

**GROUND FISH MANAGEMENT TEAM REPORT ON NEW METHODOLOGY
 INFORMING SIGMA VALUES**

Members of the Groundfish Management Team (GMT) attended the Scientific and Statistical Committee (SSC) review of the proposed sigma methodologies and received a briefing from John DeVore (Pacific Fishery Management Council [Council] Staff). As described in the SSC report ([Agenda Item G.3.a, Supplemental SSC Report 1](#)), the SSC reviewed several new, and endorsed one, new sigma methodologies that result in higher deductions from the Overfishing Limit (OFL) to the Acceptable Biological Catch (ABC) when paired with P*. Since the Council typically sets annual catch limits (ACLs) equal to ABC, we hereafter speak to the effect of the sigma deductions to ACLs.

The proposed base deduction for Category I stocks (0.5) is higher than the current sigma of 0.36; however, there is now an additional “staleness penalty” sigma, which progressively increases each year during years 3-10 of the 10-year stock projections in order to provide a new buffer to account for increased uncertainty as a stock assessment ages. The base deductions are also higher for Category II (from 0.72 to 1) and Category III (from 1.44 to 2) stocks. However, Category III stocks are exempt from the new penalty for stock assessment staleness since they use constant OFLs. The deductions for stocks that use a P*=0.45, which is used for most stocks, are shown in Table 1. Deductions for P*=0.40, which cover all remaining stocks, are shown in Table 2.

Table 1. Deductions from the OFL to the ABC for P*=0.45 (maximum in the FMP) based on the old sigma approach and the new sigma approach with a higher base (year - 1) deduction that progressively increases each year for staleness.

P*=0.45	Category I		Category II		Category III		
	Year	Old	New	Old	New	Old	New
	1	4.4%	6.1%	8.7%	11.8%	16.6%	22.2%
	2	4.4%	6.5%	8.7%	12.6%	16.6%	22.2%
	3	4.4%	7.0%	8.7%	13.5%	16.6%	22.2%
	4	4.4%	7.4%	8.7%	14.3%	16.6%	22.2%
	5	4.4%	7.8%	8.7%	15.1%	16.6%	22.2%
	6	4.4%	8.3%	8.7%	15.9%	16.6%	22.2%
	7	4.4%	8.7%	8.7%	16.7%	16.6%	22.2%
	8	4.4%	9.1%	8.7%	17.4%	16.6%	22.2%
	9	4.4%	9.6%	8.7%	18.2%	16.6%	22.2%
	10	4.4%	10.0%	8.7%	19.0%	16.6%	22.2%

Table 2. Deductions from the OFL to the ABC for P*=0.40 based on the old sigma approach and the new sigma approach with a higher base (year - 1) deduction that progressively increases each year for staleness.

P*=0.4	Category I		Category II		Category III		
	Year	Old	New	Old	New	Old	New
	1	8.7%	11.9%	16.7%	22.4%	30.6%	39.8%
	2	8.7%	12.7%	16.7%	23.8%	30.6%	39.8%
	3	8.7%	13.6%	16.7%	25.3%	30.6%	39.8%
	4	8.7%	14.4%	16.7%	26.7%	30.6%	39.8%
	5	8.7%	15.2%	16.7%	28.1%	30.6%	39.8%
	6	8.7%	16.0%	16.7%	29.4%	30.6%	39.8%
	7	8.7%	16.8%	16.7%	30.7%	30.6%	39.8%
	8	8.7%	17.6%	16.7%	32.0%	30.6%	39.8%
	9	8.7%	18.3%	16.7%	33.3%	30.6%	39.8%
	10	8.7%	19.1%	16.7%	34.6%	30.6%	39.8%

The GMT had a lengthy discussion on potential impacts of the new sigma values and potential ideas for the Council to consider moving forward to mitigate the impacts of deductions while continuing to use the best available science in setting harvest goals. These ideas are discussed further below.

Economic Impacts

There could be negative economic impacts associated with the new sigma values, due to the higher deductions from the OFLs to the ACLs. While these deductions would apply to all stocks, the GMT compared differences in ACLs for select representative scenario stocks. This was done with the help of Dr. Chantel Wetzel, National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center (NWFSC), who provided the 10-year stock assessment OFL and ACL projections using the old and new sigma approaches. The scenario stocks selected were: petrale sole, a high attainment, Category I stock (Table 3); canary rockfish, which is a low attainment Category I stock utilized in all sectors (Table 4); Oregon black rockfish, an important Category II stock (Table 5); and vermillion rockfish, an important Category III stock (Table 6).

