

Alternative Decision Tables with Overfishing Limits

Decision tables have been provided in PFMC assessments for over two decades to convey uncertainty in stock assessment model results. The content has changed over time and differed among assessments. In more recent cycles they have been standardized to provide forecasted spawning output (or spawning biomass) and relative status (e.g., depletion, or equivalently, fraction of unfished spawning output) for the base and two alternative models representing possible states of nature, under two or three hypothetical future catch streams. However, spawning output may not be the most useful or interpretable metric to convey uncertainty in assessment model results to the audiences that use decision tables. Instead, overfishing limits (OFLs) may provide a more direct and interpretable metric of uncertainty across the different states of nature for the coming biennium or in the future, under the alternative catch streams. OFLs also show how management limits could change in the event that a future assessment estimated the stock to be more similar to one of the alternative states of nature, rather than the current base model.

In order to provide information on what management would look like under the alternative states of nature in the short and long term, we provide here OFL-based decision tables with accompanying plots showing how the OFLs differ among the alternative states of nature, and in the context of the alternative catch streams (e.g., potential Annual Catch Limits [ACLs]). We provide these both for informational purposes for this cycle and also as a potential change to future decision tables if it is deemed useful.

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These materials do not constitute a formal publication and are for information only. They are in a pre-review, pre-decisional state and should not be formally cited or reproduced. They are to be considered provisional and do not represent any determination or policy of NOAA or the Department of Commerce.

Chilipepper Rockfish

Table 1: Decision table summary of 10-year projections beginning in 2027 for alternative states of nature based on an axis of uncertainty about Beverton-Holt steepness for the base model. Columns range over low, base, and high states of nature and rows range over different catch level assumptions. Steepness in the base model was fixed at 0.72. The low state of nature assumed steepness = 0.38, and the high state of nature assumed steepness = 0.97. Catch in 2025 and 2026 were based upon removal assumptions provided by the GMT. ++Time-varying buffers for the ABC were calculated in R using the PEPtools package, i.e. `PEPtools::get_buffer(2025:2036, sigma = 0.5, pstar = 0.45, m = c(0.165, 0.216), verbose = TRUE)`.

			Low State of Nature		Base State of Nature		High State of Nature	
Scenario	Year	Catch	OFL	Fraction of Unfished	OFL	Fraction of Unfished	OFL	Fraction of Unfished
P* 0.45 ACL=ABC catch++	2025	1,599	--	0.469	--	0.832	--	0.959
	2026	1,522	--	0.434	--	0.786	--	0.903
	2027	3,204	2,638	0.416	3,434	0.766	3,844	0.878
	2028	3,080	2,485	0.387	3,319	0.736	3,704	0.841
	2029	2,998	2,401	0.372	3,252	0.721	3,616	0.820
	2030	2,943	2,362	0.362	3,213	0.708	3,561	0.801
	2031	2,885	2,328	0.353	3,166	0.692	3,498	0.780
	2032	2,801	2,277	0.343	3,095	0.673	3,406	0.755
	2033	2,700	2,209	0.331	3,004	0.651	3,293	0.727
	2034	2,599	2,133	0.319	2,907	0.630	3,174	0.700
	2035	2,499	2,057	0.307	2,814	0.609	3,062	0.675
	2036	2,413	1,985	0.296	2,732	0.591	2,963	0.652
Constant Catch =F(SPR 50%) Proxy for MSY	2025	1,599	--	0.469	--	0.832	--	0.959
	2026	1,522	--	0.434	--	0.786	--	0.903
	2027	2,114	2,638	0.416	3,434	0.766	3,844	0.878
	2028	2,114	2,587	0.406	3,409	0.758	3,803	0.867
	2029	2,114	2,583	0.405	3,417	0.761	3,794	0.866
	2030	2,114	2,609	0.407	3,446	0.764	3,803	0.864
	2031	2,114	2,634	0.407	3,461	0.762	3,794	0.857
	2032	2,114	2,636	0.405	3,442	0.755	3,747	0.843
	2033	2,114	2,614	0.401	3,391	0.743	3,667	0.824
	2034	2,114	2,575	0.394	3,320	0.728	3,566	0.801
	2035	2,114	2,528	0.387	3,239	0.710	3,460	0.778
	2036	2,114	2,479	0.379	3,158	0.693	3,355	0.754

