GROUNDFISH MANAGEMENT TEAM REPORT ON BIENNIAL HARVEST
SPECIFICATIONS FOR 2023-24 INCLUDING OVERFISHING LIMITS AND
ACCEPTABLE BIOLOGICAL CATCHES

Contents

Executive Summary

The Groundfish Management Team (GMT) provides recommendations for the Council to adopt default harvest control rules (HCRs) and preliminary preferred alternatives (PPA) for a range of Annual Catch Limit (ACL) alternatives under consideration. The GMT also provides discussion of biological and economic implications for consideration under the range of alternatives.

Default Harvest Control Rules

The Groundfish Management Team (GMT) recommends the Council adopt default harvest control rules (HCRs) for all species in the Groundfish Fishery Management Plan (FMP), except for the species listed in Table 1 and discussed below.

Annual Catch Limit Alternatives

At our October meeting, the GMT reviewed the range of ACL alternatives adopted by the Pacific Fishery Management Council (Council) in September for sablefish, lingcod both north and south of 40° 10′ N lat., Oregon black rockfish, Pacific spiny dogfish, and vermilion/sunset rockfish both north and south of 40° 10′ N lat. (Agenda Item C.8.a, Supplemental REVISED GMT Report 2, September 2021). **The GMT agrees with the proposed range adopted by the Council in**

September, proposes revisions to the Pacific spiny dogfish range of alternatives, and recommends that the Council adopt all ACL alternatives at this meeting, including selection of preliminary preferred alternative (PPA) ACLs to facilitate the impact analysis.

Two stocks, quillback rockfish off of California and copper rockfish south of Point Conception in California, were assessed to be below the minimum stock size threshold (MSST) and may be declared overfished. If declared overfished, rebuilding plans will be necessary, which will impact the overfishing limits (OFLs), acceptable biological catches (ABCs), and ACLs. The GMT did not have those results at the time of submission of this report, but anticipates addressing them in a supplemental report.

Comparing benefits and risks of different harvest strategies
Higher ACLs can provide greater economic benefits, but can also increase conservation risks, especially when a stock assessment's estimates of spawning biomass and fraction of unfished biomass are uncertain. For this reason, stock assessors provide decision tables that allow the Council to compare how higher and lower harvest strategies (e.g., P* of 0.45 vs. P* of 0.40, respectively) affect spawning biomass annually over the next ten years, taking into consideration uncertainty around stock size and status. Decision tables elucidate the risks and trade-offs from alternative future management action and should be carefully considered during decision making. Table 1 contains alternative harvest specifications for select stocks that were forwarded for consideration by the Council at the September 2021 meeting.

Table 1. Alternative harvest specifications forwarded by the Council in September 2021 for consideration for 2023-24.

#	Stock	Default HCR	Alternative 1	Alternative 2
1	Sablefish	ABC P* 0.45	ABC P* 0.40	ABC P* 0.35
2	Lingcod north of 40° 10′ N lat.	ABC P* 0.45	ABC P* 0.40	N/A
3	Lingcod south of 40° 10′ N lat.	ABC P* 0.45	ABC P* 0.40	N/A
4	Black rockfish Oregon	ABC P* 0.45	"Case-by-case" ABC set = 2020 ABC of 512 mt	N/A
5	Pacific spiny dogfish	ABC P* 0.40	ACL=1,075 mt for 2023-2024, then ACL=ABC P* of 0.40 thereafter under the middle state of nature model (q = 0.43)	N/A
6	Vermilion/sunset rockfish north of 40° 10′ N lat.	ABC P* 0.45	ABC P* 0.40	N/A
7	Vermilion/sunset rockfish south of 40° 10′ N lat.	ABC P* 0.45	ABC P* 0.40	N/A
8	Quillback rockfish California	Placeholder depending on outcome of stock assessment Council action at the November meeting and the potential rebuilding plans		
9	Copper rockfish south of Pt. Conception			

N/A = not applicable

1. *Sablefish*

Alternatives under consideration:
> No Action: Default HCR ACL=ABC P* of 0.45
> Alternative 1: ACL=ABC P* of 0.40
> Alternative 2: ACL=ABC P* of 0.35

Since sablefish is the most economically valuable non-whiting stock that has been subject to historical overexploitation, the GMT provided an extensive overview of the biological impacts of alternatives in September 2019 (Agenda Item H.8.a, Supplemental GMT Report 1, September 2019).

Biological implications
The current P* of 0.45 for sablefish was adjusted in 2021 from a P* of 0.40 in response to the 2019 stock assessment for sablefish which estimated that the percent of unfished spawning biomass in 2019 was near the management target (i.e., 39 percent) with projected future increases in stock status, largely driven by a strong 2016 year-class, giving the Council reason to consider higher ACLs. The prior P* of 0.40 arose after the 2011 assessment estimated that the stock was in the Council's defined precautionary zone (i.e., between 25 and 40 percent of unfished spawning biomass).

An update assessment for sablefish in 2021 indicated that the stock is at 58 percent of unfished spawning biomass, well above the 2019 full assessment projection of 46 percent for 2021 under a P* of 0.45, suggesting a more optimistic status than was estimated in 2019. Given the uncertainty associated with the 2021 update assessment and the September 2021 public comment letter recommendation to analyze a P* of 0.35, the GMT is recommending including lower alternative HCRs (P* 0.40 and P* 0.35) in the range of alternatives.

Table 2. Decision table from the 2021 sablefish update stock assessment that compares the potential outcomes for each potential state of nature under alternative P* values.

Table vi: Decision table of 12-year projections of spawning stock biomass (SSB) and % unfished (depletion) for alternative states of nature (columns) and management options (rows) beginning in 2021. Low and high states of nature are based on the 2021 SSB ± 1.15-base model SSB standard deviation and the resulting unfished recruitment was used for the projections. Results are conditioned on the 2021 and 2022 catches, provided by the Pacific Fisheries Management Council Groundfish Management Team (GMT), being achieved exactly. The alternative catch streams are based on the GMT's requested P* values of 0.35 and 0.40. Note that values for the agreed-upon buffer level of P* = 0.45 is presented as the third row of the decision table as it represents the highest exploitation level among the three catch streams. Catches are total dead biomass, i.e., dead discard plus catch.

scenario	Year	Total catch	Low state (0.25) SSB	Low state (0.25) Depletion	Base (0.5) SSB	Base (0.5) Depletion	High state (0.25) SSB	High state (0.25) Depletion
P*=0.35	2021	7,405	64,916	0.51	97,802	0.58	131,513	0.63
	2022	7,055	66,222	0.52	99,957	0.59	134,550	0.65
	2023	9,412	65,396	0.51	99,450	0.59	134,266	0.64
	2024	8,608	62,150	0.49	96,661	0.57	131,626	0.63
	2025	8,101	59,177	0.46	94,436	0.56	129,680	0.62
	2026	7,796	56,750	0.44	92,909	0.55	128,548	0.62
	2027	7,649	54,732	0.43	91,867	0.54	127,974	0.61
	2028	7,570	52,951	0.41	91,099	0.54	127,714	0.61
	2029	7,504	51,310	0.40	90,483	0.54	127,626	0.61
	2030	7,437	49,770	0.39	89,967	0.53	127,646	0.61
	2031	7,342	48,316	0.38	89,530	0.53	127,742	0.61
	2032	7,247	46,956	0.37	89,175	0.53	127,911	0.61
P*=0.40	2021	7,405	64,916	0.51	97,802	0.58	131,513	0.63
	2022	7,055	66,222	0.52	99,957	0.59	134,550	0.65
	2023	10,107	65,396	0.51	99,450	0.59	134,266	0.64
	2024	9,252	61,794	0.48	96,308	0.57	131,273	0.63
	2025	8,722	58,494	0.46	93,761	0.56	129,004	0.62
	2026	8,421	55,765	0.44	91,935	0.54	127,568	0.61
	2027	8,282	53,451	0.42	90,602	0.54	126,699	0.61
	2028	8,218	51,380	0.40	89,546	0.53	126,149	0.60
	2029	8,168	49,449	0.39	88,643	0.52	125,774	0.60
	2030	8,117	47,616	0.37	87,840	0.52	125,509	0.60
	2031	8,039	45,869	0.36	87,117	0.52	125,324	0.60
	2032	7,950	44,214	0.35	86,479	0.51	125,215	0.60
P*=0.45	2021	7,405	64,916	0.51	97,802	0.58	131,513	0.63
	2022	7,055	66,222	0.52	99,957	0.59	134,550	0.65
	2023	10,825	65,396	0.51	99,450	0.59	134,266	0.64
	2024	9,923	61,426	0.48	95,935	0.57	130,908	0.63
	2025	9,372	57,787	0.45	93,014	0.55	128,302	0.62
	2026	9,070	54,742	0.43	90,821	0.54	126,550	0.61
	2027	8,934	52,126	0.41	89,130	0.53	125,375	0.60
	2028	8,888	49,760	0.39	87,727	0.52	124,528	0.60
	2029	8,860	47,532	0.37	86,483	0.51	123,858	0.59
	2030	8,810	45,402	0.36	85,346	0.51	123,298	0.59
	2031	8,753	43,364	0.34	84,304	0.50	122,829	0.59
	2032	8,684	41,415	0.32	83,351	0.49	122,438	0.59

