Scenario b) Place the DSR species in Tier 6 with ABC and OFL estimates based on the historical time series of catch calculated by species for each region. ABCs would be

maintained separately for each management group, the OFLs would be added to the apportioned total OFL for the OR complex.

- Alternative 2, Scenario c) Place the DSR species in Tier 6, with the exception of yelloweye rockfish in EY/SEO, with ABC and OFL estimates based on the historical time series of catch calculated by species for each region. Maintain yelloweye rockfish in EY/SEO as Tier 4. ABCs would be added to the apportioned OR complex ABC with the exception of a separate ABC for EY/SEO. The OFLs would be added to the apportioned total OFL for the OR complex.

The State of Alaska manages directed, subsistence, and recreational fisheries that fall under the ABC in the EY/SEO region. The Alternative 2 scenarios need to account for this portion of the State managed fishery catch in the OR complex ABC. State managed fisheries do not fall under Federal in-season management, thus the ABC in the EY/SEO region would need to be partitioned between Federally managed fisheries and State managed fisheries. For the purposes of this document, we calculated the EY/SEO State fishery portion of the DSR ABC to be total ABC for the region less the mean catch in Federal fisheries (including the Pacific Halibut fishery) since observer restructuring went into effect (i.e., 2013 – 2016), thus, the State ABC = Total DSR species ABC – mean Federal catch of DSR species. We used the author recommended DSR ABC from the 2015 SAFE (yelloweye rockfish = 211 t and all other DSR species = 20 t) as opposed to the maximum permissible as per historical precedence (Green et al. 2015).

Tier 6 methods are based on a fixed time frame of the historical catch data from which the ABC and OFL catch limits are derived. The commonly used time series for many of the GOA Tier 6 assessments is 1997 – 2007, based on when reliable species identification became available for those assessments. It is reasonable to assume that the species identification for the rockfish species listed here was accurate prior to 1997. It is possible that the time series of catch may be biased low due to unobserved discards prior to the observer restructuring, which occurred in 2013. Catch estimates exist for the seven DSR species outside of the EY/SEO beginning in 1991; however, the recent time series starting in 2013 may be the most reliable catch time series. The DSR species are not targeted, but have market value and are often retained. In the CGOA and WY regions the discard rates were 19% and 16% on average, respectively, prior to observer restructuring (2003 – 2012), and were 22% and 27% on average, respectively, post-observer restructuring (2013 – present). Discard rates of the DSR species in the WGOA are generally higher, on average 48% prior to observer restructuring and 66% since. This change in discard rates suggests that time series of catch prior to observer restructuring may not have represented all discards. Discard rates are highly variable from year to year and the apparent increase in discard rates is not significantly different. However, there is a very short time series of data available post observer restructuring. Landings data are available for the DSR by species in EY/SEO beginning in 1995, but full retention was not enacted until 2005, thus the landings prior to 2005 may be biased low relative to total catch. All catch data for the DSR species in the EY/SEO are provided by ADF&G and it is currently unknown if there are any conflicts or overlaps between the ADF&G catch estimates and those generated by CAS (NMFS Alaska Regional Office, Catch Accounting System). The CAS catch estimates are not included in the current DSR assessment (which is in EY/SEO only).

For the purposes of this document, Tier 6 calculations are based on catch estimates from 2013 – 2016, to ensure consistency in catch estimation and species identification between regions and data sources, and to use the most representative catch estimate time series. The maximum historical catch from 2013 – 2016 was used for Tier 6 calculations (OFL = maximum historical catch, ABC = 0.75*OFL). The ABC was calculated by area for each species and then added to the apportioned Tier 5 ABCs.

The Tier 6 estimates in the EY/SEO for the non-yelloweye rockfish species include estimated sport and subsistence catch to maintain consistency with the current assessment. Sport harvest estimates are available since 2006, when the current creel census program went into effect; however, sport harvest estimates from 2006 – 2008 extend to 144° W longitude, encompassing a greater area than EY/SEO

(which extends to 140° latitude). Subsistence harvest estimates are available only from 2010 – 2015. Thus, for the purposes of this document, the maximum sport (2013 – 2016) and subsistence (2013 – 2015) harvest of the DSR species in the EY/SEO area were added to the maximum of the commercial catch described above to calculate ABCs.

The PT and SSC expressed concerns over using the maximum historical catch for Tier 6 calculations because, by definition, it can only increase. For brevity, we continue to use only the maximum historical catch in this document, but include the below table comparing various Tier 6 alternatives for reference.

Table comparing potential Tier 6 estimation methods for the seven DSR species in each management area, with the exception that yelloweye rockfish is not included in the Tier 6 estimates for EY/SEO. Subsistence data are not included after 2015 for EY/SEO. These values are based on calculating the max, mean, etc. for the individual species and then summing across species, not at the group level.

