



NWFSC
SWFSC

Prioritizing Groundfish Stock Assessments

Preliminary Analysis and Ranking of Pacific Coast Groundfish Species for Assessment in 2021 (and 2023)

March 2020 Presentation to the
Pacific Fishery Management Council

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Overview of Process

Identifying stocks for upcoming Benchmark (Full) or Update assessments

- Review the prioritization workbook (Rev. Att. 2)
 - No changes were made to the set of included species from 2018
 - Although some potential changes are presented at the end of this
- Review the preliminary species ranks for 2021
 - Discuss available data and workload
- Review the calendar for possible 2021 STAR Panels
- Priority species for 2023 assessments
- Discuss Att. 1 Appendix, if the Council desires

Factor Scoring Overview

Category	Factors	Source/Basis	Range
FISHERY Importance	Commercial Fishery Importance	Landed Ex-vessel Revenue, from PacFIN (transformed)	0-10
	Recreational Fishery Importance	Weighted Landed catch, from RecFIN (transformed)	0-10
	Importance to Subsistence	Tribal Comm Revenue + Subsistence input from Tribes	0-10
	Constituent Demand/ Choke Stock	Higher Value to a state or gear group & Constraining Species	0-10
STOCK Status	Rebuilding Status	Assessed Status + Rebuilding Proj.	0-10
	Relative Stock Abundance	Latest assessed depletion or PSA	1-10
	Relative Fishing Mortality	Groundfish Mortality Reports and Specifications	1-10
ECOSYSTEM Importance	Key Role in Ecosystem	Top-down and bottom-up diet impacts on managed/protected sp.	0-10
ASSMT Info	Unexpected Stock Trends	No scoring system yet. Only sabl. & petrale updated since 2016.	0-10
	Relevant New Type of Information Available	Updated Steepness Prior; New availability of trend or comp data; Ability to fix prior assmt. issues	0-10
	Years Since Assessment relative to Target Frequency , adjusted	Assessment output, Fishery and Ecosystem Factor scores, recent mortality vs draft 2022 ABCs	(-3)-10

Fishery Importance – Commercial

Description:

- Average 2014-18 coastwide, ex-vessel revenue is transformed to compress the distribution (same transformation used in 2018)
- Then re-scaled so the top score is 10
- Does not include fish sold by participants in Tribal fisheries
- Point Range: 0–10

Top-15 Species		Factor Score	Revenue \$1000s
1	Sablefish	10.0	128,576
2	Petrale sole	7.8	32,968
3	Dover sole	7.8	32,781
4	Shortspine thornyhead	6.9	16,525
5	Widow rockfish	6.5	11,633
6	Lingcod	6.2	8,881
7	Yellowtail rockfish	6.0	7,560
8	Black rockfish	5.4	4,249
9	Longspine thornyhead	5.4	4,206
10	Gopher/B&Y rockfish	5.2	3,535
11	Longnose skate	5.1	3,215
12	Cabazon	5.0	2,746
13	Rex Sole	4.6	1,751
14	Brown rockfish	4.5	1,594
15	Chilipepper rockfish	4.5	1,448

Fishery Importance – Recreational

Description:

- No comparable metric to ex-vessel revenue or prices for the rec. fishery
- Value to anglers differs among species
- Relative weights ('pseudo-prices') between species created with state agency and GAP input:
 - these range from 0.5 to 2.0
- Average 2014-18 landed mts are multiplied by these weights to get 'pseudo-revenues'
 - scored in the same manner as Comm. Rev.
- Point Range: 0–10

Top-15 Species		Factor Score	Pseudo-Revenue	Landed mts
1	Lingcod	10.00	8,878	4,485
2	Black rockfish	9.83	8,082	4,288
3	Vermilion/Sunset rockfish	7.98	2,531	1,348
4	Blue/Deacon rockfish	7.40	1,673	917
5	Copper rockfish	7.11	1,339	820
6	Bocaccio	6.63	908	491
7	California scorpionfish	6.55	846	423
8	Yellowtail rockfish	6.38	733	608
9	Brown rockfish	6.25	650	448
10	Canary rockfish	6.16	604	337
11	Cabazon	5.62	362	305
12	Gopher/B&Y rockfish	5.42	296	262
13	Olive rockfish	5.25	247	214
14	Squarespot rockfish	4.94	176	98
15	Pacific sanddab	4.90	169	207

