Catch-only Projections for Arrowtooth Flounder, Yelloweye Rockfish, Blue Rockfish, and California Scorpionfish Models

by

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October, 2015

For arrowtooth flounder, yelloweye rockfish, blue rockfish, and California scorpionfish the ABC buffer and ACL control rule from Table 1 (personal comm. John DeVore, PFMC) was used to create an ACL scenario for each species after updating the latest assessment with current total mortality information through 2014. In addition an expected catch scenario was created for arrowtooth, blue, and CA scorpionfish and a yelloweye model with total mortality for 2014 set to 8.8mt was also looked at. Details of these scenarios in addition to a survey trend for arrowtooth are given below.

Arrowtooth:

- The NWFSC survey trend for arrowtooth, Figure 34 from Jason Cope's "The 2015 stock assessment of arrowtooth flounder (Atheresthes stomias) in California, Oregon, and Washington waters" (http://www.pcouncil.org/wp-content/uploads/2015/05/D8_Att5_ATF_2015_data-mod_FULL-E-Only_JUN2015BB.pdf), is reproduced here in Figure 1.

- Data: The new catch and discard data from 2007-14 is from the 2015 data-moderate stock assessment of arrowtooth flounder (personal comm. Jason Cope, NWFSC). The trawl discards are included as a "fishery" in both the 2007 and 2015 assessment models and hence can be part of an extended forecast run.

- ACL scenario: An expected total mortality of 2,500mt (personal comm. Jim Hastie, NWFSC) was used for 2015 and 2016. Starting in 2017 the model was run for an additional 10 years with the full ACL amount taken each year. See Figure 2 and Table 2.

- Expected Catch scenario: An expected total mortality of 2,500mt was removed for each year for 2015-2026. See Figure 3 and Table 3.

Yelloweye:

- For the 2011 yelloweye assessment the last year of catch data was from the 2010 GMT scorecard and totals 13.1mt. The 2010 Mortality Report has the actual yelloweye mortality at 7.6mt. Given this large difference, the 2010 catch was adjusted to sum to 7.6mt using the same 2010 fishery proportions as in the base model. For the extended forecasts, the catch data for 2011-2013 is from the WCGOP Mortality Reports and 2014 is from the adjusted GMT scorecard (as was done in the Total Mortality Report for the 2015-16 Biennium; the scorecard was updated with NOAA's Pacific Coast Groundfish Individual Fishing Quota tallies (https://www.webapps.nwfsc.noaa.gov/ifq/) for 2014 by the first author; John Wallace, NWFSC).

- ACL scenario: An initial model with SPR = 76% was run to find the total mortality catch for 2017-2020. These catches were added to the actual catches and a maximum expected

total mortality of 18 and 19mt for 2015 and 2016, respectively. A second model was then run with SPR = 50% to find the OFL and ABC values. See Figure 4 and Table 4.

- 2014 set to 8.8mt scenario: Since the 2014 total mortality in the adjusted GMT scorecard is conservatively high, the lowest total mortality catch value for 2011-2013 was used in this run to bracket the possible actual value (available in November, 2015). Two model runs were also needed here as explained above. See Figure 5 and Table 5.

Blue Rockfish:

- The base model for blue rockfish included discards (when available) with catch, so 'catch' for blue rockfish is total mortality. New catch data for 2007-14 was received from California (provided by the second author) for both recreation and commercial fisheries that covered the area (Point Conception to the California/Oregon border) in the 2007 assessment.

- ACL scenario: An expected catch of 114mt (108 for rec and 6 for commercial hook & line) was used for 2015 and 2016. Starting in 2017 the model was run for an additional 10 years with the full ACL amount taken each year. See Figure 6 and Table 6.

- Expected Catch scenario: An expected catch of 114mt was removed for each year for 2015-2026. See Figure 7 and Table 7.

California scorpionfish

- The last assessment for California scorpionfish was done in 2005 using an early version of SS2 (1.18), long before concepts of OFL, ABC, P* and buffers were instituted. Hence predicted catch scenarios required yearly model runs to find the ACL's from which yearly OFL's and ABC's could be calculated from (calculations available from Owen Hamel; personal comm.). The 2005 base model assumed no discard mortality so that 'catch' for CA scorpionfish is total mortality. The last year with actual catch data in the base model was 2004 (presumably of poor quality); however years 2005 and 2006 were included with the rest of the historical catch (in the SS2 '.dat' file) and data from 2004 was repeated therein. Years 2004-06 were updated inside the '.dat' file with logbook derived catch data provided by the second author (details given below). Logbook derived catch information for 2007-14, also from the second author, was added to the SS2 forecast file and the Council accepted ACL's for California scorpionfish were added to 2015-16 assuming the same fishery proportions as seen in 2014. An alternative PCPS catch stream was also looked at where noted below. Note that most of the scenarios were done with the assumed buffer of 8.7% (see Table 1), one scenario with the current buffer of 4.4% was done for comparison.

- ACL scenario with 8.7% buffer: Starting in 2017 a model with an 8.7% buffer was run for an additional 10 years with the full ACL amount taken each year. See Figure 8 and Table 8.

- Predicted catch scenario with 8.7% buffer: An expected catch of 111mt (the ACL for 2016) was removed for each year for 2017-2026 and a model with an 8.7% buffer was run. See Figure 9 and Table 9.

- ACL scenario with 4.4% buffer: Starting in 2017 a model with the current buffer of 4.4% was run for an additional 10 years with the full ACL amount taken each year. See Figure 10 and Table 10.

- ACL scenario with 8.7% buffer and alternative PCPS catch stream: Starting in 2017 a model with an 8.7% buffer and alternative PCPS catch stream (see below) was run for an additional 10 years with the full ACL amount taken each year. See Figure 11 and Table 11.

- Figures 8-11 are superimposed for easier comparison in Figure 12.

Updates to California Scorpionfish Mortality Estimates for 2004-2014 (by the second author)

The original OFL projections from Maunder et al. (2005; http://www.pcouncil.org/wp-content/uploads/Scorpionfish_assessment_report_2005.pdf) assumed removals equivalent to the ACL in all years from 2004-2016. To update the time series, catch estimates in this document are supplanting ACLs values from 2004-2014 and the current ACLs for 2015 and 2016 were assumed to be attained. The catch estimates were divided into the five sectors used in the original assessment including commercial hook and line, trawl, trap, and gillnet as well as the recreational catch. Commercial catch estimates were downloaded from PacFIN. Recreational catch data came from two sources analogous to those used in the original assessment including Commercial Passenger Fishing Vessel (CPFV, party boat) logbook data and catch estimates from the California Recreational Fishery Survey (CRFS), which replaced the Marine Recreational Fisheries Statistical Survey (MRFSS) in 2004.

From 2004-2010, the Party Charter Phone Survey (PCPS) was used by CRFS to estimate effort for estimates of catch in the party charter boat mode, but this method was replaced in 2011 by a method that uses logbook data, since a lack of participation resulting in a directional bias in the estimates was identified in the PCPS. The negative bias from non-participation in CRFS sampling districts 1 and 2 representing the area south of Point Conception resulted in underestimation of mortality for California scorpionfish in these years. To address this issue in a method consistent with those employed by Maunder et al. (2005) to estimate mortality in the party charter boat mode, logbooks were used to provide an alternative estimate of mortality.

The method summed log book entries for the number of kept and discarded California scorpionfish separately, to which average weights in each year from the CRFS sampling were applied as well as a non-compliance adjustment for un-submitted logbooks of 80%. While Maunder et al. (2005) assumed that discards were negligible and were thus omitted; a discard mortality rate of 7% derived by the GMT (2009-2010 SPEX EIS, Chapter 4, pg. 290 http://www.pcouncil.org/wp-content/uploads/chp4_0910.pdf) was applied to the estimate of discards to provide an estimate of discard mortality. The result was summed with the estimate of retained catch from the party charter mode as well CRFS estimates of retained catch and discard mortality from the remaining recreational fishing modes to provide an estimate of mortality in the recreational sector for 2004-2010 that addressed the bias presented by the PCPS. This yielded results comparable to the party charter mortality estimates from CRFS in 2011-2014 using estimation methods that provide the most representative estimates using effort data from logbooks as well as creel census data for catch per unit effort and weight. The recreational catch estimate for the party charter mode for 2004-2010 described above as well as the estimate resulting from the PCPS during the same period are provided in Table 12 for comparison.

Table 1. Assessed West Coast groundfish stocks and the associated 2015-16 stock category and sigma (i.e., biomass variance) designations, as well as the 2015-16 harvest control rules for acceptable biological catches (ABCs) and annual catch limits (ACLs).