Method	Metric	WGOA	CGOA	WY	EY/SEO	Total
Max	OFL	39	156	29	26	250
	ABC	29	117	22	20	188
Mean	OFL	32	109	16	22	179
	ABC	24	82	12	17	135
Perc75	OFL	35	112	17	25	189
	ABC	26	84	13	19	142
Perc95	OFL	38	114	18	26	196
	ABC	29	86	14	20	149
Median	OFL	31	116	16	22	185
	ABC	23	87	12	17	139

Alternative 3: Make a GOA - wide DSR assessment

Alternative 3 would create a GOA-wide DSR complex assessment by expanding the DSR assessment to be GOA – wide and moving the canary, China, copper, quillback, rosethorn, tiger, and yelloweye rockfish from the OR assessment (in all areas west of EY/SEO) to the expanded DSR. When this was last presented we included two scenarios. We have since included a third scenario in response to SSC comments.

- Alternative 3, Scenario a) Use Tier 6 methods for the six non-yelloweye rockfish DSR species GOA-wide. In EY/SEO, the Tier 4 approach currently used for yelloweye rockfish would be maintained, but Tier 6 methods would be used for yelloweye rockfish in all other regions. The complex ABC/OFLs would be the sum of the individual species estimates by region.
- Alternative 3, Scenario b) Create a GOA-wide age structured stock assessment for DSR, based on an expansion of the preliminary age-structured DSR assessment from the EY/SEO.
- Alternative 3, Scenario c) Same as Alternative 3a, but with redbanded rockfish shifted from OR to DSR.

Discussions of a GOA-wide age-structured model for DSR (specifically, yelloweye rockfish) are beyond the scope of this report, but the authors have consulted with that working group. The working group established to examine the feasibility of a GOA-wide DSR age-structured assessment has concerns over limited data availability. Specifically, there is not a directed fishery for DSR in the CGOA or WGOA; therefore, existing data are from incidental catch records. The surveys (e.g., trawl, IPHC, etc.) previously mentioned do not effectively capture DSR species (i.e., trawls), or have poor estimates of CPUE for rare species (i.e., in the IPHC survey, DSR caught on the first 20 hook counts are recorded and extrapolated to the rest of the catch). Due to the lack of a targeted fishery or surveys for DSR in the CGOA and WGOA,

it is anticipated that model inputs, such as catch data, would have high annual variability. Even in the EY/SEO area(s), which has the most abundant DSR data, the IPHC longline survey data are highly variable and not of great value in the age-structured model. It is also unclear how representative EY/SEO fish are for GOA-wide fish especially considering what is expected to be limited lifetime movement for species like yelloweye. Thus, a GOA-wide age-structured model that only fitted age data from one region of the GOA would be making a very strong assumption that this population is well mixed. For these reasons, Alternative 3b has not been pursued further and results are excluded from the table below.

Alternative 3c responds to a request by the SSC to look at further options for species groupings. As discussed in the *Life History* section, the most reasonable candidate would be to include the redbanded rockfish in the DSR group.

Table of the potential ABC estimates (t) for the alternatives described above where estimates were available. Estimates are separated by Other Rockfish (OR) or Demersal Shelf Rockfish (DSR) sub groups where applicable.

Alt	Complex	Other Rockfish Sub Group ABC				Demersal Shelf Rockfish Sub Group ABC					GOA-wide	
		W GOA	C GOA	Eastern WY	GOA EY/SEO	W GOA	C GOA	Eastern WY	GOA EY/SEO	ADFG ¹	ABC	OFL
1	OR	55	1,479	574	3,661						5,769	7,424
	DSR								231		231	364
2a	OR	56	1,510	583	3,681					63	5,830	7,744
2b	OR	27	1,393	561	3,661	29	117	22	137 ²	63	5,947	7,744
2c	OR	56	1,510	583	3,681				137 ^{2,3}	94	5,967	7,842
3a	OR	27	1,393	561	3,661						5,642	7,254
	DSR					29	117	22	231		399	588
3c	OR ⁵	25	1,311	528	3,445						5,309	6,826
	DSR					32	148	29	271 ⁴		480	696

¹In these examples the ADF&G ABC is not federally managed, but a calculated allocation is delegated to State management for directed fisheries only. Non-directed (incidental catch from the IFQ halibut fishery) would be managed federally.

²153 t is the mean federal fishery total catch of DSR since observer restructuring took effect in 2013. This amount was subtracted from the yelloweye rockfish ABC (either by Tier 6 methods or the Tier 4 value from the most recent SAFE) to determine the amount of ABC needed for allocation to the State of Alaska for the directed, subsistence, and sport fisheries.

³This ABC only applies to yelloweye rockfish in EY/SEO.

⁴This is different from the status quo EY/SEO DSR ABC because ABCs were calculated for the non-yelloweye rockfish species using Tier 6 methods and added to the recommended yelloweye rockfish ABC/OFL. In the status quo approach, the yelloweye rockfish ABC is increased by 3% to account for the other six non-yelloweye rockfish species.

⁵The random effects model was not re-run for the OR complex without redbanded rockfish, but redbanded rockfish are on average 6% of the total complex biomass, so the OR ABC examples for Alternative 3c were decreased by that percentage from Alternative 3a.

Discussion and Recommendations

We have presented a variety of alternative management scenarios to investigate if a different management scheme would be more appropriate for the DSR species GOA-wide. The three alternatives have pros and cons, but the authors feel that Alternative 3a is the most appropriate for this group of species.

