

GROUND FISH MANAGEMENT TEAM REPORT ON STOCK COMPLEXES

In September 2021, the Council requested the Groundfish Management Team (GMT) prepare a comprehensive evaluation of mortality estimates compared to harvest specification contributions of the species managed in stock complexes as part of the materials brought forward for the November meeting. This report provides the data for that request. Our discussions on this subject brought up some bigger picture topics in regard to stock complexes, which we plan to discuss in a supplemental report.

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Species with new Overfished Designations

In cases where the National Marine Fisheries Service declares a species within a complex as overfished based on a new assessment, additional consideration should be given to removal of that species from a complex. Previously, when a species has been designated as overfished (e.g., canary rockfish), it has been removed from a complex and managed with individual harvest

specifications. **The GMT recommends that the Council continue to give that consideration for any species newly designated as overfished.**

Considerations if Species Removed from Complexes

Restructuring of species within a complex would necessitate adjustments to off-the-top deductions and fishery harvest guidelines. New off-the-top deductions and fishery harvest guidelines would need to be developed for species that were no longer incorporated as part of a complex. Some of the information to inform the off the top deductions may be difficult to compile at the species level, given that impacts have been tracked to the complex level. Similarly, for the individual fishing quota (IFQ) fishery mechanisms for distributing species to IFQ owners would need to be developed for the species removed from the complex as well as the remainder of the complex.

Summary Information on the Stock Complexes

At our October work session, the GMT spent a fair bit of time discussing the data available and how best to present it to meet the Council's September request. In this section we provide tables with summary information on the species within each complex (i.e., overfishing limit [OFL] contribution, average annual mortality, stock category, vulnerability, etc.). Species are listed in order of number of years where mortality exceeded the OFL contribution between 2017-2020, with the greatest number of years at the top of the list. The GMT only considered stocks which exceeded their OFL contribution more than twice in the last four years as potential stocks for further examination. We also considered category 1 and 2 stocks for further examination, because category 3 stocks would be challenging to manage outside of the complex due to their data poor nature. To make it easier to review the species whose total removals have exceeded their OFL contribution, the species that do not have an OFL contribution to the complex have been removed from the tables. The detailed data that went into these summary tables can be found in Appendix A. We have not included the three complexes that were created beginning in 2019 (Oregon black/blue/deacon rockfish, Washington cabezon/kelp greenling, and Oregon cabezon/kelp greenling), since there are only two years of data on these complexes so far and state level management has responded to the one overage that happened.

The Productivity and Susceptibility Analysis (PSA) conducted in 2011 is a risk assessment approach consisting of 10 productivity and 12 susceptibility attributes each scored on a three-point scale of high (3.0), medium (2.0), or low (1.0) that when combined provide information on the vulnerability of a species or stock. Cope et al (2011) arrived at the following guidance on vulnerability scores (" V "), which the GMT used as guidance in this report:

- $V \geq 2.2$ indicates stocks of **major** concern;
- $2.0 \leq V < 2.2$ indicates stocks of **high** concern;
- $1.8 \leq V < 2.0$ indicates stocks of **medium** concern; and
- $V < 1.8$ indicates stocks of **low** concern.

Nearshore Rockfish north of 40° 10' N lat.

Four species under this complex exceeded their OFL contributions all four years between 2017 and 2020: black and yellow rockfish, copper rockfish, olive rockfish, and quillback rockfish. Of those four species, copper rockfish and quillback rockfish contribute the most to the complex OFL on average, with 12 percent and 7 percent, respectively. Both copper and quillback rockfishes also

have vulnerability scores of greater than 2.2 (2.27 and 2.22, respectively), indicating that they are both stocks of major concern ([2020 Stock Assessment and Fishery Evaluation](#)). The SSC designated the 2021 stock assessment of the quillback rockfish population off of Washington (WA) to be a category 3 assessment, whereas the stock assessments of quillback rockfish populations off of Oregon (OR) and northern California were designated as category 2 assessments. All three are data moderate assessments and spatially diverge from the prior 2011 assessment which assessed the entire stock North of 40°10' N. lat. as category 3. The 2021 stock assessments of copper rockfish, assessed as four separate areas, were each designated as category 2. **Given that both copper rockfish and quillback rockfish have repeatedly exceeded their species-specific OFL contributions, are stocks of major concern due to their vulnerability scores, and are not Category 3 stocks (with the exception of quillback rockfish off WA), these two stocks may warrant further consideration by the Council.**

Table 1. Species within the nearshore rockfish N. of 40° 10' N lat. complex, the stock assessment category, vulnerability score, average OFL contribution (mt) between 2017-2020, average percent OFL contribution to the complex level OFL, average amount (mt) over or under the OFL contribution between 2017-2020, and the number of years where removals exceeded the OFL between 2017-2020. Category 3 stocks are shown in italics and copper and quillback rockfish are highlighted in bold.

Species	Category	Vulnerability Score	Avg. OFL contribution (2017-2020, mt)	Avg. OFL contribution (2017-2020, percent)	Avg. over/under OFL contribution (2017-2020, mt)	# of years over OFL (2017-2020)
Copper Rockfish	2	2.27	11.74	11.56%	8.69	4
<i>Quillback Rockfish</i>	<i>3,2</i>	<i>2.22</i>	<i>7.37</i>	<i>7.27%</i>	<i>11.94</i>	<i>4</i>
<i>Black and Yellow Rockfish</i>	<i>3</i>	<i>1.70</i>	<i>0.01</i>	<i>0.01%</i>	<i>0.04</i>	<i>4</i>
<i>Olive Rockfish</i>	<i>3</i>	<i>1.87</i>	<i>0.32</i>	<i>0.31%</i>	<i>0.59</i>	<i>4</i>
<i>Kelp Rockfish</i>	<i>3</i>	<i>1.62</i>	<i>0.01</i>	<i>0.01%</i>	<i>0.00</i>	<i>1</i>
Brown Rockfish	2	1.99	2.06	2.03%	-1.19	0
China Rockfish	2	2.23	29.00	28.58%	-17.73	0
<i>Grass Rockfish</i>	<i>3</i>	<i>1.89</i>	<i>0.66</i>	<i>0.65%</i>	<i>-0.22</i>	<i>0</i>
<i>Treefish</i>	<i>3</i>	<i>1.73</i>	<i>0.22</i>	<i>0.21%</i>	<i>-0.22</i>	<i>0</i>
<i>Blue/Deacon Rockfish (WA) a/</i>	<i>3</i>	<i>2.01</i>	<i>8.55</i>	<i>9.37%</i>	<i>N/A</i>	<i>N/A</i>
<i>Blue/Deacon Rockfish (CA) a/</i>	<i>3</i>	<i>2.01</i>	<i>31.70</i>	<i>34.73%</i>	<i>N/A</i>	<i>N/A</i>

a/ 2-year average of 2019-2020. BDRF has shifted around in different complexes, differing by state. Under no scenario in any year evaluated was mortality higher than the OFL contribution

Nearshore Rockfish south of 40° 10' N lat.

Based on the data examined, the GMT identified one species as warranting further consideration: quillback rockfish. The annual total mortality for this species has exceeded the

species-specific OFL contribution every year in the last four years. Additionally, quillback rockfish is considered a species of major concern based on its 2.22 vulnerability score. Another factor to consider is the new assessment and likely rebuilding plan that are forthcoming. That being said, the average contribution to this complex by quillback rockfish is very small (0.41 percent), the smallest contribution in the complex, and the scale of the overage is small relative to deficits from blue rockfish and copper rockfish.

Table 2. Species within the nearshore rockfish S. of 40° 10' N lat. complex, the stock assessment category, vulnerability score, average OFL contribution (mt) between 2017-2020, average percent OFL contribution to the complex level OFL, average amount (mt) over or under the OFL contribution between 2017-2020, and the number of years where removals exceeded the OFL between 2017-2020. Category 3 stocks are shown in italics and quillback rockfish is highlighted in bold.

Species	Category	Vulnerability Score	Avg. OFL contribution (2017-2020, mt)	Avg. OFL contribution (2017-2020, percent)	Avg. over/under OFL contribution (2017-2020, mt)	# of years over OFL (2017-2020)
Quillback Rockfish	2	2.22	5.39	0.41%	1.39	4
China Rockfish	2	2.23	14.07	1.06%	-0.99	2
<i>Treefish Rockfish</i>	<i>3</i>	<i>1.73</i>	<i>13.23</i>	<i>1.00%</i>	<i>-0.96</i>	<i>2</i>
Black and Yellow Rockfish	--	1.70	27.54	2.08%	-6.52	1
<i>Blue Rockfish</i>	<i>2,3</i>	<i>2.01</i>	<i>308.40</i>	<i>23.30%</i>	<i>-131.35</i>	<i>0</i>
Brown Rockfish	2	1.99	175.95	13.29%	-82.64	0
Copper Rockfish	2	2.27	319.23	24.11%	-153.13	0
Gopher Rockfish	2	1.76	148.10	11.19%	-76.49	0
<i>Grass Rockfish</i>	<i>3</i>	<i>1.89</i>	<i>59.63</i>	<i>4.50%</i>	<i>-46.04</i>	<i>0</i>
<i>Kelp Rockfish</i>	<i>3</i>	<i>1.62</i>	<i>27.66</i>	<i>2.09%</i>	<i>-20.13</i>	<i>0</i>
<i>Olive Rockfish</i>	<i>3</i>	<i>1.87</i>	<i>224.64</i>	<i>16.97%</i>	<i>-178.73</i>	<i>0</i>

Shelf Rockfish north of 40° 10' N lat.