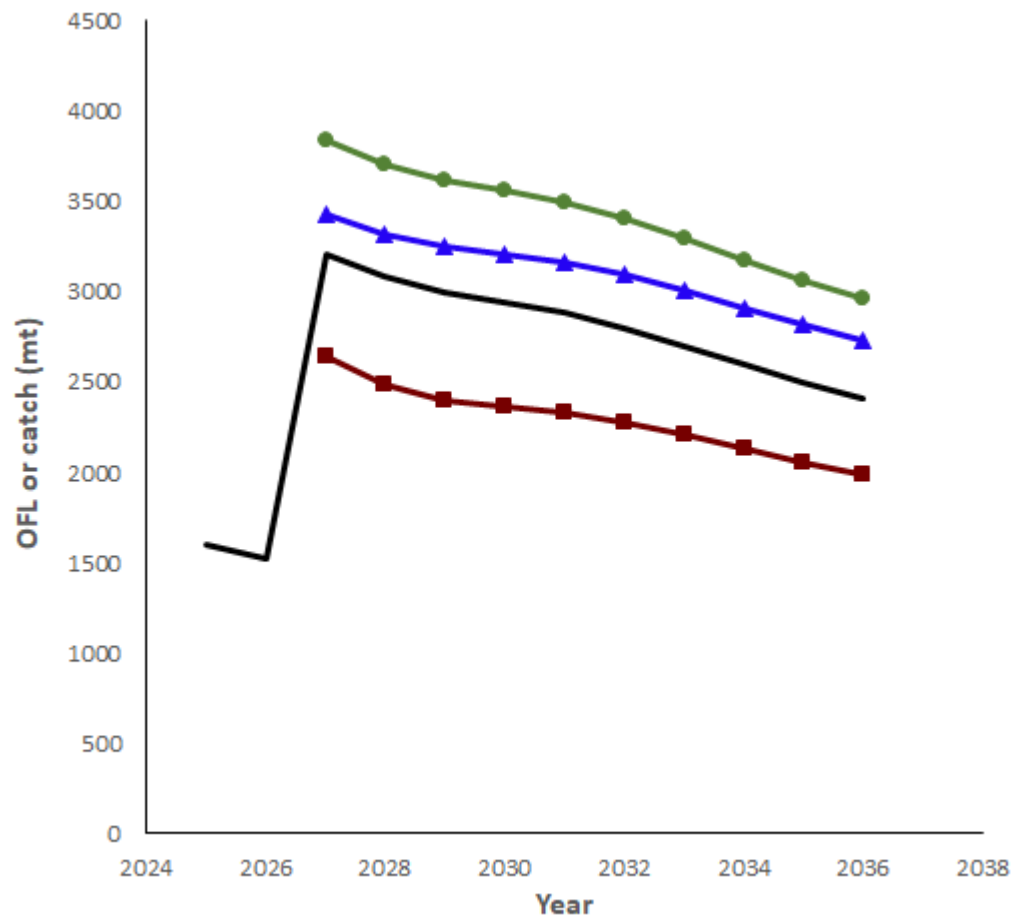


Figure 1a: Estimates of chilipepper removals for 2025-2026 from the GMT, followed by model-estimated ACLs (=ABC) for 2027-2036 with a $P^* = 0.45$ and $\sigma = 0.5$ (black line) and the model estimated OFLs for 2025-2036 from the base model (blue line and triangles), low state of nature (red line and squares), and high state of nature (green line and circles).

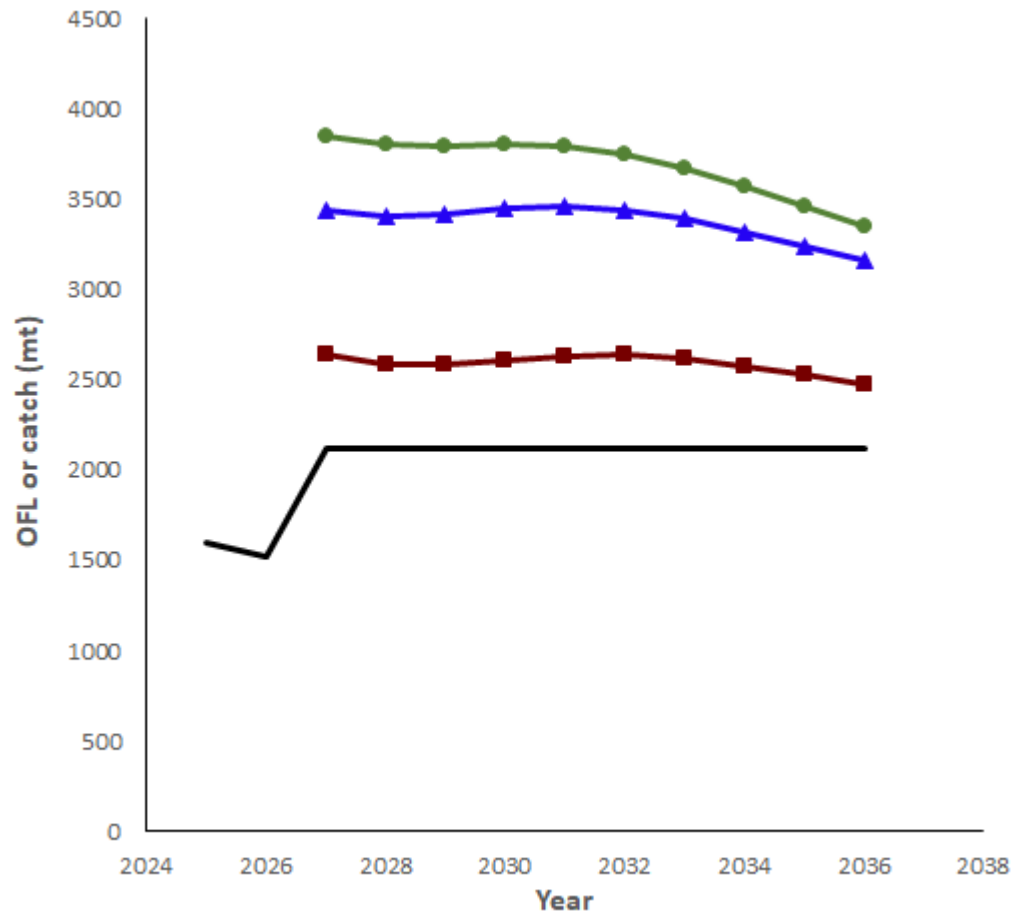


Figure 1b: Estimates of chilipepper removals for 2025-2026 from the GMT, followed by constant catches equal to the MSY proxy for 2027-2036 (black line) and the model estimated OFLs for 2025-2036 from the base model (blue line and triangles), low state of nature (red line and squares), and high state of nature (green line and circles).