Stock	2015 ACL (mt)	2016 ACL (mt)	F_{MSY} used to set OFL in 2015 and beyond [a/]	ABC Control Rule				2015-16 ACL Control Rule
				Stock Cat.	2015-16 Sigma	2015-16 P*	2015-16 ABC Buffer [b/]	
Arrowtooth flounder	????	????	SPR = 30%	2	0.72	0.40	16.7%	25-5 rule
Blue rockfish S of 42° N lat.	NA	NA	SPR = 50%	2	0.72	0.45	8.7%	40-10 rule
California scorpionfish	114	111	SPR = 50%	2 [c/] (was 1)	0.72 [c/] (was 0.36)	0.45	8.7% [c/] (was 4.4%)	40-10 rule
Yelloweye rockfish	18	19	SPR = 50%	2	0.72	0.40	16.7%	SPR = 76.0%

a/ SPR = spawning potential ratio, which is the average fecundity of a recruit over its lifetime when the stock is fished divided by the average fecundity of a recruit over its lifetime when the stock is unfished. An SPR harvest rate is the proportion of unfished reproductive potential allowed by harvesting.

b/ The 2015-16 ABC buffer assumes the same P* as was decided for 2013-14.

c/ Assumed values, not yet voted on by the full SSC nor accepted by the Council.

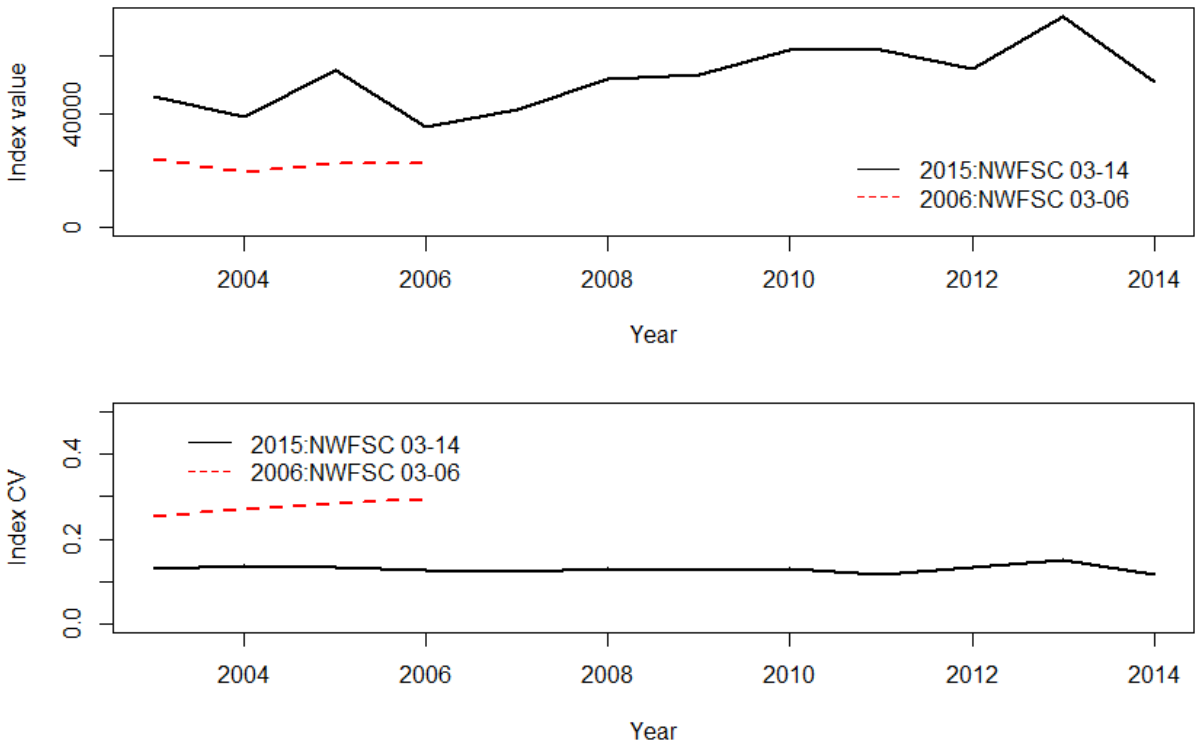

Figure 1. Comparison of the NWFSC survey indices (top panel) and associated uncertainty (bottom panel) used in the current assessment versus the 2007 assessment.

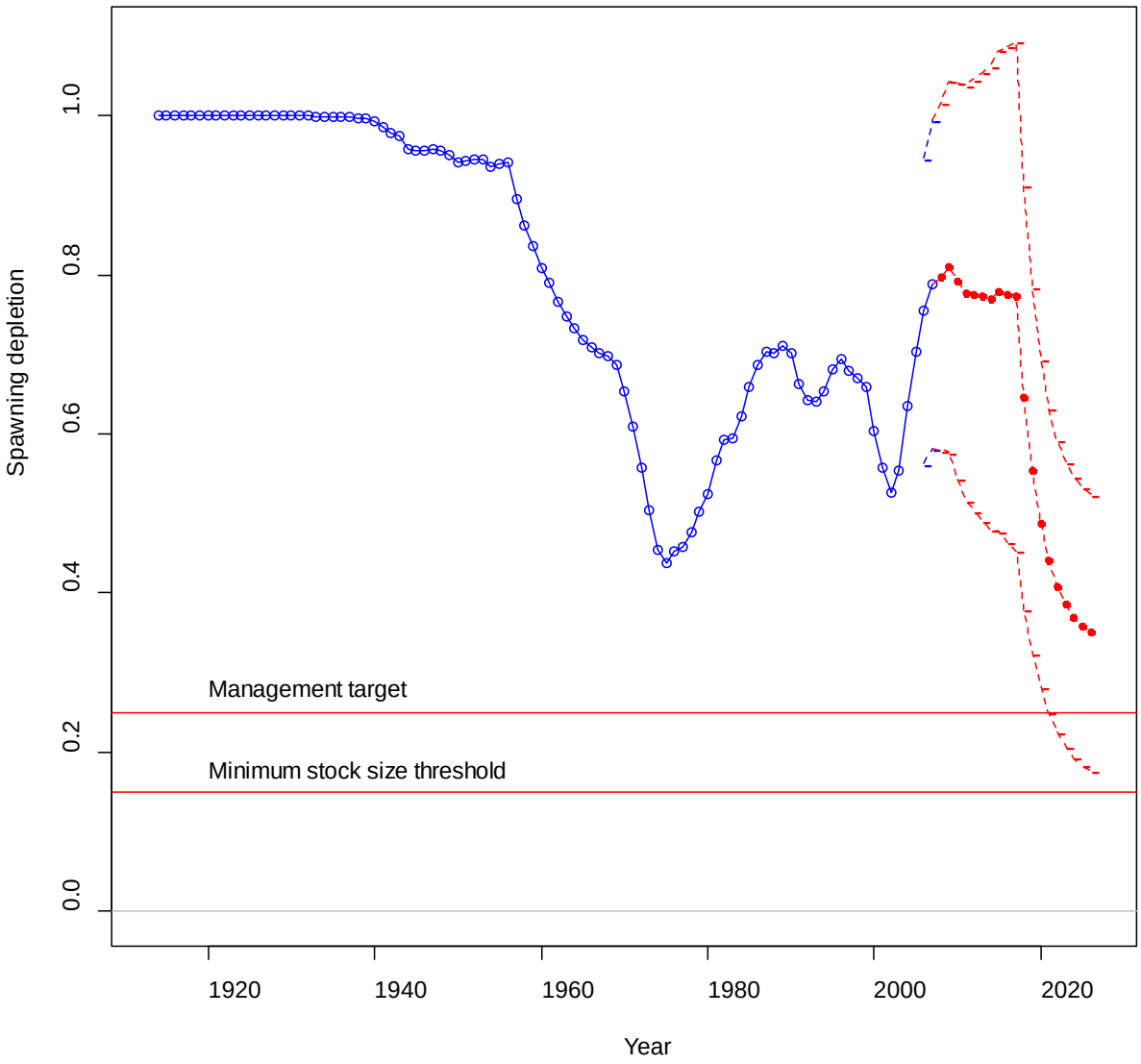

Figure 2. Arrowtooth ACL scenario.