For petrale sole, a high attainment Category I scenario stock, the new sigma would result in ACL reductions of ~50-65 metric ton (mt) per year during the first five years of the projection period, which would increase to 80 mt by year 10. However, important, high attainment stocks like petrale sole are frequently re-assessed with full or update assessments, which would reset the new sigma penalty for staleness. Other high attainment Category I stocks that the Council would want to frequently re-assess to reset the sigma penalty include Washington and California black rockfish, sablefish, widow rockfish, Oregon and California cabezon, and lingcod south of 40° 10' N. latitude.

Table 3. Differences in ACLs (in mt) for petrale sole, a high attainment Category I stock, during the 10-year projection based on the old sigma approach and the new sigma approach.

Year	Old approach (fixed sigma 0.72)			New sigma w/ staleness penalty			ACL Loss
	OFL	ACL	Deduction	OFL	ACL	Deduction	
2016	3,295.7	3,150.7	4.4%	3,306.3	3,091.4	6.5%	59.3
2017	3,225.0	3,083.1	4.4%	3,247.7	3,020.4	7.0%	62.7
2018	3,107.9	2,971.2	4.4%	3,143.3	2,910.7	7.4%	60.5
2019	3,005.6	2,873.4	4.4%	3,052.5	2,823.5	7.5%	49.8
2020	2,943.3	2,813.8	4.4%	2,998.6	2,749.7	8.3%	64.1
2021	2,918.8	2,790.4	4.4%	2,984.6	2,725.0	8.7%	65.4
2022	2,918.6	2,790.2	4.4%	2,994.8	2,719.3	9.2%	70.9
2023	2,929.3	2,800.4	4.4%	3,016.7	2,727.1	9.6%	73.3
2024	2,942.3	2,812.8	4.4%	3,041.2	2,737.1	10.0%	75.7
2025	2,953.3	2,823.3	4.4%	3,064.0	2,757.6	10.0%	65.7
2026	2,961.1	2,830.9	4.4%	3,081.4	2,748.7	10.8%	82.2

The ACLs for canary rockfish, a low attainment Category I scenario stock, were already rapidly declining from 1,473 to 1,107 mt from years 1-10 with the old sigma, due to the stock assessment projections assuming full ACL removals. The new sigmas would compound the decline, with an additional ACL reduction of 26-30 mt each year during years 1-5, resulting in 51 mt by year 10. Although ACL attainments of canary rockfish are currently low, reduced ACLs affect the resulting allocations of all the individual sectors for which canary rockfish is important to every groundfish fishery. For low attainment Category I stocks, the new sigma deductions would be relatively minor compared to the declines associated with the full ACL removal assumption. Update assessments could help resolve both issues, but catch-only projections, which would mitigate the full ACL removal assumption but not reset the sigma penalty, would be better warranted given limited assessor and aging capacity. This scenario applies to other important and low attainment Category I or II stocks (no scenario shown for these) such as Dover sole, arrowtooth flounder, thornyheads, and many more. For instance, arrowtooth flounder ACLs were already set to decline from ~15,000 mt to 6,000 mt with the old sigma and there would be even more deduction with new sigma. These declining arrowtooth flounder ACLs could constrain the shorebased Individual Fishing Quota (IFQ) fishery that has caught 4,000-6,000 mt in some years, and could have even higher catches with re-openings of the trawl rockfish conservation area and higher yelloweye rockfish bycatch allowances.

Table 4. Differences in ACLs (in mt) for canary rockfish, a low attainment Category I stock, during the 10-year projection based on the old sigma approach and the new sigma approach.

Year	Old approach (fixed sigma 0.72)			New sigma w/ staleness penalty			ACL Loss
	OFL	ACL	Deduction	OFL	ACL	Deduction	
2015	1,541.4	1,473.6	4.4%	1,541.4	1,447.4	6.1%	26.2
2016	1,407.1	1,345.2	4.4%	1,409.7	1,318.1	6.5%	27.1
2017	1,311.2	1,253.5	4.4%	1,315.7	1,223.6	7.0%	29.8
2018	1,251.6	1,196.5	4.4%	1,258.1	1,165.0	7.4%	31.6
2019	1,218.2	1,164.6	4.4%	1,226.7	1,134.7	7.5%	29.9
2020	1,198.6	1,145.9	4.4%	1,209.0	1,108.7	8.3%	37.2
2021	1,185.4	1,133.2	4.4%	1,198.3	1,094.1	8.7%	39.1
2022	1,176.3	1,124.6	4.4%	1,191.9	1,082.2	9.2%	42.3
2023	1,170.4	1,118.9	4.4%	1,188.7	1,074.6	9.6%	44.4
2024	1,166.3	1,115.0	4.4%	1,187.2	1,068.5	10.0%	46.5
2025	1,162.6	1,111.5	4.4%	1,186.1	1,067.5	10.0%	43.9
2026	1,158.7	1,107.7	4.4%	1,184.4	1,056.5	10.8%	51.2

