ADDITIONAL PROJECTIONS OF HARVEST SPECIFICATIONS FOR WEST COAST GROUNDFISH STOCKS IN 2021 AND BEYOND

The following harvest projections are provided for stocks with proposed harvest specifications not adopted at the September meeting. These projections are based on the most recent assessments and assume default harvest control rules for 2021 and beyond.

Additionally, tables are provided showing the harvest specification projections for alternative harvest control rules as requested by the Council at their September meeting

List of Tables

Table 1. Brown rockfish harvest specifications (in mts) and depletion estimates projected from the 2013 data-moderate assessment under default harvest control rules. The portion of the coastwide stock north (1.2%) and south (98.8%) of 40º10' N lat. is based on the proportion of cumulative removals by area during 1916-2012.

Year	Buffer	Coastwide		N of 40°10' N lat.		S of 40°10' N lat.		Depletion
		OFL	ABC	OFL	ABC	OFL	ABC	
2021	0.826	181.80	150.18	2.10	1.73	179.70	148.45	0.486
2022	0.818	180.60	147.73	2.08	1.71	178.52	146.02	0.483
2023	0.810	180.30	146.08	2.08	1.69	178.22	144.39	0.481
2024	0.803	181.20	145.47	2.09	1.68	179.11	143.79	0.481
2025	0.795	181.90	144.61	2.10	1.67	179.80	142.94	0.483
2026	0.788	182.50	143.82	2.11	1.66	180.39	142.16	0.484
2027	0.780	182.90	142.68	2.11	1.65	180.79	141.03	0.486
2028	0.773	183.20	141.63	2.11	1.63	181.09	140.00	0.487
2029	0.766	184.20	141.09	2.13	1.63	182.07	139.46	0.489
2030	0.758	185.00	140.26	2.14	1.62	182.86	138.64	0.492

Table 2. Canary rockfish harvest specifications (in mts), biomass, and depletion estimates projected from the 2015 full assessment under default harvest control rules.

Year	Buffer	Predicted OFL (mt)	ABC Catch (mt)	Age 5+ Biomass (mt)	Spawning Biomass (mt)	Depletion
2021	0.917	1,459	1,338	33,003	4,226	0.567
2022	0.913	1,432	1,308	33,178	4,110	0.552
2023	0.909	1,413	1,285	33,438	4,000	0.537
2024	0.904	1,401	1,266	33,740	3,903	0.524
2025	0.900	1,392	1,253	33,992	3,824	0.513
2026	0.896	1,383	1,239	34,202	3,762	0.505
2027	0.892	1,373	1,225	34,382	3,715	0.499
2028	0.888	1,362	1,209	34,565	3,680	0.494
2029	0.883	1,351	1,193	34,714	3,655	0.490
2030	0.879	1,340	1,178	36,768	3,637	0.488

Table 3. English sole harvest specifications (in mts) and depletion estimates projected from the 2013 data-moderate assessment under default harvest control rules.

Year	Buffer	OFL	ABC/ACL	Removal Assumption	Depletion
2013	0.956	7,129	6,815	358	0.872
2014	0.956	5,906	5,646	309	0.885
2015	0.913	10,792	9,853	395	0.897
2016	0.913	7,890	7,204	475	0.904
2017	0.913	10,914	9,964	352	0.907
2018	0.913	8,255	7,537	297	0.913
2019	0.913	11,101	10,135	224	0.919
2020	0.913	11,052	10,090	224	0.927
2021	0.826	11,107	9,175	375	0.930
2022	0.818	11,127	9,101	375	0.930
2023	0.810	11,133	9,018	375	0.930
2024	0.803	11,158	8,960	375	0.940
2025	0.795	11,175	8,884	375	0.940
2026	0.788	11,192	8,819	375	0.940

Table 4. Shortspine thornyhead harvest specifications (in mts), biomass, and depletion estimates projected from the 2013 full assessment under default harvest control rules. ACLs are determined based on an apportionment of the coastwide ABC north (65.4%) and south (34.6%) of 34°27' N lat. based on the 2003-2012 average swept area biomass estimated north and south of Pt. Conception at 34°27' N lat. in the NWFSC trawl survey.