Tribal Importance – Subsistence & Fish Sales

- Description:
- Revenue from sales is scored in the same manner as non-Tribal commercial, but with a maximum of 7
- Subsistence value is scored on a 0-3 scale, based on input/responses from Tribal representatives
- Point Range: 0–10

	Top-15 Species	Factor Score	Revenue \$1000s	Subsist. Score
1	Sablefish	10.0	15,148	3
2	Yellowtail rockfish	7.4	1,186	3
3	Pacific cod	7.3	1,054	3
4	Petrале sole	7.0	2,305	2
5	Lingcod	6.5	331	3
6	Canary rockfish	5.5	46	3
7	Rex Sole	5.3	215	2
8	Dover sole	5.1	390	1.5
9	Rougheye/Blksptd roc	4.9	120	2
10	English sole	4.8	247	1.5
11	Widow rockfish	4.6	65	2
12	Sand Sole	4.3	33.2	2
13	Black rockfish	4.3	1	3
14	Longnose skate	4.3	29	2
15	Big skate	4.1	4	2.5

Choke Species and Constituent Demand

Description:

- Stocks that constrain the catch of other healthy stocks, esp. rebuilding stocks
 - Informed by ABC attainment
- Species that are much more important to a specific fleet or state than is reflected in the coastwide comm/rec ranks
- Point Range: 0–10

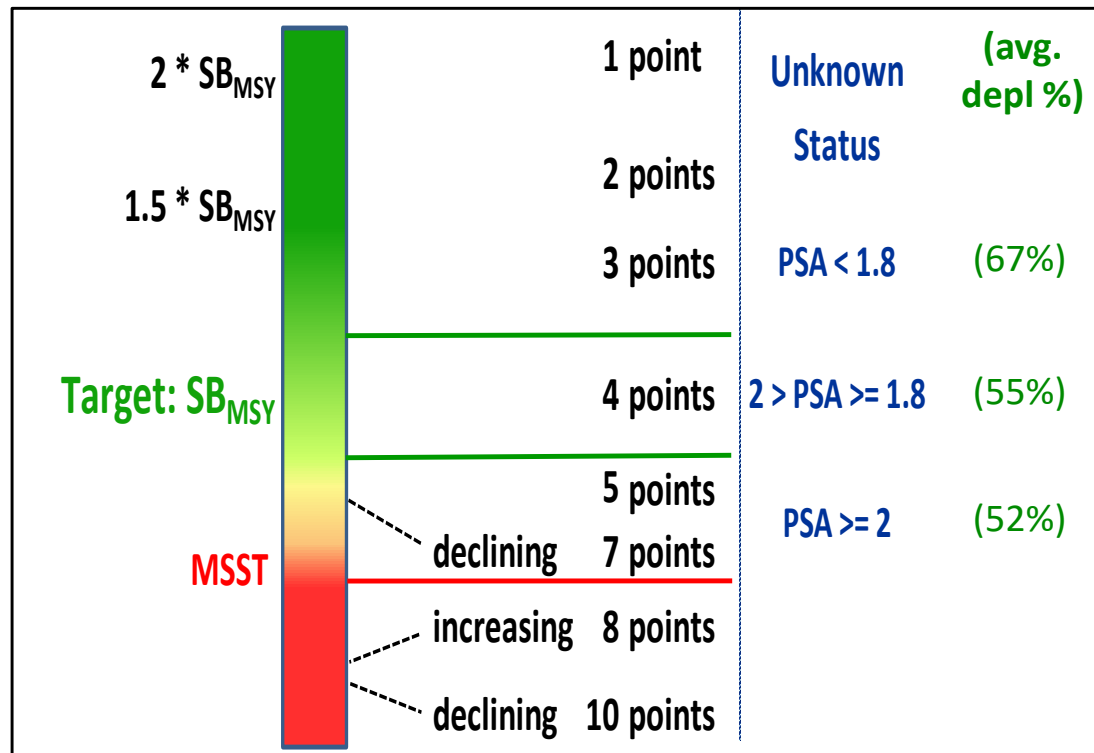
Top-15 Species		Factor Score	Choke stock	Const. Demand
1	Yelloweye rockfish	10.0	10	
2	Black rockfish	4.0	2	2
3	Bocaccio	3.0		3
3	Brown rockfish	3.0	1	2
3	Canary rockfish	3.0		3
3	Copper rockfish	3.0	2	1
3	Cowcod	3.0		3
3	Darkblotched rockfish	3.0		3
3	Gopher/B&Y rockfish	3.0	2	1
3	Pacific cod	3.0		3
3	Pacific Ocean perch	3.0		3
3	Pacific spiny dogfish	3.0	2	1
3	Quillback rockfish	3.0	1	2
3	Rougheye/Blksptd rockfish	3.0	2	1
3	Vermilion/Sunset rockfish	3.0	2	1
3	Widow rockfish	3.0		3

