2009 petrale sole rebuilding analysis

Melissa A. Haltuch and Allan Hicks
National Marine Fisheries Service
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle WA, 98112
206-302-2447 (phone)
206-860-6792 (fax)
Melissa.Haltuch@noaa.gov, allan.hicks@noaa.gov

2 November, 2009
Final – SAFE Version

Table of contents

Summary

Based on the 2009 stock assessment, this rebuilding analysis compares the results of applying a suite of potential future management actions to the U.S. petrale sole stock. The base case assessment results estimate that the petrale sole resource is at 11.6% of the unexploited equilibrium spawning biomass at the beginning of 2009. Due to the restriction of the November-December 2009 winter petrale fishery the 2009 OY is set at 2,000 mt as the annual landings are not expected to exceed this level. The 2010 OY is set at 2,393 mt (Option a). Given the estimated stock status two alternative analyses are presented for proposed lower 2010 catches. The first alternative sets the 2010 catches to 1200 mt (Option b). The second alternative sets the 2010 catches to 300 mt (Option c). These three different sets of catches for 2009-2010 result in a rebuilding analysis for each option. The distribution of catches between each fishing fleet for rebuilding options a, b, and c are set to those from 2009. However, it is likely that that the winter catches from spawning aggregations will be restricted during stock rebuilding Therefore an additional three rebuilding options, d, e, and f (corresponding to the catches from options a, b, and c, respectively) that have no winter catches are completed as a comparison.

Beginning in 2011, various management options are considered ranging from zero fishing mortality to the largest removal that could occur without overfishing (ABC catches). The results below are presented as ranges that cover the three rebuilding options discussed above. In the absence of fishing mortality from 2011 forward, the petrale sole stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{25\%}$) by 2013-2014, depending upon the catches taken during 2010 and the distribution of catches between the summer and winter fleets. In contrast, if the ABC catches are removed, given rebuilding options a-c, the stock is not projected to reach the rebuilding target until 2016-2019, depending upon the 2010 catches and the distribution of catches between the summer and winter fleets. The 25:6.25, $F_{30\%}$, control rule would produce an OY of 415-914 mt in 2011 and has a 50% probability of rebuilding by 2015-2017 if the distribution of catches between the summer and winter fleets remains the same as in 2009. The 25:6.25, $F_{30\%}$, control rule would produce an OY of 534-1010 mt in 2011 and has a 50% probability of rebuilding by 2016-2018 if al of the catch is taken during the summer. A range of alternate management approaches to recovery are presented. One harvest scenario is presented in this rebuilding plan because it is analogous to the harvest policy that would be set using the species specific estimates of reference points from the stock assessment. All other catch options recover the stock on or before 2021 with a 50% probability of recovery. Recovery is faster when there is no winter fishing mortality. Setting catches equal to the current 2010 OY is projected to cause the petrale stock to decline (2009 fleet distribution) or remain stable (no winter catch) in 2011, while reducing the catches to between 1200-300 mt projects the petrale stock to increase.

Introduction

The 2009 coast-wide petrale sole stock assessment documented that the stock had declined below the overfished level as defined by the current 40:10 control rule during the early 1950s and has remained below this level (Haltuch and Hicks 2009). Given the relatively high productivity of flatfish stocks the PFMC is currently considering two alternative control rules for setting catches. The first alternative is to use the species specific reference points estimated in the 2009 stock assessment, a 19:4.5 control rule, and does not result in a declaration of overfished for petrale sole. The second alternative is to use a generalized flatfish proxy suggested by the SSC, a 25:6.25 control rule, that would result in a declaration of overfished for petrale sole. As it is unclear which control rule will be chosen, and what the final status declaration for petrale sole will be, this rebuilding analysis is prepared for the 25:6.25 rule. This is the first rebuilding analysis for petrale sole and was completed during October 5 – 9 using version 3.12a and running 1000 simulations.

2009 Assessment summary

Based on the results of the 2005 stock assessment (Lai et al. 2005) and recommendations from the STAR panel reviews, the current 2009 stock assessment for petrale sole is implemented as a single area model. Major choices in the structuring of this stock assessment model include a coast-wide model with seasonal fleet structure for each state, splitting the triennial survey into an early and late time period, and estimating selectivity and retention curves for each fleet. The seasonal fleet structure is used due to higher winter catches in recent decades; the assessment is based on winter (November to February) and summer (March to October) fishing seasons. In the model the fishing year starts on November 1 and ends on October 31. The fisheries are divided into WA-Winter, WA-Summer, OR-Winter, OR-Summer, CA-Winter, and CA-Summer fisheries. The model includes catch, length- and age-frequency data from the trawl fleets described above as well as standardized CPUE indices developed by Sampson and Lee (1999) for the Oregon fleets from 1987–1997. Biological data are derived from both port and on-board observer sampling programs. The National Marine Fisheries Service (NMFS) triennial bottom trawl survey (1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001, and 2004) and Northwest Fisheries Science Center (NWFSC) trawl survey (2003–2008) relative biomass indices and biological sampling provide fishery independent information on relative trend and demographics of the petrale sole stock.

Petrale sole were lightly exploited during the early 1900s but by the 1950s the fishery was well developed and showing clear signs of depletion and declines in catches and biomass. The rate of decline in spawning biomass accelerated through the 1930s–1960s reaching minimums generally around or below 10% of the unexploited levels during the 1980s and 1990s. The petrale sole spawning stock biomass is estimated to have increased from its lowest estimated levels during the early 1990s, peaking in 2005, in response to above average recruitment. However, this increasing trend has reversed since the 2005 assessment and the stock has been declining, most likely due to strong year classes having passed through the fishery. The estimated relative depletion level in 2009 is 11.6%, corresponding to 2,938 mt of female spawning biomass in the base model. The base model indicates that the spawning biomass has been below 15% of the unfished level since 2008. The unfished spawning stock biomass was estimated to be 25,334 mt in the base case model. The target stock size ($SB_{25\%}$) is therefore 6,334 mt.

Two alternative states of nature were presented, with the relative probabilities of each state of nature, 25%, based on identifying low and high values from the model-estimated distribution of 2009 spawning biomass. Those high and low values for 2009 were achieved through changing the size of the 2008 NWFSC survey biomass. These alternate models estimated the stock to be at 9% and 14% relative stock size in 2009.

Important changes in the 2009 assessment included:

1. Inclusion of all of the age data discarded from the 2005 northern area model

2. A new ageing-error analysis

3. Inclusion of the NWFSC survey data

4. Inclusion of the discard data from the WCGOP

5. Updated catch history for petrale sole

6. Partitioning of the Triennial trawl survey into two periods of catchability (1980-1992, 1995-2004) based on changes in survey timing during the summer.

7. Application of time-varying asymptotic fishery selectivity based on changes in management identified *a priori*.

Management performance under rebuilding

This is the first rebuilding plan for petrale sole.

Rebuilding calculations

This rebuilding analysis was conducted using software developed by A. Punt (version 3.12a, September 2009). The steps followed were:

1. Define how virgin biomass (SB_0) will be calculated.

2. Define how future recruitment will be generated.

3. Define the fishery selectivity and allocation to be applied during rebuilding.

4. Decide how to include uncertainty in input parameters from the stock assessment in the rebuilding analysis.

5. Calculate rebuilding reference points from the most current assessment results

    a) Calculate the projected year in which the stock would rebuild with a 50% probability if all future fishing mortality was eliminated ($T_{F=0}$).

    b) Calculate the projected year for a 50% probability of rebuilding from the year in which the stock was first declared overfished (T_{MIN}).
    c) Calculate the mean generation time.
    d) Calculate the maximum allowable rebuilding time (T_{MAX}).

6. Identification and analysis of alternative harvest strategies for rebuilding.

1. Definition of SB₀

The equilibrium spawning biomass level (SB_0) used in this rebuilding analysis is calculated via the stock-recruitment relationship in order to be consistent with assessment model results. This level is estimated to be 25,334 mt in the base case assessment model, which dictates that the rebuilding target ($SB_{25\%}$) is 6,334 mt (Table 1).

2. Generation of future recruitment

The parameters of the stock recruitment relationship, unexploited equilibrium recruitment, the natural log of R_0, steepness, h, and the degree of recruitment variability, σ_r,, from the 2009 stock assessment are used to generate future recruitments in the rebuilding analysis. The base model values are 13,604, 0.94, and 0.4 for R_0, h, and, σ_r,, respectively. The values for the high state of nature are 13,734, 0.95, and 0.4 for R_0, h, and, σ_r,, respectively. The values for the low state of nature are 13,225, 0.94, and 0.4 for R_0, h, and, σ_r,, respectively.

During the rebuilding review the SSC groundfish subcommittee recommended the following corrections to the output from the stock assessment model so that the stock assessment, which has seasonal dynamics (winter Nov-Feb; summer Mar-Oct), is more consistent with the rebuilding software, which has annual dynamics. First, the unfished recruitment (R0) from the seasonal stock assessment was corrected such that the rebuilding R0 = R0*exp(M/3). This correction to R0 was made for each gender since the stock assessment estimates M for each males and females. The male and female corrected R0s were then averaged to produce a single value of R0 for the rebuilding software. The age 0 recruits for both males and females were corrected such that rebuilding Age 0 = Age 0 *exp(M/2). Note that all recruitment takes place during the summer season.

3. Fishery selectivity and allocation

In order to project the effect of fishing on the petrale sole rebuilding trajectory, it is necessary to specify the fishery selectivity and relative allocation among fleets. This analysis projects forward using selectivity and allocation from 2008. This choice was made because the realized fraction of the catch coming from each state has changed in the last 1-2 years due to change in fishing opportunities. This choice is consist with the assessment model results.

While the dynamics of the stock assessment model are seasonal the rebuilding forecasts are done on an annual basis. The effect of simplifying the projections from a seasonal to annual basis, i.e. there is no growth and mortality during the year in the annual model, is small and can be assessed via comparison with the forecasts made from Stock Synthesis (Table 2) compared to the comparable projection from the rebuilder (Tables 5b and 6b, run #4) for the years 2011-2020. The differences between SS and rebuilding run #4 ranges between 1 – 61 metric tons of catch and between 10 – 91 metric tons of spawning biomass for any given year, respectively. Proportionally this is plus or minus 0.1-1.5% for spawning biomass and 0.1% -8.8% for catch in and given year. Projections in Stock Synthesis do not include recruitment variability while the rebuilding analysis does include recruitment variability.

4. Inclusion of uncertainty

The calculation of T_{MIN} and the evaluation of alternative harvest strategies within the rebuilding software involve projecting the population ahead taking account of uncertainty about future recruitment. Model and parameter uncertainty are included in this rebuilding analysis by including the two alternative states of nature from the 2009 stock assessment, based on identifying low and high values from the model-estimated distribution of 2009 spawning biomass. Those high and low values for 2009 were achieved through changing the size of the 2008 NWFSC survey biomass. The base model is given 50% of the weight and each alternative state of nature is given 25% of the weight.

5. Calculate reference points

The 2009 and 2010 OYs are set at 2,433 mt and 2,393 mt, respectively (referred to as

Option 1). Given the estimated stock status a number of alternative analyses are presented for proposed lower 2009-2010 catches. Due to the restriction of the November-December 2009 winter petrale fishery the 2009 OY is set at 2,000 mt as the annual landings are not expected to exceed this level. The 2010 OY is set at 2,393 mt (Option a). Given the estimated stock status two alternative analyses are presented for proposed lower 2010 catches. The first alternative sets the 2010 catches to 1200 mt (Option b). The second alternative sets the 2010 catches to 300 mt (Option c). These three different sets of catches for 2009-2010 result in a rebuilding analysis for each option. The distribution of catches between each fishing fleet for rebuilding options a, b, and c are set to those from 2009. However, it is likely that that the winter catches from spawning aggregations will be restricted during stock rebuilding Therefore an additional three rebuilding options, d, e, and f (corresponding to the catches from options a, b, and c, respectively) that have no winter catches are completed as a comparison. Additional rebuilder runs were done for two scenarios requested by the GMT on October 7. Option g sets 2010 catches to 1800 mt using the 2009 distribution of catches between fleets. Option h sets 2010 catches to 900 mt and eliminates the winter fishery.