Quillback Rockfish off California

Table 2: Decision table with 10-year projections beginning in 2027 for alternative states of nature based around modeling natural mortality (M). All models assume a $P^* = 0.45$ and $\sigma = 0.75$. Catch (mt) is from the projections from the base model, and is applied to each state of nature. Catches in 2025 and 2026 are fixed at values provided by the GMT. The alternative states of nature ('Low', 'Base', and 'High') are provided in the columns. Natural mortality is fixed either at the low state of nature (Low M = 0.0525), the base model value (M = 0.068), or the high state of nature (High M = 0.08).

Scenario	Year	Catch	Low State of Nature		Base State of Nature		High State of Nature	
			OFL	Fraction of Unfished	OFL	Fraction of Unfished	OFL	Fraction of Unfished
P* 0.45	2025	1.3	--	0.299	--	0.435	--	0.563
	2026	1.5	--	0.33	--	0.475	--	0.608
	2027	11.6	7.5	0.359	12.8	0.513	19.6	0.651
	2028	11.9	7.8	0.369	13.3	0.53	20.3	0.672
	2029	12.2	7.9	0.377	13.6	0.543	20.8	0.688
	2030	12.3	8.0	0.381	13.9	0.551	21.1	0.699
	2031	12.3	8.0	0.382	14.0	0.556	21.3	0.705
	2032	12.2	8.0	0.382	14.0	0.559	21.3	0.707
	2033	12.1	8.0	0.381	14.0	0.559	21.3	0.707
	2034	12.0	7.9	0.379	13.9	0.558	21.2	0.706
	2035	11.8	7.8	0.376	13.9	0.556	21.0	0.703
	2036	11.7	7.8	0.374	13.8	0.554	20.9	0.699

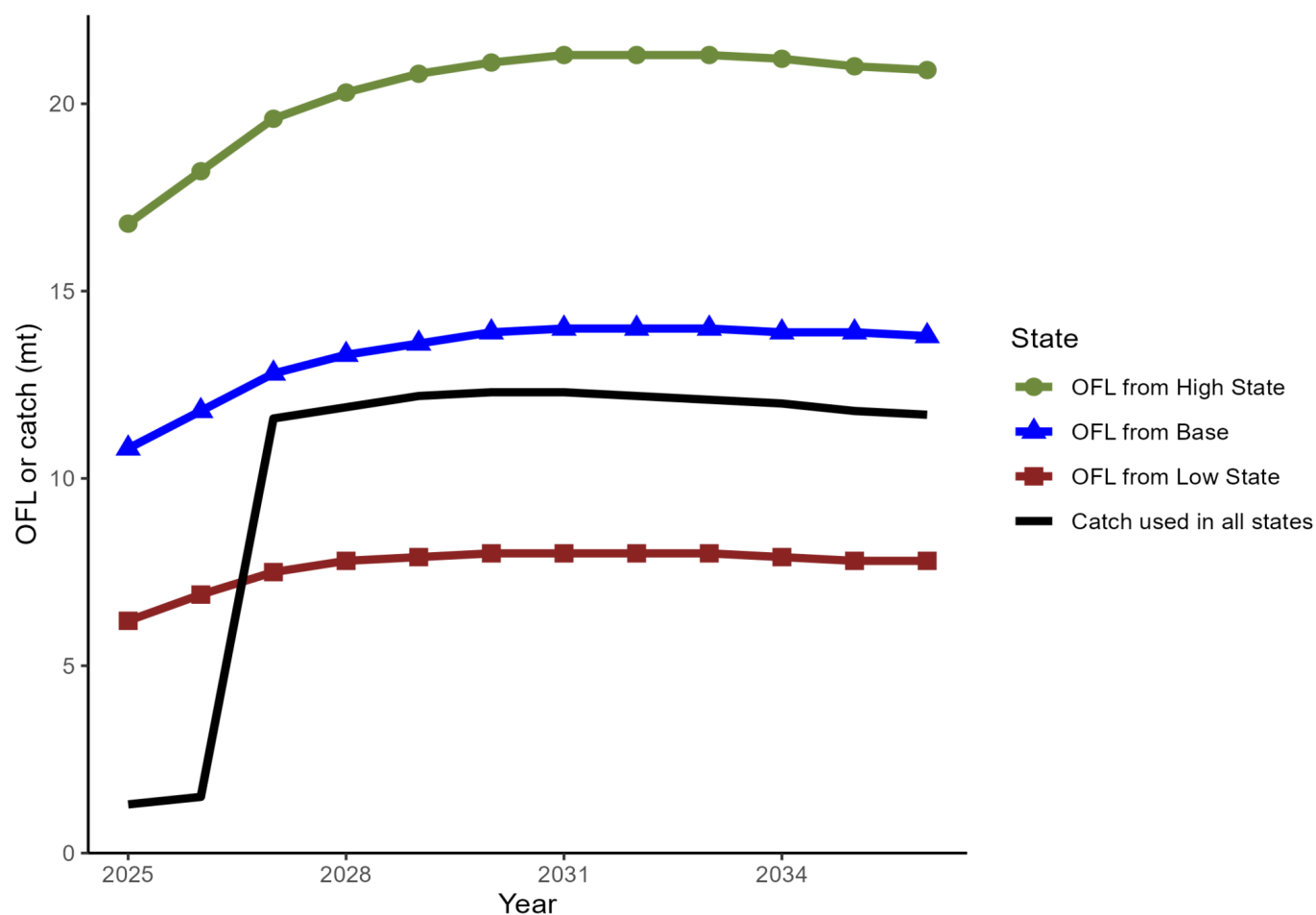


Figure 2: The GMT provided removals for 2025-2026 and ACLs for 2027-2036 with a $P^* = 0.45$ and $\sigma = 0.75$ (black line) and the model estimated OFLs for 2025-2036 from the base model (blue line), low state of nature (red line), and high state of nature (green line).