Table 2. Arrowtooth data for the ACL scenario. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2007	0.7882	16,740.8	13,945.1	16.7%	13,945.1	16.7%	3,082.1
2008	0.7981	17,329.4	14,435.4	16.7%	14,435.4	16.7%	3,408.3
2009	0.8104	17,484.0	14,564.2	16.7%	14,564.2	16.7%	5,429.4
2010	0.7928	17,029.9	14,185.9	16.7%	14,185.9	16.7%	4,095.8
2011	0.7776	16,773.9	13,972.7	16.7%	13,972.7	16.7%	2,642.6
2012	0.7748	16,742.4	13,946.4	16.7%	13,946.4	16.7%	2,499.0
2013	0.7729	16,670.5	13,886.5	16.7%	13,886.5	16.7%	2,492.6
2014	0.7709	16,585.7	13,815.9	16.7%	13,815.9	16.7%	1,442.7
							Expected Total Mort.
2015	0.7797	16,745.1	13,948.7	16.7%	13,948.7	16.7%	2,500
2016	0.7762	16,653.3	13,872.2	16.7%	13,872.2	16.7%	2,500
							Max. ACL
2017	0.7729	16,571.3	13,803.9	16.7%	13,803.9	16.7%	13,803.8
2018	0.6469	13,860.5	11,545.8	16.7%	11,545.8	16.7%	11,545.7
2019	0.5546	11,854.9	9,875.1	16.7%	9,875.1	16.7%	9,875.1
2020	0.4880	10,398.2	8,661.7	16.7%	8,661.7	16.7%	8,661.7
2021	0.4410	9,359.4	7,796.4	16.7%	7,796.4	16.7%	7,796.4
2022	0.4081	8,630.3	7,189.0	16.7%	7,189.0	16.7%	7,189.0
2023	0.3852	8,123.7	6,767.0	16.7%	6,767.0	16.7%	6,767.0
2024	0.3693	7,771.6	6,473.8	16.7%	6,473.8	16.7%	6,473.8
2025	0.3580	7,524.4	6,267.8	16.7%	6,267.8	16.7%	6,267.8
2026	0.3498	7,347.2	6,120.2	16.7%	6,120.2	16.7%	6,120.2

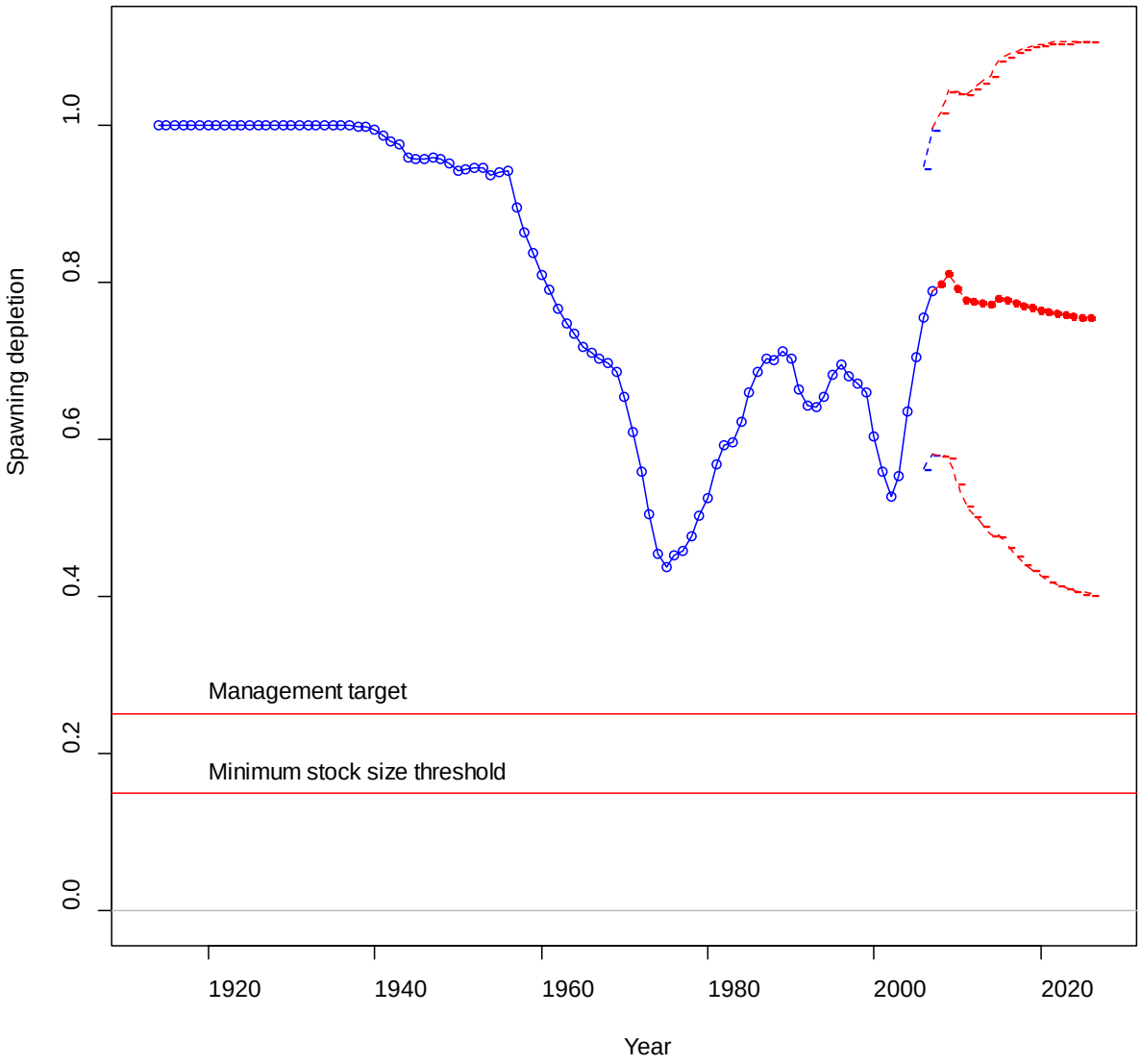

Figure 3. Arrowtooth Expected Total Mortality scenario.

Table 3. Arrowtooth data for the Expected Total Mortality scenario. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2007	0.7882	16,740.8	13,945.1	16.7%	13,945.1	16.7%	3,082.1
2008	0.7981	17,329.4	14,435.4	16.7%	14,435.4	16.7%	3,408.3
2009	0.8104	17,484.0	14,564.2	16.7%	14,564.2	16.7%	5,429.4
2010	0.7928	17,029.9	14,185.9	16.7%	14,185.9	16.7%	4,095.8
2011	0.7776	16,773.9	13,972.7	16.7%	13,972.7	16.7%	2,642.6
2012	0.7748	16,742.4	13,946.4	16.7%	13,946.4	16.7%	2,499.0
2013	0.7729	16,670.5	13,886.5	16.7%	13,886.5	16.7%	2,492.6
2014	0.7709	16,585.7	13,815.9	16.7%	13,815.9	16.7%	1,442.7
							Expected Total Mort.
2015	0.7797	16,745.1	13,948.7	16.7%	13,948.7	16.7%	2,500
2016	0.7762	16,653.3	13,872.2	16.7%	13,872.2	16.7%	2,500
2017	0.7729	16,571.3	13,803.9	16.7%	13,803.9	16.7%	2,500
2018	0.7698	16,498.4	13,743.2	16.7%	13,743.2	16.7%	2,500
2019	0.7670	16,433.9	13,689.4	16.7%	13,689.4	16.7%	2,500
2020	0.7644	16,377.1	13,642.1	16.7%	13,642.1	16.7%	2,500
2021	0.7622	16,327.2	13,600.6	16.7%	13,600.6	16.7%	2,500
2022	0.7602	16,283.6	13,564.2	16.7%	13,564.2	16.7%	2,500
2023	0.7585	16,245.4	13,532.4	16.7%	13,532.4	16.7%	2,500
2024	0.7569	16,212.0	13,504.6	16.7%	13,504.6	16.7%	2,500
2025	0.7556	16,182.6	13,480.1	16.7%	13,480.1	16.7%	2,500
2026	0.7544	16,156.9	13,458.7	16.7%	13,458.7	16.7%	2,500

