

Joint Council Staff and Northwest Fishery Science Center Report on Technical Corrections to the 2023-2024 Harvest Specifications for Yellowtail Rockfish North of 40° 10' N. Lat.

Pacific Fishery Management Council (Council) staff were informed by Northwest Fishery Science Center (NWFSC) Staff after the September 2023 advanced briefing book published that there appeared to be errors in the 2023-24 harvest specifications for yellowtail rockfish north of 40° 10' N. lat.. (hereafter yellowtail rockfish north). After additional investigation by the NWFSC it became apparent that all harvest specifications based on the 2017 assessment (e.g., harvest specifications starting in 2019) have been incorrect. Therefore, the values for 2023-24 are also in error and must be corrected. Similar to [Agenda Item G.8.a, Attachment 1, September 2023](#), the following describes the error affecting the 2023-24 harvest specifications and provides the correct values. Additionally, due to the complexity related to the background of this error, a detailed discussion is provided on how it was propagated through the system in Appendix 1.

In an effort to provide the Council information on the level of 2023 catch relative to the correct 2023 harvest specifications, a comparison of the best estimate of total mortality to date and the attainment of harvest specifications are presented for yellowtail rockfish north. These catch data are current as of 9/1/2023. The Groundfish Management Team (GMT) will provide an updated report with the most up-to-date information for the Council review at their September meeting. The Council should consider correcting the harvest specifications to represent the correctly calculated harvest specifications under the adopted harvest control rules (HCR) for these species under this agenda item.

Table 1 shows the adopted and corrected harvest specifications, trawl/non-trawl allocations, and further allocations for 2023 in the first and second columns respectively, with the difference between these amounts shown in the third column. Additionally, the mortality and percentage of total mortality to date are shown in the final column. At the time of this writing, 2023 harvest specification thresholds have not been exceeded.

Table 1. The adopted 2023 yellowtail rockfish north overfishing limit (OFL), allowable biological catch (ABC), annual catch limit (ACL), fishery harvest guidelines (HG), and the trawl/non-trawl allocations compared to the correct harvest specifications and the difference between those values. Estimated mortality and percent attained to date (9/1/2023) shown relative to the corrected value. Values in metric tons (mt).

2023 Specification	Adopted (mt)	Correct (mt)	Difference (mt)	Mortality to date (mt) a/	Percent Attained b/ (%)
OFL	6,178	5,853	-325	3,041.5	52%
ABC	5,666	5,367	-299	3,041.5	56.7%
ACL	5,666	5,367	-299	3,041.5	56.7%
Off-the-Top Deduction	1,027.6	1,027.6	0	1,027.6	100% c/
Fishery HG	4,638.5	4,339.7	-298.8	2,013.9	46.4%
Trawl (88%)	4,081.8	3,818.9	-262.9	1,945.4	50.1%
At-Sea	320	320	0	266	83.1%
IFQ	3,761.8	3,498.9	-262.9	1,625.4	46.5%
Non-trawl (12%)	556.6	520.8	-35.8	68.5	13.2%

a/ Commercial catch-to-date data was downloaded from the [PacFIN APEX reporting system](#), 9/1/2023.

b/ Percent attained is current mortality relative to the correct 2023 values

c/ Full attainment of off-the-top deductions are assumed due to differences in other fishery reporting timelines.

Table 2 shows the adopted yellowtail rockfish north harvest specifications and trawl/non-trawl allocations for 2024 in the first column and the correct values in the second column. The third column shows the difference between the adopted and correct values.

Table 2. The adopted 2024 yellowtail rockfish north OFL, ABC, ACL, HG, and the trawl/non-trawl allocations for the 2024 harvest specifications compared to the correct harvest specifications and the difference between those values. Values in metric tons (mt).

2024 Specification	Adopted (mt)	Correct (mt)	Difference (mt)
OFL	6,090	5,795	-295
ABC	5,560	5,291	-269
ACL	5,560	5,291	-269
Off-the-Top Deduction	1,027.6	1,027.6	0
Fishery HG	4,532.5	4,263.3	-269.2
Trawl (88%)	3,988.6	3,751.7	-236.9
At-Sea	320	320	0
IFQ	3,668.6	3,431.7	-236.9
Non-trawl (12%)	543.9	511.6	-32.3

Appendix 1

Overview

Yellowtail rockfish north of 40° 10' N. lat. (hereafter referred to as yellowtail rockfish north) was most recently assessed in 2017. This assessment has formed the basis for harvest specifications since 2019. In late August 2023, Council staff requested extended projections for 2025-26 for yellowtail rockfish north from the Northwest Fishery Science Center. As Science Center staff were preparing to conduct new projections for this assessment, it became apparent that previous projections from this assessment had multiple issues. In order to orient the Council to the issue, a brief timeline of the previous harvest specifications and projections is provided. Each identified error is summarized with additional detailed information provided below.