As shown in the sablefish decision table (Table 2), the risk to the stock is similar under the low state of nature for the default P* of 0.45 and the two alternative harvest strategies (Alt. 1 P* of 0.40 and Alt. 2 P* of 0.35). Assuming the base state of nature, each harvest strategy results in similar annual spawning biomass and fraction of unfished estimates in 2023-24, with each harvest strategy resulting in long-term fraction of unfished estimates above the management target by 2032 (i.e., 49 percent P* of 0.45, 51 percent P* of 0.40, and 53 percent P* of 0.35).

In recent years, removals of sablefish have been below the ACLs due to multiple fishery and economic factors. Assuming that future removals continue to be lower than the ACL, at least in the short-term, the sablefish decision table may overestimate the risk associated with alternative future catches because it assumes full ACL (i.e., coastwide ABC) removals for 2021 and beyond.

The Council has long taken a precautionary approach for sablefish, and that, along with strong recent recruitment, has contributed to the 2019 full and 2021 update assessments both estimating the stock at above the 40 percent management target as of 2020. Given the uncertainty of stock assessments in general, the Council should continue to support conducting full and update assessments for economically valuable stocks with varying recruitment like sablefish to ensure that the Council can detect and respond to variations in a timely manner.

Economic implications

The P* choice has the potential for significant economic impact during the 2023-2024 cycle. Sablefish is an economically important stock to the open access, non-whiting limited entry, and tribal fisheries. Sablefish is a high value target species and is also caught as part of a complex with co-occurring species in the bottom trawl fishery such as Dover sole and thornyheads. As shown in Table 3, the potential economic losses associated with Alternative 1 (P* of 0.40) in 2023 are $2.9 million in ex-vessel revenue, $5.9 million in income, and 83 new jobs when considering total economic impacts to the fishery, processors, and fishing support businesses. The potential economic losses associated with Alternative 2 (P* of 0.35) in 2023 are $5.7 million in ex-vessel revenue, $11.6 million in income, and 161 new jobs when considering total economic impacts to the fishery, processors, and fishing support businesses (Table 4). Analogous economic losses are expected in future years since the differences in the ACLs are similar throughout time, and these are the basis of the economic projections for 2023. Potential ex-vessel revenue loss was calculated by using the average of 2021 prices from April-September ($4,063/mt).

Table 3. Comparison of the Alternative 1 and Alternative 2 ABCs and economic impacts to No Action for 2023.

Alternative	ABC (mt)	Change in ABC from No Action (mt)	Potential Lost Revenue	Potential Lost Income	Potential Lost Jobs
P* 0.45 (No Action)	10,825				
P* 0.40 (Alternative 1)	10,107	-718	$2.9 million	$5.9 million	83
P* 0.35 (Alternative 2)	9,412	-1,413	$5.7 million	$11.6 million	161

Assumptions: Applies IOPAC income and employment ratios (calculated with 2021 fixed gear and trawl caught sablefish coastwide prices)

Recommendations

Based upon the outcome of the new update assessment, prior analyses, Council action for 2021-2022, and considerations detailed above, **the GMT recommends the Council adopt either No Action (P* of 0.45) or Alternative 1 (P* of 0.40) as the PPA for sablefish, but keep Alternative 2 (P* of 0.35) within the range of alternatives.**

2. *Lingcod north of 40° 10′ N. lat.*

Alternatives under consideration:
    No Action: Default HCR ACL=ABC P* of 0.45
    Alternative 1: ACL=ABC P* of 0.40

Biological implications

The No Action or default HCR for lingcod north of 40° 10′ N lat. is to apply a P* of 0.45 and set the ACL equal to the ABC. The 2021 stock assessment for lingcod north of 40° 10′ N lat. was highly uncertain around the estimates of stock size and was designated as a Category 2 assessment with a sigma value of 1.0 by the Scientific and Statistical Committee (SSC), whereas the previous assessment in 2017 was designated a Category 1 assessment with a sigma value of 0.50. During the STAR panel, a P* of 0.40 catch projection was conducted as a possible management option to account for the large uncertainty in the assessment. Therefore, the P* of 0.40 is included as Alternative 1, should the Council wish to be more precautionary. The resulting ACLs from applying the P* of 0.45 and P* of 0.40 can be seen in Table 4.

Table 4. Decision table for lingcod north of 40° 10′ N lat. from the 2021 Lingcod stock assessment that compares the potential outcomes for each potential state of nature under alternative P* values.

Table viii: Decision table summary of 10-year projections based on recent average catch for the first two years of the projection, alternative states of nature (columns), and management assumptions (asm.; rows) based on recent average catch and annual catch limits (ACLs) defined using an estimate of uncertainty (i.e., P^*) of 0.40 and 0.45. Catch and resulting fraction unfished are colored relatively with lighter colors representing lower values. Italicized values indicate years where the full catch could not be removed from the low state of nature due to insufficient selected biomass.

Asm.	Year	Catch	Low (sex-selectivity) SSB (mt)	Low (sex-selectivity) Frac. unfished	Base SSB (mt)	Base Frac. unfished	High (no fishery ages) SSB (mt)	High (no fishery ages) Frac. unfished
Recent avg. catch	2021	1200	22435	0.614	11010	0.642	17623	0.719
	2022	1200	22194	0.608	11090	0.646	18276	0.746
	2023	1200	21710	0.595	10722	0.625	17921	0.731
	2024	1200	21378	0.586	10967	0.639	18031	0.736
	2025	1200	21145	0.579	11415	0.665	18325	0.748
	2026	1200	20980	0.575	11879	0.692	18656	0.761
	2027	1200	20871	0.572	12299	0.717	18975	0.774
	2028	1200	20809	0.570	12657	0.738	19264	0.786
	2029	1200	20786	0.569	12955	0.755	19515	0.797
	2030	1200	20789	0.569	13199	0.769	19729	0.805
	2031	1200	20817	0.570	13396	0.781	19908	0.813
	2032	1200	20858	0.571	13554	0.790	20057	0.819
ACL $P^*=0.40$	2021	1200	22435	0.614	11010	0.642	17623	0.719
	2022	1200	22194	0.608	11090	0.646	18276	0.746
	2023	3817	21710	0.595	10722	0.625	17921	0.731
	2024	3418	19403	0.531	9628	0.561	16608	0.678
	2025	3246	17270	0.473	9175	0.535	15882	0.648
	2026	3165	15256	0.418	9005	0.525	15454	0.631
	2027	3117	13339	0.365	8957	0.522	15194	0.620
	2028	3073	11512	0.315	8950	0.522	15024	0.613
	2029	3028	9780	0.268	8963	0.522	14913	0.609
	2030	2984	8141	0.223	8993	0.524	14846	0.606
	2031	2942	6597	0.181	9038	0.527	14813	0.605
	2032	2905	5143	0.141	9096	0.530	14809	0.604
ACL $P^*=0.45$	2021	1200	22435	0.614	11010	0.642	17623	0.719
	2022	1200	22194	0.608	11090	0.646	18276	0.746
	2023	4378	21710	0.595	10722	0.625	17921	0.731
	2024	3854	18967	0.519	9345	0.545	16305	0.665
	2025	3631	16435	0.450	8726	0.509	15386	0.628
	2026	3534	14047	0.385	8449	0.492	14825	0.605
	2027	3482	11768	0.322	8320	0.485	14464	0.590
	2028	3439	9587	0.263	8245	0.480	14209	0.580
	2029	3403	7509	0.206	8195	0.478	14024	0.572
	2030	3365	5541	0.152	8166	0.476	13887	0.567
	2031	3332	3805	0.104	8156	0.475	13790	0.563
	2032	3307	2392	0.066	8162	0.476	13723	0.560