For Oregon black rockfish, a high attainment Category II scenario stock, the main source of ACL declines would be primarily attributed to the new sigmas. In years 1-5, the ACL would decline by 19-31 mt per year, and almost 50 mt by year 10. This could be problematic for Oregon coastal communities since black rockfish is the main stock for the Oregon recreational and commercial nearshore fisheries. In 2017, Oregon recreational fisheries were shut down early because of black rockfish concerns, and the Council received public testimony as to the severe negative consequences for charter business operators and tourist-revenue dependent coastal communities resulting from this closure. With the more pessimistic results from the last full assessment alone, the Oregon recreational fishery has already had to lower their bag limits to near the tipping point for some charter operators and recreational anglers. As with high attainment Category I stocks, the best approach for these would be more frequent update or full assessments which would reset the sigma penalty.

Table 5. Differences in ACLs (in mt) for Oregon black rockfish, a Category II stock, during the 10-year projection based on the old sigma approach and the new sigma approach.

Year	Old approach (fixed sigma 0.72)			New sigma w/ staleness penalty			ACL Loss
	OFL	ACL	Deduction	OFL	ACL	Deduction	
2015	610.5	557.4	8.7%	610.5	538.5	11.8%	18.9
2016	597.1	545.1	8.7%	598.7	523.3	12.6%	21.9
2017	586.3	535.3	8.7%	589.6	510.0	13.5%	25.2
2018	578.0	527.7	8.7%	583.2	499.8	14.3%	27.9
2019	571.9	522.1	8.7%	578.9	491.4	15.1%	30.7
2020	567.4	518.0	8.7%	576.1	484.5	15.9%	33.5
2021	563.9	514.9	8.7%	574.4	478.5	16.7%	36.4
2022	561.2	512.4	8.7%	573.5	473.7	17.4%	38.7
2023	559.0	510.3	8.7%	573.0	468.7	18.2%	41.6
2024	557.0	508.5	8.7%	572.9	464.0	19.0%	44.5
2025	555.3	506.9	8.7%	573.0	460.1	19.7%	46.9
2026	553.7	505.5	8.7%	573.2	455.7	20.5%	49.8

For vermilion rockfish, a high attainment Category III scenario stock, constant OFLs would be additionally reduced by 6.6 percent. This would result in an ACL loss of 15.6 mt compared to the old sigma approach. This could be problematic for the California recreational and commercial fixed gear fisheries, which regularly target and catch vermilion rockfish. Although managed within a complex and the reduction could result in decreased harvest opportunities.

The same 6.6 percent additional reduction would apply to all other Category III stocks. Changes to the nearshore rockfish complexes, of which most contributors are Category III stocks, could result in necessary reductions in bag limits for recreational fisheries and trip limit reductions for the California and Oregon nearshore fisheries. For Category III stocks, there is no ACL benefit for update or catch-only projections due to them being managed with constant OFLs and not subject to the new sigma penalty for staleness.

Table 6. Differences in ACL contributions (in mt) for vermilion rockfish to the southern shelf rockfish complex, a Category III stock, which will be constant throughout time because Category III stocks are managed with constant OFLs.

Constant OFL	ACL contribution old sigma (16.6% deduction)	ACL new sigma (22.2% deduction)	ACL Loss
269.3	224.6	209.5	15.1

In general, strategic use of more frequent update or catch-only updates would be beneficial to prevent ACL declines associated with the new sigmas and assumption of full ACL removals in the 10-year projection for Category I and II stocks. Given limited assessor and age-reader capacity, the new sigmas will certainly lead to a shake-up of future stock assessment prioritization processes. Frequent update assessments of core high attainment stocks could decrease the ability to conduct

full assessments, which are already in high demand, as many stocks, such as nearshore, have yet to have a full assessment.

Moving Forward

The GMT had considerable discussions on potential solutions to mitigate the impacts of implementation of the new sigmas endorsed by the SSC. In the short term, the GMT is working with Dr. Owen Hamel (NMFS NWFSC) to provide catch information for a series of catch-only updates for the 2021-22 biennium to reduce the initial impacts of the new sigmas. In the longer term, the GMT discussed how the Council may need to explore and re-examine the stock assessment prioritization process and implementation of the new sigmas through a phased-in approach described in the new National Standard Guidelines. This could lead to a broader re-consideration of our current P*-sigma system. The GMT would like to have additional time for further discussions with the SSC and NMFS staff to more fully develop these potential solutions for Council consideration. Given additional time and feedback from continued discussions at the SSC's April meeting, the GMT believes that we could propose pathways forward for the Council to consider in June.

PFMC
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