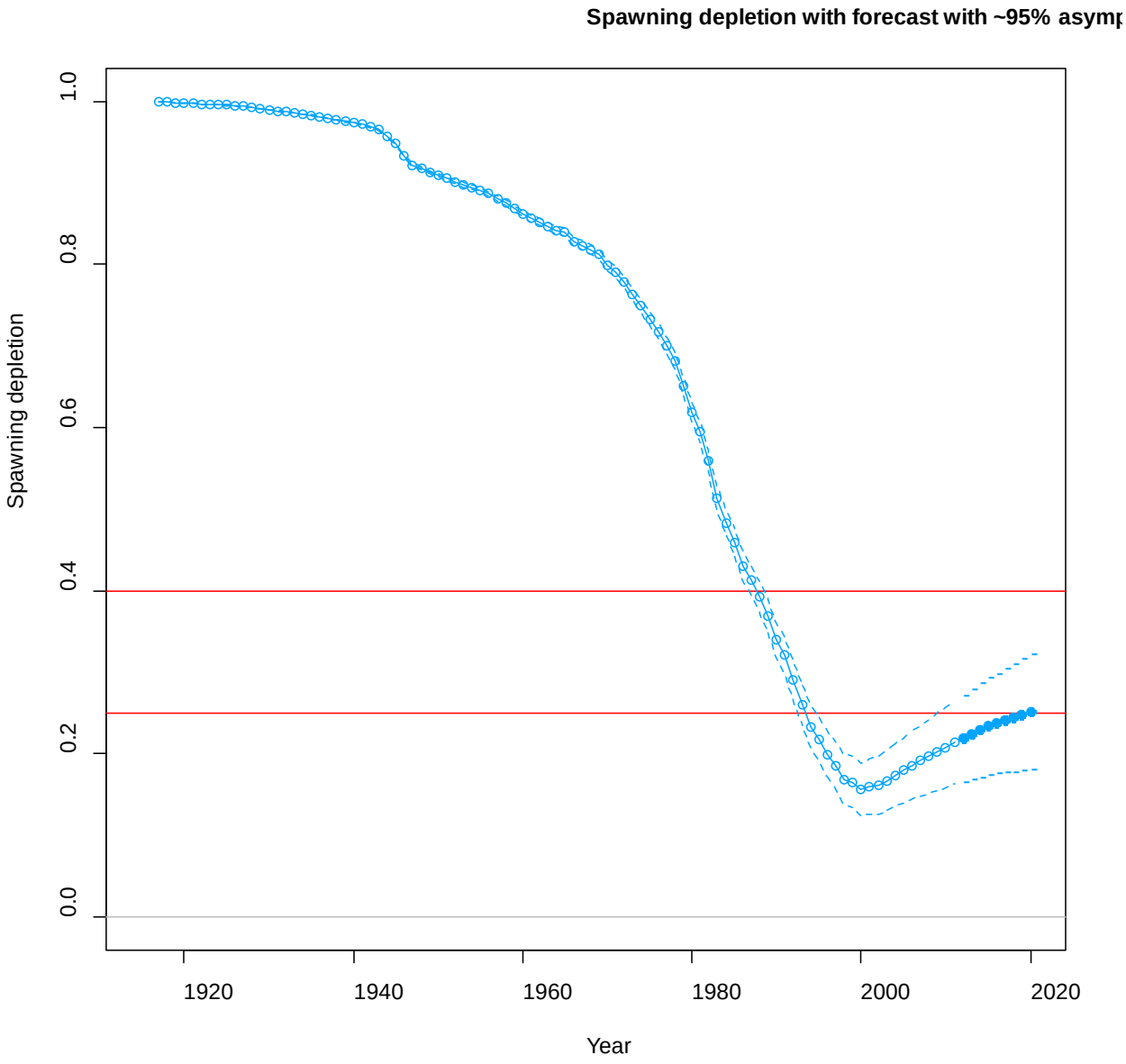

Figure 4. Yelloweye ACL scenario.

Table 4. Yelloweye data for the ACL scenario. An initial model with SPR = 76% was run to find the total mortality for 2017-2020. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2011	0.2140	51.5	42.9	16.7%	8.8	82.8%	8.8
2012	0.2196	52.6	43.8	16.7%	11.6	78.0%	11.6
2013	0.2247	53.6	44.7	16.7%	10.7	80.0%	10.7
2014	0.2298	54.6	45.5	16.7%	15.9	70.9%	15.9
							Expected Total Mort.
2015	0.2342	55.4	46.2	16.7%	18.0	67.5%	18.0
2016	0.2382	56.2	46.8	16.7%	19.0	66.2%	19.0
							Max. ACL
2017	0.2420	56.9	47.4	16.7%	19.7	65.4%	19.7
2018	0.2456	57.5	47.9	16.7%	20.0	65.2%	20.0
2019	0.2491	58.1	48.4	16.7%	20.2	65.2%	20.2
2020	0.2525	58.8	49.0	16.7%	20.4	65.3%	20.4

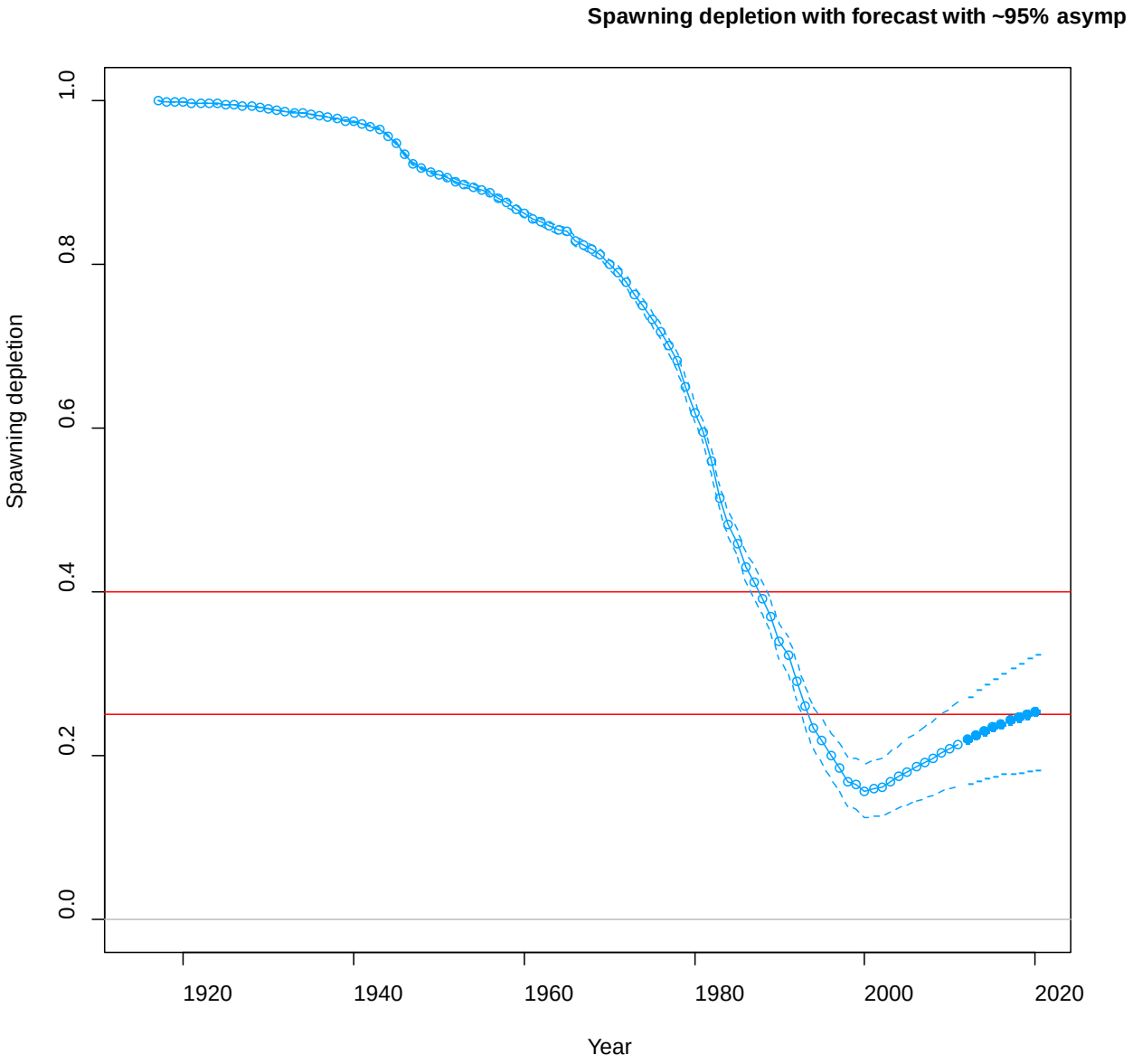

Figure 5. Yelloweye with 2014 at 8.8mt scenario.

Table 5. Yelloweye data for the scenario with 2014 at 8.8mt. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2011	0.2140	51.5	42.9	16.7%	8.8	82.8%	8.8
2012	0.2196	52.6	43.8	16.7%	11.6	78.0%	11.6
2013	0.2247	53.6	44.7	16.7%	10.7	80.0%	10.7
2014	0.2298	54.6	45.5	16.7%	8.8	83.9%	8.8
							Expected Total Mort.
2015	0.2349	55.6	46.3	16.7%	18.0	67.6%	18.0
2016	0.2389	56.3	46.9	16.7%	19.0	66.3%	19.0
							Max. ACL
2017	0.2427	57.0	47.5	16.7%	19.7	65.5%	19.7
2018	0.2463	57.7	48.1	16.7%	20.0	65.3%	20.0
2019	0.2499	58.3	48.6	16.7%	20.2	65.3%	20.2
2020	0.2533	59.0	49.1	16.7%	20.4	65.4%	20.4