Four species under this complex exceeded their OFL contributions at least three times from 2017 to 2020: starry rockfish, tiger rockfish, vermilion rockfish, and stripetail rockfish. Starry, tiger, and vermilion rockfishes exceeded their contributions all four years. Out of all four species, vermilion rockfish exceeded its OFL contribution with the greatest amount on average (13 mt). Vermilion rockfish is also the only species out of the top four that does not have a category 3 assessment. The 2021 stock assessment of vermilion rockfish for the population off of WA was designated as a category 2 assessment, while the assessment of the population within OR waters was designated as category 1. **Given that this stock has repeatedly exceeded its OFL contribution, has a vulnerability score that indicates a stock of high concern (2.05), and is not a Category 3 stock, vermilion rockfish north of 40° 10' N lat. may be a candidate species for further consideration.**

Table 3. Species within the shelf rockfish N. of 40° 10' N lat. complex, the stock assessment category, vulnerability score, average OFL contribution (mt) between 2017-2020, average percent OFL contribution to the complex level OFL, average amount (mt) over or under the OFL contribution between 2017-2020, and the number of years where removals exceeded the OFL between 2017-2020. Category 3 stocks are shown in italics and vermilion rockfish is highlighted in bold.

Species	Category	Vulnerability Score	Avg. OFL contribution (2017-2020, mt)	Avg. OFL contribution (2017-2020, percent)	Avg. over/under OFL contribution (2017-2020, mt)	# of years over OFL (2017-2020)
Vermilion Rockfish	1,2	2.05	9.71	0.42%	12.66	4
<i>Starry Rockfish</i>	3	2.09	0.00	0.00%	0.03	4
<i>Tiger Rockfish</i>	3	1.73	0.98	0.04%	1.22	4
<i>Stripetail Rockfish</i>	3	1.80	40.40	1.75%	6.14	3
<i>Redstripe Rockfish</i>	3	2.16	269.91	11.72%	-229.51	2
Chilipepper	1	1.35	198.00	8.59%	-58.38	1
<i>Flag Rockfish</i>	3	1.97	0.08	0.00%	-0.04	1
<i>Swordspine Rockfish</i>	3	1.94	0.00	0.00%	0.01	1
<i>Bocaccio Rockfish</i>	3	1.93	284.01	12.33%	-181.92	0
<i>Cowcod Rockfish</i>	3	2.13	0.40	0.02%	-0.28	0
<i>Greenblotched Rockfish</i>	3	2.12	1.28	0.06%	-1.28	0
Greenspotted Rockfish	2,3	1.98	15.41	0.67%	-14.55	0
Greenstriped Rockfish	2	1.88	1,308.05	56.77%	-1,263.59	0
<i>Pink Rockfish</i>	3	2.02	0.00	0.00%	0.00	0
<i>Rosethorn Rockfish</i>	3	2.09	12.90	0.56%	4.19	0
<i>Rosy Rockfish</i>	3	1.89	3.03	0.13%	-2.93	0
<i>Silvergray Rockfish</i>	3		159.42	6.92%	-102.63	0
<i>Speckled Rockfish</i>	3		0.18	0.01%	-0.18	0
<i>Squarespot Rockfish</i>	3		0.18	0.01%	-0.18	0

Shelf Rockfish south of 40° 10' N lat.

Based on the data examined, the GMT identified two species as warranting further consideration: squarespot and vermilion/sunset rockfish. For each of these species the annual total mortality has exceeded the species-specific OFL contribution more than twice in the last four years. Additionally, both species vulnerability scores put them in the medium to high concern category (1.86 and 2.05, respectively).

Table 4. Species within the shelf rockfish S. of 40° 10' N lat. complex, the stock assessment category, vulnerability score, average OFL contribution (mt) between 2017-2020, average percent OFL contribution to the complex level OFL, average amount (mt) over or under the OFL contribution between 2017-2020, and the number of years where removals exceeded the OFL between 2017-2020. Category 3 stocks are shown in italics and squarespot and vermilion rockfishes are highlighted in bold.

Species	Category	Vulnerability Score	Avg. OFL contribution (2017-2020, mt)	Avg. OFL contribution (2017-2020, percent)	Avg. over/under OFL contribution (2017-2020, mt)	# of years over OFL (2017-2020)
Squarespot Rockfish	2	1.86	11.09	0.58%	5.57	3
Vermilion Rockfish	1,2	2.05	269.28	14.04%	88.36	3
<i>Tiger Rockfish</i>	<i>3</i>	<i>2.06</i>	<i>0.04</i>	<i>0.00%</i>	<i>0.25</i>	<i>4</i>
<i>Stripetail Rockfish</i>	<i>3</i>	<i>1.80</i>	<i>23.62</i>	<i>1.23%</i>	<i>-0.36</i>	<i>2</i>
<i>Silvergray Rockfish</i>	<i>3</i>	<i>2.02</i>	<i>0.53</i>	<i>0.03%</i>	<i>-0.06</i>	<i>1</i>
<i>Bronzespotted Rockfish</i>	<i>3</i>	<i>2.12</i>	<i>3.63</i>	<i>0.19%</i>	<i>-3.56</i>	<i>0</i>
<i>Flag Rockfish</i>	<i>3</i>	<i>1.97</i>	<i>23.42</i>	<i>1.22%</i>	<i>-14.41</i>	<i>0</i>
<i>Greenblotched Rockfish</i>	<i>3</i>	<i>2.12</i>	<i>23.12</i>	<i>1.21%</i>	<i>-21.61</i>	<i>0</i>
Greenspotted Rockfish	2	1.98	78.46	4.09%	-60.92	0
Greenstriped Rockfish	2	1.88	239.95	12.51%	-236.68	0
<i>Honeycomb Rockfish</i>	<i>3</i>	<i>1.97</i>	<i>9.88</i>	<i>0.51%</i>	<i>-5.96</i>	<i>0</i>
<i>Mexican Rockfish</i>	<i>3</i>	<i>1.80</i>	<i>5.06</i>	<i>0.26%</i>	<i>-4.25</i>	<i>0</i>
<i>Pink Rockfish</i>	<i>3</i>	<i>2.02</i>	<i>2.52</i>	<i>0.13%</i>	<i>-2.18</i>	<i>0</i>
<i>Redstripe Rockfish</i>	<i>3</i>	<i>2.16</i>	<i>0.49</i>	<i>0.03%</i>	<i>-0.49</i>	<i>0</i>
<i>Rosethorn Rockfish</i>	<i>3</i>	<i>2.09</i>	<i>2.12</i>	<i>0.11%</i>	<i>-1.89</i>	<i>0</i>
<i>Rosy Rockfish</i>	<i>3</i>	<i>1.89</i>	<i>44.51</i>	<i>2.32%</i>	<i>-31.94</i>	<i>0</i>
<i>Speckled Rockfish</i>	<i>3</i>	<i>2.10</i>	<i>39.39</i>	<i>2.05%</i>	<i>-31.05</i>	<i>0</i>
<i>Starry Rockfish</i>	<i>3</i>	<i>1.04</i>	<i>62.58</i>	<i>3.26%</i>	<i>-23.05</i>	<i>0</i>
<i>Swordspine Rockfish</i>	<i>3</i>	<i>1.94</i>	<i>14.21</i>	<i>0.74%</i>	<i>-13.99</i>	<i>0</i>
<i>Yellowtail Rockfish</i>	<i>3</i>	<i>1.88</i>	<i>1064.43</i>	<i>55.49%</i>	<i>-986.16</i>	<i>0</i>

Slope Rockfish north of 40° 10' N lat.

Under this complex, two species exceeded their species-specific OFL contributions more than twice from 2017 to 2020. Aurora rockfish exceeded its OFL contribution four times and has a vulnerability score that indicates a stock of high concern (2.10). Compared to redbanded rockfish, which exceeded its OFL contribution three times and is a stock of high concern, aurora rockfish exceeded its contribution on average to a more notable extent (14 mt) while redbanded rockfish exceeded its contribution on average less than 1 mt. Aurora rockfish is also a category 1 stock while

redbanded is classified as category 3. For these reasons, aurora rockfish may be a candidate species for further consideration.