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Applying a P* of 0.40 compared to a P* of 0.45, the ACLs in 2023-24 would be reduced by 561 mt and 525.8 mt, respectively (Table 5). Recent estimated total mortality of lingcod north of 40° 10′ N lat. from all sources combined has been around 1,000 mt the last three years (Table 6). Therefore, with suggested ACLs greater than 3,328 mt, neither alternative would be restrictive to fisheries under the current management structure and regulations.

Table 5. The 2023-24 ACLs (mt) resulting from a P* of 0.45 and a P* 0.40.

Year	ACL with P* 0.45 (No Action)	ACL with P*0.40 (Alt. 1)
2023	4,378.4	3,817.3
2024	3,853.8	3,328.0

Table 6. Recent estimated total mortality. Data source: GEMM.

Year	Estimated Total Mortality (mt)
2018	1,021
2019	1,004
2020	815

Economic implications
Given that recent estimated total mortality has been approximately 1,000 mt, much less than the No Action ACL and the Alt 1 ACL, the GMT does not foresee any notable economic implications to lingcod north of 40° 10′ N. lat. under either of these alternatives.

Recommendations
The GMT does not have a PPA recommendation at this time for lingcod north of 40° 10′ N. lat. The GMT sees this as primarily a Council risk tolerance decision.

3. *Lingcod south of 40° 10′ N. lat.*

Alternatives under consideration:
> No Action: Default HCR ACL=ABC P* of 0.45
> Alternative 1: ACL=ABC P* of 0.40

Biological implications
Similar to lingcod north of 40° 10′ N. lat., lingcod south of 40° 10′ N lat. was designated a Category 2 stock accounting for the uncertainty around the estimated spawning biomass and fraction unfished. Also similar to lingcod north of 40° 10′ N. lat., the STAR Panel applied a P* of 0.40 as a means to address the uncertainty in the assessment. Table 7 displays the outcome for the different P* applications.

Historically, the Council has chosen to remain with the default HCR of a P* of 0.45 (No Action); however, in light of the new stock category designation and the greater uncertainty in the

assessment, the Council may prefer to consider a more precautionary approach to managing lingcod south of 40° 10′ N lat. for the 2023-24 biennium by selecting a P* of 0.40.

Table 7. Decision table for lingcod south of 40° 10′ N lat. from the 2021 lingcod stock assessment that compares the potential outcomes for each potential state of nature under alternative P* values.

Table viii: Decision table summary of 10-year projections based on recent average catch for the first two years of the projection, alternative states of nature (columns), and management assumptions (asm.; rows) based on recent average catch and annual catch limits (ACLs) defined using an estimate of uncertainty (i.e., P*) of 0.40 and 0.45. Catch and resulting fraction unfished are colored relatively with lighter colors representing lower values.

Asm.	Year	Catch	Low M (M = 0.11) SSB (mt)	Low M (M = 0.11) Frac. unfished	Base (M ~ 0.17) SSB (mt)	Base (M ~ 0.17) Frac. unfished	High M (M = 0.22) SSB (mt)	High M (M = 0.22) Frac. unfished
Recent avg. catch	2021	700	15066	0.296	10415	0.394	6475	0.419
	2022	700	15200	0.299	10224	0.387	6138	0.397
	2023	700	15221	0.299	9995	0.378	5849	0.378
	2024	700	15234	0.299	9858	0.373	5722	0.370
	2025	700	15252	0.300	9810	0.371	5715	0.369
	2026	700	15263	0.300	9813	0.371	5762	0.372
	2027	700	15265	0.300	9846	0.372	5831	0.377
	2028	700	15262	0.300	9901	0.374	5908	0.382
	2029	700	15256	0.300	9972	0.377	5991	0.387
	2030	700	15257	0.300	10057	0.380	6075	0.393
	2031	700	15264	0.300	10152	0.384	6162	0.398
	2032	700	15284	0.300	10254	0.388	6249	0.404
ACL P*=0.40	2021	700	15066	0.296	10415	0.394	6475	0.419
	2022	700	15200	0.299	10224	0.387	6138	0.397
	2023	633	15221	0.299	9995	0.378	5849	0.378
	2024	634	15277	0.300	9897	0.374	5758	0.372
	2025	658	15347	0.302	9892	0.374	5787	0.374
	2026	681	15398	0.303	9924	0.375	5856	0.379
	2027	696	15424	0.303	9969	0.377	5929	0.383
	2028	702	15432	0.303	10024	0.379	6001	0.388
	2029	703	15429	0.303	10089	0.382	6074	0.393
	2030	700	15427	0.303	10164	0.384	6149	0.397
	2031	696	15431	0.303	10250	0.388	6228	0.403
	2032	692	15448	0.304	10346	0.391	6310	0.408
ACL P*=0.45	2021	700	15066	0.296	10415	0.394	6475	0.419
	2022	700	15200	0.299	10224	0.387	6138	0.397
	2023	726	15221	0.299	9995	0.378	5849	0.378
	2024	722	15205	0.299	9832	0.372	5699	0.368
	2025	748	15194	0.299	9760	0.369	5672	0.367
	2026	773	15154	0.298	9721	0.368	5684	0.367
	2027	789	15076	0.296	9690	0.366	5701	0.369
	2028	796	14972	0.294	9667	0.366	5717	0.370
	2029	798	14848	0.292	9650	0.365	5733	0.371
	2030	796	14718	0.289	9644	0.365	5752	0.372
	2031	793	14586	0.287	9647	0.365	5775	0.373
	2032	790	14462	0.284	9659	0.365	5801	0.375

As shown in Table 7, under the default HCR (P* of 0.45), the resulting ACL for 2023 and 2024 would be 739 mt and 740 mt, respectively. Applying the alternative HCR, a P* of 0.40, would produce ACLs of 644.3 mt for 2023 and 638.9 mt for 2024 (Table 8). The GMT notes that under a P* of 0.40, future ACLs are less than 700 mt, which was the GMT projection for 2021 and 2022. The 700 mt projection was based on previous years of much higher mortality and increased access of the trawl sector to areas where lingcod could be caught. However, recent estimated total mortality of lingcod south of 40° 10′ N. lat. has been declining (Table 9). Additionally, 2021 commercial and recreational landings as of October 22, 2021 were approximately 210 mt, making it unlikely that 2021 landings will approach 700 mt. The decline in mortality may be due to poor market conditions and more recently the effects of COVID-19 on the industry. Given the decline in mortality, the GMT does not foresee fisheries under the current management structure would be restricted at either P* level.

Table 8. The 2023-24 ACLs (mt) resulting from a P* of 0.45 and a P* 0.40.

Year	ACL with P* 0.45 (No Action)	ACL with P* 0.40 (Alt. 1)
2023	739	644.3
2024	740	638.9

Table 9. Recent estimated total mortality. Data source: GEMM.