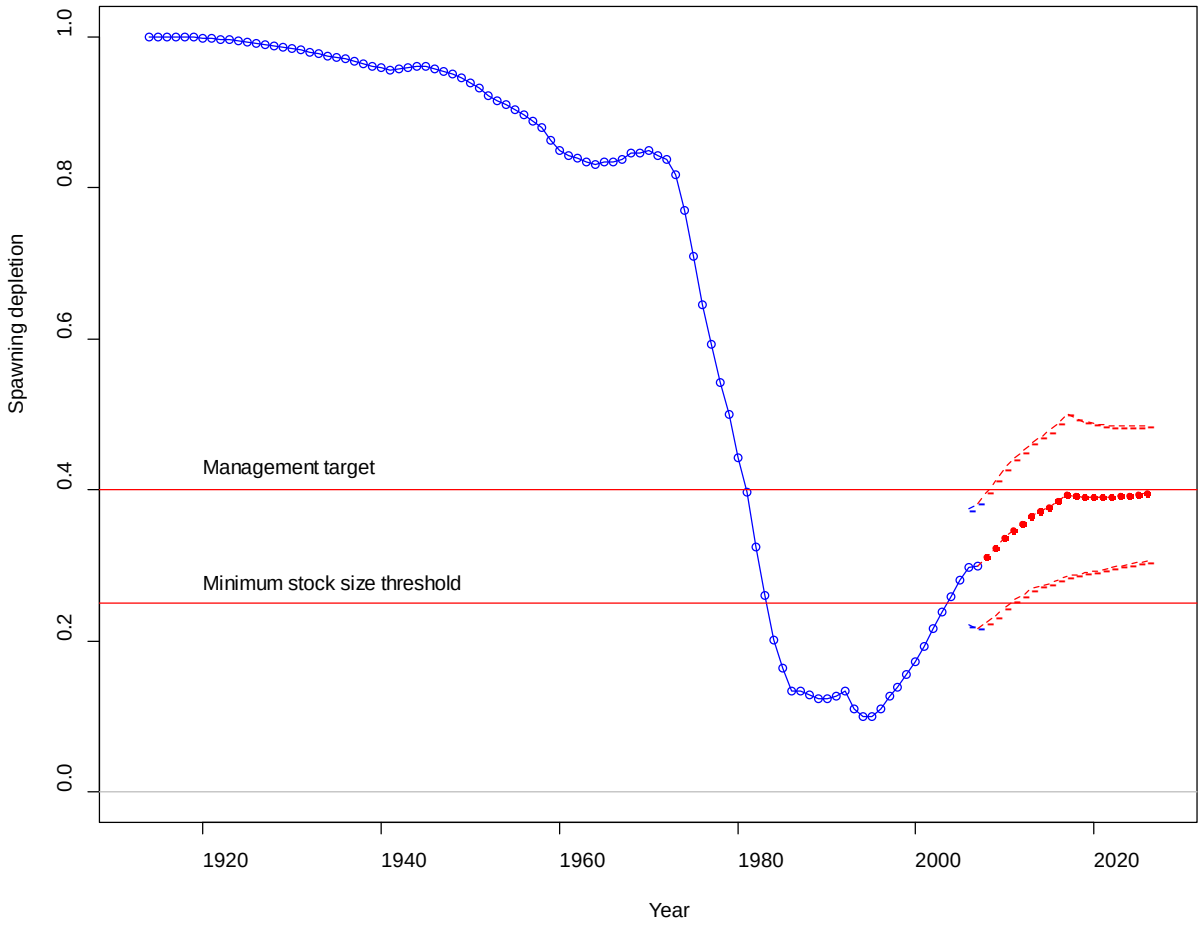

Figure 6. Blue rockfish ACL scenario.

Table 6. Blue rockfish data for the ACL scenario. The increased buffer for the maximum ACL is from the 40-10 rule. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2007	0.2993	226.6	206.9	8.7%	183.7	18.94%	148.8
2008	0.3108	231.5	211.3	8.7%	191.1	17.43%	102.7
2009	0.3227	236.3	215.7	8.7%	198.5	15.99%	47.2
2010	0.3361	242.0	221.0	8.7%	207.0	14.49%	55.6
2011	0.3467	246.3	224.8	8.7%	213.3	13.38%	66.1
2012	0.3553	249.7	227.9	8.7%	218.4	12.53%	55.5
2013	0.3648	254.0	231.9	8.7%	224.4	11.63%	108.9
2014	0.3709	256.4	234.1	8.7%	228.0	11.09%	120.1
							Expected Total Mort.
2015	0.3769	259.3	236.8	8.7%	232.0	10.56%	114.0
2016	0.3844	263.5	240.6	8.7%	237.4	9.94%	114.0
							Max. ACL
2017	0.3927	268.6	245.2	8.7%	243.7	9.27%	243.7
2018	0.3910	267.9	244.6	8.7%	242.7	9.40%	242.7
2019	0.3900	267.9	244.6	8.7%	242.5	9.48%	242.5
2020	0.3897	268.5	245.1	8.7%	243.0	9.50%	243.0
2021	0.3899	269.4	246.0	8.7%	243.8	9.49%	243.8
2022	0.3906	270.6	247.0	8.7%	245.0	9.44%	245.0
2023	0.3915	271.9	248.2	8.7%	246.4	9.36%	246.4
2024	0.3925	273.2	249.4	8.7%	247.8	9.28%	247.8
2025	0.3938	274.5	250.7	8.7%	249.3	9.18%	249.3
2026	0.3951	275.9	251.9	8.7%	250.8	9.08%	250.8

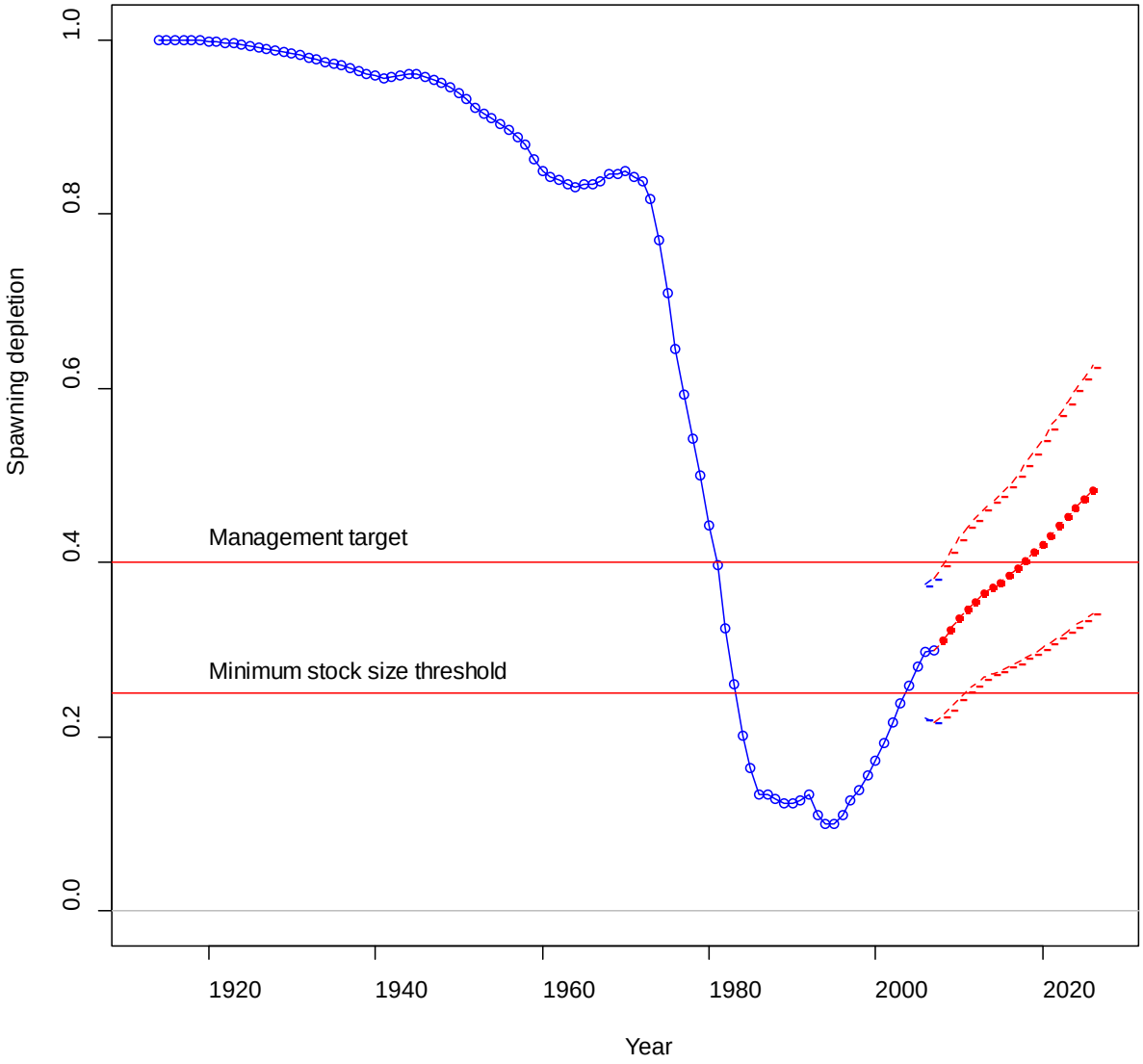

Figure 7. Blue rockfish Expected Catch scenario.