Table 5. Species within the slope rockfish N. of 40° 10' N lat. complex, the stock assessment category, vulnerability score, average OFL contribution (mt) between 2017-2020, average percent OFL contribution to the complex level OFL, average amount (mt) over or under the OFL contribution between 2017-2020, and the number of years where removals exceeded the OFL between 2017-2020. Category 3 stocks are shown in italics and aurora rockfish is highlighted in bold.

Species	Category	Vulnerability Score	Avg. OFL contribution (2017-2020, mt)	Avg. OFL contribution (2017-2020, percent)	Avg. over/under OFL contribution (2017-2020, mt)	# of years over OFL (2017-2020)
Aurora Rockfish	1	2.10	17.49	0.90%	13.73	4
<i>Redbanded Rockfish</i>	<i>3</i>	<i>2.02</i>	<i>45.27</i>	<i>2.34%</i>	<i>0.73</i>	<i>3</i>
<i>Blackgill Rockfish</i>	<i>3</i>	<i>2.08</i>	<i>4.70</i>	<i>0.24%</i>	<i>2.57</i>	<i>2</i>
Rougheye/Blackspotted Rockfish	2	2.27	215.53	11.15%	-31.71	2
<i>Bank Rockfish</i>	<i>3</i>	<i>2.02</i>	<i>17.23</i>	<i>0.89%</i>	<i>-14.72</i>	<i>0</i>
Sharpchin Rockfish	2	2.05	355.80	18.40%	-334.83	0
<i>Shorthead Rockfish</i>	<i>3</i>	<i>2.25</i>	<i>18.70</i>	<i>0.97%</i>	<i>-7.06</i>	<i>0</i>
Splitnose Rockfish	1	1.82	1066.10	55.15%	-896.29	0
<i>Yellowmouth Rockfish</i>	<i>3</i>	<i>1.96</i>	<i>192.44</i>	<i>9.95%</i>	<i>-172.72</i>	<i>0</i>

Slope Rockfish south of 40° 10' N lat.

Based on the data examined, the GMT does not see any issues with any of the species contained within the Slope Rockfish complex south of 40° 10' N lat. None of the species-specific OFL contributions have been exceeded in the last 4 years.

Table 6. Species within the slope rockfish S. of 40° 10' N lat. complex, the stock assessment category, vulnerability score, average OFL contribution (mt) between 2017-2020, average percent OFL contribution to the complex level OFL, average amount (mt) over or under the OFL contribution between 2017-2020, and the number of years where removals exceeded the OFL between 2017-2020. Category 3 stocks are shown in italics.

Species	Category	Vulnerability Score	Avg. OFL contribution (2017-2020, mt)	Avg. OFL contribution (2017-2020, percent)	Avg. over/under OFL contribution (2017-2020, mt)	# of years over OFL (2017-2020)
Aurora Rockfish	1	2.1	74.54	8.86%	-67.5	0
<i>Bank Rockfish</i>	3	<i>2.02</i>	<i>503.21</i>	<i>59.79%</i>	<i>-470.9</i>	<i>0</i>
Blackgill Rockfish	2	2.08	159.25	18.92%	-112.2	0
<i>Redbanded Rockfish</i>	3	<i>2.02</i>	<i>10.40</i>	<i>1.24%</i>	<i>-7.8</i>	<i>0</i>
Rougheye/ Blackspotted Rockfish	2	2.27	4.39	0.52%	-4.1	0
Sharpchin Rockfish	2	2.05	88.95	10.57%	-84.5	0
<i>Shortraker Rockfish</i>	3	<i>2.25</i>	<i>0.10</i>	<i>0.01%</i>	<i>-0.06</i>	<i>0</i>
<i>Yellowmouth Rockfish</i>	3	<i>1.96</i>	<i>0.84</i>	<i>0.10%</i>	<i>-0.7</i>	<i>0</i>

Other Flatfish

Based on the data examined, the GMT does not see any issues with any of the species contained within the Other Flatfish complex. There has only been one species in one year where the species specific OFL contribution was exceeded. Additionally, all of the species in this complex have vulnerability scores below 1.80, which are of low concern.

Table 7. Species within the Other Flatfish complex, the stock assessment category, vulnerability score, average OFL contribution (mt) between 2017-2020, average percent OFL contribution to the complex level OFL, average amount (mt) over or under the OFL contribution between 2017-2020, and the number of years where removals exceeded the OFL between 2017-2020. Category 3 stocks are shown in italics.

Species	Category	Vulnerability Score	Avg. OFL contribution (2017-2020, mt)	Avg. OFL contribution (2017-2020, percent)	Avg. over/under OFL contribution (2017-2020, mt)	# of years over OFL (2017-2020)
<i>Flathead Sole</i>	3	1.26	4.6	0.05%	-4.59	1
<i>Butter Sole</i>	3	1.18	8.2	0.09%	-5.26	0
<i>Curlfin Sole</i>	3	1.23	35.0	0.37%	-8.71	0
<i>Pacific Sanddab</i>	3	1.25	4,801.0	50.80%	-4,638.70	0
Rex Sole	2	1.28	3,762.7	39.81%	-3,226.95	0
<i>Rock Sole</i>	3	1.42	66.7	0.71%	-61.28	0
<i>Sand Sole</i>	3	1.23	773.2	8.18%	-745.47	0

Summary of GMT recommendations

Based on the above data, the GMT recommends:

- **the Council continue to give additional consideration for any species newly designated as overfished.**
- **the following species be given further consideration as part of complexes:**
 - **Nearshore Rockfish north of 40° 10' N lat.: copper and quillback rockfish**
 - **Nearshore Rockfish south of 40° 10' N lat.: quillback rockfish**
 - **Shelf Rockfish north of 40° 10' N lat.: vermilion rockfish**
 - **Shelf Rockfish south of 40° 10' N lat.: squarespot and vermilion/sunset rockfish**
 - **Slope Rockfish north of 40° 10' N lat.: aurora rockfish**
 - **Slope Rockfish south of 40° 10' N lat.: no species of immediate concern**
 - **Other flatfish: no species of immediate concern**

Appendix A. Detailed data on species within complexes

Acronyms: SS-CL (Stock Synthesis Catch and Length), DBSRA (Depletion-Based Stock Reduction Analysis), XDBSRA (Extended Depletion-Based Stock Reduction Analysis), BBDRF (black/blue deacon rockfish)

Nearshore Rockfish north of 40° 10' N lat.

Table A 1. Background information by species for the nearshore rockfish complex north of 40° 10' N lat. (Species in italics indicates species is a Category 3 stock; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
<i>Black and Yellow Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.01	0.01	0.01	1.7
<i>Blue/Deacon Rockfish (WA)</i>	2017 Full		3	0.45	0.222	7.6	5.9	5.9	2.01
Blue/Deacon Rockfish (CA)	2017 Full		2	0.45	0.159	33.6	28.3	28.3	2.01
Brown Rockfish	2013 XDBSRA		2	0.45	0.190	2.1	1.7	1.7	1.99
<i>Calico Rockfish</i>			3	0.45	0.222	-	-	-	1.46
China Rockfish (WA)	2015 Full	73.4% (2015)	2	0.45	0.174	10.1	8.3	8.3	2.23
China Rockfish (4010-4616)	2015 Full	61.5% (2015)	2	0.45	0.174	20.6	17.0	17.0	2.23
Copper Rockfish (WA)	2021 SS-CL	42% (2021)	2	0.45	0.126	2.2	1.9	1.9	2.27
Copper Rockfish (OR)	2021 SS-CL	74% (2021)	2	0.45	0.126	18.0	15.7	15.7	2.27
Copper Rockfish (4010-42)	2021 SS-CL	39% (2021)	2	0.45	0.126	TBD	TBD	TBD	2.27
<i>Gopher Rockfish</i>	2011 DBSRA		3	0.45	0.222	-	-	-	1.76
<i>Grass Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.7	0.5	0.5	1.89
<i>Kelp Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.01	0.01	0.01	1.62
<i>Olive Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.3	0.2	0.2	1.87
<i>Quillback Rockfish (WA)</i>	2021 SS-CL	39% (2021)	3	0.45	0.222	2.9	2.2	2.2	2.22
Quillback Rockfish (OR)	2021 SS-CL	47% (2021)	2	0.45	0.126	2.6	2.3	2.2	2.22
Quillback Rockfish (42-4010)	2021 SS-CL	14% (2021)	2	0.45	0.126	TBD	TBD	TBD	2.22
<i>Treefish</i>	2011 DBSRA		3	0.45	0.222	0.2	0.2	0.2	1.73
Complex Total						100.8	84.3	84.2	
Shaded cell indicates no harvest specifications contribution by that species									