Rougheye and Blackspotted Rockfish

Table 1: Decision table summary of 10 year projections beginning in 2027 for alternative states of nature based on an axis of uncertainty about natural mortality for the base model. Columns range over low, base, and high states of nature and rows range over different catch level assumptions. The base model estimated instantaneous natural mortality rate (M) of 0.036 yr^{-1} for males. The low state of nature assumed an M of 0.032 for males and the high state of nature assumed an M of 0.039 for males. Catch in 2025 and 2026 were based upon removal assumptions provided by the GMT. *Note that additional catch streams will be requested by the GMT to fill out the decision table.*

			Low State of Nature		Base State of Nature		High State of Nature	
Scenario	Year	Catch	OFL	Fraction of Unfished	OFL	Fraction of Unfished	OFL	Fraction of Unfished
P* 0.45, sigma = 1	2025	155	--	0.733	--	0.872	--	0.933
	2026	187	--	0.734	--	0.875	--	0.936
	2027	844	373	0.735	966	0.877	2,714	0.939
	2028	826	359	0.705	955	0.865	2,713	0.937
	2029	809	346	0.677	944	0.854	2,712	0.936
	2030	792	333	0.650	933	0.843	2,710	0.934
	2031	776	320	0.624	923	0.833	2,707	0.933
	2032	760	308	0.598	912	0.823	2,704	0.932
	2033	745	296	0.574	902	0.813	2,700	0.931
	2034	729	284	0.550	892	0.804	2,695	0.930
	2035	714	273	0.527	881	0.795	2,688	0.928
	2036	699	262	0.504	871	0.786	2,680	0.927

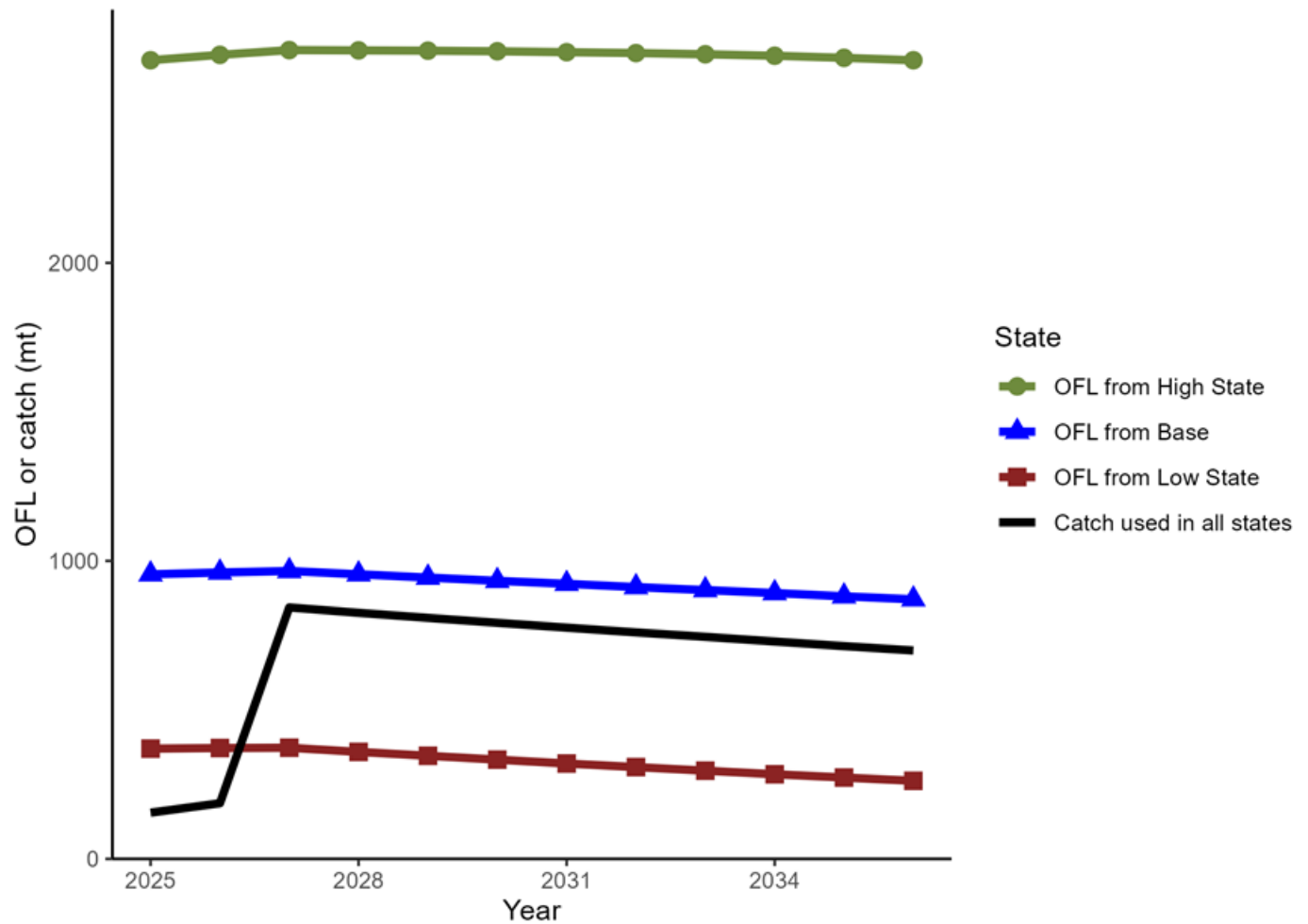


Figure 3. The GMT provided removals for 2025-206 and ACLs for 2027-2036 with a $P^* = 0.45$ and $\sigma = 1$ (black line) and the model estimated OFLs for 2025-2036 from the base model (blue line), low state of nature (red line), and high state of nature (green line).