Table 7. Blue rockfish data for the Expected Catch scenario. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2007	0.2993	226.6	206.9	8.7%	183.7	18.94%	148.8
2008	0.3108	231.5	211.3	8.7%	191.1	17.43%	102.7
2009	0.3227	236.3	215.7	8.7%	198.5	15.99%	47.2
2010	0.3361	242.0	221.0	8.7%	207.0	14.49%	55.6
2011	0.3467	246.3	224.8	8.7%	213.3	13.38%	66.1
2012	0.3553	249.7	227.9	8.7%	218.4	12.53%	55.5
2013	0.3648	254.0	231.9	8.7%	224.4	11.63%	108.9
2014	0.3709	256.4	234.1	8.7%	228.0	11.09%	120.1
							Expected Total Mort.
2015	0.3769	259.3	236.8	8.7%	232.0	10.56%	114.0
2016	0.3844	263.5	240.6	8.7%	237.4	9.94%	114.0
2017	0.3927	268.6	245.2	8.7%	243.7	9.27%	114.0
2018	0.4017	274.2	250.4	8.7%	250.4	8.70%	114.0
2019	0.4112	280.3	256.0	8.7%	256.0	8.70%	114.0
2020	0.4212	286.8	261.8	8.7%	261.8	8.70%	114.0
2021	0.4314	293.4	267.9	8.7%	267.9	8.70%	114.0
2022	0.4418	300.0	273.9	8.7%	273.9	8.70%	114.0
2023	0.4523	306.7	280.0	8.7%	280.0	8.70%	114.0
2024	0.4627	313.3	286.0	8.7%	286.0	8.70%	114.0
2025	0.4732	319.8	291.9	8.7%	291.9	8.70%	114.0
2026	0.4836	326.1	297.8	8.7%	297.8	8.70%	114.0

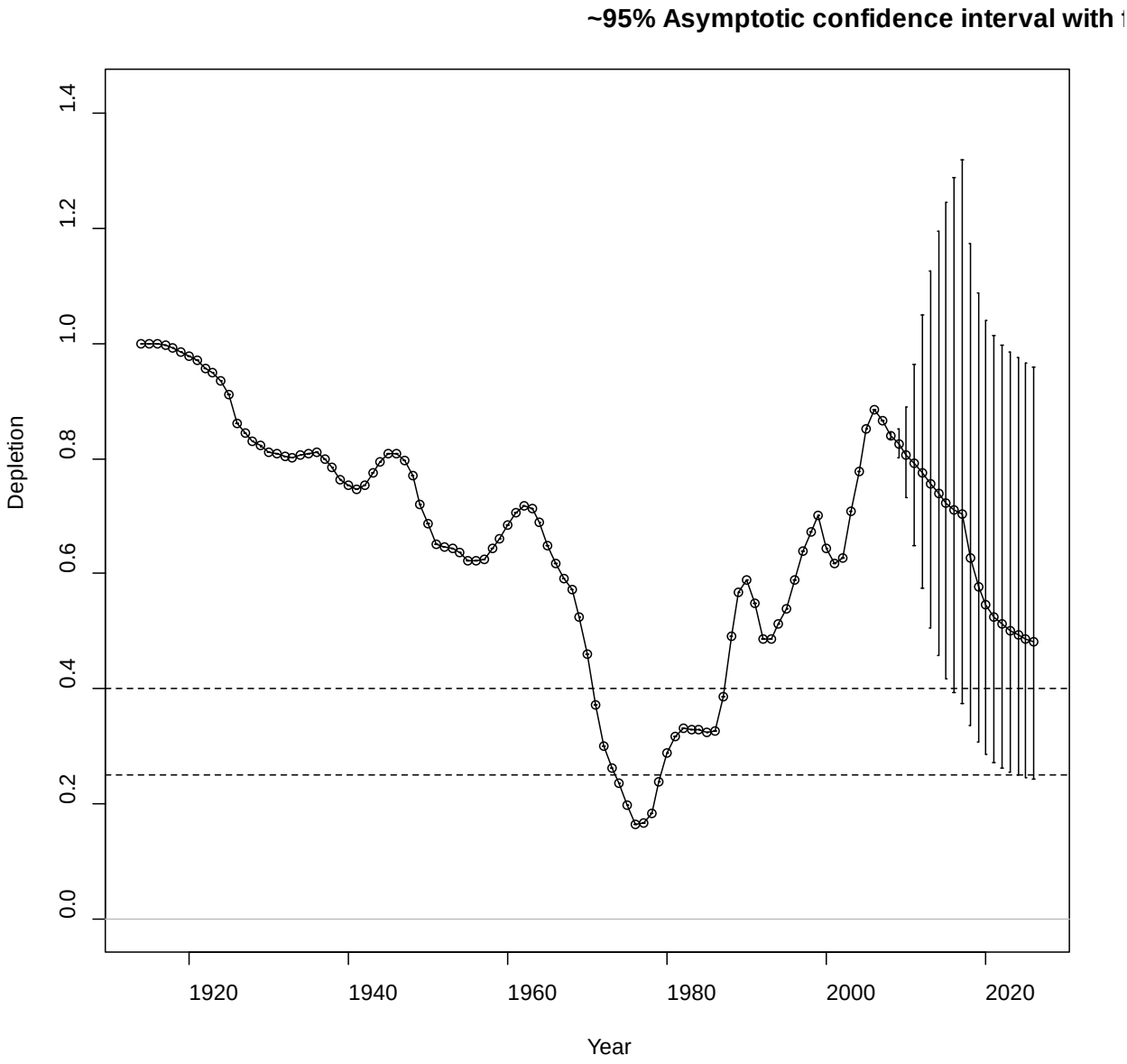

Figure 8. CA scorpionfish ACL scenario with 8.7% buffer.

Table 8. CA scorpionfish data for the ACL scenario with 8.7% buffer. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2007	0.865						137.9
2008	0.840						102.3
2009	0.826						112.1
2010	0.807						104.7
2011	0.791						104.1
2012	0.776						120.1
2013	0.756				120.0		114.7
2014	0.740				117.0		123.7
							Expected Total Mort.
2015	0.722	119.0	114.0		114.0		113.9
2016	0.711	114.0	111.0		111.0		110.9
							Max. ACL
2017	0.703	288.7	263.6	8.7%	263.6	8.7%	263.6
2018	0.628	256.2	233.9	8.7%	233.9	8.7%	233.9
2019	0.578	235.1	214.7	8.7%	214.7	8.7%	214.7
2020	0.546	221.9	202.6	8.7%	202.6	8.7%	202.6
2021	0.526	213.7	195.1	8.7%	195.1	8.7%	195.1
2022	0.512	208.6	190.4	8.7%	190.4	8.7%	190.4
2023	0.502	205.0	187.2	8.7%	187.2	8.7%	187.2
2024	0.494	202.2	184.6	8.7%	184.6	8.7%	184.6
2025	0.487	199.7	182.3	8.7%	182.3	8.7%	182.3
2026	0.482	197.5	180.3	8.7%	180.3	8.7%	180.3

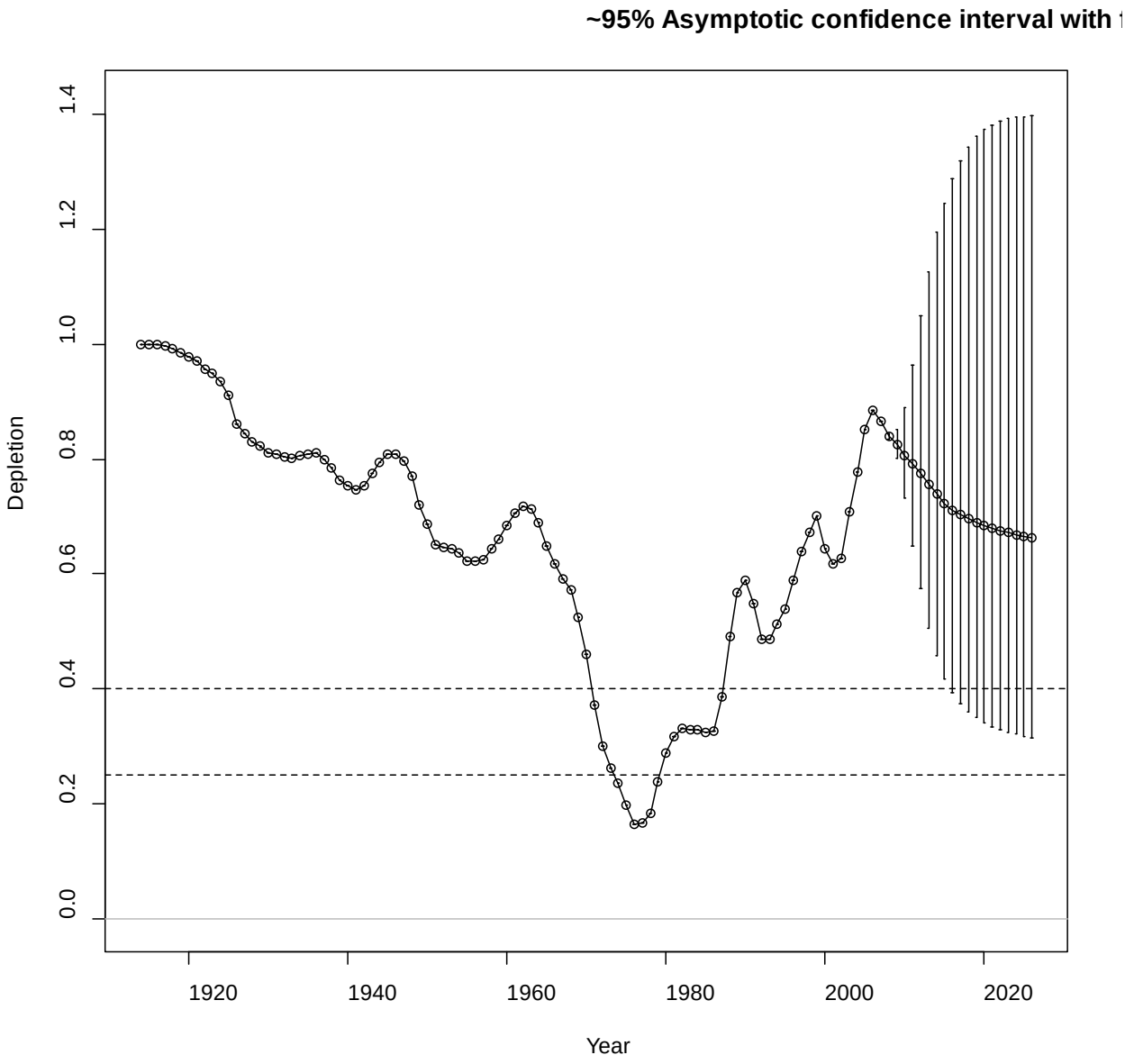

Figure 9. CA scorpionfish Expected Catch scenario with 8.7% buffer.