Recovery in the absence of fishing ($T_{F=0}$) was calculated by setting fishing mortality to zero in 2011 for all projections. The value for $T_{F=0}$ is 2013-2014, depending upon the catch level chosen for 2010. The value for T_{MIN}, the median year for rebuilding to the target level in the absence of fishing since the first year catches can be set to zero (2011) is the same as $T_{F=0}$ since this is the first rebuilding plan for petrale sole. This calculation reflects a period of below average recruitments during the 2000s. The estimated generation time is 16 years. In conjunction with T_{MIN}, the mean generation time generally dictates the estimate of T_{MAX}., unless the stock can rebuild within 10 years of T_{MIN}. Petrale sole are able to rebuild to the target biomass within ten years, so T_{MAX} is 2021. T_{TARGET}, SPR_{TARGET} and P_{MAX} are not specified as this is the first rebuilding plan for petrale sole and these values have not been set via the council process. All reference points from the rebuilding analysis are summarized in Table 1.

6. Alternate rebuilding strategies

Assuming that a constant rate of harvest will be applied throughout a rebuilding period, the basis for rebuilding alternatives can be divided into two approaches: 1) strategies based on selection of a harvest rate (SPR rate), or 2) strategies based selection of a T_{TARGET} (year for 50% probability of recovery). This rebuilding analysis presents 5 alternate strategies spread among the approaches based on the selection of a harvest rate. Alternatives 1-5 correspond to requests made in the PFMC terms of reference for rebuilding analysis. Not all Council requests are included in this analysis as they pertain to stocks already under rebuilding, this is the first rebuilding analysis for petrale sole. A sixth alternative that corresponds to a range of years between T_{MIN} and T_{MAX} that produce 50% probability of recovery given the control rule was also explored. Due to the short time frame in which the petrale sole stock can rebuild, specifying years for which the probability of recovery is 50% (2015-2019) were redundant with the range of harvest rates evaluated. Therefore these runs are included in the final document.

Specifically, the alternatives are:

1) Apply the SPR:

    a. 0.20

    b. 0.30

    c. 0.40

d. 0.50

e. 0.60

2) SPR that produces 50% probability of recovery by T_{MID}

3) Eliminate all harvest beginning in 2011 (F=0).

4) Apply the OY and 25:6.25 control rule.

5) Apply the ABC.

Results

Summary results from the rebuilding alternatives are presented in Table 3. Detailed results are presented in Tables 4-6 and Figure 1. In the absence of any future fishing mortality, the petrale sole stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{25\%}$) by 2013-2014, depending upon the 2010 catches and the catch distribution between the summer and winter fisheries. In contrast, the stock is not projected to reach this level until 2016-2019 if the ABC catches are removed (alternative 5). These two scenarios bound the range of fishing mortality between zero and the overfishing level. All other scenarios lie within this range except for scenario 1a. Scenario 1a is presented in this rebuilding plan because it is analogous to the harvest policy that would be set using the species specific estimates of reference points from the stock assessment. All other catch options recover the stock on or before 2021 with a 50% probability of recovery. Recovery is faster when there is no winter fishing mortality. Setting catches equal to the current 2010 OY is projected to cause the petrale stock to decline (2009 fleet distribution) or remain stable (no winter catch) in 2011, while reducing the catches to between 1200-300 mt projects the petrale stock to increase.

If catches in 2010 reach the current OY, subsequent OY catches given the 25:6.25 control rule (alternative 4) result in annual catches of 415 mt in 2011 and 881 mt in 2012 (Table 3a). This control rule results in a probability of median recovery of 86% by T_{MAX}, 2021 (Table 3a). Conversely, a less aggressive harvest policy, e.g. alternative 1c, with an SPR=0.4 sets annual catches at 532 mt in 2011 and 748 mt in 2012 (Table 3a). The ABC, alternative 5, results in 2011 catches of 806 mt and 2012 catches of 1082 mt. If there is no winter catch of petrale sole the catches above are slightly higher (Table 3d).

If catches in 2010 are set at 1200 mt, subsequent OY catches given the 25:6.25 control rule (alternative 4) result in annual catches of 695 mt in 2011 and 1125 mt in 2012 (Table 3b). This control rule results in a probability of median recovery of 89% by T_{MAX}, 2021 (Table 3b). Conversely, a less aggressive harvest policy, e.g. alternative 1c, with an SPR=0.4 sets annual catches at 675 mt in 2011 and 890 mt in 2012 (Table 3b). The ABC, alternative 5, results in 2011 catches of 1021 mt and 2012 catches of 1279 mt. If there is no winter catch of petrale sole the catches above are slightly higher (Table 3e).

If catches in 2010 are set at 300 mt, subsequent OY catches given the 25:6.25 control rule (alternative 4) result in annual catches of 914 mt in 2011 and 1310 mt in 2012 (Table 3c). This control rule results in a probability of median recovery of 93% by T_{MAX}, 2021 (Table 3c). Conversely, a less aggressive harvest policy, e.g. alternative 1c, with an SPR=0.4 sets annual catches at 787 mt in 2011 and 997 mt in 2012 (Table 3c). The ABC, alternative 5, results in

2011 catches of 1188 mt and 2012 catches of 1428 mt. If there is no winter catch of petrale sole the catches above are slightly higher (Table 3f).

The two options requested by the GMT that specify 2010 catches set at intermediate values (g-h) in comparison to the above (a-f) scenarios produce intermediate results.

Acknowledgements

Ian Stewart, Ian Taylor, and Andre Punt provided assistance in using SS and the rebuilding software. John Devore provided guidance in interpreting Council requests. This document benefited from the text and analysis presented in the 2009 petrale sole rebuilding document. Jim Hastie provided preliminary comments that improved the quality of the document.

References

Haltuch, M.A., Hicks, A. 2009. Status of the U.S. petrale sole resource in 2008. In: Status of the Pacific coast groundfish fishery through 2009, stock assessment and fishery evaluation: stock assessments and rebuilding analyses. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 100, Portland, OR 97220, USA.

Lai, H-L, Haltuch, M.A., Punt, A.E., Cope, J.M. 2005. Stock assessment of petrale sole: 2004. In: volume 1: status of the Pacific coast groundfish fishery through 2005, stock assessment and fishery evaluation: stock assessments and rebuilding analyses. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 100, Portland, OR 97220, USA.

Tables

Table 1. Summary of rebuilding reference points.

Parameter	2009 assessment
SB_0	25,334
Rebuilding target ($SB_{25\%}$)	6,334
SB_{2009}	2,938
SPR_{2009}	0.10
Year rebuilding begins	2011
Present year	2009
T_{MIN}	2013-2014
Mean generation time	16
T_{MAX}	2021
$T_{F=0}$ (beginning in 2011)	2013-2014
P_{MAX}	**TBD**
T_{TARGET}	**TBD**
SPR_{TARGET}	**TBD**

Table 2. Forecasts from SS3 using the 25-6.25 control rule for the base model and alternative states of nature given catches of 2000 mt in 2009 and 1200 mt in 2010 using the 2009 distribution of catches between fleets.

		Low			Base			High	
Year	Catch	Depl.B0	SB	Catch	Depl.B0	SB	Catch	Depl.B0	SB
2011	335	0.09	2,353	756	0.13	3,278	1,176	0.17	4,225
2012	743	0.13	3,315	1,164	0.17	4,270	1,579	0.21	5,246
2013	1,108	0.16	4,199	1,495	0.20	5,089	1,871	0.24	5,995
2014	1,406	0.19	4,940	1,736	0.22	5,687	2,036	0.26	6,448
2015	1,630	0.21	5,515	1,900	0.24	6,105	2,116	0.27	6,713
2016	1,785	0.23	5,922	2,002	0.25	6,379	2,163	0.27	6,872
2017	1,890	0.24	6,196	2,055	0.26	6,559	2,192	0.28	6,970
2018	1,966	0.25	6,393	2,095	0.26	6,695	2,212	0.28	7,038
2019	2,015	0.25	6,553	2,129	0.27	6,810	2,228	0.28	7,094
2020	2,056	0.26	6,698	2,157	0.27	6,910	2,242	0.28	7,142

Table 3. Results of rebuilding alternatives based on Council requests. The T_{TARGET} must be specified through the council process and is left blank.

(a) Apply the 2010 OY with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2011 OY (mt)	1324	806	532	362	245	812	0	415	806
2011 ABC (mt)	806	806	806	806	806	806	806	806	806
2012 OY (mt)	1622	1082	748	523	361	1089	0	881	1082
2012 ABC (mt)	990	1082	1132	1163	1184	1081	1229	1153	1082
50% prob. Recovery by:	2087	2018	2015	2015	2015	2017	2014	2017	2018
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	0.30	1.00	0.56	0.30
Probability of recovery by reference points:									
$T_{F=0}$ from 2011 (2014)	0.0	0.0	25.0	25.0	25.0	0.0	75.0	0.0	0.0
T_{MIN} (2014)	0.0	0.0	25.0	25.0	25.0	0.0	75.0	0.0	0.0
T_{TARGET}(NA)									
T_{MAX} (2021)	2.8	78.9	100.0	100.0	100.0	78.1	100.0	85.9	78.9

(b) Apply the catch of 1200 mt in 2010 with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2011 OY (mt)	1669	1021	675	459	311	1074	0	695	1021
2011 ABC (mt)	1021	1021	1021	1021	1021	1021	1021	1021	1021
2012 OY (mt)	1894	1279	890	624	432	1335	0	1125	1279
2012 ABC (mt)	1159	1279	1343	1384	1412	1269	1471	1340	1279
50% prob. Recovery by:	2087	2017	2015	2014	2014	2018	2014	2016	2017
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	0.29	1.00	0.42	0.30
Probability of recovery by reference points:									
$T_{F=0}$ from 2011 (2014)	0.0	25.0	25.0	75.0	75.0	0.0	75.0	25.0	25.0
T_{MIN} (2014)	0.0	25.0	25.0	75.0	75.0	0.0	75.0	25.0	25.0
T_{TARGET}(NA)									
T_{MAX} (2021)	3.2	83.8	100.0	100.0	100.0	75.4	100.0	88.8	83.8

(c) Apply the catch of 300 mt in 2010 with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2011 OY (mt)	1939	1188	787	536	363	1261	0	914	1188
2011 ABC (mt)	1188	1188	1188	1188	1188	1188	1188	1188	1188
2012 OY (mt)	2099	1428	997	702	486	1501	0	1310	1428
2012 ABC (mt)	1287	1428	1505	1553	1586	1415	1655	1480	1428
50% prob. Recovery by:	2086	2016	2014	2014	2014	2017	2013	2015	2016
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	0.29	1.00	0.37	0.30
Probability of recovery by reference points:									
$T_{F=0}$ from 2011 (2013)	0	0	25	25	25	0	75	25	0
T_{MIN} (2013)	0	0	25	25	25	0	75	25	0
T_{TARGET}(NA)									
T_{MAX} (2021)	3.6	86.4	100.0	100.0	100.0	77.2	100.0	93.1	86.4

(d) Apply the 2010 OY with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2011 OY (mt)	1476	987	694	494	346	1037	0	543	987
2011 ABC (mt)	987	987	987	987	987	987	987	987	987
2012 OY (mt)	1677	1199	875	639	456	1251	0	962	1199
2012 ABC (mt)	1123	1199	1244	1275	1298	1191	1352	1268	1199
50% prob. Recovery by:	2126	2019	2016	2015	2015	2021	2014	2018	2019
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	0.29	1.00	0.54	0.30
Probability of recovery by reference points:									
$T_{F=0}$ from 2011 (2014)	0.0	0.0	25.0	25.0	25.0	0.0	75.0	0.0	0.0
T_{MIN} (2014)	0.0	0.0	25.0	25.0	25.0	0.0	75.0	0.0	0.0
T_{TARGET} (NA)									
T_{MAX} (2021)	1.4	67.8	99.8	100.0	100.0	54.0	100.0	83.3	67.8

(e) Apply the catch of 1200 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2011 OY (mt)	1748	1170	823	586	411	1154	0	810	1170
2011 ABC (mt)	1170	1170	1170	1170	1170	1170	1170	1170	1170
2012 OY (mt)	1908	1369	1001	732	523	1352	0	1192	1369
2012 ABC (mt)	1279	1369	1423	1460	1487	1371	1552	1425	1369
50% prob. Recovery by:	2125	2018	2015	2014	2014	2018	2014	2017	2018
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	0.30	1.00	0.43	0.30
Probability of recovery by reference points:									
$T_{F=0}$ from 2011 (2014)	0.0	0.0	25.0	75.0	75.0	0.0	75.0	25.0	0.0
T_{MIN} (2014)	0.0	0.0	25.0	75.0	75.0	0.0	75.0	25.0	0.0
T_{TARGET} (NA)									
T_{MAX} (2021)	2.1	77.3	100.0	100.0	100.0	80.1	100.0	86.5	77.3