Sablefish

Table 4: Decision table summary of 10 year projections beginning in 2027 for alternative states of nature based on an axis of uncertainty about natural mortality for the base model. Columns range over low, base, and high states of nature and rows range over different catch level assumptions. The base model estimated a natural mortality rate of 0.088 yr^{-1} for females and males. The low state of nature assumed a natural mortality rate of 0.095 yr^{-1} and the high state of nature assumed a natural mortality rate of 0.070 yr^{-1} for both sexes. Catch in 2025 and 2026 were based upon removal assumptions provided by the GMT.

			Low State of Nature		Base State of Nature		High State of Nature	
Scenario	Year	Catch	OFL	Fraction of Unfished	OFL	Fraction of Unfished	OFL	Fraction of Unfished
P* 0.45	2025	19,114	--	0.237	--	0.339	--	0.436
	2026	19,082	--	0.259	--	0.369	--	0.466
	2027	13,964	10,938	0.285	14,935	0.405	19,676	0.506
	2028	15,103	12,088	0.319	16,240	0.448	21,091	0.548
	2029	14,720	11,808	0.341	15,896	0.473	20,794	0.576
	2030	14,094	11,312	0.354	15,287	0.49	20,192	0.597
	2031	13,437	10,844	0.358	14,654	0.498	19,453	0.61
	2032	12,755	10,344	0.349	13,970	0.489	18,653	0.604
	2033	12,172	9,948	0.339	13,390	0.477	17,936	0.596
	2034	11,749	9,705	0.334	12,997	0.47	17,429	0.593
	2035	11,273	9,436	0.328	12,526	0.462	16,744	0.585
	2036	10,918	9,259	0.325	12,186	0.455	16,230	0.578
P* 0.40	2025	19,114	--	0.237	--	0.339	--	0.436
	2026	19,082	--	0.259	--	0.369	--	0.466
	2027	13,039	10,938	0.285	14,935	0.405	19,676	0.506
	2028	14,084	12,152	0.322	16,300	0.45	21,143	0.55
	2029	13,713	11,938	0.346	16,019	0.478	20,901	0.58
	2030	13,115	11,502	0.362	15,466	0.498	20,348	0.602
	2031	12,500	11,085	0.369	14,881	0.508	19,651	0.617
	2032	11,842	10,625	0.362	14,234	0.501	18,884	0.614
	2033	11,275	10,262	0.354	13,683	0.491	18,194	0.607
	2034	10,880	10,051	0.351	13,317	0.486	17,712	0.605
	2035	10,407	9,807	0.347	12,864	0.479	17,041	0.599
	2036	10,045	9,654	0.345	12,541	0.474	16,541	0.593