Table A 2. Total mortality (in mt) by species in the nearshore rockfish complex north of 40° 10 ' N lat. from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
<i>Black and Yellow Rockfish</i>	0.1	0.0	0.3	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1
Blue/Deacon Rockfish (north of 40-10)	10.0	10.6	6.4	3.4	8.6	9.5	16.9	7.4	OR cont. Moved to OR BBDRF		9.1
<i>Blue/Deacon Rockfish (WA)</i>	Included in Blue/Deacon Rockfish (north of 40-10)								11.0	9.2	10.1
<i>Blue/Deacon Rockfish (CA)</i>											
Brown Rockfish	0.6	0.8	1.1	0.8	1.1	0.5	0.6	0.7	1.0	1.2	0.8
<i>Calico Rockfish</i>											
China Rockfish	16.2	17.2	15.4	9.6	7.1	6.7	9.1	11.2	14.3	10.5	11.7
Copper Rockfish	11.3	12.2	9.4	7.3	5.4	7.7	18.2	21.6	25.8	16.1	13.5
<i>Gopher Rockfish</i>	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2
<i>Grass Rockfish</i>	0.5	0.4	0.5	0.2	0.6	0.3	0.3	0.4	0.6	0.4	0.4
<i>Kelp Rockfish</i>		0.0							0.0	0.0	0.0
<i>Olive Rockfish</i>	0.2	0.1	0.1	0.2	0.5	1.1	0.8	0.7	1.2	1.0	0.6
Quillback Rockfish	12.7	18.6	11.4	8.2	6.5	6.7	17.0	19.3	23.1	17.9	14.1
<i>Treefish</i>											
Complex Total	51.9	60.1	44.6	29.9	29.9	32.6	63.0	61.7	77.2	56.6	50.7

Table A 3. Comparing total mortality to the OFL contribution (n mt) by species in the nearshore rockfish complex north of 40° 10' N lat. for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
<i>Black and Yellow Rockfish</i>	0.02	0.05	0.01	0.07
Blue/Deacon Rockfish (north of 40-10	-49.5	-59.7	OR cont moved to OR BBDRF complex	
Blue/Deacon Rockfish (WA)	included in blue/deacon (north of 40-10)		-24.558	-27.387
Blue/Deacon Rockfish (CA)				
<i>Brown Rockfish</i>	-1.4	-1.3	-1.1	-1.0
<i>Calico Rockfish</i>	0.00	0.00	0.00	0.00
China Rockfish	-21.1	-18.1	-14.3	-17.5
Copper Rockfish	7.0	10.0	13.9	3.8
<i>Gopher Rockfish</i>	0.1	0.2	0.2	0.3
<i>Grass Rockfish</i>	-0.4	-0.2	0.0	-0.2
<i>Kelp Rockfish</i>	-0.01	-0.01	-0.01	0.01
<i>Olive Rockfish</i>	0.4	0.3	0.9	0.7
Quillback Rockfish	9.6	12.0	15.7	10.5
<i>Treefish</i>	-0.2	-0.2	-0.2	-0.2
Complex Total	-55.4	-43.3	-13.7	-35.1

Nearshore Rockfish south of 40° 10' N lat.

Table A 4. Background information by species in the nearshore rockfish complex south of 40° 10' N lat. (Species in italics indicates species is a Category 3 stock; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
Black and Yellow Rockfish	2019 Full				-	-	-	-	1.70
Blue 4010-3427	2017 Full	42.1% (2019)	2	0.45	0.159	302.4	254.3	254.3	2.01
<i>Blue S 3427</i>	<i>2017 Full</i>	<i>42.1% (2019)</i>	<i>3</i>	<i>0.45</i>	<i>0.222</i>	<i>21.8</i>	<i>17.0</i>	<i>17.0</i>	<i>2.01</i>
Brown Rockfish	2013 xDBSRA	42% (2013)	2	0.45	0.190	178.2	144.4	144.4	1.99
<i>Calico Rockfish</i>			<i>3</i>	<i>0.45</i>	<i>0.222</i>	-	-	-	<i>1.46</i>
China Rockfish	2015 Full	29.6% (2015)	2	0.45	0.174	16.4	13.5	13.5	2.23
Copper Rockfish (s 3427)	2021 SS-CLI	18% (2021)	2	0.45	0.126	TBD	TBD	TBD	2.27
Copper Rockfish (4010-3427)	2021 SS-CL	39% (2021)	2	0.45	0.126	TBD	TBD	TBD	2.27
Gopher Rockfish	2019 Full	44% (2019)	2	0.45	0.143	136.0	118.9	118.9	1.76
<i>Grass Rockfish</i>	<i>2011 DBSRA</i>		<i>3</i>	<i>0.45</i>	<i>0.222</i>	<i>59.6</i>	<i>46.4</i>	<i>46.4</i>	<i>1.89</i>
<i>Kelp Rockfish</i>	<i>2011 DBSRA</i>		<i>3</i>	<i>0.45</i>	<i>0.222</i>	<i>27.7</i>	<i>21.5</i>	<i>21.5</i>	<i>1.62</i>
<i>Olive Rockfish</i>	<i>2011 DBSRA</i>		<i>3</i>	<i>0.45</i>	<i>0.222</i>	<i>224.6</i>	<i>174.8</i>	<i>174.8</i>	<i>1.87</i>
Quillback Rockfish	2021 SS-CL	14% (2021)	2	0.45	0.126	TBD	TBD	TBD	2.22
<i>Treefish Rockfish</i>	<i>2011 DBSRA</i>		<i>3</i>	<i>0.45</i>	<i>0.222</i>	<i>13.2</i>	<i>10.3</i>	<i>10.3</i>	<i>1.73</i>
Complex Total						980.0	801.0	801.0	
Shaded cell indicates no harvest specification contribution									

Table A 5. Total mortality (in mt) by species in the nearshore rockfish complex south of 40° 10' N lat. from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
Black and Yellow Rockfish	27.1	17.2	18.4	23.2	23.97	20.3	28.7	20.8	20.6	14.0	21.4
Blue 4010-3427	64.3	51.4	108.2	134.3	181.04	151.3	196.8	212.1	217.0	82.3	139.9
Blue S 3427											
Brown Rockfish	115.3	96.7	110.2	136.3	119.16	102.2	91.1	113.1	101.6	67.4	
Calico Rockfish	2.2	7.9	1.2	0.3	0.48	0.4	0.8	0.9	1.2	0.6	1.6
China Rockfish	17.1	15.9	10.9	10.1	14.07	16.2	13.9	15.8	12.9	9.8	13.7
Copper Rockfish (s 3427)	69.0	85.8	103.4	97.3	145.21	161.6	218.4	196.4	173.4	76.2	132.7
Copper Rockfish (4010-3427)											
Gopher Rockfish	108.2	77.1	65.4	75.6	85.06	91.6	76.2	71.1	82.2	57.0	78.9
Grass Rockfish	22.4	32.3	22.1	23.1	21.28	17.5	21.5	11.3	11.6	10.0	19.3
Kelp Rockfish	18.4	19.9	20.6	15.4	12.83	13.4	16.9	6.5	5.0	1.8	13.0
Olive Rockfish	24.5	33.3	22.2	27.5	51.9	54.4	36.1	47.3	61.7	38.5	39.7
Quillback Rockfish	2.4	3.0	1.1	1.3	5.0	6.5	6.4	7.2	8.0	5.6	4.6
Treefish Rockfish	13.5	12.8	14.8	10.2	15.2	15.2	15.9	12.8	14.8	5.6	13.1
Complex Total	484.5	453.1	498.3	554.5	675.2	650.6	722.5	715.2	709.9	368.7	583.2

Table A 6. Comparing total mortality to the OFL contribution (n mt) by species in the nearshore complex south of 40° 10' N lat. for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
Black and Yellow Rockfish	1.2	-6.7	-7.0	-13.6
Blue 4010-3427	-110.6	-100.2	-83.6	-231.0
Blue S 3427				
Brown Rockfish	-79.0	-60.9	-76.3	-114.5
Calico Rockfish	0.8	0.9	1.2	0.6
China Rockfish	0.5	2.0	-1.5	-5.0
Copper Rockfish (s 3427)	-92.5	-120.3	-148.6	-251.0
Copper Rockfish (4010-3427)				
Gopher Rockfish	-93.4	-98.5	-44.4	-69.6
Grass Rockfish	-38.1	-48.4	-48.0	-49.7
Kelp Rockfish	-10.8	-21.2	-22.7	-25.9
Olive Rockfish	-188.5	-177.3	-162.9	-186.1
Quillback Rockfish	1.0	1.8	2.6	0.2
Treefish Rockfish	2.7	-0.4	1.6	-7.7
Complex Total	-606.7	-629.2	-589.8	-953.2

Shelf Rockfish north of 40° 10' N lat.