Stock Status – Biomass

Description:

- Scoring based on latest ratio of spawning biomass/output to the “unfished” level, where available
- PSA (Vulnerability) scores used when depletion is unknown (italicized PSAs not used)

- Point Range: 1–10



Top-15 Species (& ties)		% of Unfished	PSA Score	Factor Score
1	Bank rockfish		2.02	6
1	Quillback rockfish		2.22	6
1	Redbanded rockfish		2.02	6
1	Shortraker rockfish		2.25	6
1	Speckled rockfish		2.1	6
1	Vermilion/Sunset rockfish		2.05	6
7	Greenspotted rockfish	35%	1.98	5
7	Yelloweye rockfish	28%	2	5
9	Black rockfish	43%	1.94	4
9	Blackgill rockfish	39%	2.08	4
9	Blue/Deacon rockfish	42%	2.01	4
9	Brown rockfish	43%	1.99	4
9	Darkblotched rockfish	40%	1.92	4
9	Flag rockfish		1.97	4
9	Gopher/B&Y rockfish	44%	1.73	4
9	Grass rockfish		1.89	4
9	Honeycomb rockfish		1.97	4
9	Olive rockfish		1.87	4
9	Sablefish	39%	1.64	4
9	Squarespot rockfish		1.86	4

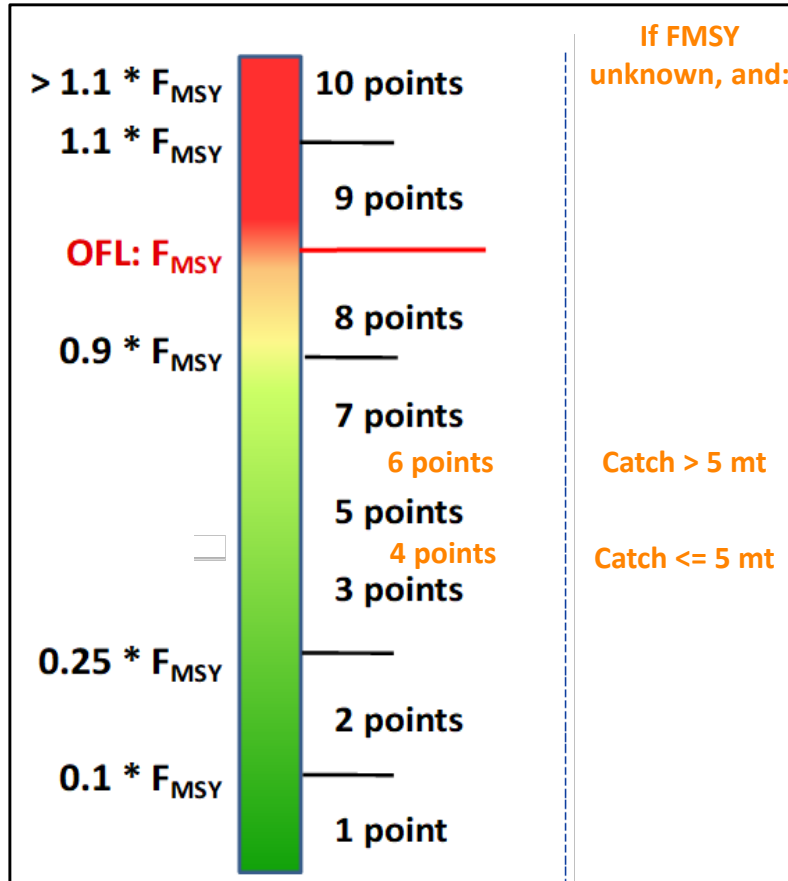
Stock Status – Fishing Mortality

Description:

- Scoring is based on ratio of average 2016-18 fishing mortality to average OFLS in those years

- Italicized* values indicate that the species makes an OFL contribution to an assemblage
- Values are **Bold** for species with individual OFLs

- Point Range:
1–10



	Top-15 Species (& ties)	% of OFL (contr.)	OFL - Catch mt)	Factor Score
1	Squarespot rockfish	<i>194%</i>	<i>-11</i>	10
1	Quillback rockfish	<i>163%</i>	<i>-8</i>	10
1	Vermilion/Sunset rockfish	<i>124%</i>	<i>-66</i>	10
4	Treefish rockfish	<i>110%</i>	<i>-1</i>	9
4	Flathead Sole	<i>107%</i>	<i>-3</i>	9
6	Petrале sole	91%	296	8
7	Rougheye/Blksptd rockfish	85%	32	7
7	Redbanded rockfish	82%	10	7
9	Shortraker rockfish	72%	5	5
9	Black rockfish	70%	410	5
9	Sablefish	68%	2,683	5