Year	Estimated Total Mortality (mt)
2018	457
2019	397
2020	290

Economic implications
Given that recent estimated total mortality has been declining and is much less than the No Action ACL and the Alternative 1 ACL, the GMT does not foresee any notable economic implications to lingcod south of 40° 10′ N lat. under these alternatives.

Recommendations
The GMT does not have a PPA recommendation at this time for lingcod south of 40° 10′ N lat. The GMT sees this as primarily a Council risk tolerance decision.

4. *Oregon Black Rockfish*

Alternatives being considered:
      No Action: Default HCR ACL=ABC with P* of 0.45,
      Alternative 1: "Case-by-case" ABC for 2023-2024 equal to the 2021-2022 ABC of 512 mt

Biological Implications

Prior to 2015, black rockfish was managed in Oregon and California under a constant catch of 1,000 mt (58:42 split OR:CA). Black rockfish in Oregon was assessed as a separate stock for the first time in 2015. The Oregon black rockfish stock assessment was approved for management but there were some issues identified by reviewers. "All STAT and STAR Panel participants recognized a broad suite of unique challenges in the data and models developed for Oregon black rockfish, which was best described as a 'data rich, but information poor' stock" ([Agenda Item I.3 Attachment 3 November 2015](#)).

The SSC designated the 2015 assessment as a Category 2 due to the large overall level of uncertainty around stock size and status ([Agenda Item I.3.a, Supplemental SSC Report, November 2015](#)). The stock was estimated to be at 60 percent of unfished spawning biomass at the beginning of 2015, well above the management target of 40 percent. However, the estimated scale of the stock from the 2015 Oregon specific model was lower than previous estimates (e.g., the 2007 assessment was an Oregon and California combined model) resulting in lower harvest levels. Table 10 shows the total mortality of black rockfish off Oregon since 2015. The Oregon Department of Fish and Wildlife (ODFW) also expressed concerns about the 2015 assessment ([Agenda Item I.3.a, Supplemental ODFW Report 1, November 2015](#)). These concerns resulted in using the 2020 ABC of 512 mt to set a "case-by-case" ABC in the 2021-2022 cycle. The Oregon Department of Fish and Wildlife (ODFW) has renewed those concerns and again requests a "case-by-case" ABC for 2023-2024 ([Agenda Item C.8.a, ODFW Report 1, September 2021](#)).

Table 10. Recent years mortality (mt) from the Oregon recreational and commercial nearshore fisheries and total mortality from all sectors (IOA, EFP, Trawl, etc.). Data for 2015 through 2020 come from the GEMM (Agenda Item C.1.b, NMFS Report 2, September 2021; Table 3).

Year	Rec Mortality	Comm. Nearshore Mort.	Total Mortality	OR ACL or HG
2015	479	121	601	580
2016	423	106	530	580
2017	417 a/	123	543	527
2018	295 b/	123	419	520
2019	319	120	440	513
2020	334	102	437	512
2021	349 c/	104 d/	453	512

a/ recreational fishery closed in mid-September, reduced bag limit from 7 to 5 fish through state regulations at the beginning of the year
b/ 5-fish daily bag limit for most of the season, 4-fish daily bag limit during the summer
c/ year-end projection based on preliminary ODFW data through Sept, 5-fish daily bag limit
d/ year-end projection based on preliminary ODFW data through Aug

The 2021-22 harvest specification cycle final preferred alternative (FPA) was a 512 mt ABC based on the 2020 ABC. If the case-by-case ABC is selected for 2023-24, depending on the realized removals, future ABCs and ACLs could be reduced to account for the higher removals between 2021-24. If the No Action alternative is chosen then the constraints on the fishery will likely be higher than they were before the 2021-22 cycle because of change in ABC that would happen once the time-varying buffer is applied. The additional 35 mt of ABC will provide much needed

stability and has only a minimal impact on the long term spawning output or fraction of unfished biomass (2032 percent unfished spawning output of 54.4 percent under No Action, Table 11, and 54.1 percent under the action Alternative 1, Table 12).

Table 11. Long-term projections for Oregon black rockfish under the No Action alternative (ACL = ABC P* of 0.45).

Year	Predicted OFL (mt)	ABC (mt)	Spawning Output (Billion eggs)	Depletion
2023	578	477	726	0.551
2024	576	471	722	0.548
2025	576	466	719	0.546
2026	575	462	717	0.544
2027	576	458	716	0.543
2028	576	454	715	0.542
2029	577	450	715	0.542
2030	578	447	715	0.543
2031	579	443	716	0.543
2032	580	439	718	0.544

Table 12. Long-term projections for Oregon black rockfish under Alternative 1 (i.e., case-by-case ABC that will be a constant 512 mt in 2023-2024 but will revert to the sigma/P* framework thereafter).

Year	Predicted OFL (mt)	ABC (mt)	Spawning Output (Billion eggs)	Depletion
2023	578	512	726	0.551
2024	573	512	720	0.546
2025	569	461	713	0.541
2026	570	458	710	0.539
2027	572	454	709	0.537
2028	573	452	708	0.537
2029	574	448	709	0.538
2030	576	445	710	0.539
2031	577	442	712	0.540
2032	578	438	714	0.541

Economic Implications

Black rockfish remain vitally important to Oregon's recreational and commercial nearshore fisheries. This fishery provides the backbone of the fishing opportunities due to its consistency, and it helps insulate many coastal communities against the boom and bust nature of other fisheries such as salmon and albacore tuna. The reduced stock size estimate from the 2015 stock assessment of black rockfish compared to previous assessments meant that, beginning in 2017, black rockfish became just as limiting for the Oregon recreational fishery as yelloweye rockfish. Since black rockfish normally account for 65-80 percent of the Oregon recreational catch, adjusting bag limits is the main tool available to control catches. The daily bag limit has continued to be reduced through state regulations from 2018 to 2021 in order to maintain removals at or below the black rockfish ACL contribution. ODFW also sets bi-monthly trip limits for the commercial nearshore fishery, and minor adjustments were made inseason, often to increase trip limits, to come closer to the state-specified commercial harvest guideline. Even though the total mortality has been below the 512 mt level for the last four years (Table 10), this higher ACL allows for more stability within the recreational and commercial fisheries in Oregon, and allows for flexibility in the state management of both sectors, while awaiting the completion of a new black rockfish survey within Oregon waters to inform the next stock assessment.

Recommendations

The GMT recommends the Council select Alternative 1 as the PPA for Oregon black rockfish. This will provide increased fishery stability for an important stock to the Oregon recreational bottomfish and commercial nearshore fisheries as ODFW works to incorporate their new hydroacoustic/visual survey results into a new full assessment.

5. *Pacific Spiny Dogfish*

Alternatives under consideration:
> No Action: Default HCR ACL=ABC P* of 0.40
> Alternative 1: ACL=ABC P* of 0.35: **GMT recommends removing this alternative**
> New Alternative 1: ACL=1,075 mt for 2023-2024, then ACL=ABC P* of 0.40 thereafter under the middle state of nature model (q = 0.43)

The GMT would like to note that at the time of our October meeting, there was not an adopted base model for Pacific spiny dogfish. Therefore, the team has provided alternatives that differ based on which model is ultimately adopted by the Council in November, and has provided a recommendation on how to move forward once a base model is chosen (see below Recommendations section).

Biological Implications
The Northwest Fisheries Science Center provided additional analysis to investigate the Pacific spiny dogfish catchability coefficient (q) from the West Coast Groundfish Bottom Trawl (WCGBT) Survey, which was reviewed at the September 2021 Mop-up Review Panel. The Groundfish Sub-Committee of the SSC recommended an update to the decision table based on the analyses examining seasonal patterns in catchability of Pacific spiny dogfish. The resulting decision table presents alternative states of nature based on values of catchability by the WCGBT Survey (Table 13) with projected removals based on either the low or middle state of nature models.