Table A 7. Background information by species in the shelf rockfish complex north of 40° 10' N lat. (Species in italics indicates species is a Category 3 stock; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
<i>Bocaccio Rockfish</i>	2011 DBSRA		3	0.45	0.222	284.0	221.0	221.0	1.93
<i>Bronzespotted Rockfish</i>			3	0.45	0.222	-	-	-	2.12
<i>Chameleon Rockfish</i>			3	0.45	0.222	-	-	-	2.03
Chilipepper	2015 Update	64%(2015)	1	0.45	0.091	180.7	164.3	164.3	1.35
<i>Cowcod Rockfish</i>	2019 DBSRA		3	0.45	0.222	0.6	0.4	0.4	2.13
Dusky Rockfish					-	-	-	-	
Dwarf-red Rockfish					-	-	-	-	
<i>Flag Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.01	0.1	0.1	1.97
<i>Freckled Rockfish</i>			3	0.45	0.222	-	-	-	1.44
<i>Greenblotched Rockfish</i>	2011 DBSRA		3	0.45	0.222	1.3	1.0	1.0	2.12
Greenspotted Rockfish (42-4010)	2011 Full	37.4% (2011)	2	0.45	0.205	9.4	7.5	7.5	1.98
<i>Greenspotted Rockfish (WA/OR)</i>	2011 DCAC		3	0.45	0.222	6.1	4.7	4.7	1.98
Greenstriped Rockfish	2009 Full	81% (2009)	2	0.45	0.222	623.6	485.2	485.2	1.88
<i>Halfbanded Rockfish</i>			3	0.45	-	-	-	-	1.26
<i>Harlequin Rockfish</i>			3	0.45	-	-	-	-	1.94
<i>Honeycomb Rockfish</i>			3	0.45	-	-	-	-	1.97
<i>Mexican Rockfish</i>			3	0.45	-	-	-	-	1.80
<i>Pink Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.004	0.003	0.003	2.02
<i>Pinkrose Rockfish</i>			3	0.45	-	-	-	-	1.82
<i>Pygmy Rockfish</i>			3	0.45	-	-	-	-	1.42

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
<i>Redstripe Rockfish</i>	2011 DBSRA		3	0.45	0.222	269.9	210.0	210.0	2.16
<i>Rosethorn Rockfish</i>	2011 DBSRA		3	0.45	0.222	12.9	10.0	0.0	2.09
<i>Rosy Rockfish</i>	2011 DBSRA		3	0.45	0.222	3.0	2.3	2.3	1.89
<i>Silvergray Rockfish</i>	2011 DBSRA		3	0.45	0.222	159.4	124.0	124.0	2.02
<i>Speckled Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.2	0.0	0.0	2.10
<i>Squarespot Rockfish</i>	2021 DM	37% (2021)	3	0.45	0.126	TBD	TBD	TBD	1.86
<i>Starry Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.004	0.003	0.003	2.09
<i>Stripetail Rockfish</i>	2011 DBSRA	77.5% (2011)	3	0.45	0.222	40.4	31.4	31.4	1.80
<i>Swordspine Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.0001	0.0001	0.0001	1.94
<i>Tiger Rockfish</i>	2011 DBSRA		3	0.45	0.222	1.0	0.8	0.8	1.73
Vermilion Rockfish (WA)	2021 Full	56% (2021)	2	0.45	0.126	0.7	0.6	0.6	2.05
Vermilion (OR)	2021 Full	73% (2021)	1	0.45	0.065	13.4	12.5	12.5	2.05
Vermilion Rockfish (42-4010)	2021 Full	42.7% (2021)	1	0.45	0.065	TBD	TBD	TBD	2.05
Complex Total						1,606.6	1,275.9	1,275.9	
Shaded cell indicates no harvest specification contribution									

Table A 8. Total mortality (in mt) by species in the shelf rockfish complex north of 40° 10' N lat. from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
Bocaccio Rockfish	3.9	6.8	3.5	4.8	2.6	5.0	62.2	58.3	138.0	149.8	43.5
<i>Bronzespotted Rockfish</i>	0.0				0.2						0.1
<i>Chameleon Rockfish</i>											
Chilipepper	2.4	1.9	5.0	11.9	6.7	10.4	115.7	105.0	228.0	109.8	59.7
<i>Cowcod Rockfish</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.1
Dusky Rockfish	0.0										0.0
Dwarf-red Rockfish											
<i>Flag Rockfish</i>	0.0		0.0		0.0		0.1	0.0	0.0	0.1	0.0
<i>Freckled Rockfish</i>					0.0						0.0
<i>Greenblotched Rockfish</i>		0.0			0.0		0.0				0.0
Greenspotted Rockfish	0.1	0.4	0.1	0.8	0.2	0.1	0.3	0.2	2.1	0.9	0.5
Greenstriped Rockfish	13.0	29.6	18.2	20.8	14.3	23.4	54.1	30.4	43.3	50.0	29.7
<i>Halfbanded Rockfish</i>	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Harlequin Rockfish</i>	0.0	0.0	0.0	0.0		0.0					0.0
<i>Honeycomb Rockfish</i>	0.0	0.0	0.0	0.0		0.0	0.1	0.0	0.0		0.0
<i>Mexican Rockfish</i>											
Pink Rockfish											
<i>Pinkrose Rockfish</i>			0.0								0.0
<i>Pygmy Rockfish</i>	1.0	0.0	1.2	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.3
<i>Redstripe Rockfish</i>	8.4	12.6	3.8	4.1	6.4	7.1	34.9	30.4	47.4	48.9	20.4
<i>Rosethorn Rockfish</i>	5.3	3.7	3.7	3.1	3.8	3.3	4.9	8.9	38.9	15.7	9.1
<i>Rosy Rockfish</i>	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1
<i>Silvergray Rockfish</i>	1.2	4.0	3.5	2.2	1.0	3.4	15.3	9.7	80.5	121.7	24.3
<i>Speckled Rockfish</i>									0.0		0.0
<i>Squarespot Rockfish</i>	0.0	0.0			0.0	0.0	0.0	0.0	0.0		0.0

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
<i>Starry Rockfish</i>	0.0	0.1				0.0	0.0	0.0	0.0	0.1	0.0
<i>Stripetail Rockfish</i>	1.7	3.3	3.6	11.0	11.5	6.4	30.7	50.4	54.5	50.6	22.3
<i>Swordspine Rockfish</i>		0.0								0.0	0.0
<i>Tiger Rockfish</i>	1.4	2.6	2.5	1.4	1.2	1.0	1.6	2.2	2.7	2.4	1.9
Vermilion Rockfish	15.2	18.7	14.1	10.5	13.5	12.1	20.6	22.9	25.7	20.2	17.4
Complex Total	53.7	83.7	59.4	70.9	61.6	72.4	340.9	318.6	661.5	570.4	229.3

Table A 9. Comparing total mortality to the OFL contribution (n mt) by species in the shelf rockfish complex north of 40° 10' N lat. for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
<i>Bocaccio Rockfish</i>	-221.8	-225.7	-146.0	-134.2
<i>Bronzespotted Rockfish</i>	0.00	0.00	0.00	0.00
<i>Chameleon Rockfish</i>	0.00	0.00	0.00	0.00
Chilipepper	-89.58	-92.37	28.39	-79.98
<i>Cowcod Rockfish</i>	-0.4	-0.3	-0.1	-0.3
Dusky Rockfish				
Dwarf-red Rockfish				
<i>Flag Rockfish</i>	0.01	-0.06	-0.09	-0.02
<i>Freckled Rockfish</i>	0.00	0.00	0.00	0.00
<i>Greenblotched Rockfish</i>	-1.3	-1.3	-1.3	-1.3
Greenspotted Rockfish	-15.2	-15.3	-13.3	-14.4
Greenstriped Rockfish	-1,245.5	-1,275.9	-1,268.1	-1,264.8
<i>Halfbanded Rockfish</i>	0.01	0.01	0.01	0.00
<i>Harlequin Rockfish</i>	0.11	0.02	0.00	0.00
<i>Honeycomb Rockfish</i>	0.00	0.00	0.00	0.00
<i>Mexican Rockfish</i>	0.00	0.00	0.00	0.00
<i>Pink Rockfish</i>	-0.004	-0.004	-0.004	-0.004
<i>Pinkrose Rockfish</i>	0.00	0.00	0.00	0.00
<i>Pygmy Rockfish</i>	0.3	0.03	0.04	0.03
<i>Redstripe Rockfish</i>	-235.0	-239.6	-222.5	-221.0
<i>Rosethorn Rockfish</i>	-8.0	-4.0	26.0	2.8
<i>Rosy Rockfish</i>	-2.9	-3.0	-2.9	-2.9
<i>Silvergray Rockfish</i>	-144.1	-149.8	-78.9	-37.7

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
<i>Speckled Rockfish</i>	-0.2	-0.2	-0.2	-0.2
<i>Squarespot Rockfish</i>	-0.2	-0.2	-0.2	-0.2
<i>Starry Rockfish</i>	0.03	0.04	0.00	0.05
<i>Stripetail Rockfish</i>	-9.7	10.0	14.1	10.2
<i>Swordspine Rockfish</i>	-0.0001	-0.0001	-0.0001	0.02
<i>Tiger Rockfish</i>	0.6	1.2	1.7	1.4
Vermilion Rockfish	10.9	13.2	16.0	10.5
Complex Total	-1,961.9	-1,983.0	-1,647.4	-1,732.0

Shelf Rockfish south of 40° 10' N lat.