9	Copper rockfish	66%	109	5
9	Starry rockfish	62%	24	5
9	Blue/Deacon rockfish	61%	139	5
9	Brown rockfish	60%	68	5
9	Widow rockfish	57%	4,466	5
9	Gopher/B&Y rockfish	52%	94	5
9	Big skate	52%	262	5

Ecosystem Importance

Description: (same values as 2018)

Based on Top-down and Bottom-up importance for managed and protected (M-P) species, using all species in the Koehn et al. (2016) Ecopath model

- **Top-down:** what eats M-P species - max (10) = P. hake
- **Bottom-up:** what M-P species eat - max (10) = Phytoplankton & infauna
- Ecopath 'assemblage' scores were distributed among spp. using 2014-16 OFLs/contributions (will be updated)
- Point Range: 1–10

Top-15 Species		Eco-system Factor Score	Top-down + bottom-up scores	Top-down score	Bottom-up score
1	Spiny dogfish	10.000	7.35	7.02	0.33
2	Sablefish	9.589	7.05	6.66	0.39
3	Arrowtooth flounder	5.701	4.19	4.04	0.15
4	Lingcod	3.170	2.33	2.19	0.14
5	Shortspine thornyhead	2.018	1.48	1.02	0.47
6	Yellowtail Rockfish	2.003	1.47	1.18	0.29
7	Longnose Skate	1.979	1.46	1.32	0.13
8	Dover sole	1.806	1.33	0.05	1.27
9	Chilipepper rockfish	1.293	0.95	0.84	0.11
10	Black rockfish	0.952	0.70	0.63	0.07
11	Bocaccio	0.929	0.68	0.60	0.08
12	Petrале sole	0.730	0.54	0.50	0.04
13	Widow Rockfish	0.478	0.35	0.19	0.16
14	California scorpionfish	0.425	0.31	0.19	0.12
15	Pacific cod	0.425	0.31	0.19	0.12

Assessment – New Information

Description:

- Scoring reflects subjective rating of the expected availability of important (new) data/sources or methods that could:
 - affect the findings of or resolve uncertainties from previous assessments,
 - allow the assessment “uncertainty” category to be upgraded, or
 - facilitate a 1st-time full assessment
- Point Range: 1–10