1. 2017 - A new assessment for yellowtail rockfish is conducted ([Stephens and Taylor, 2017](#)), approved by the Scientific and Statistical Committee (SSC), and adopted by the Council. The assessment is determined to be a category 1 assessment with Council selected P* of 0.45 resulting in a time-invariant buffer equal to 0.956.
 - a. OFL Error - The assessment document included a table of projected OFL values in the executive summary of the stock assessment, [Table h](#), that were incorrectly derived. The removal assumptions in 2017-18 were set equal to the model predicted ABC values (e.g., 0.956 * OFL) rather than the adopted ACL values for those years. This produced incorrect OFL values for 2018-2028. These incorrect OFLs values were then used in the 2019-20 biennium harvest specification process ([Agenda Item F.6, Attachment 1, November 2017](#)).
2. 2019 - Council adopted time-varying sigma values and revised sigmas by assessment category resulting in increasing buffer values for all assessments requiring new OFL and ABC projections for all historical assessments. The process to develop new projections was split between catch-only projections accounting for realized removals since the most recent assessment or simple projections where removals were assumed to be equal to the adopted ACLs. All catch-only projections are required to be reviewed by the SSC. Yellowtail rockfish north was included in the list of species that only new projections were requested.
 - a. Projection Error - Rather than conducting new projections a catch-only projection was conducted to provide harvest specifications for 2021-2025. This catch-only projection was not reviewed by the SSC.
3. 2023 - Council staff request new projections for yellowtail rockfish north to be analyzed for the 2025-26 harvest specification process. At this juncture is when the Science Center staff tasked to provide extended projections identified that not only an unreviewed and unauthorized catch-only projection had been done but also that the original OFLs arising out of the 2017 assessment were incorrect.

2017 Assessment Projections

In order to conduct new projections for yellowtail rockfish north the Science Center researched the historical adopted ACLs starting in 2019. The values of the OFL, ABC, and ACLs from the harvest specification database starting in 2019 are shown in Table A1.

Table A1. Adopted harvest specifications for yellowtail rockfish north between 2019-2024. Time-varying buffers were adopted for application in 2021 and beyond in metric tons (mt).

Year	OFL (mt)	Buffer	ABC (mt)	ACL (mt)
2019	6,568	0.956	6,279.01	6,279
2020	6,261	0.956	5,985.52	5,986
2021	6,533.69	0.926	6,050.20	6,050
2022	6,323.77	0.922	5,930.52	5,831
2023	6,178.45	0.917	5,655.64	5,666
2024	6,089.74	0.913	5,559.96	5,560

Upon examination of the adopted harvest specifications, the increase in the OFL, ABC, and ACL between 2020 and 2021 indicated that there was some sort of error in the adopted values since they should have been based on projections which, in general, decrease across the projection period. In order to fully understand what the harvest specifications should have been for yellowtail rockfish north, investigations began by examining the 2017 assessment document and model files.

The 2017 assessment for yellowtail rockfish north was determined to be a category 1 assessment with an adopted P^* of 0.45 (Stephens and Taylor, 2017). The resulting harvest specifications starting in 2019 and beyond should be based upon the 2017 assessment. In the executive summary of this assessment the projection of OFLs estimated from the assessment are shown in [Table h](#) and alternative catch streams are shown in [Table i](#) of the 2017 assessment document. The third catch stream in the decision table is called “Base catch stream” where the document describes this as:

“Annual catches for each fleet are calculated within Stock Synthesis by applying the default SPR-based control rule with a 0.956 adjustment from OFL to ACL associated with a P-star of 0.45 and the default 0.36 Sigma for Category-1 stocks”