The Pacific spiny dogfish decision tables provides three alternative 12-year projections: P* of 0.40 with full ABC removals from the old base model, P* of 0.40 with 65 percent of the ABC from the old base model assumed to be removed (i.e., based on recent trends in ACL attainment), and P* of 0.40 with full ABC removals from the new middle state of nature model (i.e., model that assumes q = 0.43). Under each alternative projection, the impact to spawning output and relative stock status for the middle state of nature is minimal over the projection period (e.g., relative stock status ranges between 41 to 42 percent in 2032). Similar to the middle state of nature, the low state of nature projections across the three alternative projections have similar spawning output and fraction unfished, although the fraction unfished in 2032 is below the management target of 40 percent (e.g., stock status ranges between 33-34 percent in 2032).

Table 13. 12-year projections for alternative states of nature defined based on the WCGBT Survey catchability coefficient. Columns range over low, mid, and high states of nature, and rows range over different assumptions of catch levels.

Management decision	Year	Catch (mt)	Low state (old base): q=0.586 Spawning output	Depletion	Middle state: q=0.43 Spawning output	Depletion	High state: q=0.3 Spawning output	Depletion
Full ACL for 2021 and 2022 catches; P*0.4 with 65% of ACL from old base model taken after that	2021	1,621	9,895	0.344	13,613	0.418	20,067	0.513
	2022	1,585	9,876	0.343	13,604	0.418	20,068	0.513
	2023	655	9,854	0.342	13,591	0.417	20,066	0.513
	2024	635	9,868	0.343	13,614	0.418	20,100	0.514
	2025	616	9,879	0.343	13,634	0.419	20,130	0.515
	2026	598	9,888	0.344	13,652	0.419	20,158	0.515
	2027	581	9,893	0.344	13,666	0.420	20,182	0.516
	2028	565	9,896	0.344	13,677	0.420	20,202	0.516
	2029	549	9,895	0.344	13,684	0.420	20,219	0.517
	2030	535	9,892	0.344	13,688	0.420	20,232	0.517
	2031	520	9,885	0.343	13,689	0.420	20,241	0.517
	2032	507	9,875	0.343	13,686	0.420	20,246	0.518
Full ACL for 2021 and 2022 catches; P*0.4 with 100% of ACL from old base model taken after that	2021	1,621	9,895	0.344	13,613	0.418	20,067	0.513
	2022	1,585	9,876	0.343	13,604	0.418	20,068	0.513
	2023	1,001	9,854	0.342	13,591	0.417	20,066	0.513
	2024	970	9,859	0.343	13,595	0.417	20,092	0.514
	2025	941	9,861	0.343	13,596	0.417	20,114	0.514
	2026	913	9,860	0.343	13,594	0.417	20,132	0.515
	2027	887	9,855	0.342	13,588	0.417	20,147	0.515
	2028	862	9,847	0.342	13,579	0.417	20,157	0.515
	2029	839	9,834	0.342	13,566	0.417	20,162	0.515
	2030	816	9,817	0.341	13,550	0.416	20,164	0.516
	2031	794	9,797	0.340	13,530	0.415	20,160	0.515
	2032	774	9,773	0.340	13,506	0.415	20,152	0.515
Full ACL for 2021 and 2022 catches; P*0.4 with full ACL from new middle state (q = 0.43) after that	2021	1,621	9,895	0.344	13,613	0.418	20,067	0.513
	2022	1,585	9,876	0.343	13,604	0.418	20,068	0.513
	2023	1,456	9,854	0.342	13,591	0.417	20,066	0.513
	2024	1,407	9,839	0.342	13,586	0.417	20,072	0.513
	2025	1,361	9,821	0.341	13,578	0.417	20,074	0.513
	2026	1,318	9,798	0.340	13,565	0.416	20,072	0.513
	2027	1,278	9,771	0.340	13,548	0.416	20,066	0.513
	2028	1,240	9,740	0.338	13,526	0.415	20,055	0.513
	2029	1,204	9,705	0.337	13,500	0.414	20,039	0.512
	2030	1,170	9,664	0.336	13,470	0.414	20,018	0.512
	2031	1,138	9,620	0.334	13,434	0.412	19,993	0.511
	2032	1,108	9,571	0.333	13,394	0.411	19,962	0.510

Given that the new middle state of nature model (q = 0.43) projects a more optimistic status of the stock compared to the low state of nature model ("old base", q = 0.59), along with the uncertainty around q, the Council may wish to take a more precautionary approach if the new model is adopted. For this reason, the GMT proposes a New Alternative 1, which, using the new middle state model (q = 0.43), would set an ACL of 1,075 mt for 2023 and 2024, then use the default HCR of ACL=ABC P* 0.40 thereafter. This new alternative would allow the Council to move forward with precaution without unnecessarily constraining groundfish sectors.

The GMT recognizes that our proposed New Alternative 1 is similar in catch projection levels for 2023-24 to the middle row of Table 13 the decision table for this species (i.e., full ACL for 2021-22, P* of 0.40 with 100% of ACL from the old base model after that). However, as shown in Table 14, Pacific spiny dogfish catch is variable across all sectors and years, and a difference of 74 to 105 mt could severely constrain some sectors (Table 15).

Table 14. Recent mortality (mt) from the sectors which most contribute to Pacific spiny dogfish catch and estimated total across all sectors. Data source: GEMM. (CP = Catcher/Processor; MS = Mothership)

Year	Shoreside Whiting	Shoreside IFQ (Non-Whiting)	Non-Nearshore Fixed Gear	At-Sea CP	At-Sea MS	Total Mortality
2016	184.23	248.5	112.6	135.0	58.6	795.1
2017	101.66	144.1	68.9	108.2	31.7	498.7
2018	391.39	215.8	231.8	701.1	256.3	1,939.7
2019	373.1	245.4	148.9	554.4	59.9	1,652.4
2020	197.5	117.1	61.2	90.2	3.6	489.4
Recent Five-Year Average	249.6	194.2	124.7	317.8	82.0	1,075.1

Table 15. Comparison of the 2023 and 2024 decision table projected ABCs, their difference from the five-year average estimated total mortality, and projected fraction unfished levels.

Decision Table Alternative	Year	ABC (mt)	Difference from Recent Five-Year Average Mortality (mt)	2032 Fraction Unfished (low state)	2032 Fraction Unfished (mid state)
P* of 0.40 with 65% of ACL from old base model after that	2023	655	-420	34.3%	42.0%
	2024	635	-440		
P* of 0.40 with 100% of ACL from old base model after that	2023	1,001	-74	34.0%	41.5%
	2024	970	-105		
P* of 0.40 with 100% of ACL from new middle state (q = 0.43) after that	2023	1,456	+381	33.3%	41.1%
	2024	1,407	+332		

Economic Implications

Pacific spiny dogfish is primarily caught as bycatch in all sectors. Given that Pacific spiny dogfish is not targeted by any groundfish sectors and approximately 60 percent is discarded, the GMT does not anticipate any direct economic impacts from reduced ACLs aside from effects in which the fishery is required to alter their operations to minimize Pacific spiny dogfish bycatch if it becomes a constraint.

Recommendations

The GMT discussed whether assessing an alternative run with a P* of 0.35 would lower the conservation risk to the species, but given that an assumption of 65 percent removal of the ACL under a P* of 0.40 under the old base model lowers the fraction unfished by only 0.3 percent compared to full removal of the ACL, the GMT does not see merit to keeping an alternative of P* of 0.35 in the range of alternatives.

The team views the decision regarding Pacific spiny dogfish PPA as dependent on the Council's judgment regarding whether a catchability value of 0.59 or 0.43 is more reflective of Pacific spiny dogfish available to the WCGBT Survey during the summer months. If the Council considers a catchability value of 0.43 (new middle state model) to be more representative, the GMT recommends selecting the new Alternative 1 as PPA, which, using the new middle state model (q = 0.43), would set an ACL of 1,075 mt for 2023 and 2024, then use the default HCR of ACL=ABC P* 0.40 thereafter. However, if the Council considers a catchability value of 0.59 to be more representative, the GMT recommends selecting the No Action alternative under the old base model given that the 2023 and 2024 ABCs shown in the decision table are already likely constraining to the fishery and that the unfished spawning biomass projections do not greatly differ between the alternative catch streams. The GMT proposed Alternative 1 would offer a more precautionary approach if the Council feels that the new middle state model, which provides more optimistic projections, is most appropriate, without overly constraining the fishery. Under the middle state of nature model, the stock is not projected to dip below the 40 percent management target, but the uncertainty around q may warrant a more precautionary approach in the near term.