Year	Buffer	Coastwide		Depletion	Spawning Biomass (mt)	ACL N of 34°27' N lat.	ACL S of 34°27' N lat.
		OFL	ABC				
2021	0.680	3,211	2,184	0.731	138,739	1,428	756
2022	0.667	3,194	2,130	0.727	137,865	1,393	737
2023	0.654	3,177	2,078	0.722	137,029	1,359	719
2024	0.642	3,162	2,030	0.718	136,233	1,328	702
2025	0.630	3,148	1,983	0.714	135,475	1,297	686
2026	0.618	3,136	1,938	0.710	134,756	1,267	671
2027	0.606	3,124	1,893	0.707	134,075	1,238	655
2028	0.595	3,113	1,853	0.703	133,433	1,212	641
2029	0.584	3,104	1,813	0.700	132,829	1,186	627
2030	0.573	3,095	1,774	0.697	132,261	1,160	614

Table 5. Cowcod south of 40°10' N lat. harvest specifications (in mts), spawning output, and depletion estimates projected from the 2019 full assessment under default harvest control rules (ACL = ABC (P* = 0.45)). 2019 and 2020 ABC values are the removals projected by the Groundfish Management Team.

Year	Coastwide			
	OFL (mt)	ABC (mt)	Spawning Output (eggs * 10^9)	Depletion
2019	90.7	3.1	325	0.571
2020	92.9	3.1	334	0.587
2021	95.0	83.2	343	0.603
2022	93.9	81.5	340	0.597
2023	93.0	79.9	337	0.592
2024	92.0	78.4	334	0.587
2025	91.2	76.9	331	0.581
2026	90.4	75.5	328	0.576
2027	89.7	74.3	325	0.571
2028	89.1	73.1	323	0.567
2029	88.5	71.9	321	0.563
2030	88.1	70.9	319	0.560

Table 6. Cowcod south of 40°10' N lat. harvest specifications (in mts), spawning output, and depletion estimates projected from the 2019 full assessment under Alternative 1 harvest control rules (ACL = ABC (P* = 0.4)). 2019 and 2020 ABC values are the removals projected by the Groundfish Management Team.

Year	Coastwide			
	OFL (mt)	ABC (mt)	Spawning Output (eggs * 10^9)	Depletion
2019	90.7	3.1	325	0.571
2020	92.9	3.1	334	0.587
2021	95.0	72.4	343	0.603
2022	94.3	70.5	341	0.600
2023	93.8	68.7	340	0.597
2024	93.3	67.1	338	0.595
2025	92.8	65.5	337	0.592
2026	92.4	64.0	336	0.590
2027	92.1	62.6	335	0.588
2028	91.9	61.3	334	0.586
2029	91.7	60.0	333	0.585
2030	91.6	58.8	333	0.584

Table 7. Cowcod south of 40°10' N lat. harvest specifications (in mts), spawning output, and depletion estimates projected from the 2019 full assessment under Alternative 2 harvest control rules (ACL = ABC (P* = 0.3)). 2019 and 2020 ABC values are the removals projected by the Groundfish Management Team.

Year	Coastwide			
	OFL (mt)	ABC (mt)	Spawning Output (eggs * 10^9)	Depletion
2019	90.7	3.1	325	0.571
2020	92.9	3.1	334	0.587
2021	95.0	54.0	343	0.603
2022	95.0	52.0	344	0.605
2023	95.2	50.1	345	0.607
2024	95.4	48.3	347	0.609
2025	95.6	46.5	348	0.611
2026	95.9	44.8	349	0.614
2027	96.2	43.2	351	0.617
2028	96.6	41.7	353	0.620
2029	97.1	40.3	355	0.623
2030	97.6	38.9	357	0.627

Table 8. Lingcod projections for the north of 42° area model from the 2019 catalog-only projection that include the new "GMT realistic catch" scenario.