Additionally, the assessment document provides the assumed removals in 2017 and 2018 as 6,196 mt and 6,002 mt, equal to the adopted ACL, that would result in the subsequent harvest specifications for 2019 and beyond. However, the adopted ACL for 2019-2020 from the harvest specification database (Table A1) and the catch values in the base catch stream in [Table i](#) from the assessment do not match implying that potentially one of these sources are incorrect. The ACL (set equal to the ABC) in both 2019 and 2020 should equal the buffer times the OFL where the buffer at that time was a constant 0.956. Comparing the ratio of the ACL/OFL from Table A1 for 2019 and 2020 quickly confirms that the ACLs are set at $0.956 \times \text{OFL}$, the correct buffer value, indicating that the base catch stream in [Table i](#) in the assessment document is incorrect and should be ignored.

The 2017 assessment model file was investigated in order to verify that the OFL projections in the assessment document [Table h](#) were correct. However, upon examination of the archived model files, it was found that the OFL projections provided in the assessment document were incorrect. The assessment document states that the assumed removals in 2017 and 2018 were set equal to the adopted ACLs, however, actual removals for these years in the model were significantly higher, 7134.4 and 6656.93 mt. These values were the model projections of the ABC based on the estimated stock size and status and not the adopted ACLs that should have been assumed for 2017

and 2018. This means that the OFLs and subsequent ABCs and ACLs that have been informed by this assessment have been incorrect starting in 2019.

Time-Varying Buffer Projections

In 2019 time-varying sigmas and revised base sigma values by assessment category were adopted by the Council, requiring new projections for 2021 and beyond for all assessments. In the 2019 assessment cycle there were also a large number of catch-only projections conducted that were reviewed by the SSC, but yellowtail rockfish north was not one of those species and the revisions to the projections should have been made based on the 2017 assessment assuming model predicted ACL removals. However, it appears that the catch assumptions were not set equal to the ACLs for yellowtail rockfish north but rather were inappropriately updated to equal the actual removals since both the OFL and ACL increase in 2021 from the adopted 2020 value (Table A1). Given yellowtail rockfish north was only to have new projections, not a catch-only projection, the new projections were not reviewed in detail by the Groundfish Subcommittee-SSC. Additionally, the 2019 analysis was not added to the assessment archive, resulting in no documentation concerning the assumed removals and how the new projections were conducted.

Based on the increase in the OFL and ACL in 2021 relative to the adopted 2020 values, this indicates that the adopted harvest specifications since 2021 have incorrectly been based on an unauthorized catch-only projection for yellowtail rockfish north.

Alternative Model Projections for 2025-26

Given that the adopted OFLs for 2019 and 2020 were set to the incorrect projections from the assessment document, this indicates that all subsequent OFL and ACL values for 2019 and beyond have also been incorrect. Combining this with the improperly conducted catch-only projection in 2019, the harvest specifications have been set at incorrect values in some fashion since 2019, not just starting in 2021.

New projections for yellowtail rockfish north have been requested by Council staff to inform harvest specifications for 2025-26. There are two potential avenues for conducting new projections:

1. Conduct projections with removals equal to the adopted ACLs or
2. Conduct revised projections that correct all of the issues identified above in the historical projections and the adopted harvest specifications for yellowtail rockfish north.

The Science Center has provided a projection for each of the potential options.

Table A2 shows the projections where the adopted ACLs were set as the assumed for removals between 2019-2024. However, these new projections include a new minor error that will need to be addressed. The yellowtail rockfish north model includes a recreational fleet in Washington that has catches specified in terms of number of fish rather than catches in weight. Stock Synthesis requires future catch removals to be specified in the same units as the historical catch which requires the analyst to determine the number of fish that results in a pre-specified allocation of the ACL in weight for that fleet which can be challenging. These new projections result in realized removals that are subtly different than the specified ACLs ranging between +8 to -6 mt (Table

A2). It is often difficult to match the assumed removals to the ACLs when having to convert from numbers of fish to biomass within Stock Synthesis, however, those differences should be relatively small at most (approximately ∓ 0.5 mt). However, the difference between the assumed removals and the ACLs are minor enough that the projections can still be used for illustrative purposes to understand the general impact to the stock under these projection assumptions.

Table A2. New projections for yellowtail rockfish north where the OFL and ACL values are set equal to the adopted harvest specifications for 2017-2024 and the resulting projected values. The difference between the ACL and the model removals during the projection period due to conversion issues between numbers of fish and biomass are given in the “ACL minus Assumed Removals (mt)” column.