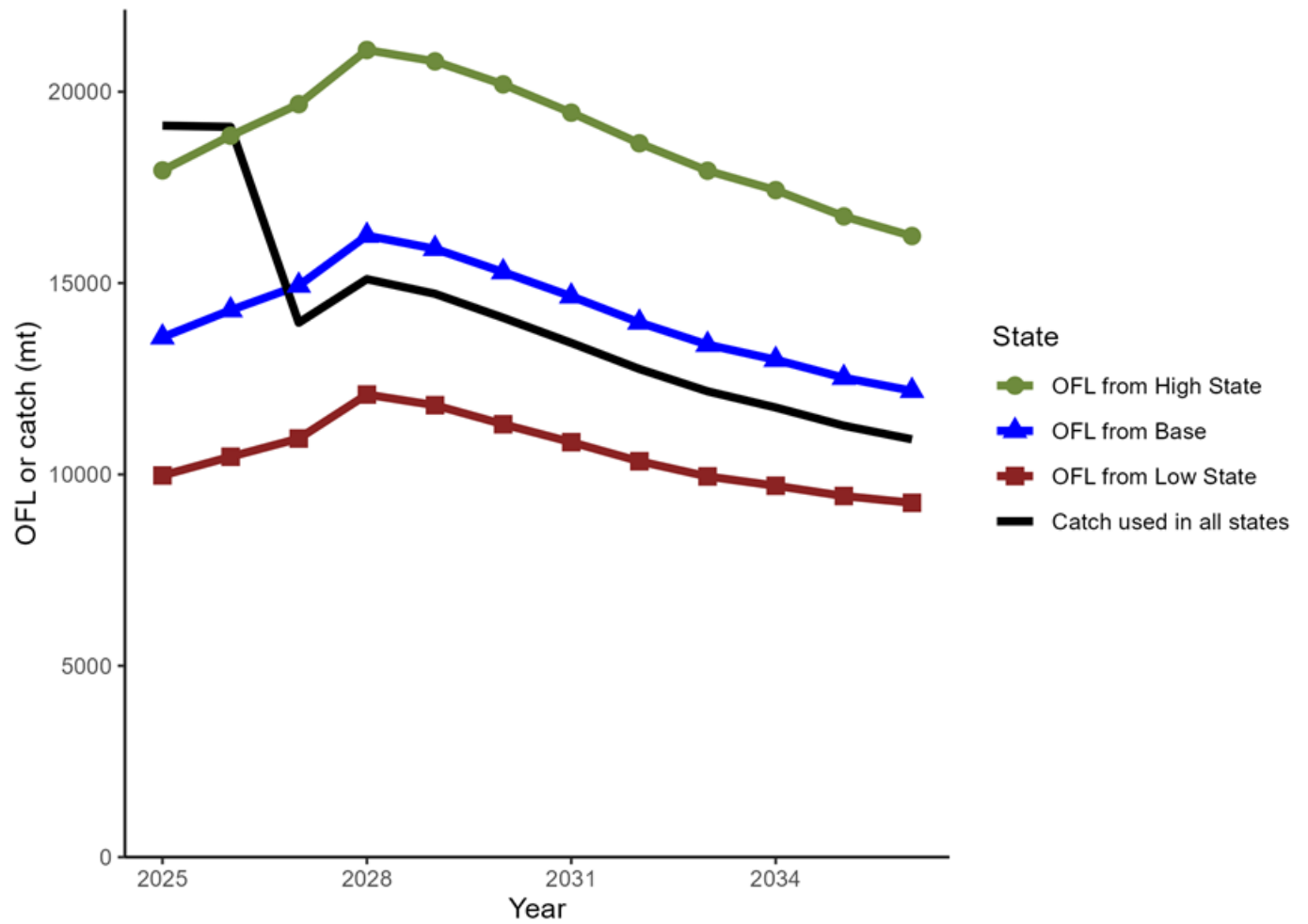


Figure 4a: The GMT provided removals for 2025-2026 and ACLs for 2027-2036 with a $P^* = 0.45$ and $\sigma = 0.5$ (black line) and the model estimated OFLs for 2025-2036 from the base model (blue line), low state of nature (red line), and high state of nature (green line).

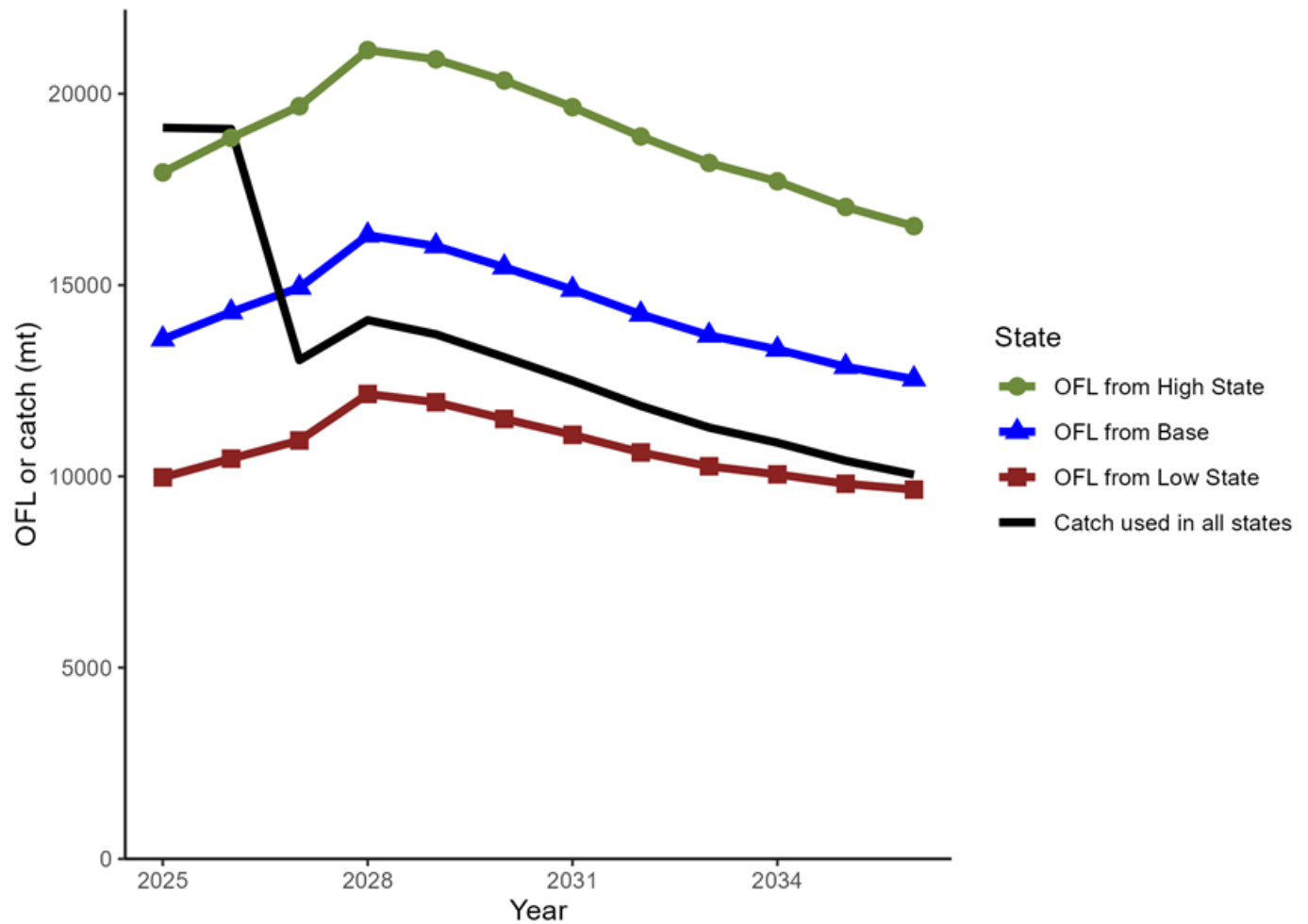


Figure 4b: The GMT provided removals for 2025-2026 and ACLs for 2027-2036 with a $P^* = 0.40$ and $\sigma = 0.5$ (black line) and the model estimated OFLs for 2025-2036 from the base model (blue line), low state of nature (red line), and high state of nature (green line).

