Prioritizing Fish Stock Assessments

Draft Analysis and Ranking of

Pacific Coast Groundfish Species

for Assessment in 2019 (and 2021)

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Overview of Process

Identifying stocks for upcoming <u>Benchmark/Full or Update</u> assessments

1. **Define stock list – excludes:**
   - International assessments
   - Ecosystem component species
   - Stocks not listed in the FMP
   - FMP Stocks with *de minimus* catch and/or data availability
     - Listed on following slide

2. **Assemble data and develop Factor Scores**

3. **Calculate Target Frequency for each stock**

4. **Determine weights and Calculate total species scores**
   - Sum of factor scores times weights

5. **Evaluate priority ranking, in light of other factors**
   - Available index and composition data, workload

6. **Play it forward to 2021**

Excluded Species

- "Unbolded" names indicate species the were previously excluded from detailed analysis.

- "**Bolded**" names indicate additional species not included in detailed 2018 analysis.

| Species | Fishing Mortality | | Fishery "Value" | | All Fishery sampling | Trawl Survey |
| | | | Comm. | Rec. | Lengths | |
	2014-16 avg. mt	% of **OFL** (or *OFL contribution*)	**Annual Avg Ex-ves $1000s, 2012-16**	2012-16 landed mts * rel. wts	Annual average, 2002-11; Coastwide; Rec and Comm, combined	Average 2012-15: # of pos. tows
Bronzespotted Rockfish	0.0	*1%*	$ 0			
Butter Sole	0.4	*9%*	$ 1		6	10
Calico Rockfish	0.4	*no OFLc*	$ 0	1	320	6
chameleon RF						
Curlfin sole	7.2	*87%*	$ 3	0	40	72
Freckled Rockfish	0.0	*no OFLc*	$ 0		12	
Greenblotched Rockfish	0.5	*2%*	$ 1	1	84	12
halfbanded RF	3.2	*no OFLc*		7	226	49
harlequin RF	0.0	*no OFLc*			0	
Leopard Shark	36.2	*22%*	$ 8	36	144	
Mexican RF	0.1	*1%*	$ 0		4	
pink rockfish		*1%*	$ 0		1	2
Pinkrose Rockfish	0.0	*no OFLc*	$ 0		4	
Pygmy Rockfish	0.0	*no OFLc*	$ 0		0	9
Redstripe Rockfish	5.7	*2%*	$ 2		159	14
Rosethorn Rockfish	3.6	*24%*	$ 2	0	112	50
Rosy Rockfish	7.1	*15%*	$ 1	22	953	
Shortbelly Rockfish	19.0	0.3%	$ 1			59
Silvergray Rockfish	2.6	*2%*	$ 2		22	7
Stripetail Rockfish	17.5	*27%*	$ 1		42	137
Swordspine Rockfish	0.1	*1%*			4	3
Tiger Rockfish	1.0	*124%*	$ 3	4	174	
Yellowmouth Rockfish	2.8	*1%*	$ 5		102	2

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 Habitat Assmt. & Tribes	0-10
	Constituent Demand/ Choke Stock	Higher Value to fleet or area & Constraining Species	0-10
	~~Non-Catch Value~~	~~Scuba/snorkel Viewing~~	~~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	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, and Fishery Factor scores	(-3)-10

Fishery Importance – Commercial

Description:

- Score based on transformed ex-vessel value of landed catch
  - New exponential approach to transformation
- Preserves rank order, but reduces range & inter-species differences
- Scaled against most valuable *regional* groundfish stock
- Does not include tribal landings

Point Range: 0-10

Data Source:

- Ex-vessel revenue,
- Averaged over years 2012-16
- Obtained from PacFIN

Top-15 Species	Factor Score	Revenue $1000s
Sablefish	10.0	118,143
Dover sole	8.0	33,708
Petrale sole	7.7	28,080
Shortspine thornyhead	6.9	14,706
Lingcod	5.9	6,529
Yellowtail Rockfish	5.8	5,916
Longspine thornyhead	5.5	4,381
Black rockfish	5.4	3,847
Longnose Skate	5.4	3,688
Cabezon	5.1	2,767
Widow Rockfish	5.1	2,684
Gopher Rockfish	4.8	1,970
Pacific cod	4.8	1,896
Arrowtooth flounder	4.7	1,889
Brown Rockfish	4.7	1,864

Fishery Importance – Recreational

Description:

- No comparable metric to commercial revenue for rec. fishery
- Landed weight alone ignores differential species value to anglers
- Applying relative weights ('pseudo-prices') from 2016 to landed mts;
  • these range from 0.5 to 2.0
- Resulting 'pseudo-revenues' are scored in the same manner as Comm. Revenues (with the new exponential transformation)

Point Range: 0-10

Data Sources:

- Landings from RecFIN;
- Summed over 2012-2016
- Weights developed with State agency staff & Angler representatives in 2016

Top-15 Species	Factor Score	Pseudo-Revenue	Landed mts
Black rockfish	10.00	8,695	4,592
Lingcod	9.89	8,191	4,138
Vermilion Rockfish	7.85	2,263	1,197
Blue Rockfish	7.10	1,300	710
California scorpionfish	6.74	971	486
Copper Rockfish	6.73	963	590
Bocaccio	6.68	924	499
Brown Rockfish	6.23	628	433
Yellowtail Rockfish	6.18	598	506
Cabezon	5.64	359	307
Gopher Rockfish	5.41	285	263
Pacific Sanddab	5.31	259	317
Olive Rockfish	5.11	208	180
Squarespot Rockfish	4.82	151	84
Starry Rockfish	4.58	114	103

Fishery Importance – Subsistence (Tribal)

Description:

- Interpreted as Tribal fishery importance
    - Includes both tribal commercial landings and subsistence importance
- Commercial portion is scored as non-Tribal commercial, but 0-7
- Subsistence scored 0-3

Point Range: 0-10

Data Sources:

- Tribal revenues from PacFIN
    - Summed over 2012-16
- Subsistence scores based on feedback received during NW Regional Habitat Assessment Prioritization process (Makah and Quinault tribal responses)
- Additional feedback from Tribal GMT rep.

Top-15 Species	Factor Score	Revenue $1000s	Subsist. Score
Sablefish	10.0	14,095	3
Yellowtail Rockfish	7.9	1,894	3
Pacific cod	7.6	1,354	3
Petrale sole	6.9	1,854	2
Lingcod	6.7	409	3
Canary rockfish	5.3	28	3
Rex Sole	5.2	175	2
Dover sole	5.2	380	1.5
English sole	5.0	320	1.5
Widow Rockfish	5.0	127	2
Rougheye Rockfish	4.9	113	2
Black rockfish	4.1	0.5	3
Longnose Skate	4.0	13	2
Shortraker Rockfish	3.8	7	2
Yelloweye Rockfish	3.5	2	2

Fishery Importance – Rebuilding Status

Description: Includes rebuilding, ESA-listed stocks

Point Range: 0-10

Scoring:

  0 points = Stock does not have a rebuilding plan
  ~~3 points~~ = Recently rebuilt stock with impacted landings history:
                - 3 points shifted to Constituent Demand Factor in 2018 analysis
  4 points = Stock projected to rebuild > 20 years (reduced from 7)
  6 points = Stock projected to rebuild within 20 years (reduced from 8)
  9 points = Stock projected to be rebuilt by next assessment
10 points = Stock has a rebuilding plan, but biomass is still declining

Data Source:

  - Stock status
  - Recent assessments and rebuilding plans

Top Species	Factor Score
Cowcod	6
Yelloweye Rockfish	6

Fishery Importance – Choke Species and Constituent Demand

Description:

- Stocks that constrain the catch of other healthy stocks, esp. rebuilding stocks
- Species that are more important to a specific fleet or area than reflected in the coastwide comm/rec ranks
- Recently rebuilt stocks with restricted 2012-16 catch histories, during rebuilding, got 3 additional points in Const. Demand

Point Range: 0-10

Data Sources:

- Level and attainment of ACL
- Commercial ranks: Overall & by fleet, state
- Recreational ranks: Overall & by state

Top-15 Species (& ties)	Factor Score	Choke stock	Const. Demand
Yelloweye Rockfish	10.0	10	
Cowcod	9.0	9	
Bocaccio	5.0		5
Canary rockfish	5.0		5
Darkblotched rockfish	4.0		4
Pacific ocean perch	4.0		4
Blackgill Rockfish	3.0	1	2
Pacific cod	3.0		3
Widow Rockfish	3.0		3
Bank Rockfish	2.0		2
Black rockfish	2.0		2
Brown Rockfish	2.0		2
California scorpionfish	2.0	1	1
Copper Rockfish	2.0		2
English sole	2.0		2
Longnose Skate	2.0		2
Rock Sole	2.0		2
Rougheye Rockfish	2.0	1	1
Shortraker Rockfish	2.0	1	1
Spiny dogfish	2.0		2
Treefish Rockfish	2.0	1	1
Vermilion Rockfish	2.0		2
Yellowtail Rockfish	2.0		2

Fishery Importance – Non-Catch Value

Description:

- Value in addition to those associated with harvest
- Although some traditional sources of non-consumptive value apply, there is not a clear differentiation of these values among groundfish species

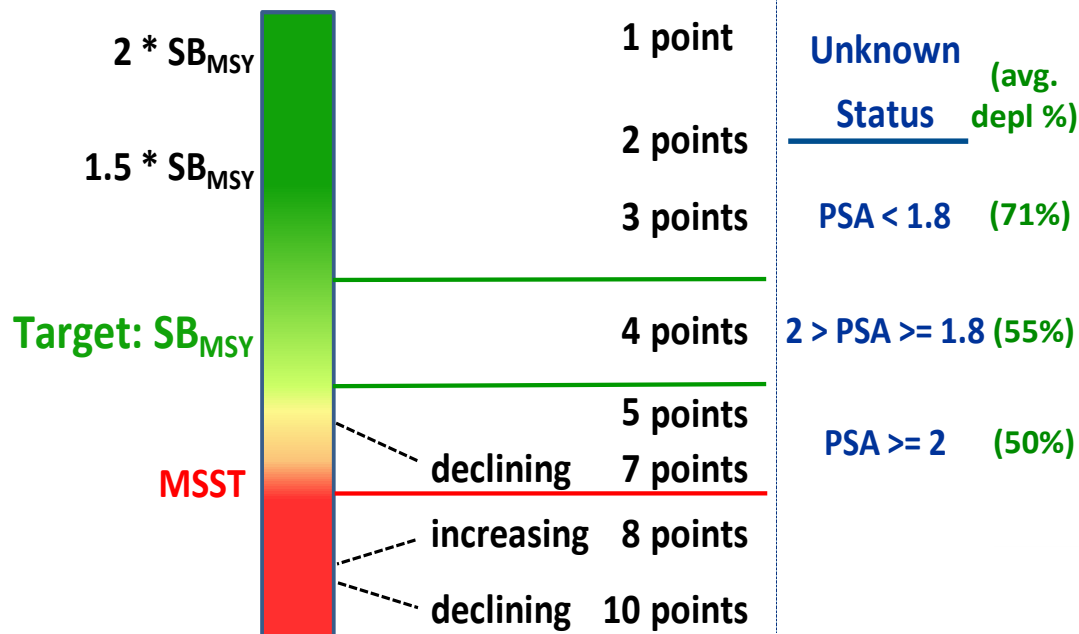- **This Factor is no longer included!**

Stock Status – Biomass

Description:

- Based on latest relative spawning biomass (depletion ratio), when available
- PSA (Vulnerability) scores **used** when depletion is unknown (*italicized* PSAs not used)

Point Range: Possible points 1-10

Data Sources: Most recent assessments & PSA scores

Temperature scale	Points
$2 * SB_{MSY}$	1 point
	2 points
$1.5 * SB_{MSY}$	
	3 points
Target: SB_{MSY}	4 points
	5 points
	declining 7 points
MSST	
increasing	8 points
declining	10 points

Unknown Status (avg. depl %)

PSA < 1.8 (71%)

2 > PSA >= 1.8 (55%)

PSA >= 2 (50%)

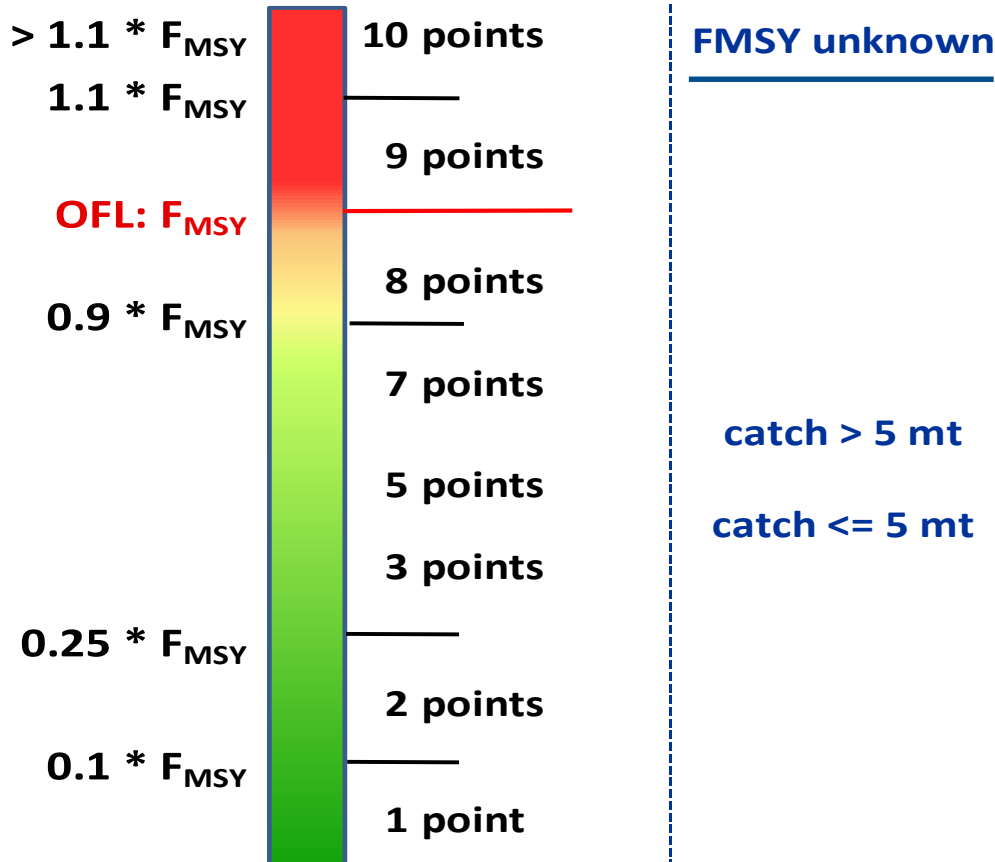| Top-15 Species (& ties)	Dep %	PSA	Factor Score
Cowcod	34%	*2.13*	7
Yelloweye Rockfish	28%	*2*	7
Bank Rockfish		**2.02**	6
Quillback Rockfish		**2.22**	6
Redbanded Rockfish		**2.02**	6
Shortraker Rockfish		**2.25**	6
Speckled Rockfish		**2.1**	6
Vermilion Rockfish		**2.05**	6
Greenspotted Rockfish	35%	*1.98*	5
Sablefish	35%	*1.64*	5
Big Skate		**1.99**	4
Black rockfish	43%	*1.94*	4
Blackgill Rockfish	39%	*2.08*	4
Blue/Deacon Rockfish	42%	*2.01*	4
Brown Rockfish	43%	*1.99*	4
Darkblotched rockfish	40%	*1.92*	4
Flag Rockfish		**1.97**	4
Grass Rockfish		**1.89**	4
Honeycomb Rockfish		**1.97**	4
Olive Rockfish		**1.87**	4
Squarespot Rockfish		**1.86**	4