(f) Apply the catch of 300 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2011 OY (mt)	1955	1309	921	655	460	1321	0	1010	1309
2011 ABC (mt)	1309	1309	1309	1309	1309	1309	1309	1309	1309
2012 OY (mt)	2083	1497	1097	802	574	1509	0	1362	1497
2012 ABC (mt)	1396	1497	1558	1599	1630	1495	1703	1544	1497
50% prob. Recovery by:	2123	2017	2015	2014	2014	2017	2013	2016	2017
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	0.30	1.00	0.39	0.30
Probability of recovery by reference points:									
$T_{F=0}$ from 2011 (2013)	0	0	25	25	25	0	75	0	0
T_{MIN} (2013)	0	0	25	25	25	0	75	0	0
T_{TARGET} (NA)									
T_{MAX} (2021)	2.4	82.7	100.0	100.0	100.0	79.9	100.0	88.9	82.7

(g) Apply the catch of 1800 mt in 2010 with the 2009 distribution between fleets.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2011 OY (mt)	1494	912	602	410	277	942	0	552	912
2011 ABC (mt)	912	912	912	912	912	912	912	912	912
2012 OY (mt)	1757	1180	818	573	396	1213	0	1003	1180
2012 ABC (mt)	1074	1180	1237	1272	1297	1174	1349	1246	1180
50% prob. Recovery by:	2087	2017	2015	2015	2014	2018	2014	2016	2017
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	0.29	1.00	0.47	0.30
Probability of recovery by reference points:									
$T_{F=0}$ from 2011 (2013)	0.0	0.0	25.0	25.0	75.0	0.0	75.0	25.0	0.0
T_{MIN} (2013)	0.0	0.0	25.0	25.0	75.0	0.0	75.0	25.0	0.0
T_{TARGET} (NA)									
T_{MAX} (2021)	3.0	80.8	100.0	100.0	100.0	76.4	100.0	87.1	80.8

(h) Apply the catch of 900 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2011 OY (mt)	1817	1216	855	609	427	1189	0	877	1216
2011 ABC (mt)	1216	1216	1216	1216	1216	1216	1216	1216	1216
2012 OY (mt)	1966	1411	1033	755	540	1384	0	1249	1411
2012 ABC (mt)	1318	1411	1468	1506	1535	1416	1602	1465	1411
50% prob. Recovery by:	2125	2018	2015	2014	2014	2017	2013	2017	2018
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	0.31	1.00	0.41	0.30
Probability of recovery by reference points:									
$T_{F=0}$ from 2011 (2013)	0.0	0.0	25.0	25.0	25.0	0.0	75.0	0.0	0.0
T_{MIN} (2013)	0.0	0.0	25.0	25.0	25.0	0.0	75.0	0.0	0.0
T_{TARGET} (NA)									
T_{MAX} (2021)	2.2	78.7	100.0	100.0	100.0	83.3	100.0	87.1	78.7

Table 4. Probability of recovery for rebuilding alternatives.

(a) Apply the 2010 OY with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.00	0.00	0.25	0.00	0.25	0.00	0.00
2014	0.00	0.00	0.25	0.25	0.25	0.00	0.75	0.00	0.00
2015	0.00	0.25	0.75	0.75	0.75	0.23	1.00	0.25	0.25
2016	0.00	0.27	0.76	1.00	1.00	0.27	1.00	0.44	0.27
2017	0.00	0.45	0.94	1.00	1.00	0.44	1.00	0.62	0.45
2018	0.01	0.58	0.99	1.00	1.00	0.56	1.00	0.70	0.58
2019	0.01	0.67	1.00	1.00	1.00	0.65	1.00	0.76	0.67
2020	0.02	0.73	1.00	1.00	1.00	0.71	1.00	0.82	0.73
2021	0.03	0.79	1.00	1.00	1.00	0.78	1.00	0.86	0.79
2022	0.04	0.84	1.00	1.00	1.00	0.83	1.00	0.90	0.84
2023	0.04	0.88	1.00	1.00	1.00	0.87	1.00	0.92	0.88
2024	0.05	0.90	1.00	1.00	1.00	0.90	1.00	0.94	0.90
2025	0.06	0.93	1.00	1.00	1.00	0.93	1.00	0.96	0.93
2026	0.07	0.95	1.00	1.00	1.00	0.95	1.00	0.97	0.95
2027	0.08	0.96	1.00	1.00	1.00	0.96	1.00	0.97	0.96
2028	0.09	0.97	1.00	1.00	1.00	0.96	1.00	0.98	0.97
2029	0.10	0.97	1.00	1.00	1.00	0.97	1.00	0.99	0.97
2030	0.10	0.98	1.00	1.00	1.00	0.98	1.00	0.99	0.98
2040	0.18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2050	0.25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(b) Apply the catch of 1200 mt in 2010 with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.25	0.25	0.25	0.00	0.25	0.00	0.00
2014	0.00	0.25	0.25	0.75	0.75	0.00	0.75	0.25	0.25
2015	0.00	0.25	0.75	0.76	1.00	0.25	1.00	0.25	0.25
2016	0.00	0.38	0.90	1.00	1.00	0.29	1.00	0.63	0.38
2017	0.00	0.56	1.00	1.00	1.00	0.45	1.00	0.71	0.56
2018	0.01	0.65	1.00	1.00	1.00	0.55	1.00	0.77	0.65
2019	0.02	0.73	1.00	1.00	1.00	0.64	1.00	0.82	0.73
2020	0.03	0.79	1.00	1.00	1.00	0.70	1.00	0.86	0.79
2021	0.03	0.84	1.00	1.00	1.00	0.75	1.00	0.89	0.84
2022	0.04	0.88	1.00	1.00	1.00	0.81	1.00	0.92	0.88
2023	0.05	0.91	1.00	1.00	1.00	0.84	1.00	0.94	0.91
2024	0.05	0.93	1.00	1.00	1.00	0.88	1.00	0.96	0.93
2025	0.06	0.95	1.00	1.00	1.00	0.90	1.00	0.97	0.95
2026	0.08	0.96	1.00	1.00	1.00	0.92	1.00	0.97	0.96
2027	0.09	0.97	1.00	1.00	1.00	0.94	1.00	0.98	0.97
2028	0.09	0.97	1.00	1.00	1.00	0.95	1.00	0.99	0.97
2029	0.10	0.98	1.00	1.00	1.00	0.96	1.00	0.99	0.98
2030	0.11	0.98	1.00	1.00	1.00	0.96	1.00	0.99	0.98
2040	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2050	0.25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(c) Apply the catch of 300 mt in 2010 with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
2013	0.00	0.00	0.25	0.25	0.25	0.00	0.75	0.25	0.00
2014	0.00	0.25	0.75	0.75	0.75	0.25	1.00	0.25	0.25
2015	0.00	0.25	0.75	1.00	1.00	0.25	1.00	0.51	0.25
2016	0.00	0.53	1.00	1.00	1.00	0.35	1.00	0.74	0.53
2017	0.00	0.65	1.00	1.00	1.00	0.50	1.00	0.81	0.65
2018	0.01	0.71	1.00	1.00	1.00	0.59	1.00	0.85	0.71
2019	0.02	0.77	1.00	1.00	1.00	0.66	1.00	0.89	0.77
2020	0.03	0.82	1.00	1.00	1.00	0.72	1.00	0.92	0.82
2021	0.04	0.86	1.00	1.00	1.00	0.77	1.00	0.93	0.86
2022	0.04	0.90	1.00	1.00	1.00	0.82	1.00	0.95	0.90
2023	0.05	0.92	1.00	1.00	1.00	0.85	1.00	0.96	0.92
2024	0.06	0.94	1.00	1.00	1.00	0.88	1.00	0.97	0.94
2025	0.07	0.96	1.00	1.00	1.00	0.90	1.00	0.98	0.96
2026	0.08	0.97	1.00	1.00	1.00	0.92	1.00	0.98	0.97
2027	0.09	0.97	1.00	1.00	1.00	0.94	1.00	0.99	0.97
2028	0.10	0.98	1.00	1.00	1.00	0.94	1.00	0.99	0.98
2029	0.10	0.99	1.00	1.00	1.00	0.96	1.00	0.99	0.99
2030	0.11	0.99	1.00	1.00	1.00	0.96	1.00	0.99	0.99
2040	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2050	0.26	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(d) Apply the 2010 OY with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
2014	0.00	0.00	0.25	0.25	0.25	0.00	0.75	0.00	0.00
2015	0.00	0.00	0.25	0.75	0.75	0.00	1.00	0.18	0.00
2016	0.00	0.12	0.75	0.81	1.00	0.05	1.00	0.29	0.12
2017	0.00	0.26	0.82	1.00	1.00	0.16	1.00	0.49	0.26
2018	0.00	0.39	0.93	1.00	1.00	0.26	1.00	0.61	0.39
2019	0.00	0.50	0.99	1.00	1.00	0.37	1.00	0.71	0.50
2020	0.01	0.61	0.99	1.00	1.00	0.46	1.00	0.77	0.61
2021	0.01	0.68	1.00	1.00	1.00	0.54	1.00	0.83	0.68
2022	0.02	0.75	1.00	1.00	1.00	0.62	1.00	0.88	0.75
2023	0.02	0.81	1.00	1.00	1.00	0.68	1.00	0.91	0.81
2024	0.03	0.85	1.00	1.00	1.00	0.74	1.00	0.93	0.85
2025	0.03	0.88	1.00	1.00	1.00	0.78	1.00	0.95	0.88
2026	0.04	0.91	1.00	1.00	1.00	0.81	1.00	0.96	0.91
2027	0.04	0.93	1.00	1.00	1.00	0.85	1.00	0.97	0.93
2028	0.05	0.94	1.00	1.00	1.00	0.87	1.00	0.97	0.94
2029	0.05	0.96	1.00	1.00	1.00	0.89	1.00	0.98	0.96
2030	0.06	0.96	1.00	1.00	1.00	0.91	1.00	0.98	0.96
2040	0.11	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
2050	0.16	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(e) Apply the catch of 1200 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.00	0.25	0.25	0.00	0.25	0.00	0.00
2014	0.00	0.00	0.25	0.75	0.75	0.00	0.75	0.25	0.00
2015	0.00	0.25	0.75	0.75	1.00	0.25	1.00	0.25	0.25
2016	0.00	0.26	0.76	1.00	1.00	0.27	1.00	0.42	0.26
2017	0.00	0.41	0.93	1.00	1.00	0.43	1.00	0.60	0.41
2018	0.00	0.55	0.99	1.00	1.00	0.57	1.00	0.70	0.55
2019	0.01	0.64	1.00	1.00	1.00	0.66	1.00	0.77	0.64
2020	0.01	0.71	1.00	1.00	1.00	0.73	1.00	0.83	0.71
2021	0.02	0.77	1.00	1.00	1.00	0.80	1.00	0.87	0.77
2022	0.03	0.83	1.00	1.00	1.00	0.85	1.00	0.90	0.83
2023	0.03	0.87	1.00	1.00	1.00	0.89	1.00	0.93	0.87
2024	0.03	0.90	1.00	1.00	1.00	0.92	1.00	0.95	0.90
2025	0.04	0.93	1.00	1.00	1.00	0.93	1.00	0.96	0.93
2026	0.04	0.95	1.00	1.00	1.00	0.95	1.00	0.97	0.95
2027	0.05	0.96	1.00	1.00	1.00	0.96	1.00	0.97	0.96
2028	0.05	0.96	1.00	1.00	1.00	0.97	1.00	0.98	0.96
2029	0.06	0.97	1.00	1.00	1.00	0.98	1.00	0.99	0.97
2030	0.06	0.98	1.00	1.00	1.00	0.98	1.00	0.99	0.98
2040	0.12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2050	0.17	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(f) Apply the catch of 300 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
2013	0.00	0.00	0.25	0.25	0.25	0.00	0.75	0.00	0.00
2014	0.00	0.25	0.25	0.75	0.75	0.25	1.00	0.25	0.25
2015	0.00	0.25	0.75	1.00	1.00	0.25	1.00	0.25	0.25
2016	0.00	0.35	0.89	1.00	1.00	0.33	1.00	0.61	0.35
2017	0.00	0.53	1.00	1.00	1.00	0.50	1.00	0.69	0.53
2018	0.00	0.63	1.00	1.00	1.00	0.61	1.00	0.77	0.63
2019	0.01	0.71	1.00	1.00	1.00	0.69	1.00	0.82	0.71
2020	0.02	0.77	1.00	1.00	1.00	0.75	1.00	0.86	0.77
2021	0.02	0.83	1.00	1.00	1.00	0.80	1.00	0.89	0.83
2022	0.03	0.87	1.00	1.00	1.00	0.85	1.00	0.92	0.87
2023	0.03	0.90	1.00	1.00	1.00	0.88	1.00	0.94	0.90
2024	0.04	0.92	1.00	1.00	1.00	0.90	1.00	0.96	0.92
2025	0.04	0.94	1.00	1.00	1.00	0.93	1.00	0.97	0.94
2026	0.05	0.95	1.00	1.00	1.00	0.95	1.00	0.97	0.95
2027	0.05	0.96	1.00	1.00	1.00	0.96	1.00	0.98	0.96
2028	0.06	0.97	1.00	1.00	1.00	0.97	1.00	0.98	0.97
2029	0.07	0.98	1.00	1.00	1.00	0.97	1.00	0.99	0.98
2030	0.07	0.98	1.00	1.00	1.00	0.98	1.00	0.99	0.98
2040	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2050	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(g) Apply the catch of 1800 mt in 2010 with the 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.00	0.25	0.25	0.00	0.25	0.00	0.00
2014	0.00	0.00	0.25	0.25	0.75	0.00	0.75	0.25	0.00
2015	0.00	0.25	0.75	0.75	0.86	0.25	1.00	0.25	0.25
2016	0.00	0.31	0.81	1.00	1.00	0.28	1.00	0.53	0.31
2017	0.00	0.51	0.98	1.00	1.00	0.44	1.00	0.66	0.51
2018	0.01	0.61	1.00	1.00	1.00	0.56	1.00	0.73	0.61
2019	0.02	0.70	1.00	1.00	1.00	0.64	1.00	0.79	0.70
2020	0.03	0.75	1.00	1.00	1.00	0.70	1.00	0.83	0.75
2021	0.03	0.81	1.00	1.00	1.00	0.76	1.00	0.87	0.81
2022	0.04	0.86	1.00	1.00	1.00	0.82	1.00	0.91	0.86
2023	0.04	0.89	1.00	1.00	1.00	0.85	1.00	0.93	0.89
2024	0.05	0.91	1.00	1.00	1.00	0.89	1.00	0.95	0.91
2025	0.06	0.94	1.00	1.00	1.00	0.92	1.00	0.96	0.94
2026	0.07	0.95	1.00	1.00	1.00	0.94	1.00	0.97	0.95
2027	0.09	0.96	1.00	1.00	1.00	0.95	1.00	0.98	0.96
2028	0.09	0.97	1.00	1.00	1.00	0.96	1.00	0.98	0.97
2029	0.10	0.98	1.00	1.00	1.00	0.97	1.00	0.99	0.98
2030	0.11	0.98	1.00	1.00	1.00	0.97	1.00	0.99	0.98
2040	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2050	0.25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(h) Apply the catch of 900 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.25	0.25	0.25	0.00	0.75	0.00	0.00
2014	0.00	0.00	0.25	0.75	0.75	0.25	0.75	0.25	0.00
2015	0.00	0.25	0.75	0.75	1.00	0.25	1.00	0.25	0.25
2016	0.00	0.28	0.78	1.00	1.00	0.30	1.00	0.47	0.28
2017	0.00	0.44	0.96	1.00	1.00	0.50	1.00	0.62	0.44
2018	0.00	0.57	0.99	1.00	1.00	0.62	1.00	0.72	0.57
2019	0.01	0.66	1.00	1.00	1.00	0.71	1.00	0.78	0.66
2020	0.02	0.72	1.00	1.00	1.00	0.77	1.00	0.83	0.72
2021	0.02	0.79	1.00	1.00	1.00	0.83	1.00	0.87	0.79
2022	0.03	0.84	1.00	1.00	1.00	0.88	1.00	0.90	0.84
2023	0.03	0.88	1.00	1.00	1.00	0.91	1.00	0.93	0.88
2024	0.03	0.90	1.00	1.00	1.00	0.93	1.00	0.95	0.90
2025	0.04	0.93	1.00	1.00	1.00	0.95	1.00	0.96	0.93
2026	0.04	0.95	1.00	1.00	1.00	0.96	1.00	0.97	0.95
2027	0.05	0.96	1.00	1.00	1.00	0.97	1.00	0.98	0.96
2028	0.06	0.97	1.00	1.00	1.00	0.97	1.00	0.98	0.97
2029	0.06	0.97	1.00	1.00	1.00	0.98	1.00	0.99	0.97
2030	0.07	0.98	1.00	1.00	1.00	0.98	1.00	0.99	0.98
2040	0.12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2050	0.17	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 5. Median spawning biomass (mt) for rebuilding alternatives.