Alternative 1 (status quo) is the simplest option. However, the management structure may not be appropriate for yelloweye rockfish and the other DSR species being considered here. Adding yelloweye rockfish to the OR complex or not assessing it GOA-wide is problematic based on the following:

- 1) This species is slower growing, longer-lived and late to mature compared to most of the OR complex;
- 2) There are directed State fisheries for the species, as well as substantial catch in federal fisheries;
- 3) This species is primarily caught by longline gear, but in the OR complex catch is dominated by trawl fishery bycatch, and any trends in catch or survey indices for yelloweye rockfish would be masked in this large complex.

The above comments also apply to the six non-yelloweye species, which are also predominantly caught by longline gear, poorly sampled by surveys, and are not targeted and with small catch (average ~13 t, annually 2005 – 2016). As with yelloweye rockfish, the spatial composition of the catch of these six species has shifted westward (Figure 3).

Alternative 2, Scenarios a – c (moving DSR into the OR assessment) is not recommended. We do not recommend Alternative 2 for a number of reasons. First, any potential conservation issues that may arise within the DSR complex may be masked by the larger OR complex being dominated by trawl caught species such as harlequin and silvergray rockfish. Each of the scenarios in Alternative 2 is complex, e.g. Alternative 2b, would result in six ABCs to manage in-season. Additionally, ABCs under 50 t are potentially too small to effectively manage. It is possible to combine some ABCs, such as combining WY and EY/SEO, similar to how many species are managed in the GOA. The WY was split from EY/SEO to prevent disproportionate harvest relative to estimated biomass when GOA Groundfish FMP Amendment 11 was adopted by the Council in July 1982. The FMP states that: “This division is intended to protect localized sablefish stocks and demersal shelf rockfish stocks and is necessary to prevent overexploitation in the Eastern regulatory area. The Southeast Outside district delineates the primary rockfish fishing ground in this region.” However, this amendment was put in place prior to the trawling restrictions in the EY/SEO area, and may not apply to this situation. Alternative 2 would require an FMP amendment to dissolve the DSR complex as well as to combine the WY and EY/SEO (if that were chosen), adding another level of challenge to this alternative.

Alternatives 2a & b would also eliminate the historical open access directed fisheries managed by ADF&G. The ADF&G typically opens up one to three of the four management areas with a combined annual directed quota of approximately 30 to 100 t. A directed quota on the order of 40 t may be insufficient to hold a directed fishery.

Our preferred option is Alternative 3a (GOA-wide DSR assessment). This alternative would afford the DSR species a higher level of management oversight in the WGOA and CGOA and would be relatively simple to implement from a stock assessment perspective. Relevant concerns and considerations for Alternative 3a are: potential ABC/OFL overages, stock assessments, jurisdictions, regulatory implementation, in-season management and potential for conservation concerns.

While redbanded rockfish could be grouped with the DSR species (and has in the past) based on life history, we do not recommend Alternative 3c. The species is caught in both hook and line and trawl fisheries. Since 2003, 55% of redbanded catch, on average, has occurred in trawl fisheries, but for the last

3 three years >70% of the catch has been from trawl fisheries. The species is relatively well sampled by the trawl survey compared to other species in either complex with CVs on average ~27%.

Exceeding the ABC or nearing the OFL could limit other fisheries as the Federally managed fisheries could be prohibited. When examining the most recent 15 years of catch, the estimated ABC for EY/SEO would have been exceeded in four years, the WY estimated ABC would have been exceeded in eight years, the WGOA in 10 out of 15 years, and the CGOA in five of the years. However, the GOA-wide proposed OFL would not have been exceeded. To reduce the potential of overages due to small ABCs and the non-target nature of the catch of these species, particularly outside of EY/SEO, we recommend the following ABC groupings for a GOA-wide DSR complex, based on Alternative 3a above (all species Tier 6 (max catch) with the exception of EY/SEO yelloweye rockfish is Tier 4):

	Western/Central GOA + West Yakutat	Eastern GOA – EY/SEO only	Total
Area ABC (t)	168	231	399
OFL (t)			588

We recommend combining the WY ABC with that of the WGOA and CGOA areas because the fishery characteristics differ between EY/SEO and the rest of the GOA. In EY/SEO there are state managed directed fisheries, and non-directed fisheries included in the assessment. The catch in the EY/SEO has been much less than the ABC for the last 5 years. In all other areas catch of the DSR species is incidental. With the above recommended ABCs, the WGOA/CGOA/WY ABC would have been exceeded in seven of the last 15 years. If an ABC were to be exceeded, it would place these species on non-retention status, but would not prevent fisheries from continuing.

Alternative 3a would be easily implemented in the existing stock assessments. The current DSR assessment is conducted by the ADF&G, and includes state-managed fisheries. The proposed alternative would retain that assessment structure, and incorporate the DSR species to the west of EY/SEO. Being Tier 6, it would be relatively simple to add these species to the existing assessment. The NMFS would participate in the GOA-wide DSR assessment as well, in that NMFS would provide survey data and estimates of catch from federal fisheries (and the Pacific Halibut IFQ fishery) and staff to participate in the assessment (i.e., co-authorship).

Alternative 3a would not change the current jurisdictional structure. The State of Alaska would maintain the management of the DSR fisheries in the EY/SEO and the NMFS would manage the DSR catch in the federal fisheries west of EY/SEO.