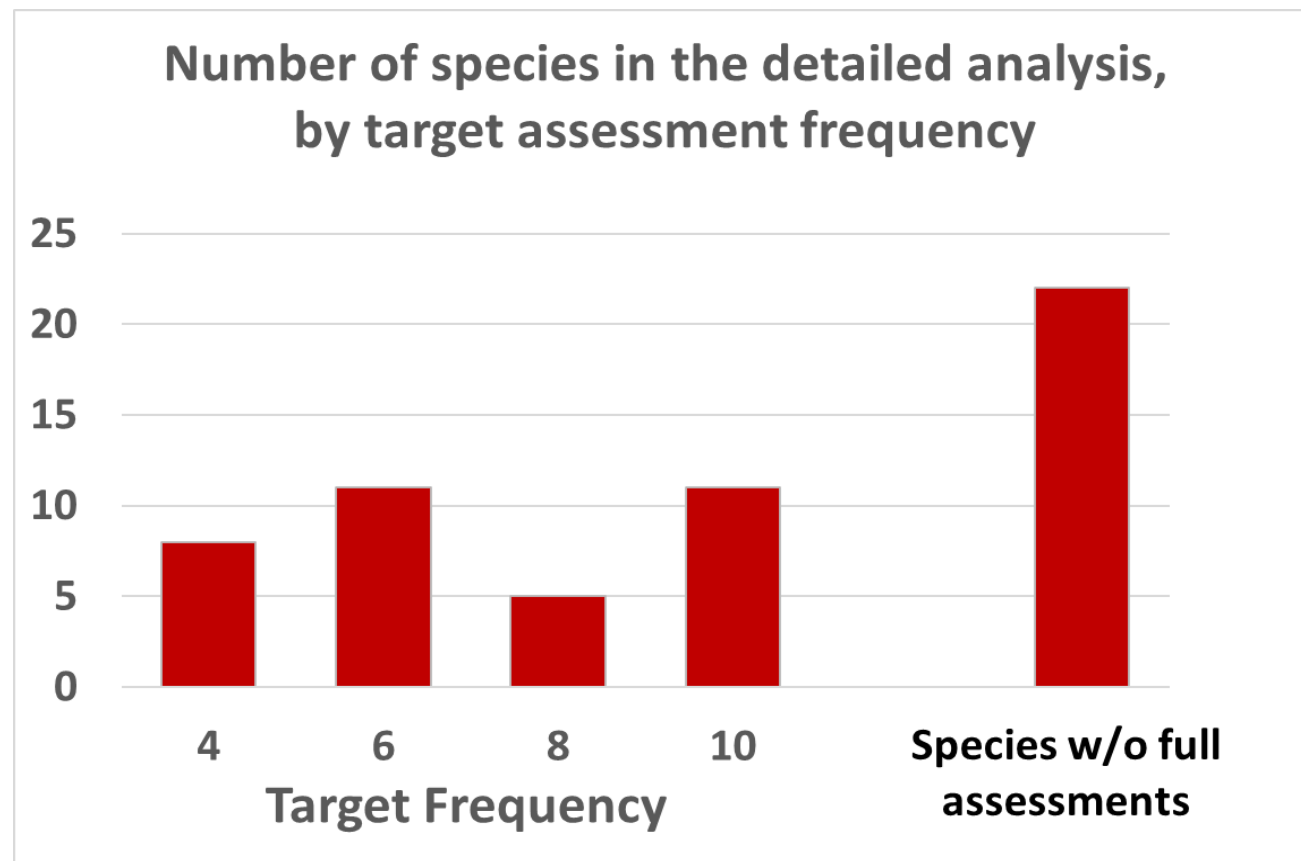
	Top-15 Species (& ties)	Year of last full asmt	Factor Score
1	Splitnose rockfish	2009	8
2	Greenstriped rockfish	2009	7
3	Vermilion/Sunset rockfish		6
4	Bank rockfish		5
4	Brown rockfish		5
4	English sole	2005	5
4	Quillback rockfish		5
4	Redbanded rockfish		5
9	Flag rockfish		4
9	Grass rockfish		4
9	Honeycomb rockfish		4
9	Kelp rockfish		4
9	Lingcod	2017	4
9	Shortraker rockfish		4
9	Starry rockfish		4
9	Treefish rockfish		4