(a) Apply the 2010 OY with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2938	2938	2938	2938	2938	2938	2938	2938	2938
2010	2700	2700	2700	2700	2700	2700	2700	2700	2700
2011	2585	2585	2585	2585	2585	2585	2585	2585	2585
2012	3232	3508	3655	3747	3810	3505	3942	3718	3508
2013	3750	4355	4702	4927	5086	4348	5430	4700	4355
2014	4098	5047	5632	6027	6313	5035	6955	5444	5047
2015	4319	5588	6427	7018	7456	5573	8475	5973	5588
2016	4439	5973	7061	7858	8466	5953	9927	6307	5973
2017	4468	6248	7576	8562	9347	6225	11300	6497	6248
2018	4479	6421	7955	9163	10123	6392	12604	6606	6421
2019	4498	6540	8254	9633	10770	6512	13808	6696	6540
2020	4545	6663	8501	10047	11368	6634	14929	6795	6663
2021	4573	6789	8715	10399	11856	6756	15996	6885	6789
2022	4603	6857	8887	10705	12248	6825	16929	6942	6857
2023	4631	6970	9090	10999	12688	6933	17799	7052	6970
2024	4677	7041	9248	11245	13035	7006	18667	7103	7041
2025	4684	7111	9400	11495	13422	7077	19445	7151	7111
2026	4686	7134	9461	11663	13674	7099	20111	7174	7134
2027	4693	7173	9541	11791	13851	7135	20706	7194	7173
2028	4735	7231	9626	11920	14085	7192	21301	7261	7231
2029	4716	7238	9676	12012	14220	7198	21811	7264	7238
2030	4732	7225	9717	12076	14346	7185	22169	7250	7225
2040	4773	7323	9854	12405	14923	7283	24467	7331	7323
2050	4733	7280	9809	12392	14989	7241	25001	7296	7280

(b) Apply the catch of 1200 mt in 2010 with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2938	2938	2938	2938	2938	2938	2938	2938	2938
2010	2700	2700	2700	2700	2700	2700	2700	2700	2700
2011	3244	3244	3244	3244	3244	3244	3244	3244	3244
2012	3760	4114	4303	4422	4503	4085	4674	4292	4114
2013	4142	4872	5295	5572	5768	4808	6194	5152	4872
2014	4368	5461	6145	6612	6951	5362	7718	5772	5461
2015	4494	5906	6855	7530	8034	5772	9215	6195	5906
2016	4550	6209	7408	8296	8978	6046	10632	6453	6209
2017	4547	6435	7858	8941	9799	6240	11969	6609	6435
2018	4543	6572	8198	9494	10537	6365	13239	6705	6572
2019	4552	6663	8465	9934	11135	6440	14408	6778	6663
2020	4599	6778	8672	10302	11695	6547	15504	6870	6778
2021	4626	6877	8885	10629	12139	6632	16534	6955	6877
2022	4643	6939	9041	10913	12541	6684	17417	6997	6939
2023	4659	7040	9204	11161	12910	6783	18282	7104	7040
2024	4697	7087	9341	11385	13233	6824	19084	7131	7087
2025	4700	7140	9461	11614	13580	6873	19822	7186	7140
2026	4699	7159	9522	11763	13815	6877	20462	7188	7159
2027	4703	7192	9587	11875	13982	6911	21012	7208	7192
2028	4741	7248	9665	11989	14187	6971	21560	7270	7248
2029	4725	7258	9708	12078	14300	6957	22058	7271	7258
2030	4739	7236	9746	12114	14420	6952	22379	7256	7236
2040	4773	7324	9856	12409	14935	7031	24539	7332	7324
2050	4733	7280	9809	12392	14991	6995	25018	7296	7280

(c) Apply the catch of 300 mt in 2010 with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2938	2938	2938	2938	2938	2938	2938	2938	2938
2010	2700	2700	2700	2700	2700	2700	2700	2700	2700
2011	3752	3752	3752	3752	3752	3752	3752	3752	3752
2012	4153	4567	4790	4929	5025	4527	5227	4719	4567
2013	4426	5251	5733	6049	6273	5166	6764	5481	5251
2014	4560	5761	6520	7040	7420	5632	8282	6008	5761
2015	4618	6133	7164	7902	8455	5964	9758	6354	6133
2016	4627	6377	7658	8612	9349	6174	11147	6556	6377
2017	4599	6558	8059	9213	10123	6320	12453	6687	6558
2018	4589	6681	8366	9725	10834	6416	13711	6771	6681
2019	4593	6747	8605	10134	11386	6478	14843	6827	6747
2020	4635	6851	8790	10478	11915	6570	15929	6911	6851
2021	4656	6934	8994	10779	12351	6643	16908	6997	6934
2022	4673	6978	9136	11046	12716	6683	17759	7034	6978
2023	4676	7082	9280	11262	13063	6779	18611	7134	7082
2024	4706	7124	9401	11478	13367	6803	19380	7150	7124
2025	4708	7164	9504	11696	13683	6853	20076	7203	7164
2026	4708	7176	9564	11825	13900	6856	20708	7200	7176
2027	4708	7204	9614	11926	14072	6871	21234	7217	7204
2028	4744	7259	9688	12035	14240	6925	21744	7277	7259
2029	4729	7266	9728	12110	14365	6920	22218	7279	7266
2030	4742	7247	9760	12149	14458	6908	22532	7261	7247
2040	4773	7325	9857	12412	14941	6981	24577	7333	7325
2050	4733	7280	9810	12393	14992	6942	25028	7296	7280

(d) Apply the 2010 OY with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2938	2938	2938	2938	2938	2938	2938	2938	2938
2010	2700	2700	2700	2700	2700	2700	2700	2700	2700
2011	2701	2701	2701	2701	2701	2701	2701	2701	2701
2012	3210	3459	3609	3712	3788	3434	3967	3687	3459
2013	3609	4150	4497	4743	4930	4093	5384	4541	4150
2014	3900	4738	5306	5723	6046	4646	6861	5213	4738
2015	4117	5230	6024	6627	7106	5105	8352	5721	5230
2016	4255	5608	6622	7415	8059	5452	9787	6070	5608
2017	4347	5913	7131	8098	8908	5730	11153	6310	5913
2018	4409	6148	7554	8717	9701	5933	12456	6471	6148
2019	4433	6327	7884	9208	10345	6094	13665	6583	6327
2020	4489	6484	8183	9677	10974	6236	14792	6699	6484
2021	4535	6611	8431	10028	11476	6353	15874	6828	6611
2022	4571	6708	8633	10372	11910	6435	16817	6886	6708
2023	4610	6822	8855	10688	12365	6539	17692	6991	6822
2024	4656	6927	9043	10973	12760	6643	18573	7043	6927
2025	4670	7031	9215	11249	13133	6724	19366	7099	7031
2026	4659	7047	9299	11413	13411	6738	20035	7128	7047
2027	4691	7119	9411	11588	13651	6802	20641	7189	7119
2028	4737	7166	9507	11763	13891	6838	21236	7223	7166
2029	4718	7180	9584	11886	14027	6858	21760	7234	7180
2030	4718	7197	9627	11941	14179	6870	22118	7236	7197
2040	4759	7317	9850	12395	14875	6978	24454	7324	7317
2050	4737	7271	9832	12412	14981	6940	24997	7277	7271