Table A 10. Background information by species in the shelf rockfish complex south of 40° 10' N lat. (species in italics indicates species is a Category 3 stock; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
<i>Bronzespotted Rockfish</i>	2011 DBSRA		3	0.45	0.222	3.6	2.8	2.8	2.12
<i>Chameleon Rockfish</i>			3	0.45	0.222	-	-	-	2.03
Dusky Rockfish						-	-	-	
Dwarf-red Rockfish						-	-	-	
<i>Flag Rockfish</i>	2011 DBSRA		3	0.45	0.222	23.4	18.2	18.2	1.97
<i>Freckled Rockfish</i>			3	0.45	0.222	-	-	-	1.44
<i>Greenblotched Rockfish</i>	2011 DBSRA		3	0.45	0.222	23.1	18.0	18.0	2.12
Greenspotted Rockfish 3427-4010	2011 Full	30.6% (2011)	2	0.45	0.205	32.9	26.2	26.2	1.98
Greenspotted Rockfish s 3427	2011 Full	37.4% (2011)	2	0.45	0.205	45.7	36.3	36.3	1.98
Greenstriped Rockfish	2009 Full	81% (2009)	2	0.45	0.222	114.4	89.0	89.0	1.88
<i>Halfbanded Rockfish</i>			3	0.45	0.222	-	-	-	1.26
<i>Harlequin Rockfish</i>			3	0.45	0.222	-	-	-	1.94
<i>Honeycomb Rockfish</i>	2011 DBSRA		3	0.45	0.222	9.9	7.7	7.7	1.97
<i>Mexican Rockfish</i>	2011 DBSRA		3	0.45	0.222	5.1	4.0	4.0	1.80
<i>Pink Rockfish</i>	2011 DBSRA		3	0.45	0.222	2.5	1.9	1.9	2.02
<i>Pinkrose Rockfish</i>			3	0.45	0.222	-	-	-	1.82
<i>Pygmy Rockfish</i>			3	0.45	0.222	-	-	-	1.42
<i>Redstripe Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.5	0.4	0.4	2.16
<i>Rosethorn Rockfish</i>	2011 DBSRA		3	0.45	0.222	2.1	1.6	1.6	2.09
<i>Rosy Rockfish</i>	2011 DBSRA		3	0.45	0.222	44.5	34.6	34.6	1.89
<i>Silvergray Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.5	0.4	0.4	2.02

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
<i>Speckled Rockfish</i>	2011 DBSRA		3	0.45	0.222	39.4	30.7	30.7	2.10
Squarespot Rockfish	2021 DM	37% (2021)	2	0.45	0.126	11.1	9.7	9.7	1.86
<i>Starry Rockfish</i>	2011 DBSRA		3	0.45	0.222	62.6	48.7	48.7	1.04
<i>Stripetail Rockfish</i>	2011 DBSRA	77.5% (2011)	3	0.45	0.222	23.6	18.4	18.4	1.80
<i>Swordspine Rockfish</i>	2011 DBSRA		3	0.45	0.222	14.2	11.0	11.0	1.94
<i>Tiger Rockfish</i>	2011 DBSRA		3	0.45	0.222	0.0	0.0	0.0	2.06
Vermilion Rockfish 4010-3427	2021 Full	42.7% (2021)	1	0.45	0.065	161.4	150.9	150.9	2.05
Vermilion Rockfish s of 3427	2021 Full	48.2% (2021)	2	0.45	0.126	166.4	145.4	145.4	2.05
<i>Yellowtail Rockfish</i>	2011 DBSRA		3	0.45	0.222	1064.4	828.1	828.1	1.88
Complex Total						1,851.3	1,484.0	1,484.0	
Shaded cells indicate no harvest specifications contribution									

Table A 11. Total mortality (in mt) by species in the shelf rockfish complex south of 40° 10' N lat. from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
<i>Bronzespotted Rockfish</i>		0.1	0.1	0.0	0.0	0.1	0.1		0.2		0.1
<i>Chameleon Rockfish</i>	0.1										0.1
Dusky Rockfish											
Dwarf-red Rockfish											
<i>Flag Rockfish</i>	9.4	14.6	14.7	7.1	10.9	9.6	10.8	10.5	12.9	1.7	10.2
<i>Freckled Rockfish</i>	0.1	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1
<i>Greenblotched Rockfish</i>	1.4	0.9	0.6	0.3	0.6	0.6	0.6	1.0	1.9	2.7	1.0
Greenspotted Rockfish	19.4	19.9	13.6	9.7	10.4	11.8	19.5	18.7	23.1	8.8	15.5
Greenstriped Rockfish	1.9	2.5	3.7	2.4	2.0	1.6	1.9	3.3	5.0	2.9	2.7
<i>Halfbanded Rockfish</i>	3.5	6.6	6.8	3.4	1.7	2.4	7.4	34.3	14.1	13.6	9.4
<i>Harlequin Rockfish</i>											
<i>Honeycomb Rockfish</i>	10.1	6.5	9.3	4.0	4.3	5.1	5.9	3.4	5.9	0.4	5.5
<i>Mexican Rockfish</i>		0.0	0.2	0.1	0.0	0.0	0.9	0.6	0.6	1.2	0.4
<i>Pink Rockfish</i>		0.8	0.1	0.0	0.0	0.0	0.3	0.7	0.3	0.0	0.3
<i>Pinkrose Rockfish</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Pygmy Rockfish</i>	0.0	0.0	0.0		0.0						0.0
<i>Redstripe Rockfish</i>	0.0	0.0	0.1	0.0	0.0		0.0			0.0	0.0
<i>Rosethorn Rockfish</i>	0.1	0.5	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.2
<i>Rosy Rockfish</i>	7.7	6.5	6.0	4.3	7.0	9.1	12.9	17.7	16.3	3.4	9.1
<i>Silvergray Rockfish</i>	0.0		0.2			0.1	0.0	0.0	0.0	1.8	0.3
<i>Speckled Rockfish</i>	8.4	9.8	15.9	7.6	27.7	10.9	9.3	9.3	12.4	2.3	11.4
Squarespot Rockfish	5.9	4.7	17.3	14.4	22.1	22.2	17.4	23.5	24.4	1.3	15.3
<i>Starry Rockfish</i>	25.8	24.2	25.1	12.9	21.4	27.9	49.2	38.8	51.2	19.0	29.5
<i>Stripetail Rockfish</i>	3.9	13.4	15.7	7.5	8.8	7.7	11.2	33.0	22.5	26.4	15.0
<i>Swordspine Rockfish</i>	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.2	0.6	0.0	0.1

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
<i>Tiger Rockfish</i>	0.3	0.1	0.0	0.1	0.0	0.1	0.3	0.5	0.3	0.2	0.2
Vermilion Rockfish	210.3	235.2	237.1	197.0	335.0	292.4	341.2	344.5	485.0	259.9	293.8
<i>Yellowtail Rockfish</i>	46.8	55.5	61.3	64.5	100.4	34.5	81.0	69.5	106.3	56.3	67.6
Complex Total	355.5	402.3	428.0	335.6	552.6	436.3	570.3	609.7	783.2	402.2	487.6

Table A 12. Comparing total mortality to the OFL contribution (n mt) by species in the shelf rockfish complex south of 40° 10' N lat. for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
<i>Bronzespotted Rockfish</i>	-3.5	-3.6	-3.4	-3.6
<i>Chameleon Rockfish</i>	0.00	0.00	0.00	0.00
Dusky Rockfish				
Dwarf-red Rockfish				
<i>Flag Rockfish</i>	-12.6	-12.9	-10.5	-21.7
<i>Freckled Rockfish</i>	0.04	0.01	0.14	0.004
<i>Greenblotched Rockfish</i>	-22.6	-22.2	-21.2	-20.5
Greenspotted Rockfish	-59.3	-59.8	-55.2	-69.3
Greenstriped Rockfish	-236.5	-236.3	-235.6	-238.3
<i>Halfbanded Rockfish</i>	7.4	34.3	14.1	13.6
<i>Harlequin Rockfish</i>	0.00	0.00	0.00	0.00
<i>Honeycomb Rockfish</i>	-4.0	-6.4	-4.0	-9.4
<i>Mexican Rockfish</i>	-4.2	-4.5	-4.5	-3.9
<i>Pink Rockfish</i>	-2.2	-1.8	-2.2	-2.5
<i>Pinkrose Rockfish</i>	0.001	0.002	0.01	0.01
<i>Pygmy Rockfish</i>	0.00	0.00	0.00	0.00
<i>Redstripe Rockfish</i>	-0.5	-0.5	-0.5	-0.5
<i>Rosethorn Rockfish</i>	-2.0	-1.9	-1.9	-1.8
<i>Rosy Rockfish</i>	-31.6	-26.8	-28.2	-41.1
<i>Silvergray Rockfish</i>	-0.5	-0.5	-0.5	1.3
<i>Speckled Rockfish</i>	-30.0	-30.1	-27.0	-37.1
<i>Squarespot Rockfish</i>	6.4	12.4	13.3	-9.8
<i>Starry Rockfish</i>	-13.4	-23.8	-11.4	-43.6

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
<i>Stripetail Rockfish</i>	-12.4	9.4	-1.1	2.7
<i>Swordspine Rockfish</i>	-14.2	-14.0	-13.6	-14.2
<i>Tiger Rockfish</i>	0.2	0.4	0.2	0.1
Vermilion Rockfish	71.9	75.2	215.7	-9.4
<i>Yellowtail Rockfish</i>	-983.4	-994.9	-958.1	-1,008.2
Complex Total	-1,346.9	-1,308.5	-1,135.5	-1,517.1

Slope Rockfish north of 40° 10' N lat.