From a regulatory standpoint, implementing Alternative 3a would be relatively simple because it does not require changes to the FMP. Expanding the DSR assessment to be GOA-wide would only require a change to footnote 4 in Table 10 to Part 679 of the GOA FMP.

The primary challenge with Alternative 3a is in-season management. From a management perspective, Alternative 3a is challenging. The DSR species are currently part of the larger OR complex in all areas west of EY/SEO. The vast majority of the catch of the OR complex comes from the rockfish trawl fishery, while DSR species are rarely caught in the rockfish trawl fishery, but rather in the Pacific halibut fishery. Thus, breaking the DSR species out from the OR complex in the WGOA and CGOA (and WY) would improve tracking of DSR species because they would not be obfuscated by the more predominant OR species. However, the breakout would result in smaller and potentially difficult to manage ABCs, even if the WGOA, CGOA and WY were combined. Further, the Pacific halibut IFQ fishery is the primary source of catch for the DSR species, and NMFS does not have jurisdiction to manage this fishery. If a DSR OFL were approached, NMFS may prohibit directed fishing for federally managed groundfish fisheries (e.g., rockfish trawl), but not for Pacific halibut IFQ. On the other hand, under Alternative 3a, if

the OR ABC is exceeded, the Pacific halibut fishery would not be put on discard status for the DSR fishery, as occurs with the existing management protocol.

Proposed Alternative 3a is the most appropriate alternative based on the biology of all 25 OR and DSR species. The stock structure analysis suggests that the biological characteristics of the DSR species are dissimilar from the other OR species; DSR species tend to be nearshore, slower growing with greater longevity, and thus likely have lower productivity. Whereas the 17 remaining OR species tend to be pelagic, offshore, faster growing, shorter-lived, and may have higher dispersal. The one exception is the redbanded rockfish, which is an intermediary to both groups. At this time, available data do not suggest a conservation concern in the DSR species to the west of the EY/SEO area. There is a paucity of data to inform managers on these species; however, it is reasonable to assume that the shift in catch from east to west could be indicative of a distributional shift. Further, the IPHC survey, the only consistent survey that catches these species west of EY/SEO exhibits stable catches of the two most commonly caught DSR species: quillback and yelloweye rockfish. In comparison, the EY/SEO ROV survey suggests declines in the density estimates of yelloweye rockfish.

In conclusion, the assessment authors of both the OR and DSR assessments recommend Alternative 3a as a more appropriate management grouping for these species. While there are no obvious conservation concerns based on available data, the biology of the species in the DSR complex (in particular, yelloweye rockfish) necessitates a higher degree of oversight. Implementing Alternative 3a has minimal regulatory changes and does not require an FMP amendment. In-season management of small ABCs has challenges, but this alternative ensures DSR catch won't be obscured in the larger OR complex, especially given the market value of the DSR species and the lower discard rate.

Literature Cited

- Green, K., K. Van Kirk, J. Stahl, M. Jaenicke, and S. Meyer. 2015. Assessment of the demersal shelf rockfish stock for 2014 in the southeast outside district of the Gulf of Alaska. *In* 2014 Stock Assessment and Fishery Evaluation Report for 2015. North Pacific Fishery Management Council, Anchorage, AK. Pgs. 1219 – 1302.
- Tribuzio, C. A. and K. B. Echave. 2015. Assessment of the other rockfish stock complex in the Gulf of Alaska. *In* 2014 Stock Assessment and Fishery Evaluation Report for 2015. North Pacific Fishery Management Council, Anchorage, AK. Pgs. 1351 – 1464.

Tables

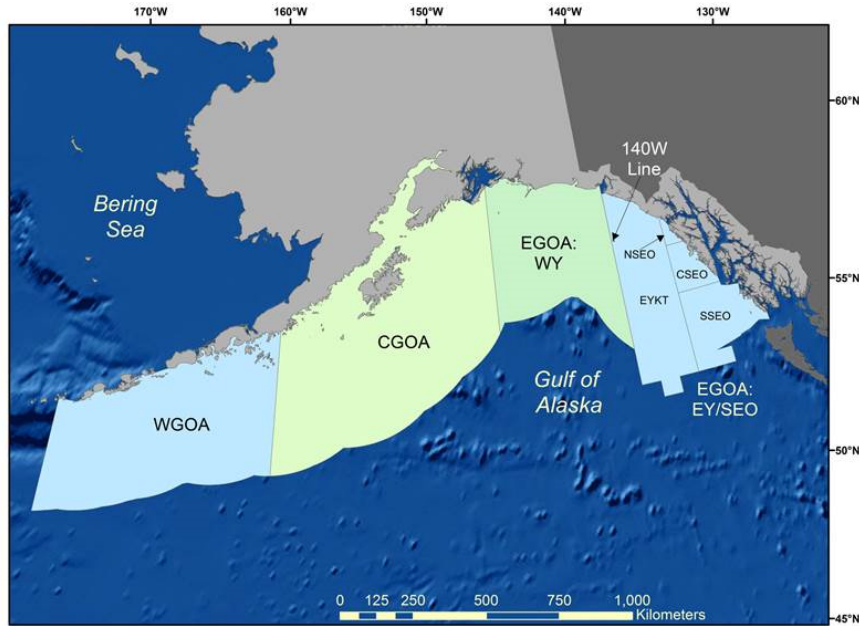
Table 1. Catch of the seven Demersal Shelf Rockfish (DSR) species across the full Gulf of Alaska (GOA), broken out by Yelloweye Rockfish (YE) and all others combined. Data is provided by the Alaska Regional Office for the Western Gulf of Alaska (WGOA), Central GOA (CGOA) and West Yakutat (WY) regions. Data for the East Yakutat/Southeast Outside (EY/SEO) Region is provided by the Alaska Department of Fish and Game, which includes sport and subsistence catch estimates when available. There are multiple caveats in this time series of data to make note of: 1) the restructured observer program went into effect for federal fisheries in 2013; 2) beginning in 2005, full retention of Demersal Shelf Rockfish species was required in EY/SEO; 3) sport catch is included in the EY/SEO total catch estimates beginning in 2006 and the 2016 estimates are considered preliminary; and; and 4) subsistence catch estimates in EY/SEO are only available 2010 – 2015.