(e) Apply the catch of 1200 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2938	2938	2938	2938	2938	2938	2938	2938	2938
2010	2700	2700	2700	2700	2700	2700	2700	2700	2700
2011	3304	3304	3304	3304	3304	3304	3304	3304	3304
2012	3771	4071	4252	4377	4469	4079	4685	4259	4071
2013	4083	4717	5124	5413	5632	4735	6167	5028	4717
2014	4275	5229	5878	6356	6727	5258	7665	5595	5229
2015	4400	5638	6526	7203	7741	5676	9147	6006	5638
2016	4463	5939	7051	7926	8637	5986	10555	6274	5939
2017	4508	6185	7499	8555	9433	6241	11888	6468	6185
2018	4532	6365	7875	9119	10173	6434	13159	6605	6365
2019	4543	6515	8181	9572	10781	6584	14335	6689	6515
2020	4585	6637	8426	9989	11366	6710	15429	6798	6637
2021	4610	6759	8637	10317	11815	6836	16468	6900	6759
2022	4631	6827	8833	10627	12217	6905	17357	6951	6827
2023	4662	6944	9002	10911	12631	7021	18227	7041	6944
2024	4695	7003	9184	11155	12986	7089	19035	7081	7003
2025	4699	7088	9333	11398	13335	7176	19776	7136	7088
2026	4686	7095	9393	11549	13590	7189	20421	7162	7095
2027	4709	7160	9478	11705	13799	7248	20975	7212	7160
2028	4751	7200	9568	11856	14018	7293	21529	7240	7200
2029	4730	7206	9629	11960	14138	7295	22027	7247	7206
2030	4731	7220	9666	12007	14273	7311	22352	7252	7220
2040	4759	7319	9855	12407	14891	7416	24531	7325	7319
2050	4737	7271	9832	12413	14984	7368	25017	7277	7271

(f) Apply the catch of 300 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2938	2938	2938	2938	2938	2938	2938	2938	2938
2010	2700	2700	2700	2700	2700	2700	2700	2700	2700
2011	3767	3767	3767	3767	3767	3767	3767	3767	3767
2012	4195	4535	4740	4881	4985	4529	5230	4693	4535
2013	4439	5142	5595	5916	6160	5129	6756	5396	5142
2014	4554	5595	6305	6829	7237	5575	8268	5884	5595
2015	4609	5941	6899	7631	8215	5914	9741	6221	5941
2016	4617	6183	7370	8305	9067	6150	11127	6430	6183
2017	4622	6383	7770	8887	9820	6346	12432	6594	6383
2018	4621	6529	8111	9425	10522	6490	13689	6707	6529
2019	4608	6642	8383	9828	11091	6595	14824	6775	6642
2020	4637	6743	8596	10212	11635	6695	15909	6865	6743
2021	4654	6846	8795	10511	12061	6798	16890	6957	6846
2022	4672	6901	8954	10798	12449	6851	17742	6996	6901
2023	4693	7009	9103	11057	12818	6959	18596	7077	7009
2024	4716	7055	9252	11275	13144	6998	19368	7114	7055
2025	4717	7130	9404	11498	13477	7072	20064	7165	7130
2026	4708	7127	9457	11650	13712	7070	20698	7181	7127
2027	4721	7196	9528	11796	13904	7135	21224	7228	7196
2028	4760	7227	9611	11916	14100	7169	21735	7253	7227
2029	4738	7223	9660	12008	14219	7161	22210	7258	7223
2030	4737	7234	9692	12061	14342	7174	22526	7263	7234
2040	4759	7321	9858	12417	14901	7256	24575	7325	7321
2050	4737	7272	9832	12414	14986	7212	25027	7277	7272

(g) Apply the catch of 1800 mt in 2010 with the 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2938	2938	2938	2938	2938	2938	2938	2938	2938
2010	2700	2700	2700	2700	2700	2700	2700	2700	2700
2011	2910	2910	2910	2910	2910	2910	2910	2910	2910
2012	3495	3810	3978	4083	4154	3794	4306	4005	3810
2013	3947	4614	4999	5250	5427	4578	5812	4927	4614
2014	4234	5255	5890	6321	6633	5197	7337	5610	5255
2015	4408	5749	6643	7275	7747	5669	8846	6086	5749
2016	4496	6093	7236	8079	8724	5994	10281	6381	6093
2017	4508	6345	7717	8751	9575	6225	11636	6556	6345
2018	4512	6494	8080	9325	10328	6367	12922	6656	6494
2019	4528	6607	8364	9790	10957	6463	14114	6736	6607
2020	4578	6722	8585	10180	11535	6574	15215	6835	6722
2021	4603	6834	8811	10510	11997	6678	16260	6918	6834
2022	4625	6895	8974	10802	12399	6742	17187	6973	6895
2023	4645	7009	9144	11083	12802	6843	18037	7077	7009
2024	4686	7062	9297	11318	13143	6900	18885	7118	7062
2025	4692	7127	9431	11558	13508	6956	19642	7172	7127
2026	4694	7147	9492	11712	13751	6973	20284	7180	7147
2027	4698	7183	9566	11831	13920	7003	20867	7201	7183
2028	4738	7241	9645	11958	14133	7061	21430	7266	7241
2029	4720	7250	9692	12053	14260	7055	21936	7268	7250
2030	4735	7230	9733	12096	14385	7048	22278	7253	7230
2040	4773	7324	9855	12407	14927	7137	24500	7332	7324
2050	4733	7280	9809	12392	14990	7102	25011	7296	7280

(h) Apply the catch of 900 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2938	2938	2938	2938	2938	2938	2938	2938	2938
2010	2700	2700	2700	2700	2700	2700	2700	2700	2700
2011	3457	3457	3457	3457	3457	3457	3457	3457	3457
2012	3912	4226	4415	4545	4640	4240	4866	4404	4226
2013	4202	4859	5281	5581	5808	4890	6363	5151	4859
2014	4368	5351	6021	6514	6898	5400	7866	5691	5351
2015	4470	5739	6651	7346	7899	5804	9345	6077	5739
2016	4514	6020	7158	8053	8781	6100	10747	6326	6020
2017	4547	6251	7589	8667	9563	6344	12071	6509	6251
2018	4563	6423	7952	9218	10290	6528	13338	6638	6423
2019	4564	6561	8250	9657	10883	6675	14497	6716	6561
2020	4604	6671	8484	10063	11463	6794	15595	6820	6671
2021	4626	6787	8686	10383	11898	6914	16608	6918	6787
2022	4644	6853	8875	10685	12291	6988	17489	6967	6853
2023	4674	6964	9036	10960	12694	7094	18365	7055	6964
2024	4702	7018	9207	11196	13039	7161	19150	7090	7018
2025	4706	7103	9358	11432	13388	7247	19883	7147	7103
2026	4695	7108	9414	11587	13633	7256	20510	7167	7108
2027	4713	7172	9493	11737	13828	7315	21055	7217	7172
2028	4755	7209	9586	11878	14048	7360	21600	7245	7209
2029	4733	7210	9640	11976	14170	7357	22090	7250	7210
2030	4733	7225	9675	12027	14294	7380	22409	7256	7225
2040	4759	7320	9856	12410	14894	7477	24547	7325	7320
2050	4737	7272	9832	12413	14984	7427	25020	7277	7272

Table 6. Median catches (mt) for rebuilding alternatives. Note that after 25 years the table is compressed.

(a) Apply the 2010 OY with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2000	2000	2000	2000	2000	2000	2000	2000	2000
2010	2393	2393	2393	2393	2393	2393	2393	2393	2393
2011	1324	806	532	362	245	812	0	415	806
2012	1622	1082	748	523	361	1089	0	881	1082
2013	1861	1341	966	694	488	1348	0	1287	1341
2014	2025	1557	1165	857	613	1564	0	1597	1557
2015	2126	1723	1334	1003	729	1730	0	1813	1723
2016	2181	1844	1469	1129	833	1849	0	1947	1844
2017	2192	1926	1577	1234	923	1931	0	2006	1926
2018	2194	1976	1655	1319	1002	1981	0	2038	1976
2019	2205	2016	1718	1389	1065	2020	0	2063	2016
2020	2223	2052	1767	1447	1122	2055	0	2085	2052
2021	2235	2082	1810	1492	1168	2085	0	2116	2082
2022	2256	2108	1842	1535	1210	2112	0	2134	2108
2023	2274	2138	1883	1574	1247	2140	0	2162	2138
2024	2293	2164	1917	1612	1283	2167	0	2181	2164
2025	2291	2179	1945	1645	1316	2182	0	2191	2179
2026	2289	2185	1959	1668	1342	2188	0	2197	2185
2027	2304	2200	1970	1685	1361	2202	0	2209	2200
2028	2313	2214	1988	1698	1376	2217	0	2223	2214
2029	2301	2208	2001	1715	1389	2210	0	2213	2208
2030	2309	2209	2004	1724	1402	2212	0	2216	2209
2040	2322	2236	2036	1768	1455	2237	0	2236	2236
2050	2312	2228	2026	1763	1458	2231	0	2229	2228

(b) Apply the catch of 1200 mt in 2010 with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2000	2000	2000	2000	2000	2000	2000	2000	2000
2010	1200	1200	1200	1200	1200	1200	1200	1200	1200
2011	1669	1021	675	459	311	1074	0	695	1021
2012	1894	1279	890	624	432	1335	0	1125	1279
2013	2058	1507	1096	791	558	1563	0	1479	1507
2014	2159	1690	1277	945	679	1742	0	1735	1690
2015	2211	1824	1427	1081	789	1872	0	1905	1824
2016	2236	1919	1545	1195	886	1961	0	2000	1919
2017	2231	1984	1639	1291	970	2019	0	2042	1984
2018	2226	2022	1709	1368	1043	2055	0	2065	2022
2019	2235	2053	1761	1431	1102	2081	0	2088	2053
2020	2250	2079	1804	1483	1154	2105	0	2106	2079
2021	2258	2108	1842	1524	1196	2136	0	2136	2108
2022	2282	2129	1870	1565	1234	2154	0	2151	2129
2023	2285	2157	1907	1598	1270	2181	0	2178	2157
2024	2301	2177	1939	1631	1301	2200	0	2190	2177
2025	2300	2191	1960	1660	1332	2209	0	2197	2191
2026	2297	2194	1970	1678	1355	2214	0	2202	2194
2027	2306	2207	1984	1698	1372	2224	0	2214	2207
2028	2316	2220	1996	1708	1386	2239	0	2226	2220
2029	2303	2211	2006	1723	1397	2231	0	2215	2211
2030	2311	2214	2009	1731	1409	2230	0	2219	2214
2040	2322	2236	2036	1768	1456	2252	0	2236	2236
2050	2312	2228	2026	1763	1458	2244	0	2229	2228

(c) Apply the catch of 300 mt in 2010 with 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2000	2000	2000	2000	2000	2000	2000	2000	2000
2010	300	300	300	300	300	300	300	300	300
2011	1939	1188	787	536	363	1261	0	914	1188
2012	2099	1428	997	702	486	1501	0	1310	1428
2013	2203	1632	1193	864	611	1700	0	1620	1632
2014	2255	1787	1360	1011	728	1850	0	1835	1787
2015	2272	1898	1495	1138	833	1953	0	1972	1898
2016	2274	1973	1599	1243	925	2020	0	2032	1973
2017	2257	2024	1682	1331	1004	2064	0	2066	2024
2018	2245	2055	1744	1402	1073	2091	0	2085	2055
2019	2254	2078	1790	1460	1128	2110	0	2105	2078
2020	2269	2101	1829	1508	1177	2131	0	2121	2101
2021	2272	2125	1860	1546	1216	2156	0	2149	2125
2022	2294	2143	1889	1583	1250	2172	0	2162	2143
2023	2295	2167	1920	1612	1284	2198	0	2185	2167
2024	2305	2185	1951	1644	1313	2212	0	2198	2185
2025	2303	2197	1971	1673	1343	2219	0	2202	2197
2026	2300	2199	1977	1687	1363	2222	0	2206	2199
2027	2307	2211	1992	1706	1379	2230	0	2217	2211
2028	2318	2223	2001	1713	1393	2245	0	2229	2223
2029	2304	2214	2011	1729	1402	2235	0	2216	2214
2030	2312	2216	2012	1735	1414	2236	0	2220	2216
2040	2322	2236	2037	1769	1457	2255	0	2236	2236
2050	2312	2228	2026	1763	1458	2247	0	2229	2228