Target Frequency & Years Since Last Assessment

Most important Factor for lowering ranking after assessment

Assessment Target Frequency for previously-assessed stocks is calculated as in 2018:

- Starting with a transformation of Mean age in Catch (for assessed species, only)
- With additive adjustments based on:
 - Degree of Recruitment variability, σ_R
 - Fishery Importance (using the sum of weighted Fishery Factor scores)
 - Ecosystem Importance
- Rounded to the nearest 2 years, between 4 and 10.
- Initial score is calculated as:
Max[(Years since last assessment – Target Frequency), 0]



Target Frequency & Years Since Last Assessment

Adjustments to the initial score are essentially the same as last cycle, except for:

A new element, which attempts to account for future constraints created by increasing uncertainty buffers, as σ (of $P \cdot \sigma$) increases

- Higher of (average 2016-18 and 2018 fishing mortality) is divided by the draft 2022 ABC (or contribution) amount [reported in tab <2022 spex limiting>]
- Species with high ratios have up to 2 points added to their frequency scores
 - Except for species assessed in 2019
- Species with low ratios have 1 point subtracted to their frequency scores

The elements of this factor are primarily responsible for allowing new or infrequently-assessed stocks to rise in the rankings over time

Point Range: -3–10

Target Frequency & Years Since Last Assessment

Adjustments from potential 2022 OFL attainment

Species	Recent mortality % of 2022 OFL	Adjust to Freq score
Vermilion/Sunset rockfish	170%	2
Rougeye/Blcksptd rockfish	123%	2
Pacific Spiny Dogfish	122%	2
Copper rockfish	104%	2
Black rockfish	86%	2
Squarespot rockfish	274%	1
Quillback rockfish	262%	1
Flathead Sole	180%	1
Treefish rockfish	143%	1
Redbanded rockfish	106%	1
Shortraker rockfish	103%	1
Starry rockfish	80%	1
Brown rockfish	77%	1

Species	Recent mortality % of 2022 OFL	Adjust to Freq score
Chilipepper rockfish	19%	-1
Kelp Greenling	18%	-1
Arrowtooth flounder	16%	-1
Pacific cod	14%	-1
Bank rockfish	9%	-1
Dover sole	9%	-1
Pacific Sanddab	8%	-1
Greenstriped rockfish	5%	-1
Sharpchin rockfish	5%	-1
Sand Sole	4%	-1
English sole	4%	-1
Pacific ocean perch	4%	-1
Starry flounder	4%	-1
Cowcod	3%	-1

Final Frequency Scores

Top-15 Species (& ties)	Year of last asmt	Factor Score
1 Copper rockfish	2013	7
2 Brown rockfish	2013	6
2 Splitnose rockfish	2009	6
2 Vermilion/Sunset rockfish		6
5 Black rockfish	2015	5
5 Dover sole	2011	5
5 Pacific cod		5
8 Pacific sanddab		4
8 Pacific spiny dogfish	2011	4
8 Quillback rockfish		4
8 Starry rockfish		4
8 Treefish rockfish		4
13 Bank rockfish		3
13 Flathead Sole		3
13 Grass rockfish		3
13 Greenstriped rockfish	2009	3
13 Olive rockfish		3
13 Redbanded rockfish		3
13 Rex Sole	2013	3
13 Shortraker rockfish		3
13 Speckled rockfish		3
13 Squarespot rockfish		3

Total Weighted Factor Scores

- All Factor Scores are assembled in the 'Factor Summary' tab
- The Factor Scores are weighted, using the weights shown below
- The summation of those weighted scores forms the basis for ranking species

Individual Factor Scores for each species, with factor weights shown in row 7

Factor	Fishery Factors				Status			Eco-system score	Assessment Information		
	Comm Factor Score	Rec Factor Score	Tribal Factor Score	Const. Dem/ Choke Sp Factor	Rebuild Factor Score	Stock Status Score	Harvest Status Score		New Info Score	Assess. Freq. Score	Unexp Trend Score
	Weights ->	0.21	0.09	0.05	0.11	0.10	0.08		0.08	0.05	0.18
Average ->	3.83	3.22	2.47	1.77	0.11	3.18	3.58	0.77	2.00	1.49	
Wtd Average ->	0.81	0.29	0.12	0.19	0.01	0.25	0.29	0.04	0.10	0.27	