Stock Status –Fishing Mortality

Description: Based on current fishing mortality & **OFL**s (or *OFL contributions*)

Point Range: 1-10

Data Source: 2014-16 Mortality Reports & Spex

Scoring:

> 1.1 * F_{MSY} **10 points**

1.1 * F_{MSY}

                    9 points

OFL: F_{MSY}

                    8 points

0.9 * F_{MSY}

                    7 points

                    5 points

                    3 points

0.25 * F_{MSY}

                    2 points

0.1 * F_{MSY}

                    1 point

FMSY unknown

catch > 5 mt

catch <= 5 mt

Top-15 Species (& ties)	% of OFL (*contr.*)	OFL - Catch (mt)	Factor Score
Squarespot Rockfish	*197%*	-11	**10**
Vermilion Rockfish	*107%*	-19	**9**
Flathead Sole	*104%*	-2	**9**
Treefish Rockfish	*100%*	0.0	**9**
Shortraker Rockfish	*98%*	0.4	**8**
Petrale sole	**89%**	335	**7**
Quillback Rockfish	*88%*	2	**7**
California scorpionfish	**81%**	23	**7**
Black & Yellow Rockfish	*80%*	6	**7**
Canary rockfish	**10%**	658	**7**
Rougheye Rockfish	*74%*	42	**5**
Redbanded Rockfish	*72%*	15	**5**
Black rockfish	**72%**	445	**5**
Brown Rockfish	**69%**	56	**5**
Sablefish	**65%**	2,776	**5**
Blue Rockfish	*59%*	130	**5**
Copper Rockfish	*56%*	113	**5**
Kelp Rockfish	*54%*	13	**5**
Big Skate	*53%*	214	**5**
Cabezon	**53%**	99	**5**

Ecosystem Importance

Description: New implementation this year (by Kristin Marshall)

Based on Top-down and Bottom-up importance for <u>managed and protected (**M-P**) spp</u>

Data Source: Koehn et al. (2016) Ecopath model

Scoring: Max score of 10 calculated with <u>all</u> species in ecosystem included

Top-down: <u>what eats M-P species</u>;

max (10) = P. hake

Bottom-up: <u>what M-P species eat</u>;

max (10) = Phytoplankton &

infauna

2014-16 avg OFLs (*contributions*)

used to represent relative

biomass among GF sp

Ecopath 'assemblage' scores

were distributed among sp.

using OFLs/contributions

Point Range: 1-10

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

Assessment – New Information

Description:

- Scoring reflects expected availability of significant new data sources or methods
  to resolve uncertainties from previous assessments,
  or potential to upgrade the assessment category
- Species assessed in 2017 reset to 0
- Some credit given to unassessed species for
  available comp or index potential (New in 2018)

Point Range: 0-10

Calculation:

Sum of points in four sub-categories (currently):
- Impact of updating steepness prior
- New source of index data
- New source of composition data
- Previous assessment issues/problems now have
 have a reasonable expectation of being resolved