Year	WGOA		CGOA		WY		EY/SEO		Totals		Total
	YE	Others	YE	Others	YE	Others	YE	Others	YE	Others	
1995	<1	<1	30	1	8	4	238	20	276	25	301
1996	2	<1	21	1	7	6	398	27	428	34	462
1997	6	<1	22	<1	15	<1	343	22	386	22	408
1998	2	<1	18	<1	9	1	340	19	369	20	389
1999	3	<1	112	1	15	1	348	18	478	20	498
2000	7	<1	13	1	16	<1	275	12	311	13	324
2001	6	<1	18	<1	5	<1	304	13	333	13	346
2002	6	<1	12	1	3	1	270	13	291	15	306
2003	39	<1	84	3	26	2	256	13	405	18	423
2004	35	<1	73	1	20	<1	315	12	443	13	456
2005	18	<1	59	1	12	<1	228	5	317	6	323
2006	46	<1	71	2	29	1	199	4	345	7	352
2007	21	<1	83	1	28	1	192	3	324	5	329
2008	46	1	129	3	25	<1	190	4	390	8	398
2009	41	1	99	2	27	1	209	5	376	9	385
2010	52	1	112	6	36	1	160	52	360	60	420
2011	56	1	98	6	22	1	150	16	326	24	350
2012	51	1	133	10	15	<1	200	22	399	33	432
2013	38	1	106	8	17	1	239	26	400	36	436
2014	25	<1	98	6	13	1	119	18	255	25	280
2015	36	<1	130	25	23	5	128	23	317	53	370
2016	12	<1	98	20	10	1	140	22	260	43	303

Table 2. Catch (excluding research catches), acceptable biological catch (ABC) and total allowable catch (TAC) of the Other Rockfish (OR) and Demersal Shelf Rockfish (DSR) complexes. Data for the OR is from the Alaska Regional Office and for the DSR is from the most recent full assessment (Table 2, Green et al. 2015) and updated for this analysis by the authors.

Year	Other Rockfish							Demersal Shelf Rockfish		
	WGOA	CGOA	WY	EY/SE	Total	ABC	TAC	EY/SE	ABC	TAC
1991	20	175	81	2	278	10,100	10,100			
1992	76	854	731	14	1,675	14,060	14,060	478	550	550
1993	342	2423	735	1,923	5,423	8,300	5,383	522	800	800
1994	101	715	564	233	1,613	8,300	2,235	600	960	960
1995	31	883	460	23	1,397	7,110	2,235	258	580	580
1996	19	618	233	11	881	7,110	2,020	425	945	945
1997	68	941	123	85	1,217	5,260	2,170	364	945	945
1998	46	701	108	6	861	5,260	2,170	359	560	560
1999	39	614	125	10	788	5,270	5,270	366	560	560
2000	49	363	132	33	577	4,900	4,900	287	340	340
2001	25	318	169	47	559	4,900	1,010	317	330	330
2002	223	481	45	25	774	5,040	990	283	350	350
2003	133	683	227	26	1,069	5,050	990	269	390	390
2004	269	582	78	31	960	3,900	670	327	450	450
2005	65	516	71	48	700	3,900	670	233	410	410
2006	279	604	138	79	1,100	4,152	1,480	267	410	410
2007	249	340	54	53	696	4,154	1,482	270	410	410
2008	250	439	50	29	768	4,297	1,730	245	382	382
2009	403	403	83	15	904	4,297	1,730	248	362	362
2010	365	439	131	40	975	3,749	1,192	212	295	295
2011	301	366	190	38	895	3,749	1,192	166	300	300
2012	254	723	37	23	1,037	4,045	1,080	222	293	293
2013	202	474	77	63	816	4,045	1,080	265	303	303
2014	171	717	60	38	986	4,080	1,811	137	274	274
2015	210	842	36	19	1,107	4,080	1,811	151	225	225
2016	156	1,033	53	40	1,282	5,773	2,308	162	231	231