Table A 13. Background information by species in the slope rockfish complex north of 40° 10' N lat. (Species in italics indicates species is a Category 3 stock; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
Aurora Rockfish	2013 Full	64% (2013)	1	0.45	0.100	17.4	15.7	15.7	2.10
<i>Bank Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>17.2</i>	<i>13.4</i>	<i>13.4</i>	<i>2.02</i>
<i>Blackgill Rockfish</i>	<i>2011 DCAC</i>		3	<i>0.45</i>	<i>0.222</i>	<i>4.7</i>	<i>3.7</i>	<i>3.7</i>	<i>2.08</i>
<i>Redbanded Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>45.3</i>	<i>35.2</i>	<i>35.2</i>	<i>2.02</i>
Rougheye/Blackspotted Rockfish	2013 Full	47% (2013)	2	0.45	0.190	223.2	188.9	188.9	2.27
Sharpchin Rockfish	2013 ExSSS	68% (2013)	2	0.45	0.190	285.3	231.1	231.1	2.05
<i>Shortraker Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>18.7</i>	<i>14.5</i>	<i>14.5</i>	<i>2.25</i>
Splitnose Rockfish	2009 Full	90% (2009)	1	0.45	0.117	1,005.3	887.6	887.6	1.82
<i>Yellowmouth Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>192.4</i>	<i>149.7</i>	<i>149.7</i>	<i>1.96</i>
Complex Total						1,809.5	1,539.8	1,539.8	
Shaded cells indicate no harvest specifications contribution									

Table A 14. Total mortality (in mt) by species in the slope rockfish complex north of 40° 10' N lat. from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
Aurora Rockfish	21.2	18.3	23.3	19.9	18.0	22.8	30.5	26.2	24.0	44.2	24.8
<i>Bank Rockfish</i>	0.7	0.8	2.0	2.6	1.0	1.1	2.7	2.3	1.6	3.5	1.8
<i>Blackgill Rockfish</i>	5.0	8.6	8.9	7.4	7.6	4.4	10.8	3.8	12.1	2.3	7.1
<i>Redbanded Rockfish</i>	32.5	35.5	35.4	28.6	43.0	45.2	51.5	47.4	51.4	33.7	40.4
Rougheye/ Blackspotted Rockfish	209.9	238.7	154.1	89.8	131.5	148.3	160.0	242.0	225.3	108.0	170.8
Sharpchin Rockfish	6.5	15.3	12.5	22.2	5.4	4.2	9.2	9.7	37.9	27.1	15.0
<i>Shortraker Rockfish</i>	29.9	30.9	24.6	28.6	15.2	10.8	14.5	15.6	11.3	5.1	18.7
Splitnose Rockfish	29.5	54.6	76.4	86.5	132.5	104.9	145.8	237.6	202.9	92.9	116.4
<i>Yellowmouth Rockfish</i>	1.7	9.6	6.2	4.4	2.5	1.5	6.9	28.0	26.6	17.5	10.5
Complex Total	337.1	412.3	343.5	289.9	356.8	343.1	431.8	612.7	593.0	334.3	405.4

Table A 15. Comparing total mortality to the OFL contribution (in mt) by species in the slope rockfish complex north of 40° 10' N lat. for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
Aurora Rockfish	13.0	8.7	6.5	26.7
Bank Rockfish	-14.6	-14.9	-15.6	-13.8
Blackgill Rockfish	6.1	-0.9	7.4	-2.4
Redbanded Rockfish	6.2	2.2	6.1	-11.5
Rougheye/Blackspotted Rockfish	-50.7	27.4	7.7	-111.2
Sharpchin Rockfish	-354.8	-348.7	-314.9	-320.9
Shortraker Rockfish	-4.2	-3.1	-7.4	-13.6
Splitnose Rockfish	-880.9	-789.5	-998.1	-916.7
Yellowmouth Rockfish	-185.6	-164.5	-165.8	-175.0
Complex Total	-1,465.5	-1,283.3	-1,474.2	-1,538.3

Slope Rockfish south of 40° 10' N lat.

Background information by species. (*Species in italics indicates species is a Category 3 stock*; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
Aurora Rockfish	2013 Full	64% (2013)	1	0.45	0.100	74.2	66.8	66.8	2.10
<i>Bank Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>503.2</i>	<i>391.5</i>	<i>391.5</i>	<i>2.02</i>
Blackgill Rockfish	2017 Update	41.5% (2019)	2	0.45	0.159	205.0	172.4	172.4	2.08
<i>Pacific Ocean Perch</i>			3	<i>0.45</i>	<i>0.222</i>	-	-	-	<i>1.69</i>
<i>Redbanded Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>10.4</i>	<i>8.1</i>	<i>8.1</i>	<i>2.02</i>
Rougeye/Blackspotted Rockfish	2013 Full	47% (2013)	2	0.45	0.190	4.8	3.9	3.9	2.27
Sharpchin Rockfish	2013 ExSSS	68% (2013)	2	0.45	0.190	71.3	57.8	57.8	2.05
<i>Shortraker Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>0.1</i>	<i>0.1</i>	<i>0.1</i>	<i>2.25</i>
<i>Yellowmouth Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>0.8</i>	<i>0.6</i>	<i>0.6</i>	<i>1.96</i>
Complex Total						869.8	701.1	701.1	
Shaded cells indicate no harvest specifications contribution									

Total mortality (in mt) by species from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
Aurora Rockfish	7.0	25.3	8.2	5.3	5.3	3.4	8.1	12.6	5.0	2.6	8.3
<i>Bank Rockfish</i>	29.2	18.0	56.5	61.5	54.6	39.2	38.8	30.3	27.4	32.7	38.8
Blackgill Rockfish	151.4	195.6	74.3	73.1	42.3	36.7	72.0	54.3	35.2	26.6	76.2
<i>Pacific Ocean Perch</i>	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Redbanded Rockfish</i>	0.5	5.7	5.5	1.8	3.0	1.6	3.4	3.4	1.0	2.5	2.9
Rougheye/ Blackspotted Rockfish	0.4	5.6	3.2	2.5	1.1	0.4	0.2	0.2	0.7	0.1	1.4
Sharpchin Rockfish	0.4	0.3	0.9	0.1	0.1	0.3	16.5	0.3	0.1	1.0	2.0
<i>Shorthead Rockfish</i>		0.0			0.0	0.0	0.1	0.1	0.0	0.0	0.0
<i>Yellowmouth Rockfish</i>		0.0	0.0		0.0	0.0	0.0		0.4	0.0	0.1
Complex Total	188.9	250.6	148.7	144.3	106.4	81.7	139.2	101.2	69.8	65.6	129.6

Comparing total mortality to the OFL contribution (in mt) by species for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
Aurora Rockfish	-66.4	-61.9	-69.6	-71.9
<i>Bank Rockfish</i>	-464.4	-472.9	-475.8	-470.5
Blackgill Rockfish	-71.0	-91.7	-138.8	-147.4
<i>Pacific Ocean Perch</i>	0.01	0.05	0.001	0.003
<i>Redbanded Rockfish</i>	-7.0	-7.0	-9.4	-7.9
Rougheye/Blackspotted Rockfish	-4.1	-4.1	-3.7	-4.4
Sharpchin Rockfish	-74.5	-89.3	-88.1	-86.0
<i>Shortraker Rockfish</i>	-0.05	-0.04	-0.09	-0.06
<i>Yellowmouth Rockfish</i>	-0.8	-0.8	-0.4	-0.8
Complex Total	-688.1	-727.9	-785.9	-789.0