(d) Apply the 2010 OY with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2000	2000	2000	2000	2000	2000	2000	2000	2000
2010	2393	2393	2393	2393	2393	2393	2393	2393	2393
2011	1476	987	694	494	346	1037	0	543	987
2012	1677	1198	875	639	456	1251	0	962	1198
2013	1827	1381	1042	778	565	1433	0	1294	1381
2014	1937	1531	1189	905	667	1581	0	1539	1531
2015	2006	1645	1310	1015	758	1693	0	1708	1645
2016	2054	1736	1410	1109	838	1780	0	1823	1736
2017	2075	1803	1492	1192	911	1843	0	1889	1803
2018	2095	1854	1556	1259	970	1891	0	1926	1854
2019	2118	1898	1613	1318	1024	1931	0	1958	1898
2020	2133	1933	1658	1365	1070	1963	0	1987	1933
2021	2152	1959	1698	1407	1110	1991	0	2008	1959
2022	2169	1991	1741	1449	1149	2020	0	2035	1991
2023	2196	2027	1780	1489	1186	2055	0	2056	2027
2024	2195	2051	1809	1523	1217	2078	0	2078	2051
2025	2189	2059	1827	1548	1243	2086	0	2082	2059
2026	2205	2072	1842	1566	1261	2098	0	2095	2072
2027	2221	2089	1862	1582	1280	2113	0	2106	2089
2028	2214	2098	1877	1600	1296	2122	0	2109	2098
2029	2215	2093	1883	1608	1305	2112	0	2104	2093
2030	2218	2102	1882	1616	1315	2125	0	2109	2102
2040	2251	2141	1927	1664	1368	2160	0	2142	2141
2050	2238	2134	1928	1668	1375	2157	0	2136	2134

(e) Apply the catch of 1200 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2000	2000	2000	2000	2000	2000	2000	2000	2000
2010	1200	1200	1200	1200	1200	1200	1200	1200	1200
2011	1748	1170	823	586	411	1154	0	810	1170
2012	1908	1369	1001	732	523	1352	0	1191	1369
2013	2010	1528	1157	866	630	1512	0	1474	1528
2014	2074	1653	1289	985	727	1638	0	1672	1653
2015	2106	1744	1395	1085	812	1730	0	1803	1744
2016	2128	1816	1483	1171	887	1803	0	1890	1816
2017	2137	1868	1554	1246	954	1857	0	1933	1868
2018	2141	1912	1610	1305	1010	1902	0	1958	1912
2019	2155	1945	1660	1360	1060	1936	0	1985	1945
2020	2167	1970	1697	1402	1102	1960	0	2011	1970
2021	2180	1990	1730	1440	1135	1981	0	2027	1990
2022	2189	2018	1769	1477	1173	2010	0	2053	2018
2023	2212	2048	1802	1511	1206	2041	0	2069	2048
2024	2207	2068	1830	1543	1235	2060	0	2089	2068
2025	2203	2074	1841	1563	1258	2065	0	2089	2074
2026	2213	2088	1857	1581	1274	2081	0	2101	2088
2027	2227	2100	1873	1594	1291	2093	0	2111	2100
2028	2219	2105	1886	1610	1304	2098	0	2113	2105
2029	2218	2099	1890	1618	1314	2094	0	2107	2099
2030	2221	2105	1889	1623	1322	2098	0	2111	2105
2040	2252	2141	1928	1665	1369	2134	0	2142	2141
2050	2238	2134	1929	1668	1375	2127	0	2136	2134

(f) Apply the catch of 300 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2000	2000	2000	2000	2000	2000	2000	2000	2000
2010	300	300	300	300	300	300	300	300	300
2011	1955	1309	921	655	460	1321	0	1010	1309
2012	2083	1497	1097	802	574	1509	0	1362	1497
2013	2147	1638	1244	932	678	1649	0	1608	1638
2014	2176	1744	1364	1044	772	1754	0	1772	1744
2015	2181	1817	1459	1137	852	1825	0	1875	1817
2016	2182	1874	1536	1216	923	1882	0	1933	1874
2017	2179	1916	1600	1285	987	1923	0	1962	1916
2018	2174	1949	1647	1339	1038	1955	0	1983	1949
2019	2181	1977	1695	1390	1085	1984	0	2005	1977
2020	2192	1998	1728	1428	1123	2004	0	2028	1998
2021	2196	2017	1754	1463	1154	2022	0	2041	2017
2022	2206	2037	1789	1495	1191	2042	0	2064	2037
2023	2223	2062	1816	1526	1219	2066	0	2077	2062
2024	2215	2082	1842	1556	1249	2086	0	2095	2082
2025	2212	2081	1853	1574	1268	2086	0	2094	2081
2026	2218	2096	1866	1591	1284	2101	0	2107	2096
2027	2232	2107	1880	1604	1300	2111	0	2116	2107
2028	2222	2109	1892	1617	1310	2114	0	2115	2109
2029	2220	2103	1896	1624	1319	2106	0	2109	2103
2030	2225	2108	1893	1627	1327	2112	0	2113	2108
2040	2000	2000	2000	2000	2000	2000	2000	2000	2000
2050	300	300	300	300	300	300	300	300	300

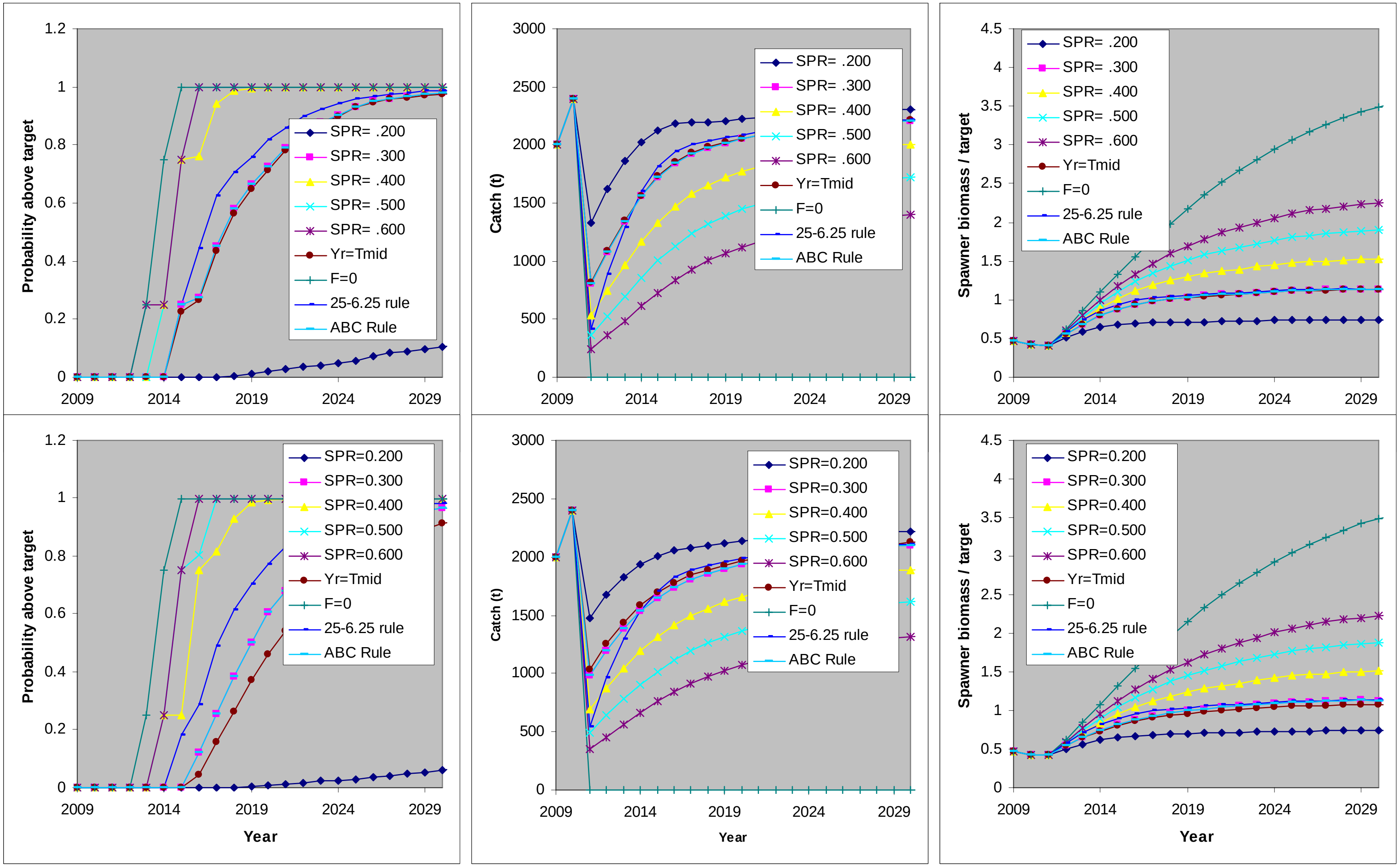
(g) Apply the catch of 1800 mt in 2010 with the 2009 fleet allocation.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2000	2000	2000	2000	2000	2000	2000	2000	2000
2010	1800	1800	1800	1800	1800	1800	1800	1800	1800
2011	1494	912	602	409	277	942	0	552	912
2012	1757	1180	818	573	396	1213	0	1002	1180
2013	1959	1424	1031	742	523	1458	0	1383	1424
2014	2092	1624	1221	901	646	1656	0	1667	1624
2015	2169	1774	1381	1042	759	1804	0	1860	1774
2016	2209	1882	1507	1162	859	1909	0	1976	1882
2017	2212	1955	1608	1262	947	1978	0	2025	1955
2018	2211	2000	1683	1344	1024	2021	0	2053	2000
2019	2221	2034	1740	1410	1083	2053	0	2076	2034
2020	2235	2066	1786	1466	1138	2082	0	2096	2066
2021	2247	2095	1825	1509	1182	2110	0	2125	2095
2022	2271	2119	1858	1552	1222	2136	0	2142	2119
2023	2280	2147	1895	1587	1258	2164	0	2170	2147
2024	2298	2170	1928	1621	1293	2186	0	2186	2170
2025	2296	2183	1952	1653	1324	2197	0	2193	2183
2026	2293	2190	1965	1673	1349	2203	0	2199	2190
2027	2305	2203	1978	1692	1366	2216	0	2212	2203
2028	2315	2217	1992	1704	1382	2230	0	2225	2217
2029	2302	2210	2003	1720	1394	2220	0	2214	2210
2030	2310	2212	2006	1729	1405	2221	0	2218	2212
2040	2322	2236	2036	1768	1456	2247	0	2236	2236
2050	2312	2228	2026	1763	1458	2239	0	2229	2228

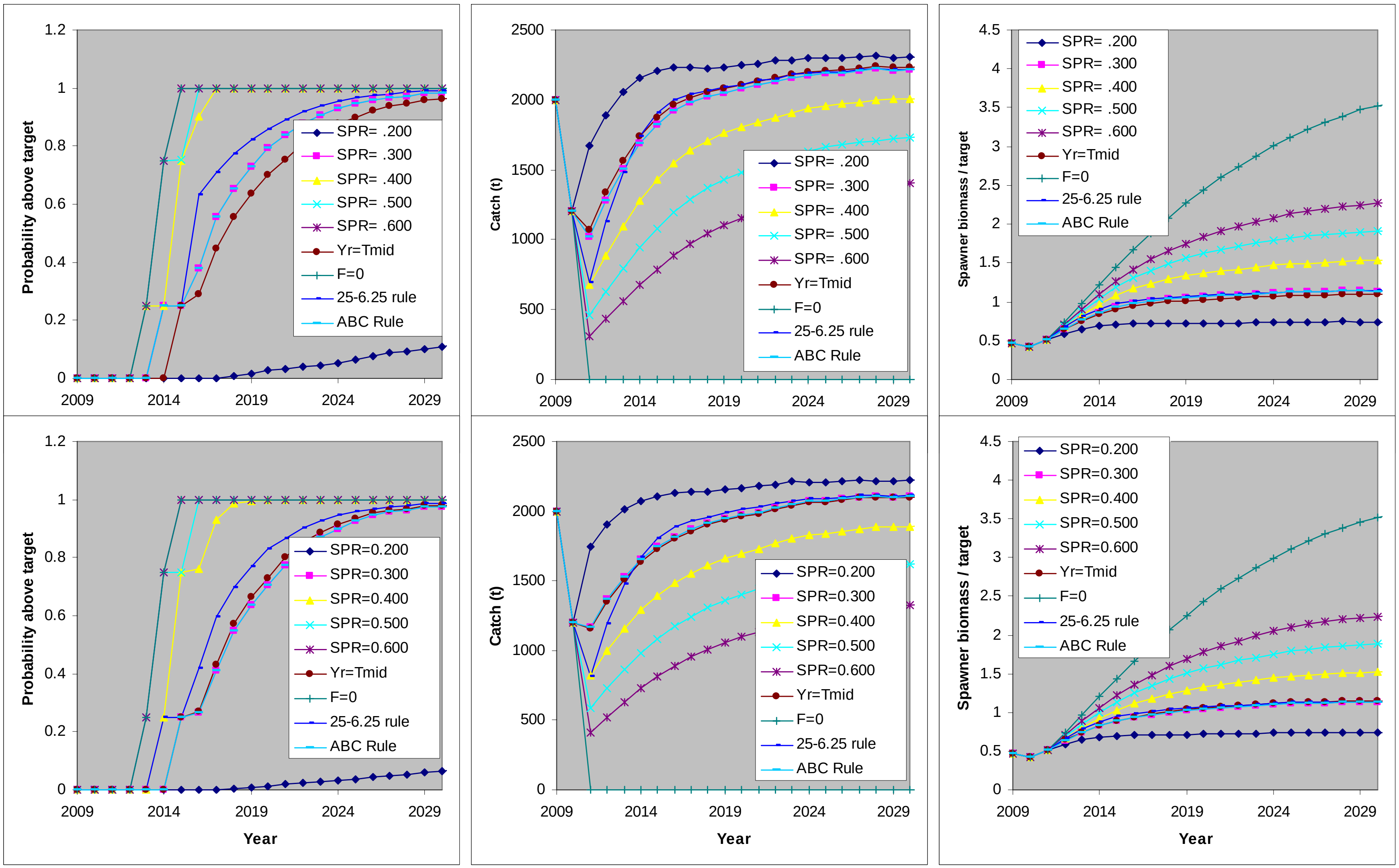
(h) Apply the catch of 900 mt in 2010 with no winter fishery.