Figures



Other Rockfish			Demersal Shelf Rockfish
WGOA & CGOA	EGOA:WY	EGOA:EY/SEO	EGOA:EY/SEO
Blackgill Rockfish	Blackgill Rockfish	Blackgill Rockfish	
Bocaccio	Bocaccio	Bocaccio	
Canary Rockfish	Canary Rockfish		Canary Rockfish
Chilipepper Rockfish	Chilipepper Rockfish	Chilipepper Rockfish	
China Rockfish	China Rockfish		China Rockfish
Copper Rockfish	Copper Rockfish		Copper Rockfish
Darkblotched Rockfish	Darkblotched Rockfish	Darkblotched Rockfish	
Greenstriped Rockfish	Greenstriped Rockfish	Greenstriped Rockfish	
Harlequin Rockfish	Harlequin Rockfish	Harlequin Rockfish	
	Northern Rockfish	Northern Rockfish	
Pygmy Rockfish	Pygmy Rockfish	Pygmy Rockfish	
Quillback Rockfish	Quillback Rockfish		Quillback Rockfish
Redbanded Rockfish	Redbanded Rockfish	Redbanded Rockfish	
Redstripe Rockfish	Redstripe Rockfish	Redstripe Rockfish	
Rosethorn Rockfish	Rosethorn Rockfish		Rosethorn Rockfish
Sharpchin Rockfish	Sharpchin Rockfish	Sharpchin Rockfish	
Silvergray Rockfish	Silvergray Rockfish	Silvergray Rockfish	
Splitnose Rockfish	Splitnose Rockfish	Splitnose Rockfish	
Stripetail Rockfish	Stripetail Rockfish	Stripetail Rockfish	
Tiger Rockfish	Tiger Rockfish		Tiger Rockfish
Vermilion Rockfish	Vermilion Rockfish	Vermilion Rockfish	
Widow Rockfish	Widow Rockfish	Widow Rockfish	
Yelloweye Rockfish	Yelloweye Rockfish		Yelloweye Rockfish
Yellowmouth Rockfish	Yellowmouth Rockfish	Yellowmouth Rockfish	
Yellowtail Rockfish	Yellowtail Rockfish	Yellowtail Rockfish	

Figure 1. Map of the Gulf of Alaska (GOA) management areas: Western (WGOA), Central (CGOA) and Eastern (EGOA) with the species of the Other Rockfish (OR) and Demersal Shelf Rockfish (DSR) included for each area. The EGOA is subdivided into the West Yakutat (WY) and East Yakutat/Southeast Outside (EY/SEO) areas. The EY/SEO is subdivided for the DSR complex into East Yakutat (EYKT), Northern, Central and Southern Southeast Outside (NSEO, CSEO, and SSEO, respectively). The table below the figure lists the species that are part of the each complex in each of the areas.