Table A 16. Background information by species in the slope rockfish complex south of 40° 10' N lat. (species in italics indicates species is a Category 3 stock; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
Aurora Rockfish	2013 Full	64% (2013)	1	0.45	0.100	74.2	66.8	66.8	2.10
<i>Bank Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>503.2</i>	<i>391.5</i>	<i>391.5</i>	<i>2.02</i>
Blackgill Rockfish	2017 Update	41.5% (2019)	2	0.45	0.159	205.0	172.4	172.4	2.08
<i>Pacific Ocean Perch</i>			3	<i>0.45</i>	<i>0.222</i>	-	-	-	<i>1.69</i>
<i>Redbanded Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>10.4</i>	<i>8.1</i>	<i>8.1</i>	<i>2.02</i>
Rougheye/Blackspotted Rockfish	2013 Full	47% (2013)	2	0.45	0.190	4.8	3.9	3.9	2.27
Sharpchin Rockfish	2013 ExSSS	68% (2013)	2	0.45	0.190	71.3	57.8	57.8	2.05
<i>Shortraker Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>0.1</i>	<i>0.1</i>	<i>0.1</i>	<i>2.25</i>
<i>Yellowmouth Rockfish</i>	<i>2011 DBSRA</i>		3	<i>0.45</i>	<i>0.222</i>	<i>0.8</i>	<i>0.6</i>	<i>0.6</i>	<i>1.96</i>
Complex Total						869.8	701.1	701.1	
Shaded cells indicate no harvest specifications contribution									

Table A 17. Total mortality (in mt) by species in the slope rockfish complex south of 40° 10' N lat. from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
Aurora Rockfish	7.0	25.3	8.2	5.3	5.3	3.4	8.1	12.6	5.0	2.6	8.3
<i>Bank Rockfish</i>	29.2	18.0	56.5	61.5	54.6	39.2	38.8	30.3	27.4	32.7	38.8
Blackgill Rockfish	151.4	195.6	74.3	73.1	42.3	36.7	72.0	54.3	35.2	26.6	76.2
<i>Pacific Ocean Perch</i>	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Redbanded Rockfish</i>	0.5	5.7	5.5	1.8	3.0	1.6	3.4	3.4	1.0	2.5	2.9
Rougheye/ Blackspotted Rockfish	0.4	5.6	3.2	2.5	1.1	0.4	0.2	0.2	0.7	0.1	1.4
Sharpchin Rockfish	0.4	0.3	0.9	0.1	0.1	0.3	16.5	0.3	0.1	1.0	2.0
<i>Shortraker Rockfish</i>		0.0			0.0	0.0	0.1	0.1	0.0	0.0	0.0
<i>Yellowmouth Rockfish</i>		0.0	0.0		0.0	0.0	0.0		0.4	0.0	0.1
Complex Total	188.9	250.6	148.7	144.3	106.4	81.7	139.2	101.2	69.8	65.6	129.6

Table A 18. Comparing total mortality to the OFL contribution (in mt) by species for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
Aurora Rockfish	-66.4	-61.9	-69.6	-71.9
<i>Bank Rockfish</i>	-464.4	-472.9	-475.8	-470.5
Blackgill Rockfish	-71.0	-91.7	-138.8	-147.4
<i>Pacific Ocean Perch</i>	0.01	0.05	0.001	0.003
<i>Redbanded Rockfish</i>	-7.0	-7.0	-9.4	-7.9
Rougheye/Blackspotted Rockfish	-4.1	-4.1	-3.7	-4.4
Sharpchin Rockfish	-74.5	-89.3	-88.1	-86.0
<i>Shortraker Rockfish</i>	-0.05	-0.04	-0.09	-0.06
<i>Yellowmouth Rockfish</i>	-0.8	-0.8	-0.4	-0.8
Complex Total	-688.1	-727.9	-785.9	-789.0

Other Flatfish

Table A 19. Background information by species in the other flatfish complex. (species in italics indicates species is a Category 3 stock; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
<i>Butter Sole</i>	<i>None</i>		3	0.4	0.398	4.6	2.8	2.8	1.18
<i>Curlfin Sole</i>	<i>None</i>		3	0.4	0.398	8.2	5.0	5.0	1.23
<i>Flathead Sole</i>	<i>None</i>		3	0.4	0.398	35.0	21.1	21.1	1.26
<i>Pacific Sanddab</i>	2011 DBSRA	95.5% (2013)	3	0.4	0.398	4,801.0	2,890.2	2,890.2	1.25
Rex Sole	2013 ExSSS	80% (2013)	2	0.4	0.346	2,197.9	1,437.4	1,437.4	1.28
<i>Rock Sole</i>	2011 DBSRA		3	0.4	0.398	66.7	40.2	40.2	1.42
<i>Sand Sole</i>	2011 DBSRA		3	0.4	0.398	773.2	465.5	465.5	1.23
Complex Total						7,886.7	4,862.1	4,862.1	

Table A 20. Total mortality (in mt) by species in the other flatfish complex from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
<i>Butter Sole</i>	0.9	2.3	0.3	4.4	0.3	0.2	0.1	0.0	0.0	0.0	0.9
<i>Curlfin Sole</i>	1.8	1.7	2.8	3.4	10.2	7.7	4.2	2.8	2.8	2.1	4.0
<i>Flathead Sole</i>	24.4	21.7	24.0	30.3	41.8	37.4	38.6	20.0	11.8	8.7	25.9
<i>Pacific Sanddab</i>	328.3	300.5	312.8	425.7	339.4	254.8	222.7	213.7	149.5	63.4	261.1
Rex Sole	444.4	446.5	564.1	485.0	625.4	714.6	719.1	550.3	448.4	425.1	542.3
<i>Rock Sole</i>	7.7	14.7	11.6	8.6	13.9	11.9	11.2	5.2	3.3	2.0	9.0
<i>Sand Sole</i>	80.5	87.9	26.3	33.8	22.9	31.6	17.7	46.2	41.6	5.5	39.4
Complex Total	888.0	875.3	941.9	991.2	1,053.9	1,058.1	1,013.6	838.3	657.3	506.8	882.4

Table A 21. Comparing total mortality to the OFL contribution (in mt) by species for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
Butter Sole	-4.6	-4.6	-4.6	-4.6
Curlfin Sole	-4.0	-5.4	-5.4	-6.2
Flathead Sole	7.3	-6.2	-24.2	-11.7
Pacific Sanddab	-4,578.3	-4,587.3	-4,651.5	-4,737.6
Rex Sole	-4,756.9	-3,450.7	-2,612.5	-2,087.7
Rock Sole	-55.5	-61.5	-63.4	-64.7
Sand Sole	-755.5	-727.0	-731.6	-767.7
Complex Total	-10,147.4	-8,842.8	-8,093.4	-7,680.3

Other Fish

Table A 22. Background information by species in the other fish complex. (species in italics indicates species is a Category 3 stock; cont. = contribution)

Species	Last Assessment	Estimated Depletion (year)	Category	P*	2023 ABC Buffer Fraction	2023 OFL cont.	2023 ABC cont.	2023 ACL cont.	Vulnerability Score
<i>Kelp greenling (CA)</i>	2011 DBSRA		3	0.45	0.222	118.9	92.5	92.5	1.56
<i>Leopard shark</i>	2011 DBSRA		3	0.45	0.222	167.1	130.0	130.0	2.00
Complex Total						286.0	222.5	222.5	

Table A 23. Total mortality (in mt) by species in the other fish complex from 2011-2020 with 10-year average.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-yr avg.
cabezon (WA)	8.7	7.3	6.1	5.0	4.7	5.2	4.8	6.8	Part of the WA Cab/green complex		6.1
Kelp greenling (WA)	2.3	2.3	2.8	2.3	1.6	2.1	1.5	1.2	Cab/green complex		2.0
<i>Kelp greenling (CA)</i>	<i>25.1</i>	<i>17.8</i>	<i>19.2</i>	<i>16.3</i>	<i>24.5</i>	<i>15.6</i>	<i>15.9</i>	<i>9.4</i>	<i>6.1</i>	<i>3.5</i>	<i>15.3</i>
Kelp greenling (OR)	43.2	40.9	44.7	34.3	31.5	25.6	24.0	35.2	Part of OR cab/green		34.9
<i>Leopard shark</i>	<i>32.3</i>	<i>38.1</i>	<i>16.0</i>	<i>20.6</i>	<i>31.5</i>	<i>69.4</i>	<i>57.6</i>	<i>21.8</i>	<i>22.0</i>	<i>15.8</i>	<i>32.5</i>
Complex Total	111.6	106.4	88.8	78.5	93.7	117.8	103.9	74.3	28.1	19.3	82.2

Table A 24. Comparing total mortality to the OFL contribution (in mt) by species in the other fish complex for 2016-2020. Negative numbers mean the mortality was below the OFL contribution (green-shaded cells), positive numbers indicate mortality exceeded the OFL contribution (red-shaded cells).

Species	Over/under OFL contribution (mt)			
	2017	2018	2019	2020
cabezon (WA)	0.3	2.0	part of WA cab/green complex	
Kelp greenling (WA)	-5.6	-5.3	part of WA cab/green complex	
<i>Kelp greenling (CA)</i>	<i>-103.3</i>	<i>-103.0</i>	<i>-112.8</i>	<i>-115.4</i>
Kelp greenling (OR)	-215.1	-168.0	part of OR cab/green complex	
<i>Leopard shark</i>	<i>-97.7</i>	<i>-109.5</i>	<i>-145.3</i>	<i>-151.3</i>
Complex Total	-421.4	-383.8	-258.2	-266.7