			State of nature					
			Low 2017 Spawning Biomass		Base 2017 Spawning Biomass		High 2017 Spawning Biomass	
			Ln(Ro)=8.81		*Ln(R0) = 9.0669*		*Ln(Ro)=9.8*	
Probability			**0.25**		**0.5**		**0.25**	
Mgmt. decision	**Year**	**Catch (mt)**	**Spawning biomass (mt)**	**Depletion**	**Spawning biomass (mt)**	**Depletion**	**Spawning biomass (mt)**	**Depletion**
~700 mt Constant Catch	2021	700	18,007	61.2%	25,187	66.3%	58,665	74.2%
	2022	700	18,717	63.6%	26,106	68.7%	60,594	76.7%
	2023	700	19,400	65.9%	26,968	71.0%	62,350	78.9%
	2024	700	20,038	68.1%	27,760	73.1%	63,930	80.9%
	2025	700	20,623	70.1%	28,478	75.0%	65,339	82.7%
	2026	700	21,154	71.9%	29,122	76.7%	66,581	84.3%
	2027	700	21,631	73.5%	29,696	78.2%	67,672	85.6%
	2028	700	22,059	75.0%	30,206	79.5%	68,629	86.9%
	2029	700	22,442	76.3%	30,658	80.7%	69,466	87.9%
	2030	700	22,782	77.4%	31,056	81.8%	70,196	88.8%
~40% ACL	2021	2,039	18,006	61.2%	25,187	66.3%	58,665	74.3%
	2022	1,867	17,864	60.7%	25,247	66.5%	59,727	75.6%
	2023	1,732	17,806	60.5%	25,365	66.8%	60,734	76.9%
	2024	1,636	17,834	60.6%	25,545	67.3%	61,699	78.1%
	2025	1,568	17,931	61.0%	25,774	67.9%	62,618	79.3%
	2026	1,515	18,073	61.4%	26,032	68.6%	63,477	80.3%
	2027	1,474	18,242	62.0%	26,304	69.3%	64,273	81.3%
	2028	1,441	18,428	62.6%	26,580	70.0%	65,006	82.3%
	2029	1,413	18,623	63.3%	26,854	70.7%	65,679	83.1%
	2030	1,388	18,820	64.0%	27,122	71.4%	66,293	83.9%
ACL	2021	5,099	18,007	61.2%	25,187	66.3%	58,665	74.3%
	2022	4,667	15,912	54.1%	23,286	61.3%	57,737	73.1%
	2023	4,331	14,092	47.9%	21,627	57.0%	56,938	72.1%
	2024	4,091	12,602	42.8%	20,267	53.4%	56,340	71.3%
	2025	3,919	11,410	38.8%	19,188	50.5%	55,938	70.8%
	2026	3,787	10,446	35.5%	18,330	48.3%	55,691	70.5%
	2027	3,686	9,646	32.8%	17,642	46.5%	55,564	70.3%
	2028	3,603	8,961	30.5%	17,084	45.0%	55,529	70.3%
	2029	3,533	8,364	28.4%	16,629	43.8%	55,565	70.3%
	2030	3,469	7,832	26.6%	16,257	42.8%	55,655	70.4%

			State of nature					
			Low 2017 Spawning Biomass ***Ln(Ro)=8.81***		**Base 2017 Spawning Biomass** ***Ln(R0) = 9.0669***		**High 2017 Spawning Biomass** ***Ln(Ro)=9.8***	
Probability			**0.25**		**0.5**		**0.25**	
Mgmt. decision	**Year**	**Catch (mt)**	**Spawning biomass (mt)**	**Depletion**	**Spawning biomass (mt)**	**Depletion**	**Spawning biomass (mt)**	**Depletion**
GMT Realistic Catch	2021	1,135	18,023	61.3%	25,204	66.4%	58,683	74.3%
	2022	1,194	18,473	62.8%	25,861	68.1%	60,348	76.4%
	2023	1,254	18,856	64.1%	26,422	69.6%	61,803	78.2%
	2024	1,314	19,171	65.2%	26,889	70.8%	63,059	79.8%
	2025	1,374	19,417	66.0%	27,268	71.8%	64,128	81.2%
	2026	1,433	19,598	66.6%	27,563	72.6%	65,023	82.3%
	2027	1,493	19,718	67.0%	27,780	73.2%	65,759	83.2%
	2028	1,553	19,782	67.2%	27,930	73.6%	66,359	84.0%
	2029	1,612	19,797	67.3%	28,017	73.8%	66,837	84.6%
	2030	1,672	19,766	67.2%	28,048	73.9%	67,206	85.1%