Data Source: NMFS staff

Top-15 Species (& ties)	Factor Score
Gopher Rockfish	8
Greenstriped Rockfish	7
Longnose Skate	7
Splitnose Rockfish	7
Vermilion Rockfish	7
Big Skate	6
Redbanded Rockfish	6
Quillback Rockfish	5
Shortraker Rockfish	5
Bank Rockfish	4
Black and Yellow Rockfish	4
Flag Rockfish	4
Grass Rockfish	4
Honeycomb Rockfish	4
Kelp Rockfish	4
Starry Rockfish	4
Treefish Rockfish	4

Target Frequency Details

Assessment Target Frequency for previously-assessed stocks is calculated using:

 - Transformed Mean age in Catch; shifted higher in 2018

 - Additive adjustments for stocks with high or low:

- Degree of Recruitment fluctuation, σ_R
- Fishery Importance (using the sum of weighted Fishery Factor scores)
- Ecosystem Importance (added in 2018, using Ecosystem Factor Score)

 - No target frequencies less than 4 in 2018; none more than 10 years

How many stocks do we think should have a target frequency as short as 4 years?
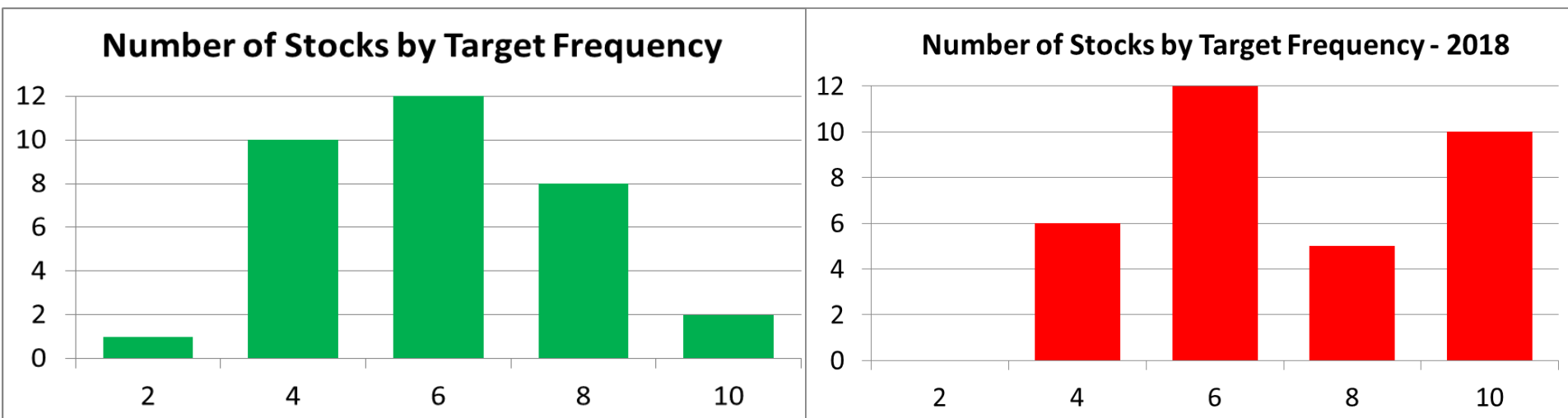
Assessment status relative to Target Frequency and new elements

Description:

- Initial score is similar to 2016 calculation
  - However, set at -2 for stocks assessed last cycle
- **New tweaks added to final in 2018**
  - Stocks begin getting points when they reach their target frequencies (not afterwards)
  - 1 point subtracted if on SSC Update list
    - (and < 6 years since last assessment)
  - Initial value of '4' for unassessed species (final score in 2016) is now adjusted
  - 1 point added if years since last assessment will be >= 10 in 2019

Point Range: (-3) - 10

Data Sources:

- Target assessment frequency
- Year of last assessment

Top-15 Species (& ties)	Year of last asmt	Factor Score
Gopher rockfish	2005	10
Cabezon	2009	9
Longnose skate	2007	9
Pacific cod		6
Brown rockfish		5
Copper rockfish	2013	5
Splitnose rockfish	2009	5
Bank rockfish		4
Big skate		4
Cowcod	2013	4
Dover sole	2011	4
Pacific sanddab		4
Vermilion rockfish		4
Black-&-yellow rockfish		3
Grass rockfish		3
Greenstriped rockfish	2009	3
Olive rockfish		3
Sand sole		3
Speckled rockfish		3
Starry flounder		3
Starry rockfish		3

Development of Overall Scores/Ranks

- All Factor Scores are assembled in the 'Factor Summary' spreadsheet/tab in the Excel file in Briefing Book

- The Factor Scores are weighted

- The summation of those weighted scores forms the basis for ranking species

Factor Weights	Fishery Factors				Non-Catch Score	Status			Eco-system Score	Assessment Information	
	Comm Factor Score	Rec Factor Score	Tribal Factor Score	Const. Dem/ Choke Sp Factor		Rebuild Factor Score	Depl Status Score	Harvest Status Score		New Info Score	Assess. Freq. Score
2018 ->	0.21	0.09	0.05	0.11		0.10	0.08	0.08	0.05	0.05	0.18
2016 ->	0.28	0.06	0.05	0.12	0.01	0.10	0.08	0.08		0.05	0.17

Switch to Spreadsheet

Data Availability

- Includes stop-light overview of available survey & fisheries length, age & index data
- Highlights the anticipated number of assessment areas
- This Tab includes detailed summary of available bio-data from surveys, and commercial and recreational fisheries

Species	Rank	Base Total Score	Last Assessment Year	Last Assessment Type	SSC suggests Update for next asmnt		Data adequacy for a Benchmark/Full Asmt Lengths	Ages	Index	Notes
Sablefish	1	4.57	2015	U		X				1-area; Trawl survey
Longnose Skate	2	4.15	2007	F		X				1-area; Trawl survey
Gopher Rockfish	3	4.13	2005	F		X				N'shore; 1-area
Vermilion Rockfish	4	4.07		d-p						2-3 areas; w/ Sunset
Cabezon	5	3.94	2009	F		X				N'shore; 2-area + d-p
Cowcod	6	3.63	2013	F		X				2-area; CalCOFI genetic ID
Black rockfish	7	3.59	2015	F						N'shore; 3-area
Pacific cod	8	3.56		d-p						1-area; Trawl survey
Brown Rockfish	9	3.52	2013	D-M						N'shore; 1-area
Copper Rockfish	10	3.28	2013	D-M						2-3 areas
Petrale sole	11	3.22	2015	U	Update					1-area; Trawl survey
Dover sole	12	3.10	2011	F						1-area; Trawl survey
Big Skate	13	2.83		d-p		X				1-area; Trawl survey
Bank Rockfish	14	2.82		d-p		O				1-area
Quillback Rockfish	15	2.81		d-p						N'shore; 3-area
Black and Yellow Rockfis	16	2.80		d-p		X			X	Complex with Gopher?
Treefish Rockfish	17	2.74		d-p						N'shore; 1-area
Shortraker Rockfish	18	2.73		d-p					X	Unsorted fishery catch
Grass Rockfish	19	2.69		d-p					X	N'shore; 1-area

Play it Forward to 2021

- New part of the 2018 analysis

- This sheet allows exploration of species ranks in 2021, based on assumptions about which species are assessed in 2019.

- Score changes after selecting species for 2019 assessment only address the Assessment Frequency and New Information Factors.

- The scores for other factors will also change by 2020, but in ways that cannot be predicted with any confidence at this time.

Switch to Spreadsheet

Next Steps: Before June

- Updated swept-area abundance trends for stocks that are sampled well by the trawl survey

- More experimentation to explore/improve multi-cycle performance

- Refine evaluation of workload and data-availability considerations for assessing individual species, or suites of species

End of Presentation