Table 9. CA scorpionfish data for the Expected Catch scenario with 8.7% buffer. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2007	0.865						137.9
2008	0.840						102.3
2009	0.826						112.1
2010	0.807						104.7
2011	0.791						104.1
2012	0.776						120.1
2013	0.756				120.0		114.7
2014	0.740				117.0		123.7
							Expected Total Mort.
2015	0.722	119.0	114.0		114.0		113.9
2016	0.711	117.0	111.0		111.0		110.9
2017	0.703	288.7	263.6	8.7%	263.6	8.7%	110.9
2018	0.696	285.7	260.8	8.7%	260.8	8.7%	110.9
2019	0.690	283.1	258.5	8.7%	258.5	8.7%	110.9
2020	0.685	280.8	256.4	8.7%	256.4	8.7%	110.9
2021	0.680	278.8	254.6	8.7%	254.6	8.7%	110.9
2022	0.676	277.1	253.0	8.7%	253.0	8.7%	110.9
2023	0.672	275.5	251.6	8.7%	251.6	8.7%	110.9
2024	0.669	274.2	250.3	8.7%	250.3	8.7%	110.9
2025	0.666	273.0	249.3	8.7%	249.3	8.7%	110.9
2026	0.664	272.0	248.3	8.7%	248.3	8.7%	110.9

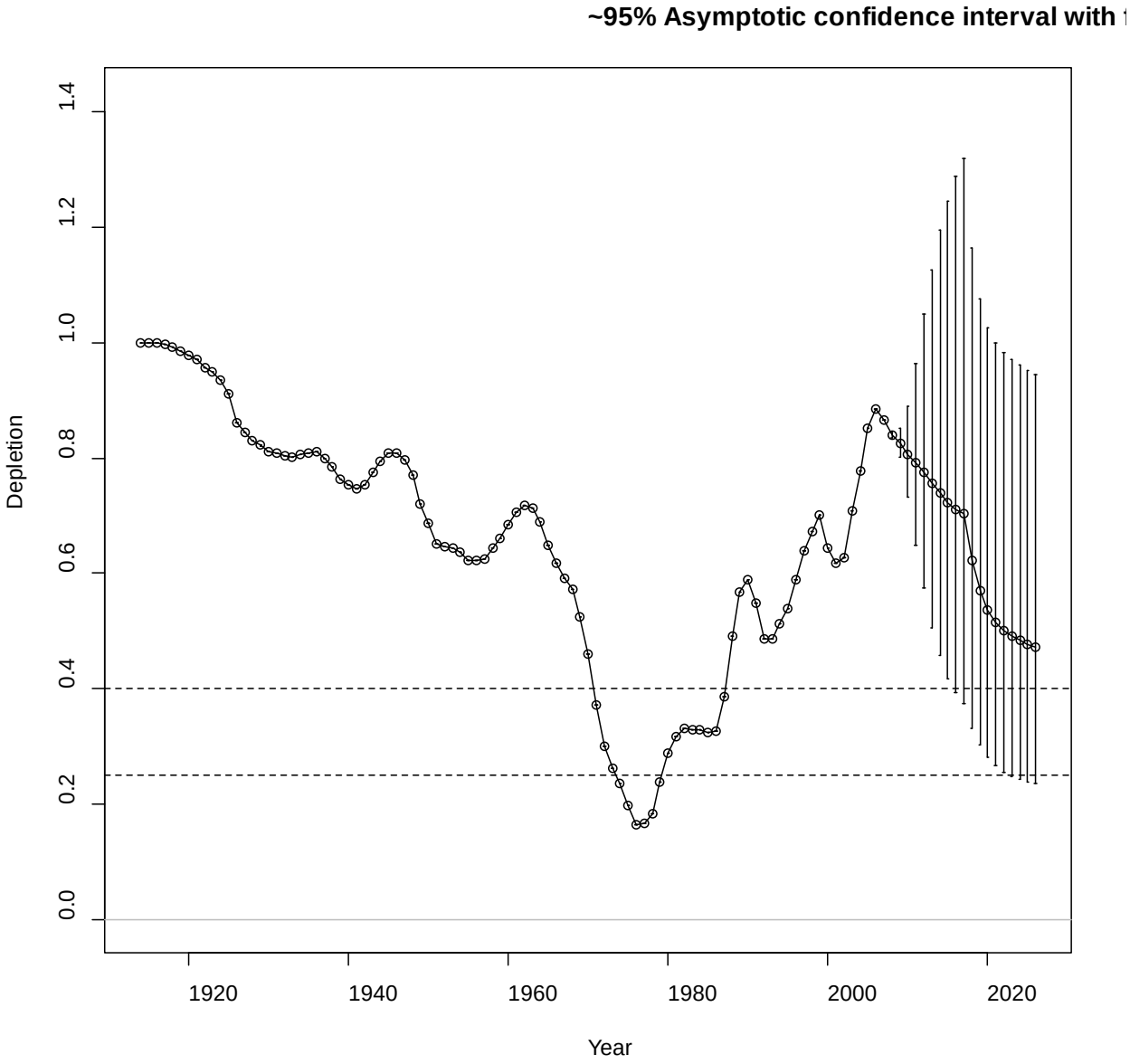

Figure 10. CA scorpionfish ACL scenario with 4.4% buffer.

Table 10. CA scorpionfish data for the ACL scenario with 4.4% buffer. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2007	0.865						137.9
2008	0.840						102.3
2009	0.826						112.1
2010	0.807						104.7
2011	0.791						104.1
2012	0.776						120.1
2013	0.756				120		114.7
2014	0.740				117		123.7
							Expected Total Mort.
2015	0.722	119	114		114		113.9
2016	0.711	117	111		111		110.9
							Max. ACL
2017	0.703	288.7	276.0	4.4%	276.0	4.4%	276.0
2018	0.622	253.8	242.7	4.4%	242.7	4.4%	242.7
2019	0.570	231.5	221.4	4.4%	221.4	4.4%	221.4
2020	0.537	217.8	208.2	4.4%	208.2	4.4%	208.2
2021	0.516	209.4	200.2	4.4%	200.2	4.4%	200.2
2022	0.502	204.2	195.2	4.4%	195.2	4.4%	195.2
2023	0.491	200.6	191.8	4.4%	191.8	4.4%	191.8
2024	0.483	197.7	189.0	4.4%	189.0	4.4%	189.0
2025	0.477	195.2	186.6	4.4%	186.6	4.4%	186.6
2026	0.471	192.9	184.4	4.4%	184.4	4.4%	184.4