Total Weighted Factor Scores

Species	Rank	Wt.'d Total Score	2021 Asmnt Options	Last Assessment	
				Year	Type
Vermilion/Sunset rockfish	1	4.64			d-p
Black rockfish	2	4.34		2015	F
Brown rockfish	3	4.02	F/D-M	2013	D-M
Copper rockfish	4	3.98	F/D-M	2013	D-M
Sablefish	5	3.90		2019	F
Quillback rockfish	6	3.70			d-p
Lingcod	7	3.36	Full/Upd	2017	F
Dover sole	8	3.31		2011	F
Pacific cod	9	3.23			
Treefish rockfish	10	3.11			d-p
Yelloweye rockfish	11	3.00	Update	2017	F
Petrale sole	12	2.93	Full/Upd	2019	U
Redbanded rockfish	13	2.86			d-p
Pacific spiny dogfish	14	2.84		2011	
Yellowtail rockfish	15	2.75	Update	2017	F
Canary rockfish	16	2.65		2015	F
Squarespot rockfish	17	2.65			d-p
Grass rockfish	18	2.65			d-p
Starry rockfish	19	2.60			d-p

Species	Rank	Wt.'d Total Score	2021 Asmnt Options	Last Assessment	
				Year	Type
Pacific sanddab	20	2.56			d-p
Splitnose rockfish	21	2.53		2009	F
Rougeye/Blksptd rockfish	22	2.49		2013	F
Bank rockfish	23	2.47			d-p
Rex Sole	24	2.47	F/D-M	2013	D-M
Speckled rockfish	25	2.45			d-p
Shortspine thornyhead	26	2.40		2013	F
Shortraker rockfish	27	2.36			d-p
Flathead Sole	28	2.31			d-p
Bocaccio	29	2.29	Update	2017	U
Gopher/B&Y rockfish	30	2.28		2019	F
Widow rockfish	31	2.26	Update	2019	U
Kelp greenling	32	2.19	Full/Upd	2015	F
English sole	33	2.09		2013	D-M
Olive rockfish	34	2.08			d-p
Blue/Deacon rockfish	35	2.06	Update	2017	F
Kelp rockfish	36	2.03			d-p
Greenstriped rockfish	37	1.93		2009	F
Longspine thornyhead	38	1.93		2013	F

Data Availability

Species	Rank	Base Total Score	Last Assessment		SSC suggests Update for next asmnt	Data adequacy for a Benchmark/Full Asmt			Notes
			Year	Type		Lengths	Ages	Index	
Vermilion/Sunset rockfish	1	4.64		d-p					2-3 areas; w/ Sunset
Black rockfish	2	4.34	2015	F					N'shore; 3-area
Brown rockfish	3	4.02	2013	D-M					N'shore; 1-area
Copper rockfish	4	3.98	2013	D-M					N'shore; 2-3 areas
Sablefish	5	3.90	2019	F					1-area; Trawl survey
Quillback rockfish	6	3.70		d-p					N'shore; 3-area
Lingcod	7	3.36	2017	F	Update				
Dover sole	8	3.31	2011	F					1-area; Trawl survey
Pacific cod	9	3.23							1-area; Trawl survey
Treefish rockfish	10	3.11		d-p				X	N'shore; 1-area
Yelloweye rockfish	11	3.00	2017	F	Update				
Petrale sole	12	2.93	2019	U	Update				1-area; Trawl survey
Redbanded rockfish	13	2.86		d-p					
Pacific spiny dogfish	14	2.84	2011						
Yellowtail rockfish	15	2.75	2017	F	Update				
Canary rockfish	16	2.65	2015	F					
Squarespot rockfish	17	2.65		d-p				X	
Grass rockfish	18	2.65		d-p				X	N'shore; 1-area
Starry rockfish	19	2.60		d-p				X	

Data Availability

Should these species be removed from future detailed Prioritization Analyses, until some source of age and index data is identified?