Yellowtail Rockfish

Table 5. Decision table for yellowtail rockfish showing OFLs for each state of nature. Scenario refers to the two management scenarios: (1) the default harvest control rule $P^* = 0.45$ and $\sigma = 0.5$ and (2) assuming an average attainment of 55% of the default harvest control rule ACL values from the first scenario (consistent with recent attainment) from 2027-2036. In each case the 2025 and 2026 catches are fixed at estimates provided by the GMT. The alternative states of nature ('Low', 'Base', and 'High' as discussed in the text) are provided in the columns, with OFL (in metric tons) and Fraction of unfished spawning output provided for each state.

			Low State of Nature		Base State of Nature		High State of Nature	
Scenario	Year	Catch	OFL	Fraction of Unfished	OFL	Fraction of Unfished	OFL	Fraction of Unfished
P* 0.45	2025	4,060	--	0.539	--	0.626	--	0.693
	2026	4,066	--	0.515	--	0.601	--	0.666
	2027	4,723	3,896	0.490	5,051	0.575	6,237	0.639
	2028	4,540	3,749	0.462	4,882	0.545	6,042	0.608
	2029	4,445	3,676	0.440	4,800	0.523	5,952	0.585
	2030	4,421	3,665	0.426	4,794	0.509	5,951	0.572
	2031	4,435	3,694	0.421	4,837	0.504	6,009	0.568
	2032	4,467	3,734	0.421	4,892	0.506	6,082	0.572
	2033	4,485	3,764	0.425	4,934	0.512	6,138	0.578
	2034	4,476	3,775	0.429	4,952	0.517	6,163	0.585
	2035	4,452	3,769	0.431	4,947	0.520	6,159	0.588
	2036	4,414	3,752	0.431	4,926	0.520	6,136	0.589
55% of ACL values from the P* 0.45 scenario	2025	4,060	--	0.539	--	0.626	--	0.693
	2026	4,066	--	0.515	--	0.601	--	0.666
	2027	2,598	3,896	0.490	5,051	0.575	6,237	0.639
	2028	2,497	3,890	0.483	5,034	0.566	6,204	0.628
	2029	2,445	3,942	0.480	5,086	0.562	6,254	0.623
	2030	2,431	4,045	0.484	5,199	0.565	6,378	0.626
	2031	2,439	4,177	0.495	5,349	0.576	6,547	0.636
	2032	2,457	4,313	0.510	5,503	0.592	6,721	0.652
	2033	2,467	4,434	0.528	5,637	0.610	6,870	0.671
	2034	2,462	4,530	0.546	5,740	0.628	6,980	0.689
	2035	2,449	4,603	0.561	5,813	0.643	7,054	0.703
	2036	2,428	4,658	0.573	5,863	0.654	7,099	0.713