The GMT is working with the Stock Assessment Team (STAT) prior to the November Council meeting to develop an alternative decision table run that sets the ACL at 1,075 mt in 2023 and 2024 then ACL=ABC P* of 0.40 thereafter under the new base model. Upon seeing this new run in November, the GMT may offer more comments in a supplemental report at that time.

6.   *Vermilion/Sunset Rockfish North of 40° 10′ N lat.*

Alternatives under consideration:
>   No Action: Default HCR ACL=ABC P* of 0.45
>   Alternative 1: ACL=ABC P* of 0.40

The default HCR for vermilion/sunset rockfish north of 40° 10′ N lat. is to apply a P* of 0.45 and set the ACL equal to the ABC. Table 16 and Table 17 are the decision tables for vermilion rockfish off Washington and Oregon, respectively. The ACLs under a P* of 0.45 and 0.40 for the area between 42° and 40° 10' N. lat. are expected to be provided at the November meeting. With the recent overages of the OFL contribution to the Minor Shelf complex north of 40° 10′ N lat., the Council may want to consider being more precautionary and apply a P * of 0.40 (Alternative 1). Even under the default HCR of P* of 0.45 management actions may be necessary to keep the total mortality (Table 18) below the ACL contribution (Table 19) for vermilion rockfish off Washington and Oregon. Additional management measures would likely be necessary under a P* of 0.40, as it would reduce the ACL contribution. This may prove to be difficult as vermilion rockfish are not a targeted species in the recreational fisheries off of Washington and Oregon, nor are they targeted by commercial nearshore and non-nearshore fisheries. Vermilion rockfish are mostly a

bycatch species while targeting other more plentiful co-occurring species. Therefore designing management measures to reduce impacts will be challenging.

Table 16. Decision table for vermilion rockfish off of Washington from the 2021 assessment that compares the potential outcomes for each potential state of nature under alternative P* values.

Table viii: Decision table summary of 10 year projections beginning in 2023 for alternative states of nature based on an axis of uncertainty about female and male natural mortality for the reference model. Columns range over low (12.5 quantile), mid (reference model), and high states (87.5 quantile) of nature and rows range over different catch level assumptions. Values in italics indicate years where the stock size prevented the full catch removals.

	Year	Catch	Female M = 0.067; Male =0.069		Female M = 0.084; Male =0.086		Female M = 0.099; Male =0.100	
			Spawning Output	Fraction Unfished	Spawning Output	Fraction Unfished	Spawning Output	Fraction Unfished
	2021	2.69	0.68	0.31	1.55	0.56	3.62	0.81
	2022	3.26	0.50	0.23	1.38	0.50	3.44	0.77
	2023	0.62	0.28	0.13	1.16	0.42	3.21	0.72
	2024	0.61	0.26	0.12	1.15	0.42	3.20	0.72
	2025	0.61	0.25	0.11	1.15	0.42	3.19	0.72
P*=0.45	2026	0.61	0.24	0.11	1.15	0.42	3.18	0.72
sigma=1.0	2027	0.61	0.24	0.11	1.16	0.42	3.18	0.72
	2028	0.62	0.24	0.11	1.17	0.43	3.19	0.72
	2029	0.62	0.24	0.11	1.18	0.43	3.20	0.72
	2030	0.62	0.24	0.11	1.20	0.44	3.21	0.72
	2031	0.63	0.24	0.11	1.21	0.44	3.23	0.73
	2032	0.63	0.24	0.11	1.23	0.45	3.24	0.73
	2021	2.69	0.68	0.31	1.55	0.56	3.62	0.81
	2022	3.26	0.50	0.23	1.38	0.50	3.44	0.77
	2023	0.54	0.28	0.13	1.16	0.42	3.21	0.72
	2024	0.53	0.27	0.12	1.16	0.42	3.20	0.72
	2025	0.53	0.26	0.12	1.16	0.42	3.20	0.72
P*=0.4	2026	0.53	0.26	0.12	1.17	0.43	3.20	0.72
sigma=1.0	2027	0.53	0.26	0.12	1.18	0.43	3.21	0.72
	2028	0.53	0.27	0.12	1.20	0.44	3.22	0.72
	2029	0.53	0.27	0.12	1.22	0.44	3.24	0.73
	2030	0.53	0.28	0.13	1.24	0.45	3.26	0.73
	2031	0.52	0.29	0.13	1.26	0.46	3.28	0.74
	2032	0.52	0.30	0.13	1.28	0.47	3.30	0.74
	2021	2.69	0.68	0.31	1.55	0.56	3.62	0.81
	2022	3.26	0.50	0.22	1.38	0.50	3.44	0.77
	2023	0.77	0.28	0.13	1.15	0.42	3.21	0.72
	2024	0.77	0.25	0.11	1.14	0.41	3.18	0.72
FMSY proxy	2025	0.77	0.23	0.10	1.12	0.41	3.16	0.71
SPR=0.5	2026	0.77	0.21	0.09	1.11	0.40	3.15	0.71
	2027	0.77	0.19	0.09	1.11	0.40	3.14	0.71
	2028	0.77	0.18	0.08	1.11	0.40	3.13	0.70
	2029	0.77	0.17	0.08	1.11	0.40	3.13	0.70
	2030	0.77	0.16	0.07	1.11	0.40	3.13	0.70
	2031	0.77	0.15	0.07	1.12	0.41	3.14	0.71
	2032	0.77	0.14	0.06	1.12	0.41	3.15	0.71

Table 17. Decision table for vermilion rockfish off of Oregon from the 2021 assessment that compares the potential outcomes for each potential state of nature under alternative P* values.

Table viii: Decision table summary of 10 year projections beginning in 2023 for alternative states of nature based on an axis of uncertainty about female and male natural mortality for the reference model. Columns range over low (12.5 quantile), mid (reference model), and high states (87.5 quantile) of nature and rows range over different catch level assumptions. Values in italics indicate years where the stock size prevented the full catch removals.