(though still included at the bottom of the Fishing Mortality tab)

Removing these 6 would leave 49 in the detailed analysis

Species	2020 Rank	Base Total Score	Data adequacy for a Benchmark/Full Asmt		
			Lengths	Ages	Index
Treefish rockfish	10	3.11			X
Squarespot rockfish	17	2.65			X
Grass rockfish	18	2.65			X
Starry rockfish	19	2.60			X
Speckled rockfish	25	2.45			X
Shortraker rockfish	27	2.36			X

Total Weighted Factor Scores – after removing 6 spp

Species	Rank	Wt.'d Total Score	2021 Asmnt Options	Last Assessment	
				Year	Type
Vermilion/Sunset rockfish	1	4.64			d-p
Black rockfish	2	4.34		2015	F
Brown rockfish	3	4.02	F/D-M	2013	D-M
Copper rockfish	4	3.98	F/D-M	2013	D-M
Sablefish	5	3.90		2019	F
Quillback rockfish	6	3.70			d-p
Lingcod	7	3.36	Full/Upd	2017	F
Dover sole	8	3.31		2011	F
Pacific cod	9	3.23			
Yelloweye rockfish	10	3.00	Update	2017	F
Petrале sole	11	2.93	Full/Upd	2019	U
Redbanded rockfish	12	2.86			d-p
Pacific spiny dogfish	13	2.84		2011	
Yellowtail rockfish	14	2.75	Update	2017	F
Canary rockfish	15	2.65		2015	F
Pacific sanddab	16	2.56			d-p
Splitnose rockfish	17	2.53		2009	F
Rougheye/Blksptd rockfish	18	2.49		2013	F
Bank rockfish	19	2.47			d-p

Species	Rank	Wt.'d Total Score	2021 Asmnt Options	Last Assessment	
				Year	Type
Rex Sole	20	2.47	F/D-M	2013	D-M
Shortspine thornyhead	21	2.40		2013	F
Flathead Sole	22	2.31			d-p
Bocaccio	23	2.29	Update	2017	U
Gopher/B&Y rockfish	24	2.28		2019	F
Widow rockfish	25	2.26	Update	2019	U
Kelp greenling	26	2.19	Full/Upd	2015	F
English sole	27	2.09		2013	D-M
Olive rockfish	28	2.08			d-p
Blue/Deacon rockfish	29	2.06	Update	2017	F
Kelp rockfish	30	2.03			d-p
Greenstriped rockfish	31	1.93		2009	F
Longspine thornyhead	32	1.93		2013	F
Sand Sole	33	1.93			d-p
Longnose skate	34	1.89		2019	F
Flag rockfish	35	1.87			d-p
Greenspotted rockfish	36	1.87		2011	F
China rockfish	37	1.85		2015	F
Starry flounder	38	1.79			d-p

2021 Calendar, with potential review meeting dates

May						
Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

June						
Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

July						
Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

August						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September						
Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

October						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Holidays

Council Meetings

Prospective Briefing Book Deadlines

Possible STAR Panel weeks, for review in June

Recommended

Possible STAR Panel weeks, for review in Sept.

Recommended

Possible SSC-GSC Pre-Sept. Assessment Review

Week for additional review, if needed



Wrap-up

- Priority species for 2023 assessments will be highly-ranked species this year that are not selected for assessment in 2021
- There is a tab in the revised Supp Att 2 for estimating 2023 ranking, given 2021 selections

Rank	2021 Rank in 2020	2021 Rank in 2018
1	Vermilion/Sunset rockfish	Vermilion/Sunset rockfish
2	Black rockfish	Black rockfish
3	Copper rockfish	Sablefish
4	Brown rockfish	Pacific cod
5	Quillback rockfish	Brown rockfish
6	Sablefish	Dover sole
7	Lingcod	Lingcod
8	Dover sole	Copper rockfish
9	Pacific cod	Yelloweye rockfish
10	Treefish rockfish	Canary rockfish

Wrap-up

Any questions or comments regarding the Appendix to Attachment 1?

The End