Table 9. Oregon black rockfish harvest specifications (in mts), spawning output, and depletion estimates projected from the 2015 full assessment under default harvest control rules (ACL = ABC (P* = 0.45)).

Year	Buffer	Predicted OFL (mt)	ABC Catch (mt)	Spawning Output (B eggs)	Depletion
2021	0.840	570	479	727	0.550
2022	0.833	569	474	721	0.550
2023	0.826	569	470	718	0.540
2024	0.819	569	466	715	0.540
2025	0.809	570	461	714	0.540
2026	0.804	570	458	713	0.540
2027	0.795	571	454	713	0.540
2028	0.788	571	450	713	0.540
2029	0.780	572	446	714	0.540
2030	0.773	573	443	715	0.540

Table 10. Oregon black rockfish harvest specifications (in mts), spawning output, and depletion estimates projected from the 2015 full assessment under Alternative 1 harvest control rules (specify the 2020 ABC/ACL of 512 mt in 2021 and 2022 then revert to the default harvest control rule (ACL = ABC (P* = 0.45)) in 2023).

Year	Buffer	Predicted OFL (mt)	ABC Catch (mt)	Spawning Output (B eggs)	Depletion
2021	0.899	570	512	726.56	0.551
2022	0.904	566	512	718.78	0.545
2023	0.826	563	465	711.62	0.540
2024	0.818	564	462	708.74	0.538
2025	0.810	566	458	707.19	0.536
2026	0.803	567	455	706.78	0.536
2027	0.795	568	452	707.22	0.536
2028	0.788	570	449	708.33	0.537
2029	0.780	571	445	709.87	0.538
2030	0.773	572	442	711.74	0.540

Table 11. Petrale sole harvest specifications (in mts), spawning biomass, and depletion estimates projected from the 2019 update assessment under default harvest control rules (ACL = ABC (P* = 0.45)).

Year	OFL (mt)	ABC (mt)	ACL (mt)	Spawning biomass (mt)	Depletion
2019	-	2,908	2,908	13,078	0.391
2020	-	2,845	2,845	12,558	0.376
2021	4,402	4,115	4,115	12,019	0.360
2022	3,936	3,660	3,660	10,799	0.323
2023	3,634	3,365	3,365	10,038	0.300
2024	3,470	3,199	3,199	9,655	0.289
2025	3,402	3,120	3,120	9,523	0.285
2026	3,392	3,097	3,097	9,527	0.285
2027	3,406	3,096	3,096	9,580	0.287
2028	3,425	3,097	3,097	9,635	0.288
2029	3,442	3,098	3,098	9,677	0.290
2030	3,452	3,093	3,093	9,701	0.290

Table 12. Petrale sole harvest specifications (in mts), spawning biomass, and depletion estimates projected from the 2019 update assessment under Alternative 1 harvest control rules (ACLs predicted to keep the stock at equilibrium biomass and depletion in the next 10 years).