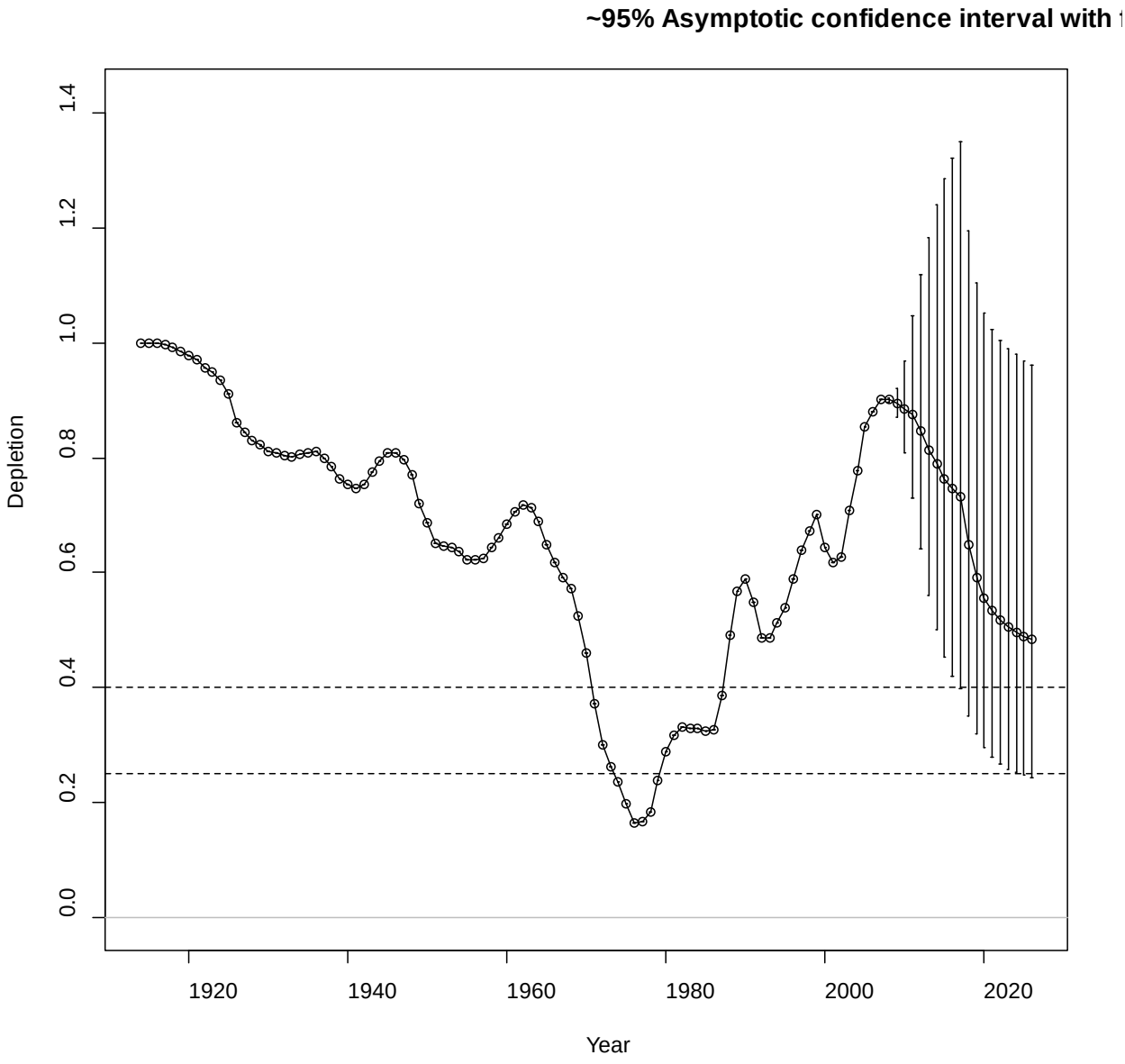

Figure 11. CA scorpionfish ACL scenario with PCPS catch stream and an 8.7% buffer.

Table 11. CA scorpionfish data for the ACL scenario with PCPS catch stream and an 8.7% buffer. Both buffer columns are buffers from the OFL. All weights are in metric tons.

Year	Depletion	OFL	ABC	Buffer to ABC	ACL	Buffer to ACL	Total Mort.
2007	0.902			8.7%		8.7%	71.6
2008	0.901			8.7		8.7	64.3
2009	0.896			8.7		8.7	69.4
2010	0.885			8.7		8.7	66.2
2011	0.875			8.7		8.7	104.1
2012	0.847			8.7		8.7	120.1
2013	0.814			8.7	120	8.7	114.7
2014	0.789			8.7	117	8.7	123.7
							Expected Total Mort.
2015	0.763	119	114		114		113.9
2016	0.746	117	111		111		110.9
							Max. ACL
2017	0.732	292.6	267.2	8.7%	267.2	8.7%	267.2
2018	0.648	257.6	235.2	8.7%	235.2	8.7%	235.2
2019	0.593	234.8	214.4	8.7%	214.4	8.7%	214.4
2020	0.557	220.4	201.3	8.7%	201.3	8.7%	201.3
2021	0.534	211.5	193.1	8.7%	193.1	8.7%	193.1
2022	0.518	205.8	187.9	8.7%	187.9	8.7%	187.9
2023	0.506	201.8	184.2	8.7%	184.2	8.7%	184.2
2024	0.497	198.6	181.3	8.7%	181.3	8.7%	181.3
2025	0.490	195.9	178.8	8.7%	178.8	8.7%	178.8
2026	0.484	193.5	176.7	8.7%	176.7	8.7%	176.7

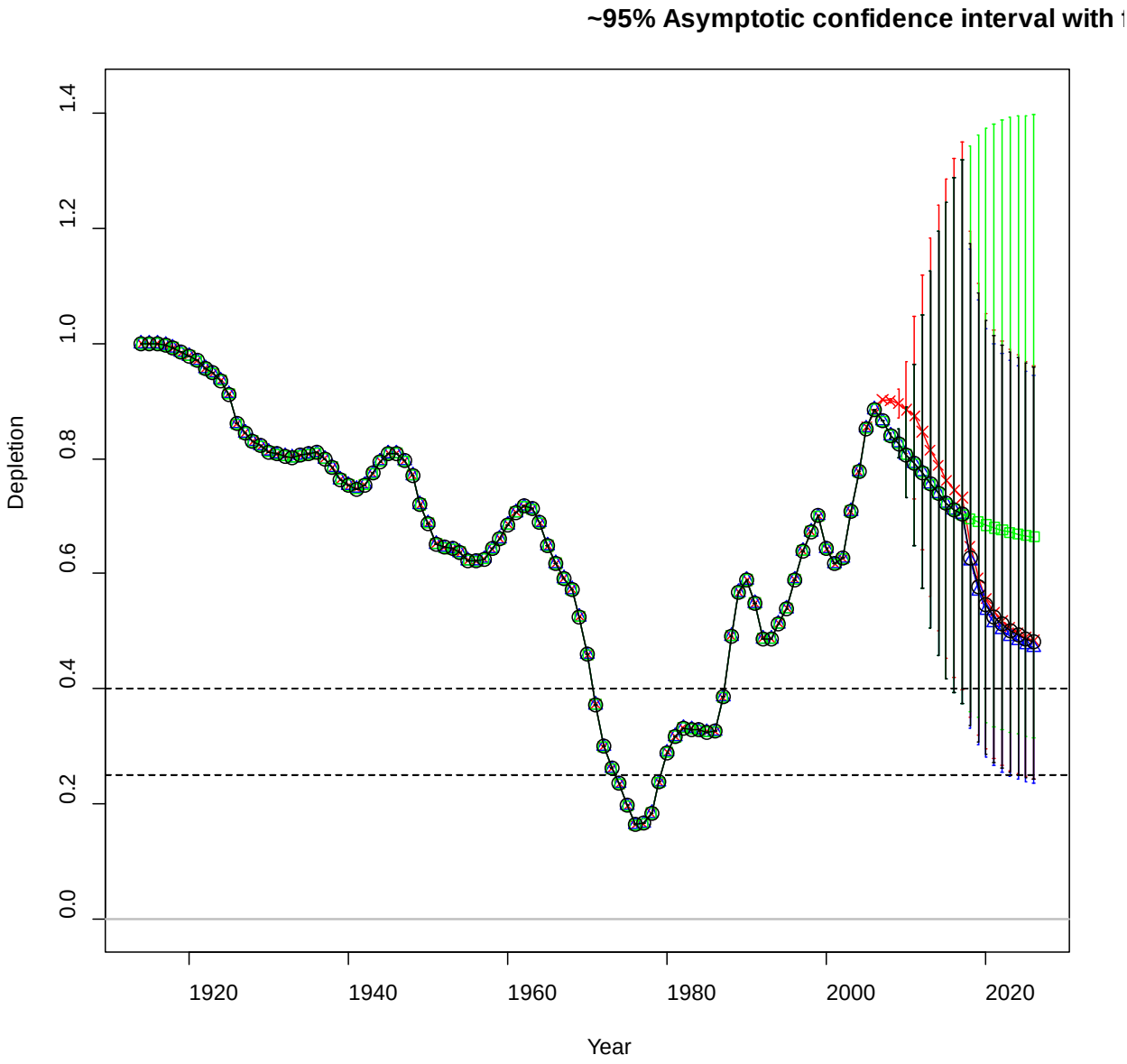

Figure 12. Figures 8-11 superimposed. Figure 8 is black with circles, Figure 9 is green with squares, Figure 10 is blue with triangles, and Figure 11 is red with ‘x’s.

Table 12. Annual California scorpionfish total mortality estimates for trawl, commercial hook and line, trap, and gillnet commercial fisheries as well as recreational fisheries using party charter phone survey and logbook based estimates of mortality for 2004-2010 and CRFS estimates for 2011-2014.

Year	Trawl	Hook and Line	Trap	Gillnet	Recreational PCPS 2004-2010	Recreational Logbook 2004-2010
2014	0.129	0.978	0.048	0.037	122.624	122.624
2013	0.807	1.685	0.068	0.138	112.003	112.003
2012	0.429	3.105	0.104	0.178	116.255	116.255
2011	1.056	2.913	0.334	0.137	99.675	99.675
2010	0.142	2.856	0.144	0.020	63.099	101.622
2009	0.276	2.800	0.205	0.029	66.115	108.771
2008	0.865	2.349	0.115	0.161	60.794	98.846
2007	1.484	1.717	0.146	0.217	68.134	134.411
2006	1.390	0.687	0.173	0.444	44.789	145.742
2005	2.998	1.252	0.236	0.699	90.299	70.108
2004	2.371	1.640	0.369	0.633	43.894	49.864

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