	Run #								
	1a	1b	1c	1d	1e	2	3	4	5
2009	2000	2000	2000	2000	2000	2000	2000	2000	2000
2010	900	900	900	900	900	900	900	900	900
2011	1817	1216	855	609	427	1189	0	877	1216
2012	1966	1411	1033	755	540	1384	0	1248	1411
2013	2056	1565	1186	888	646	1538	0	1519	1565
2014	2108	1683	1315	1004	742	1659	0	1706	1683
2015	2131	1768	1416	1102	825	1745	0	1827	1768
2016	2146	1835	1501	1186	899	1815	0	1906	1835
2017	2152	1884	1569	1259	965	1865	0	1942	1884
2018	2152	1925	1622	1317	1020	1908	0	1967	1925
2019	2164	1956	1672	1370	1069	1940	0	1992	1956
2020	2174	1980	1707	1410	1109	1965	0	2017	1980
2021	2185	2000	1737	1448	1142	1985	0	2032	2000
2022	2193	2024	1775	1483	1180	2011	0	2056	2024
2023	2215	2054	1807	1516	1211	2040	0	2071	2054
2024	2210	2072	1835	1546	1240	2059	0	2091	2072
2025	2207	2076	1845	1567	1262	2063	0	2091	2076
2026	2214	2090	1860	1584	1277	2078	0	2103	2090
2027	2229	2103	1875	1597	1294	2091	0	2113	2103
2028	2220	2107	1888	1612	1306	2096	0	2114	2107
2029	2218	2100	1892	1620	1316	2091	0	2108	2100
2030	2223	2106	1890	1624	1324	2095	0	2112	2106
2040	2252	2141	1928	1665	1369	2129	0	2142	2141
2050	2238	2134	1929	1668	1375	2122	0	2136	2134

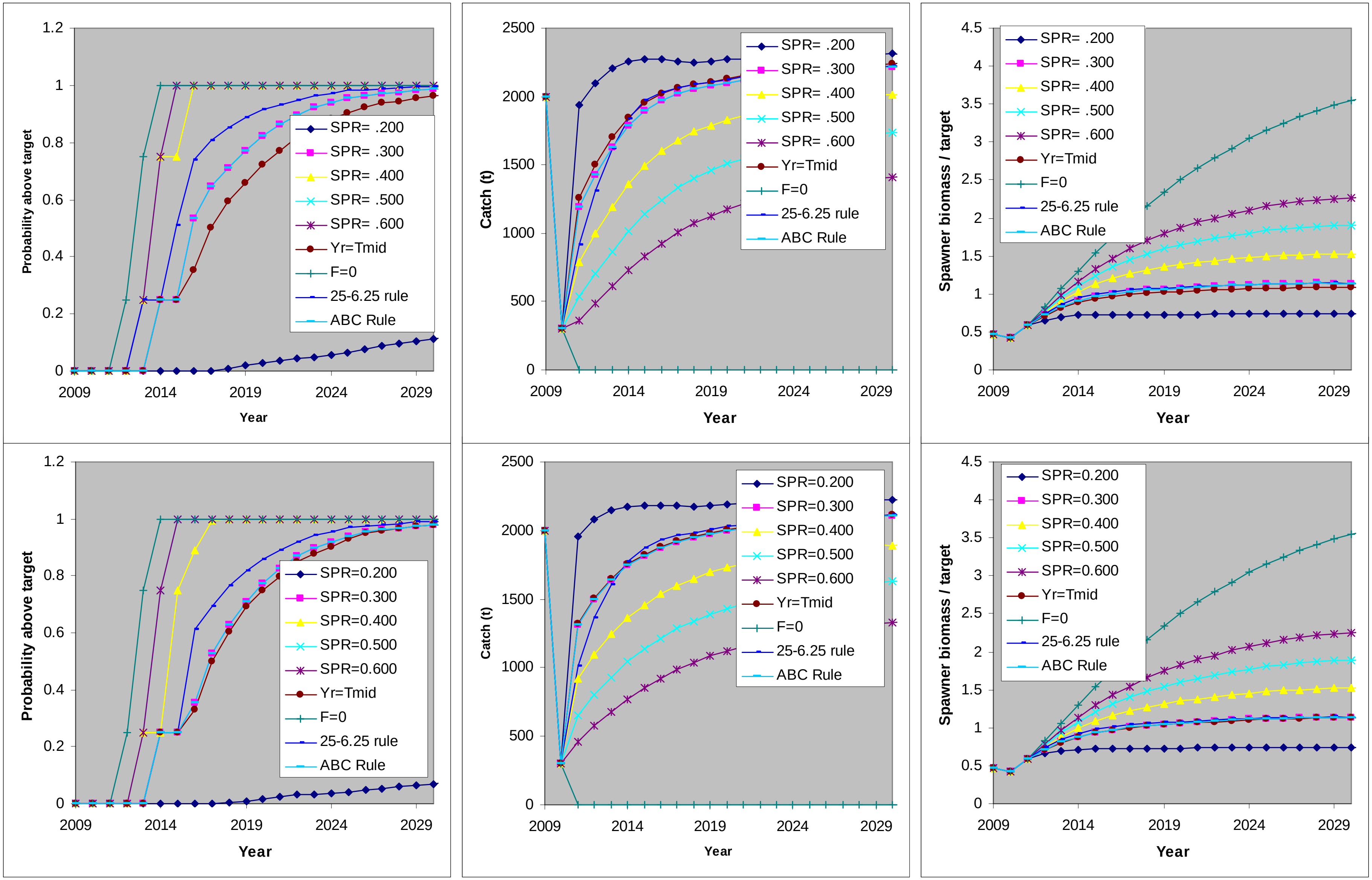
Figures



(a) Apply the 2009-2010 OY. The top panel shows results for options that use the 2009 fleet allocation. The bottom panel shows results for options that eliminate the winter fishery.



(b) Apply the catches of 2000 mt in 2009 and 1200 mt in 2010. The top panel shows results for options that use the 2009 fleet allocation. The bottom panel shows results for options that eliminate the winter fishery.



(c) Apply the catches of 2000 mt in 2009 and 300 mt in 2010. The top panel shows results for options that use the 2009 fleet allocation. The bottom panel shows results for options that eliminate the winter fishery.

Figure 1. The left panel: the probability of recovery for rebuilding alternatives 1-5. The middle panel: the projected median catch (mt) for rebuilding alternatives 1-5. The right panel: the projected median spawning biomass / target biomass for rebuilding alternatives 1-5.

Appendix A. Basic input file for rebuilding analyses.

Rebuild.dat for 2009 petrale rebuiding
Petrale.SSv3.04
Number of sexes
2
Age range to consider (minimum age; maximum age)
0 40
Number of fleets to consider
6
First year of projection (Yinit)
2009
First year the OY could have been zero under a rebuilding plan (Ydecl)
2011
Number of simulations
1000
Maximum number of years
200
Conduct projections for multiple starting values (0=No;else yes)
1
Number of parameter vectors
4
Is the maximum age a plus-group (1=Yes;2=No)
1
Generate future recruitments using historical recruitments (1), historical recruits/spawner (2), or a stock-recruitment (3)
3
Constant fishing mortality (1) or constant Catch (2) projections
1
Fishing mortality based on SPR (1) or actual rate (2)
1
Pre-specify the year of recovery (or -1) to ignore
-1
Fecundity-at-age
A blank comment line - needed for the program to run
0 0 0 4.87529e-006 0.000678759 0.0238077 0.168393 0.428812 0.67624 0.887689 1.08158 1.26471 1.43681 1.59644 1.74262 1.87502 1.99387 2.09908 2.19199 2.27372 2.3453 2.40775 2.46207 2.50919 2.54998 2.58523 2.61563 2.64182 2.66436 2.68374 2.70038 2.71467 2.72692 2.73743 2.74643 2.75415 2.76075 2.76641 2.77125 2.7754 2.77894 #female fecundity; weighted by N in year Y_init across morphs and areas
wgt and sel by gender/fleet
#wt and selex for gender,fleet: 1 1
0.00223969 0.0154754 0.0492871 0.0950751 0.198433 0.336981 0.500822 0.679875 0.865112 1.04924 1.22687 1.39447 1.55019 1.6935 1.82456 1.94378 2.0516 2.14679 2.23177 2.30716 2.37365 2.43201 2.48301 2.52743 2.56601 2.59942 2.62831 2.65323 2.67471 2.69319 2.70908 2.72273 2.73445 2.7445 2.75312 2.7605 2.76683 2.77225 2.77689 2.78086 2.78426
1.17336e-007 3.54765e-007 3.54765e-007 5.51273e-006 7.82484e-005 0.00130654 0.00964235 0.0398554 0.108612 0.219514 0.358231 0.501938 0.631245 0.735896 0.814218 0.869731 0.907781 0.933444 0.95155 0.963908 0.972429 0.978389 0.982625 0.985689 0.987944 0.98963 0.990911 0.991899 0.992669 0.993278 0.993764 0.994155 0.994472 0.994732 0.994945 0.995122 0.995269 0.995391 0.995493 0.99558 0.995652 0.995713
#wt and selex for gender,fleet: 1 2
0.0152562 0.0356226 0.058373 0.118555 0.227685 0.367997 0.529468 0.702592 0.879496 1.05514 1.2271 1.39345 1.55163 1.69919 1.8345 1.95693 2.06615 2.16273 2.24792 2.32267 2.388 2.44489 2.49429 2.53708 2.57409 2.60602 2.63355 2.65725 2.67762 2.69513 2.71016 2.72306 2.73412 2.7436 2.75172 2.75868 2.76463 2.76973 2.7741 2.77783 2.78103
2.92678e-006 0.000125003 0.00189626 0.0148808 0.0704597 0.197008 0.385604 0.589606 0.760814 0.876742 0.942133 0.974199 0.988599 0.994825 0.997524 0.998732 0.999326 0.999633 0.999788 0.99987 0.999916 0.999942 0.999959 0.999969 0.999976 0.999981 0.999984 0.999987 0.999988 0.99999 0.999991 0.999992 0.999992 0.999993 0.999993 0.999993 0.999994 0.999994 0.999994 0.999994 0.999994
#wt and selex for gender,fleet: 1 3
0.00198288 0.00699777 0.0223923 0.147266 0.274473 0.398989 0.531628 0.667469 0.808689 0.962327 1.12884