	Year	Catch	Female M = 0.071; Male =0.065		Female M = 0.079; Male =0.073		Female M = 0.085; Male =0.079	
			Spawning Output	Fraction Unfished	Spawning Output	Fraction Unfished	Spawning Output	Fraction Unfished
	2021	12.96	17.70	0.62	21.37	0.73	24.46	0.79
	2022	12.96	17.76	0.62	21.53	0.73	24.68	0.80
	2023	12.60	17.89	0.63	21.79	0.74	25.01	0.81
	2024	12.45	17.93	0.63	21.92	0.75	25.20	0.82
	2025	12.19	17.81	0.63	21.85	0.74	25.16	0.82
P*=0.45	2026	11.89	17.56	0.62	21.63	0.74	24.93	0.81
sigma=0.5	2027	11.56	17.23	0.60	21.29	0.72	24.58	0.80
	2028	11.24	16.86	0.59	20.90	0.71	24.16	0.78
	2029	10.93	16.46	0.58	20.48	0.70	23.70	0.77
	2030	10.63	16.06	0.56	20.04	0.68	23.23	0.75
	2031	10.36	15.67	0.55	19.62	0.67	22.76	0.74
	2032	10.10	15.29	0.54	19.21	0.65	22.31	0.72
	2021	12.96	17.70	0.62	21.37	0.73	24.46	0.79
	2022	12.96	17.76	0.62	21.53	0.73	24.68	0.80
	2023	11.77	17.89	0.63	21.79	0.74	25.01	0.81
	2024	11.60	18.00	0.63	21.99	0.75	25.27	0.82
	2025	11.34	17.96	0.63	21.99	0.75	25.30	0.82
P*=0.4	2026	11.04	17.78	0.62	21.84	0.74	25.14	0.82
sigma=0.5	2027	10.72	17.53	0.62	21.58	0.73	24.87	0.81
	2028	10.41	17.22	0.60	21.25	0.72	24.51	0.79
	2029	10.10	16.89	0.59	20.89	0.71	24.11	0.78
	2030	9.82	16.56	0.58	20.52	0.70	23.70	0.77
	2031	9.55	16.23	0.57	20.15	0.69	23.29	0.76
	2032	9.29	15.91	0.56	19.80	0.67	22.89	0.74
	2021	12.96	17.70	0.62	21.37	0.73	24.46	0.79
	2022	12.96	17.76	0.62	21.53	0.73	24.68	0.80
	2023	7.95	17.89	0.63	21.79	0.74	25.01	0.81
	2024	7.95	18.32	0.64	22.30	0.76	25.58	0.83
FMSY proxy	2025	7.95	18.59	0.65	22.62	0.77	25.92	0.84
SPR=0.5	2026	7.95	18.72	0.66	22.75	0.77	26.05	0.84
	2027	7.95	18.73	0.66	22.75	0.77	26.03	0.84
	2028	7.95	18.66	0.66	22.65	0.77	25.89	0.84
	2029	7.95	18.53	0.65	22.47	0.76	25.67	0.83
	2030	7.95	18.36	0.64	22.25	0.76	25.39	0.82
	2031	7.95	18.16	0.64	21.99	0.75	25.09	0.81
	2032	7.95	17.94	0.63	21.71	0.74	24.76	0.80

Table 18. Recent estimated total mortality. Data source: GEMM.

Year	Total Mortality (mt)
2018	22.9
2019	25.7
2020	20.2

Table 19. The 2023-24 ACLs (mt) resulting from a P* of 0.45 and a P* 0.40.

Year		Area	ACL Contribution with P* 0.45 (No Action)	ACL Contribution with P*0.40 (Alt. 1)
2023		WA	0.72	0.63
		OR	12.54	11.71
		40° 10′ to 42° N lat.	N/A	N/A
		Combined	**TBD**	**TBD**
2024		WA	0.70	0.61
		OR	11.71	11.48
		40° 10′ to 42° N lat.	N/A	N/A
		Combined	**TBD**	**TBD**

N/A means not available

<u>Recommendations</u>
The GMT does not have a recommendation on the vermilion/sunset rockfish north of 40° 10′ N lat. ACL contribution PPA, as we see this to be a Council risk tolerance decision. This may also be impacted by the Council's decision to potentially remove vermillion rockfish from this complex.

7. *Vermilion/Sunset Rockfish South of 40° 10′ N lat.*

Alternatives under consideration:
   <u>No Action:</u> Default HCR ACL=ABC P* of 0.45
   <u>Alternative 1:</u> ACL=ABC P* of 0.40

The default and alternative HCRs are the same as for vermilion/sunset rockfish north of 40° 10′ N lat. and for the same reasons. Table 20 and Table 21 show the decision tables for California vermilion/sunset rockfish by the assessment areas. It's the GMT's understanding that decision tables for north and south of 40° 10′ N lat. are forthcoming. At which point the GMT can provide additional information and guidance.

Table 20. Decision table for vermilion rockfish off of California north of Pt. Conception from the 2021 assessment that compares the potential outcomes for each potential state of nature under alternative P* values. The below decision table has projections based on a category 2 sigma; however, the SSC decided to designate the stock assessment north of Pt. Conception as category 1. An updated decision table using a category 1 sigma is forthcoming.

Table x: Decision table summarizing 12-year projections (2021 to 2032) for vermilion rockfish based on three alternative states of nature spanning quantiles of spawning output in 2021. Columns range over low, medium, and high state of nature, and rows range over different assumptions of total catch levels corresponding to the forecast catches from each state of nature. Catches in 2021 and 2022 are fixed at catches provided by the CDFW.

	Year	Buffer	Catch (mt)	Low Productivity Female M = 0.0769 Male M = 0.0723 NLL = 1031.36 Spawning Output	Low Productivity Fraction Unfished	Base Model Female M = 0.0856 Male M = 0.0805 NLL = 1030.7 Spawning Output	Base Model Fraction Unfished	High Productivity Female M = 0.0956 Male M = 0.0899 NLL = 1031.36 Spawning Output	High Productivity Fraction Unfished
$p^* = 0.45, \sigma = 1$	2021	1.000	227	437	0.362	489	0.427	554	0.506
	2022	1.000	227	435	0.361	491	0.429	558	0.510
	2023	0.874	135	438	0.363	497	0.434	568	0.519
	2024	0.865	136	453	0.376	516	0.451	591	0.540
	2025	0.857	137	467	0.387	533	0.466	612	0.559
	2026	0.849	136	477	0.396	547	0.478	629	0.575
	2027	0.841	134	485	0.402	558	0.487	642	0.587
	2028	0.833	132	491	0.407	566	0.494	652	0.595
	2029	0.826	130	496	0.411	572	0.500	658	0.602
	2030	0.818	128	499	0.414	577	0.504	663	0.606
	2031	0.810	127	502	0.416	580	0.507	666	0.608
	2032	0.803	125	505	0.418	583	0.509	667	0.610
$p^* = 0.40, \sigma = 1$	2021	1.000	227	437	0.362	489	0.427	554	0.506
	2022	1.000	227	435	0.361	491	0.429	558	0.510
	2023	0.762	118	438	0.363	497	0.434	568	0.519
	2024	0.747	118	456	0.378	519	0.453	593	0.542
	2025	0.733	118	472	0.392	539	0.470	616	0.563
	2026	0.719	117	487	0.404	556	0.485	636	0.581
	2027	0.706	115	499	0.414	570	0.498	652	0.595
	2028	0.693	113	509	0.422	581	0.508	664	0.607
	2029	0.680	111	518	0.429	591	0.516	674	0.615
	2030	0.667	108	525	0.436	599	0.523	681	0.622
	2031	0.654	106	533	0.442	606	0.529	686	0.627
	2032	0.642	105	539	0.447	612	0.534	691	0.631
Long-term Equil. Yield (MSY proxy, $SPR_{50\%}$), no buffer	2021	1.000	227	437	0.362	489	0.427	554	0.506
	2022	1.000	227	435	0.361	491	0.429	558	0.510
	2023	1.000	139	438	0.363	497	0.434	568	0.519
	2024	1.000	139	453	0.376	516	0.451	590	0.539
	2025	1.000	139	467	0.387	533	0.465	610	0.558
	2026	1.000	139	477	0.396	546	0.477	627	0.573
	2027	1.000	139	485	0.402	557	0.486	639	0.584
	2028	1.000	139	491	0.407	564	0.493	647	0.591
	2029	1.000	139	495	0.410	569	0.497	652	0.596
	2030	1.000	139	497	0.412	572	0.499	654	0.598
	2031	1.000	139	98	0.413	573	0.500	655	0.598
	2032	1.000	139	499	0.414	573	0.501	654	0.597
Long-term Equil. Yield (MSY proxy, $SPR_{50\%}$), with buffer	2021	1.000	227	437	0.362	489	0.427	554	0.506
	2022	1.000	227	435	0.361	491	0.429	558	0.510
	2023	0.874	122	438	0.363	497	0.434	568	0.519
	2024	0.865	120	456	0.378	518	0.453	593	0.542
	2025	0.857	119	472	0.392	538	0.470	616	0.563
	2026	0.849	118	486	0.403	555	0.485	635	0.580
	2027	0.841	117	498	0.413	569	0.497	651	0.595
	2028	0.833	116	508	0.421	580	0.507	663	0.606
	2029	0.826	116	516	0.428	589	0.515	672	0.614
	2030	0.818	115	522	0.433	596	0.521	678	0.620
	2031	0.810	114	528	0.438	602	0.526	682	0.624
	2032	0.803	113	533	0.442	606	0.529	685	0.626

Table 21. Decision table for vermilion rockfish off of California south of Pt. Conception from the 2021 assessment that compares the potential outcomes for each potential state of nature under alternative P* values.