Year	OFL (mt)	ABC (mt)	ACL (mt)	Spawning biomass (mt)	Depletion
2019	-	2,908	2,908	13,078	0.391
2020	-	2,845	2,845	12,558	0.376
2021	4,402	4,115	3,600	12,019	0.360
2022	4,054	3,770	3,600	11,105	0.332
2023	3,762	3,483	3,300	10,369	0.310
2024	3,607	3,325	3,300	10,008	0.300
2025	3,511	3,219	3,100	9,803	0.293
2026	3,499	3,195	3,100	9,804	0.293
2027	3,509	3,190	3,000	9,846	0.295
2028	3,548	3,207	3,000	9,951	0.298
2029	3,584	3,226	3,000	10,046	0.301
2030	3,616	3,240	3,000	10,124	0.303

Table 13. Petrale sole harvest specifications (in mts), spawning biomass, and depletion estimates projected from the 2019 update assessment under Alternative 2 harvest control rules (ACL = ABC (P* = 0.4)).

Year	OFL (mt)	ABC (mt)	ACL (mt)	Spawning biomass (mt)	Depletion
2019	-	2,908	2,908	13,078	0.391
2020	-	2,845	2,845	12,558	0.376
2021	4,402	3,843	3,843	12,019	0.360
2022	3,999	3,455	3,455	10,961	0.328
2023	3,741	3,202	3,202	10,315	0.309
2024	3,608	3,060	3,060	10,012	0.300
2025	3,564	2,994	2,994	9,941	0.298
2026	3,573	2,973	2,973	9,993	0.299
2027	3,605	2,971	2,971	10,091	0.302
2028	3,643	2,976	2,976	10,194	0.305
2029	3,676	2,974	2,974	10,280	0.308
2030	3,705	2,968	2,968	10,351	0.310

Table 14. Sablefish harvest specifications (in mts), spawning biomass, and depletion estimates projected from the 2019 full assessment under default harvest control rules (ACL = ABC (P* = 0.4)). The ACLs are apportioned north (73.7%) and south (26.3%) of 36° N lat. using the coastwide ABCs based on average trawl survey biomass from 2003-2018.

Year	Coastwide				ACL (mt)	
	OFL (mt)	ABC (mt)	Spawning biomass (mt)	Depletion	N of 36° N lat.	S of 36° N lat.
2019	8,489	7,596	57,444	0.389	5,598	1,998
2020	8,648	7,755	63,350	0.429	5,715	2,040
2021	9,402	8,208	68,120	0.461	6,049	2,159
2022	9,040	7,811	68,778	0.466	5,757	2,054
2023	8,877	7,599	68,177	0.462	5,600	1,999
2024	8,713	7,388	67,482	0.457	5,445	1,943
2025	8,579	7,207	66,984	0.453	5,312	1,895
2026	8,479	7,055	66,691	0.451	5,200	1,855
2027	8,411	6,930	66,555	0.451	5,107	1,823
2028	8,368	6,837	66,525	0.450	5,039	1,798
2029	8,346	6,752	66,564	0.451	4,976	1,776
2030	8,339	6,679	66,652	0.451	4,922	1,757

Table 15. Sablefish harvest specifications (in mts), spawning biomass, and depletion estimates projected from the 2019 full assessment under Alternative 1 harvest control rules (ACL = ABC (P* = 0.45)). The ACLs are apportioned north (73.7%) and south (26.3%) of 36° N lat. using the coastwide ABCs based on average trawl survey biomass from 2003-2018.

Year	Coastwide				ACL (mt)	
	OFL (mt)	ABC (mt)	Spawning biomass (mt)	Depletion	N of 36° N lat.	S of 36° N lat.
2019	8,489	7,596	57,444	0.389	5,598	1,998
2020	8,648	7,755	63,350	0.429	5,715	2,040
2021	9,402	8,791	68,120	0.461	6,479	2,312
2022	9,005	8,375	68,488	0.464	6,172	2,203
2023	8,810	8,158	67,594	0.458	6,012	2,146
2024	8,618	7,946	66,618	0.451	5,856	2,090
2025	8,461	7,758	65,851	0.446	5,718	2,040
2026	8,339	7,614	65,304	0.442	5,612	2,002
2027	8,250	7,499	64,918	0.439	5,527	1,972
2028	8,187	7,401	64,643	0.438	5,455	1,946
2029	8,146	7,331	64,445	0.436	5,403	1,928
2030	8,120	7,275	64,296	0.435	5,362	1,913