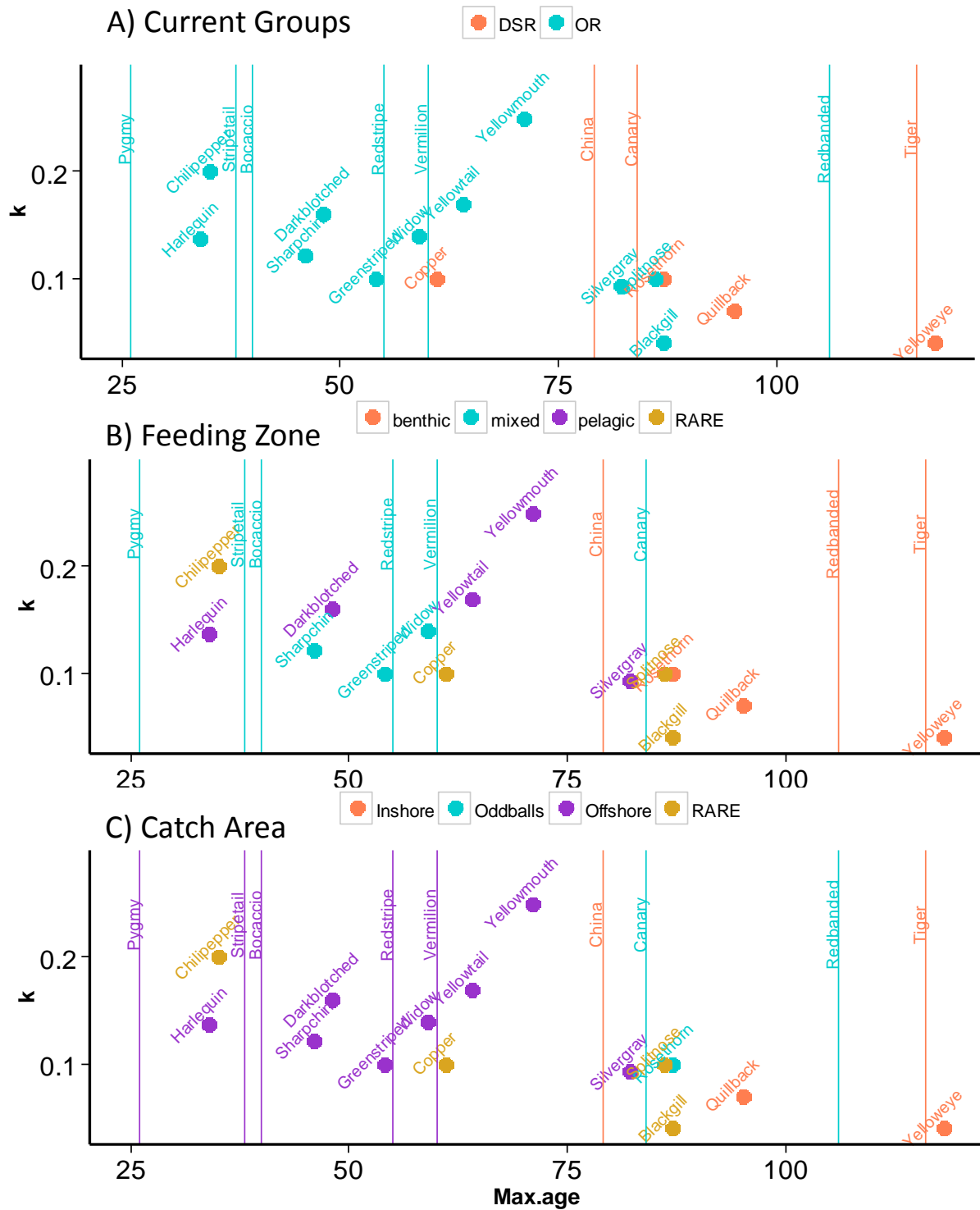


Figure 2. Life history comparison of the species of the Other Rockfish (OR) and Demersal Shelf Rockfish (DSR) complexes, categorized by: A) current complex groupings; B) primary feeding zone; and C) area of primary catch.

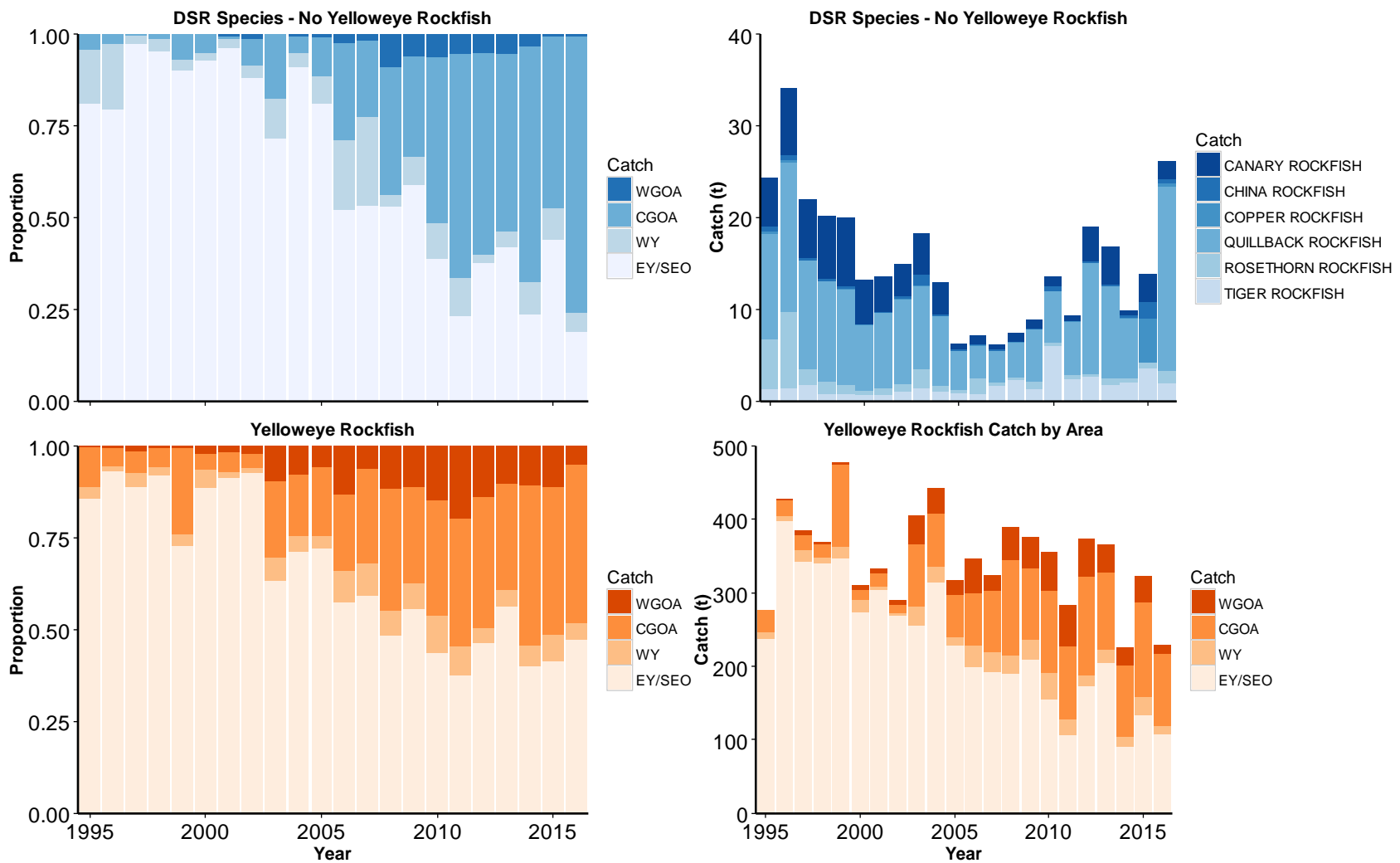


Figure 3. Catch distribution by management area for: A) all of the DSR species except yelloweye rockfish, and B) just yelloweye rockfish. C) Catch by species for all of the DSR species except yelloweye rockfish, and D) catch by area for just the yelloweye rockfish. Catch estimates in EY/SEO include estimated catch from State managed directed fisheries, subsistence and sport fisheries. The time series of catch in EY/SEO has the following caveats: retention was not required until 2005, sport fishery estimates are available 2006 – 2016 and the 2016 estimates are preliminary, subsistence estimates available from 2010 - 2015. Further, the restructured observer program went into effect in 2013.