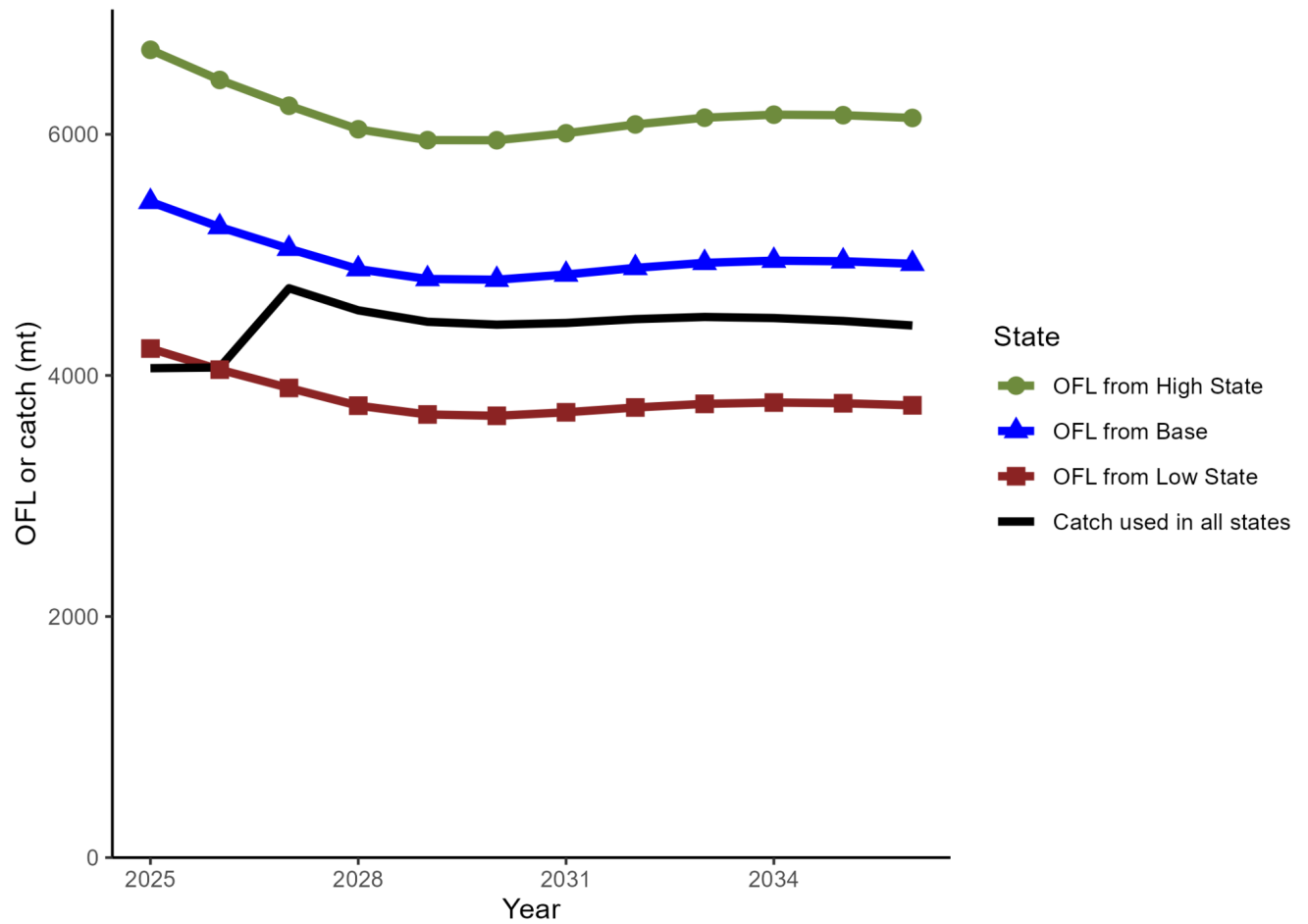


Figure 5a: The GMT provided removals for 2025-2026 and ACLs for 2027-2036 with a $P^* = 0.40$ and $\sigma = 0.5$ (black line) and the model estimated OFLs for 2025-2036 from the base model (blue line), low state of nature (red line), and high state of nature (green line).

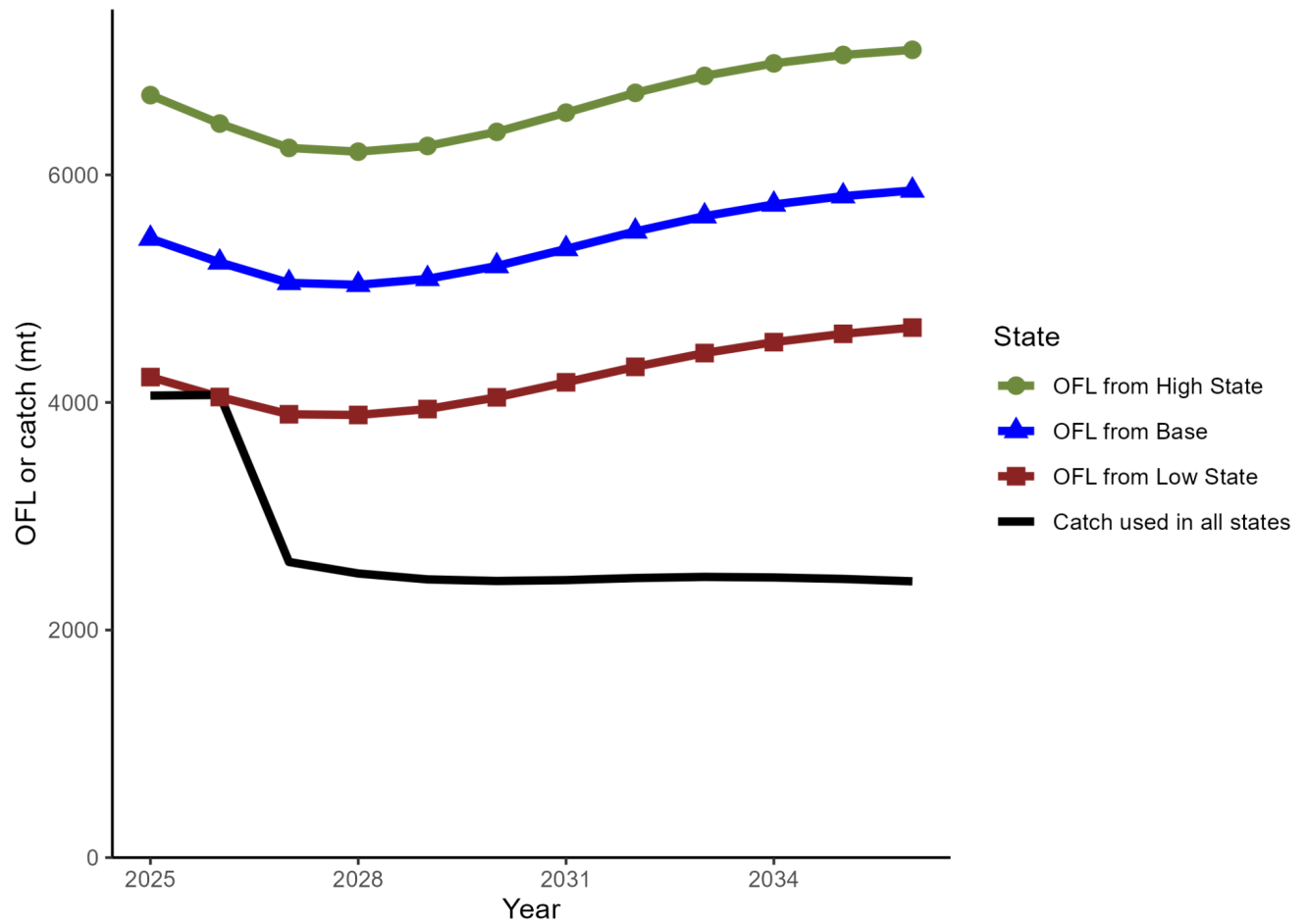


Figure 5b: The GMT provided removals for 2025-2026 and an average attainment of 55% of the default harvest control rule ACL (consistent with recent attainment) from 2027-2036 (black line) and the model estimated OFLs for 2025-2036 from the base model (blue line), low state of nature (red line), and high state of nature (green line)