Table x: Decision table summarizing 12-year projections (2021 to 2032) for vermilion rockfish based on three alternative states of nature spanning quantiles of spawning output in 2021. Columns range over low, medium, and high state of nature, and rows range over different assumptions of total catch levels corresponding to the forecast catches from each state of nature. Catches in 2021 and 2022 are fixed at catches provided by the CDFW.

	Year	Buffer	Catch (mt)	Low Productivity M = 0.1125 h = 0.675 NLL = 1015.23		Base Model M = 0.1302 h = 0.730 NLL = 1013.02		High Productivity M = 0.1475 h = 0.875 NLL = 1014.72	
				Spawning Output	Fraction Unfished	Spawning Output	Fraction Unfished	Spawning Output	Fraction Unfished
$p^* = 0.45, \sigma = 1$	2021	1.000	210	406	0.355	471	0.482	581	0.642
	2022	1.000	210	407	0.357	474	0.485	585	0.646
	2023	0.874	139	408	0.358	477	0.488	589	0.651
	2024	0.865	137	411	0.360	482	0.493	595	0.658
	2025	0.857	136	413	0.361	485	0.496	599	0.662
	2026	0.849	135	413	0.362	487	0.498	601	0.664
	2027	0.841	134	413	0.362	488	0.499	601	0.664
	2028	0.833	133	413	0.362	489	0.500	600	0.663
	2029	0.826	132	414	0.362	490	0.501	599	0.661
	2030	0.818	131	415	0.363	491	0.502	597	0.659
	2031	0.810	130	417	0.365	491	0.503	594	0.657
	2032	0.803	129	419	0.367	493	0.504	592	0.654
$p^* = 0.40, \sigma = 1$	2021	1.000	210	406	0.355	471	0.482	581	0.642
	2022	1.000	210	407	0.357	474	0.485	585	0.646
	2023	0.762	121	408	0.358	477	0.488	589	0.651
	2024	0.747	119	413	0.362	484	0.495	598	0.660
	2025	0.733	118	418	0.366	490	0.501	604	0.667
	2026	0.719	116	421	0.368	495	0.506	608	0.672
	2027	0.706	115	424	0.371	499	0.510	611	0.675
	2028	0.693	114	427	0.374	503	0.514	613	0.677
	2029	0.680	112	432	0.378	506	0.518	614	0.678
	2030	0.667	111	437	0.382	510	0.522	615	0.679
	2031	0.654	109	442	0.387	515	0.526	616	0.680
	2032	0.642	108	448	0.392	519	0.531	617	0.681
Long-term Equil. Yield (MSY proxy, $SPR_{50\%}$), no buffer	2021	1.000	210	406	0.355	471	0.482	581	0.642
	2022	1.000	210	407	0.357	474	0.485	585	0.646
	2023	1.000	148	408	0.358	477	0.488	589	0.651
	2024	1.000	148	413	0.362	484	0.495	598	0.660
	2025	1.000	148	416	0.364	488	0.499	603	0.665
	2026	1.000	148	415	0.364	490	0.501	604	0.667
	2027	1.000	148	413	0.362	489	0.500	602	0.665
	2028	1.000	148	409	0.358	486	0.497	598	0.660
	2029	1.000	148	405	0.354	482	0.493	592	0.654
	2030	1.000	148	399	0.350	477	0.488	584	0.646
	2031	1.000	148	393	0.345	471	0.482	576	0.637
	2032	1.000	148	388	0.339	466	0.476	568	0.628
Long-term Equil. Yield (MSY proxy, $SPR_{50\%}$), with buffer	2021	1.000	210	406	0.355	471	0.482	581	0.642
	2022	1.000	210	407	0.357	474	0.485	585	0.646
	2023	0.874	130	408	0.358	477	0.488	589	0.651
	2024	0.865	128	415	0.364	486	0.497	599	0.662
	2025	0.857	127	420	0.368	493	0.504	607	0.670
	2026	0.849	126	423	0.370	497	0.508	611	0.675
	2027	0.841	125	424	0.372	500	0.511	612	0.676
	2028	0.833	124	425	0.372	501	0.512	611	0.675
	2029	0.826	123	425	0.372	501	0.512	609	0.673
	2030	0.818	122	424	0.371	500	0.511	606	0.669
	2031	0.810	121	424	0.371	499	0.510	602	0.665
	2032	0.803	120	423	0.371	498	0.509	598	0.660

However, with the recent mortality (Table 22) exceeding the OFL contribution to the Minor Shelf complex south of 40° 10′ N lat., the Council may want to consider being more precautionary and apply a P* of 0.40 (Alternative 1). For refence, the GMT has provided the ACL contributions for each HCR alternative in Table 23.

Table 22. Recent estimated total mortality. Data source: GEMM.

Year	Total Mortality (mt)
2018	344.5
2019	485.0
2020	259.9

Table 23. The 2023-24 ACLs (mt) resulting from a P* of 0.45 and a P* of 0.40 with a category 2 sigma value for the area south of 34° 27′ N lat. and a category 1 sigma for the stock in California north of 34° 27′ N lat.

Year	Assessment Area	ACL Contribution with P* 0.45 (No Action)	ACL Contribution with P* 0.40 (Alt. 1)
2023	34-27 to 40-10	150.9	140.9
	South of 34-27	145.4	126.8
	Total	**296.3**	**267.7**
2024	34-27 to 40-10	153.2	142.4
	South of 34-27	143.4	123.8
	Total	**296.6**	**266.2**

Recommendations
The GMT does not have a recommendation on the vermilion/sunset rockfish south of 40° 10′ N lat. ACL contribution PPA, as we see this to be a Council risk tolerance decision. This may also be impacted by the Council's decision on keeping vermilion/sunset rockfish in a complex or removing it.

8. *Quillback Rockfish off of California and Copper Rockfish south of Pt. Conception*
At this time, the information the GMT needs to provide alternatives for quillback rockfish off of California and/or copper rockfish south of Pt. Conception is not available. The GMT expects these materials to be available for the November briefing book. After the GMT reviews these documents and hears the Council discussion and decision on stock assessments (Agenda Item E.2.) at the November 2021 meeting, we will provide additional information in a supplemental report, as appropriate.

GMT Recommendations

The GMT recommends the Council adopt as PPA

- **default harvest control rules (HCRs) for all species in the Groundfish Fishery Management Plan (FMP), except for the species listed in Table 1, and**
- **The range of alternatives for the following species, alternatives that are bolded are recommended as PPA.**

Copy of Table 1, provided here for easy reference, with GMT recommendations, if any, bolded.

#	Stock	Default HCR	Alternative 1	Alternative 2
1	Sablefish	**ABC P* 0.45**	**ABC P* 0.40**	ABC P* 0.35
2	Lingcod north of 40° 10′ N lat.	ABC P* 0.45	ABC P* 0.40	N/A
3	Lingcod south of 40° 10′ N lat.	ABC P* 0.45	ABC P* 0.40	N/A
4	Black rockfish Oregon	**ABC P* 0.45**	**"Case-by-case" ABC set = 2020 ABC of 512 mt**	N/A
5	Pacific spiny dogfish	ABC P* 0.40	ACL=1,075 mt for 2023-2024, then ACL=ABC P* of 0.40 thereafter under the middle state of nature model (q = 0.43)	N/A
6	Vermilion/sunset rockfish north of 40° 10′ N lat.	ABC P* 0.45	ABC P* 0.40	N/A
7	Vermilion/sunset rockfish south of 40° 10′ N lat.	ABC P* 0.45	ABC P* 0.40	N/A
8	Quillback rockfish California	Placeholder depending on outcome of stock assessment council action at the November meeting and the potential rebuilding plans		
9	Copper rockfish south of Pt. Conception			

N/A = not applicable