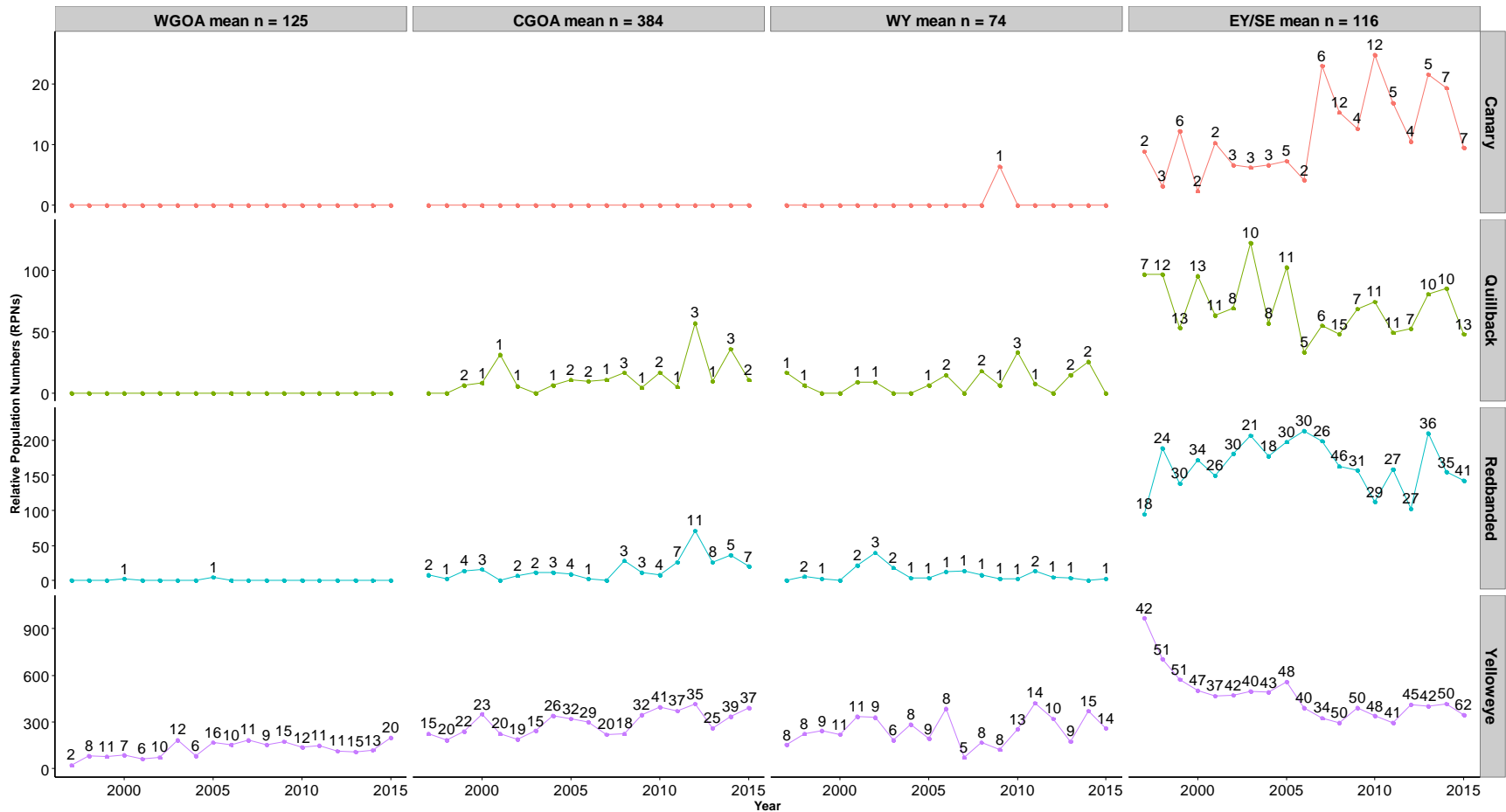


Figure 4. Relative Population Numbers (RPNs) from the International Pacific Halibut Commission (IPHC) annual longline survey for the most commonly caught species of Other Rockfish (OR) and Demersal Shelf Rockfish (DSR). The RPNs are calculated by region: Western Gulf of Alaska (WGOA), Central GOA (CGOA), West Yakutat (WY) and East Yakutat/Southeast Outside (EY/SEO). The mean numbers of stations that occur in each area annually are provided. The numbers above the points represent the number of station in which that species was captured that year.