Year	OFL (mt)	Buffer	ACL (mt)	Assumed Removals (mt)	ACL minus Assumed Removals (mt)	Spawning Output (trillions of eggs)	Fraction Unfished
2017			6,196	6,195.7	0		
2018			6,002	5,993.9	8		
2019	6,568*	0.956	6,279*	6,285.3	-6	9.815	0.654
2020	6,261*	0.956	5,986*	5,989.1	-3	9.168	0.611
2021	6,534*	0.926	6,050*	6,051.1	-1	8.653	0.577
2022	6,324*	0.922	5,831*	5,830.7	0	8.227	0.549
2023	6,178*	0.917	5,666*	5,664.9	1	7.93	0.529
2024	6,090*	0.913	5,560*	5,558.5	2	7.736	0.516
2025	5,726	0.909	5,205	5,203.1	2	7.614	0.508
2026	5,714	0.904	5,166	5,164.3	1	7.574	0.505
2027	5,709	0.900	5,138	5,137.0	1	7.556	0.504
2028	5,704	0.896	5,111	5,110.0	1	7.548	0.503

*Adopted harvest specifications that were set at incorrect values due to incorrect removal assumptions in 2017 and 2018 and projections from the 2017 assessment.

The projections provided in Table A2 could be used to set harvest specifications for 2025 and beyond if it was determined that revising the historical OFL and ACLs to align with those that should have arisen from the adopted assessment in 2017 was appropriate and that the differences between the ACL and the assumed removals was determined to be adequate.

An alternative projection was conducted using the 2017 yellowtail rockfish north model where the OFLs and ACLs were based on those that should have been projected originally with the correct buffer value by year and are shown in Table A3 below.

Table A3. Projections for yellowtail rockfish north based on the 2017 assessment estimated OFLs and the resulting ABC given the year-specific buffer. The assumed removals in 2017 and 2018 are set equal to the adopted ACLs for those years.

Year	OFL (mt)	Buffer	ACL (mt)	Assumed Removals (mt)	ACL minus Assumed Removals (mt)	Spawning Output (trillions of eggs)	Fraction Unfished
2017			6,196	6,196.0	0.00	11.28	0.752
2018			6,002	6,002.3	-0.27	10.45	0.697
2019	6,689	0.956	6,395.0	6,395.0	-0.01	9.76	0.651
2020	6,359	0.956	6,079.4	6,079.4	0.00	9.10	0.607
2021	6,112	0.926	5,660.0	5,660.1	-0.09	8.58	0.572
2022	5,953	0.922	5,488.9	5,488.9	-0.05	8.22	0.548
2023	5,853	0.917	5,367.2	5,367.1	0.09	7.97	0.532
2024	5,795	0.913	5,291.1	5,291.1	-0.05	7.82	0.522
2025	5,764	0.909	5,239.1	5,239.1	-0.04	7.73	0.516
2026	5,746	0.904	5,194.0	5,193.9	0.11	7.68	0.512
2027	5,734	0.900	5,160.2	5,160.3	-0.09	7.65	0.510
2028	5,722	0.896	5,127.1	5,127.0	0.06	7.64	0.509

Table A4 provides a comparison between the adopted OFLs and ACLs compared to those projected from the corrected projections.

Table A4. Comparison between the adopted ACLs and the corrected ACL estimates based on the projection shown in Table A2 and A3, and the difference for the OFLs and ACLs between 2019-2024 in metric tons (mt).

Year	Adopted OFL (mt)	Adopted ACL (mt)	Corrected OFL (mt)	Corrected ACL (mt)	Corrected Minus Adopted OFL (mt)	Corrected Minus Adopted ACL (mt)
2019	6,568	6,279	6,689	6,395	121	116
2020	6,261	5,986	6,359	6,079	98	94
2021	6,534	6,050	6,112	5,660	-422	-390
2022	6,324	5,831	5,953	5,489	-371	-342
2023	6,178	5,666	5,853	5,367	-325	-299
2024	6,090	5,560	5,795	5,291	-295	-269

References

[Stephens, A., & Taylor, I. G. \(2018\). Status of Yellowtail Rockfish \(*Sebastes flavidus*\) along the US Pacific coast in 2017. *Pacific Fishery Management Council*.](#)