1.2999 1.4663 1.62248 1.76593 1.89588 2.01245 2.11541 2.20638 2.28634 2.35632 2.41734 2.4704 2.51641 2.55622 2.59061 2.62027 2.64582 2.6678 2.68669 2.70292 2.71684 2.72879 2.73903 2.7478 2.75532 2.76176 2.76727 2.77199 2.77603 2.77948
1.3657e-007 2.85353e-007 5.80957e-007 4.21094e-006 0.000673523 0.0186236 0.137666 0.418366 0.719824 0.899075 0.969779 0.99161 0.997646 0.999292 0.999764 0.999911 0.999962 0.999984 0.999993 0.999996 0.999998 0.999999 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
#wt and selex for gender,fleet: 1 4
0.0035563 0.0139004 0.0506138 0.12998 0.237531 0.365165 0.507834 0.66553 0.839848 1.02353 1.20625 1.38119 1.54485 1.69549 1.83245 1.95574 2.06546 2.16232 2.24767 2.32251 2.38788 2.44481 2.49423 2.53704 2.57405 2.60599 2.63353 2.65722 2.6776 2.69511 2.71015 2.72304 2.7341 2.74358 2.75171 2.75867 2.76462 2.76972 2.77409 2.77782 2.78102
0.000319845 0.000817062 0.00242979 0.019844 0.134295 0.412277 0.728097 0.916316 0.981476 0.996631 0.999425 0.999898 0.99998 0.999995 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
#wt and selex for gender,fleet: 1 5
0.00742209 0.0311093 0.049553 0.0893624 0.185 0.313772 0.465839 0.631669 0.80304 0.974651 1.14462 1.31181 1.47355 1.62651 1.76813 1.89711 2.01317 2.11582 2.20662 2.28649 2.35642 2.41741 2.47045 2.51645 2.55625 2.59064 2.62029 2.64584 2.66781 2.6867 2.70293 2.71685 2.7288 2.73904 2.74781 2.75533 2.76177 2.76728 2.772 2.77604 2.77949
1.1128e-007 2.39361e-006 9.12663e-005 0.00116754 0.0139556 0.0725189 0.213696 0.424487 0.642557 0.810394 0.911498 0.961877 0.984038 0.993207 0.996964 0.998546 0.999246 0.999611 0.999787 0.999875 0.999922 0.999949 0.999965 0.999974 0.999981 0.999985 0.999988 0.99999 0.999991 0.999992 0.999993 0.999994 0.999994 0.999995 0.999995 0.999995 0.999996 0.999996 0.999996 0.999996 0.999996
#wt and selex for gender,fleet: 1 6
0.00450419 0.0383035 0.0846485 0.15416 0.257929 0.378664 0.512463 0.664894 0.838615 1.023 1.20609 1.38115 1.54483 1.69548 1.83245 1.95574 2.06546 2.16232 2.24767 2.32251 2.38788 2.44481 2.49423 2.53704 2.57405 2.60599 2.63353 2.65722 2.6776 2.69511 2.71015 2.72304 2.7341 2.74358 2.75171 2.75867 2.76462 2.76972 2.77409 2.77782 2.78102
9.20058e-007 6.93433e-006 0.0002241 0.0070759 0.0900655 0.37002 0.724316 0.925352 0.985921 0.997805 0.999671 0.999947 0.99999 0.999998 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
#wt and selex for gender,fleet: 2 1
0.00136552 0.00553294 0.0170847 0.0440535 0.240718 0.355074 0.456919 0.542351 0.613161 0.672829 0.723346 0.765629 0.800512 0.829014 0.852249 0.87128 0.887044 0.895103 0.901208 0.905818 0.90929 0.9119 0.913859 0.915327 0.916428 0.917252 0.917869 0.91833 0.918675 0.918933 0.919126 0.919271 0.919379 0.919459 0.91952 0.919565 0.919599 0.919624 0.919643 0.919657 0.919667
1.02105e-007 2.2213e-007 4.81137e-007 5.89678e-007 9.22308e-005 0.00874665 0.0899119 0.288031 0.508811 0.671407 0.771148 0.828831 0.861943 0.880967 0.89169 0.897307 0.899643 0.905616 0.90991 0.913025 0.915301 0.916973 0.918207 0.919121 0.919798 0.920302 0.920678 0.920957 0.921166 0.921321 0.921437 0.921524 0.921589 0.921637 0.921673 0.9217 0.921721 0.921736 0.921747 0.921755 0.921762
#wt and selex for gender,fleet: 2 2
0.0025337 0.0171633 0.0538248 0.11742 0.218145 0.322057 0.418027 0.504453 0.581254 0.646984 0.701198 0.744801 0.77936 0.806559 0.827943 0.844822 0.857009 0.865281 0.871511 0.876195 0.879711 0.882347 0.884322 0.885801 0.886908 0.887736 0.888356 0.888819 0.889166 0.889425 0.889618 0.889763 0.889872 0.889952 0.890013 0.890058 0.890092 0.890117 0.890136 0.89015 0.890161
1.36297e-006 5.12941e-006 0.000150819 0.00803068 0.120189 0.424266 0.723509 0.884088 0.949028 0.973993 0.984196 0.988723 0.990823 0.991741 0.992002 0.991842 0.992045 0.992657 0.993087 0.993394 0.993615 0.993777 0.993895 0.993982 0.994046 0.994094 0.99413 0.994156 0.994176 0.99419 0.994201 0.994209 0.994216 0.99422 0.994224 0.994226 0.994228 0.994229 0.99423 0.994231 0.994232
#wt and selex for gender,fleet: 2 3
0.00136552 0.00553295 0.0170862 0.0512975 0.241992 0.33237 0.410865 0.48373 0.555014 0.621447 0.679138 0.726863 0.76528 0.795787 0.819896 0.838989 0.854225 0.863563 0.870615 0.875925 0.879916 0.882912 0.885158 0.886841 0.888101 0.889044 0.88975 0.890277 0.890672 0.890967 0.891188 0.891353 0.891476 0.891569 0.891638 0.891689 0.891728 0.891756 0.891778 0.891794 0.891806
1.19964e-007 2.60983e-007 5.65324e-007 7.43859e-007 0.000863034 0.0625928 0.368394 0.705568 0.877387 0.944005 0.96955 0.980155 0.984892 0.987012 0.987787 0.987763 0.987197 0.988355 0.98916 0.989729 0.990138 0.990434 0.990651 0.99081 0.990927 0.991014 0.991078 0.991126 0.991161 0.991188 0.991208 0.991223 0.991234 0.991242 0.991248 0.991253 0.991256 0.991259 0.991261 0.991262 0.991263
#wt and selex for gender,fleet: 2 4
0.00251835 0.0102905 0.0282833 0.120151 0.222586 0.316579 0.40647 0.493961 0.573841 0.641856 0.697387 0.741688 0.776584 0.803903 0.825265 0.842022 0.85422 0.86265 0.868995 0.873762 0.877338 0.880019 0.882027 0.883531 0.884656 0.885498 0.886127 0.886598 0.88695 0.887213 0.88741 0.887557 0.887667 0.88775 0.887811 0.887857 0.887891 0.887917 0.887936 0.887951 0.887961

```
 0.000278474 0.000735982 0.00120641 0.00766725 0.158632 0.567455 0.859591 0.959489 0.986426 0.994136
0.996722 0.997718 0.998117 0.998239 0.998201 0.99805 0.998057 0.998237 0.998362 0.99845 0.998512
0.998558 0.998591 0.998615 0.998633 0.998647 0.998656 0.998664 0.998669 0.998673 0.998676 0.998678
0.99868 0.998681 0.998682 0.998683 0.998684 0.998684 0.998684 0.998684 0.998685
 #wt and selex for gender,fleet: 2 5
 0.00136552 0.005533 0.017088 0.0524822 0.251414 0.322684 0.389557 0.463106 0.540492 0.611968 0.672599
0.721871 0.761059 0.791898 0.816076 0.835061 0.850062 0.859678 0.866929 0.872383 0.876479 0.879552
0.881855 0.88358 0.884871 0.885837 0.88656 0.8871 0.887505 0.887807 0.888033 0.888202 0.888328 0.888423
0.888493 0.888546 0.888586 0.888615 0.888637 0.888654 0.888666
 7.76321e-008 1.6889e-007 3.65899e-007 4.77942e-007 0.0016443 0.12418 0.557766 0.857092 0.955505
0.983141 0.991716 0.994817 0.996055 0.996522 0.996592 0.996412 0.996038 0.996456 0.996741 0.996941
0.997083 0.997185 0.99726 0.997314 0.997354 0.997384 0.997406 0.997422 0.997434 0.997443 0.99745
0.997455 0.997458 0.997461 0.997463 0.997465 0.997466 0.997467 0.997468 0.997468 0.997468
 #wt and selex for gender,fleet: 2 6
 0.00251834 0.0102836 0.0285116 0.174454 0.254144 0.327291 0.407223 0.492947 0.573013 0.641304 0.696996
0.741378 0.776312 0.803645 0.825006 0.841752 0.853952 0.862398 0.868754 0.873529 0.877112 0.879797
0.881809 0.883315 0.884442 0.885285 0.885915 0.886387 0.88674 0.887003 0.887201 0.887348 0.887458
0.887541 0.887602 0.887648 0.887683 0.887708 0.887727 0.887742 0.887753
 7.7606e-007 2.05054e-006 3.30618e-006 0.000435334 0.0843968 0.53097 0.869103 0.967776 0.990387
0.996125 0.9979 0.998543 0.998781 0.998831 0.99877 0.998622 0.998611 0.998749 0.998844 0.998911 0.998958
0.998993 0.999017 0.999036 0.999049 0.999059 0.999066 0.999072 0.999076 0.999079 0.999081 0.999083
0.999084 0.999085 0.999086 0.999086 0.999087 0.999087 0.999087 0.999087 0.999088
# Age specific information (Females then males), natural mortality and numbers at age
# Females
 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324
0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324
0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324
0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324 0.150324
 6655.95 5657.95 4689.12 4265.31 4532.23 2884.95 1384.65 1136.3 763.097 566.562 346.76 311.828 156.65
38.8373 19.2256 8.11082 6.99515 1.66341 0.576062 0.648094 0.258535 0.112238 0.0361549 0.0103088
0.00468696 0.00335243 0.00162228 0.000353395 0.000181416 7.5933e-005 5.37151e-005 1.35773e-005
6.36678e-006 5.78906e-006 2.2484e-006 6.04507e-007 3.46524e-007 1.16792e-007 6.8162e-008 4.91794e-008
4.3854e-008
# Males
 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536
0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536
0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536
0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536 0.167536
 6713.48 5593.4 4556.56 4074.71 4262.75 2666.1 1199.56 843.294 477.207 318.461 182.957 150.104 65.672
14.5163 6.82351 2.86107 2.54202 0.623517 0.2178 0.245594 0.0957433 0.0389686 0.0115672 0.00307937
0.00132058 0.000917147 0.000436098 9.66802e-005 5.23196e-005 2.26639e-005 1.64726e-005 4.50797e-006
2.33585e-006 2.29076e-006 9.13661e-007 2.46111e-007 1.44723e-007 5.08731e-008 3.04547e-008 2.23463e-008
2.16376e-008
# Age-structure at the start of year Yinit^0
 6655.95 5657.95 4689.12 4265.31 4532.23 2884.95 1384.65 1136.3   763.097 566.562 346.76   311.828 156.65
        38.8373 19.2256 8.11082 6.99515 1.66341 0.576062        0.648094        0.258535
        0.112238        0.0361549       0.0103088       0.00468696      0.00335243      0.00162228
        0.000353395     0.000181416     7.59E-05        5.37E-05        1.36E-05        6.37E-06
        5.79E-06        2.25E-06        6.05E-07        3.47E-07        1.17E-07        6.82E-08
        4.92E-08        4.39E-08
 6713.48 5593.4  4556.56 4074.71 4262.75 2666.1   1199.56 843.294 477.207 318.461 182.957 150.104 65.672
        14.5163 6.82351 2.86107 2.54202 0.623517        0.2178  0.245594        0.0957433
        0.0389686       0.0115672       0.00307937      0.00132058      0.000917147     0.000436098
        9.67E-05        5.23E-05        2.27E-05        1.65E-05        4.51E-06        2.34E-06
        2.29E-06        9.14E-07        2.46E-07        1.45E-07        5.09E-08        3.05E-08
        2.23E-08        2.16E-08
# Year Yinit^0 (used to compute the stock size at the start of year Ydecl)
2009
# Recruitment and Spanwer biomasses
# Number of historical assessment years
135
```

Historical data: Year, Recruitment, Spawner biomass, Used to compute B0, Used to project based
on R, Used to project based on R/S
 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894
1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914
1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934
1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954
1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974
1975 1976
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 #years (with first value representing R0)
 14344.6 13604.4 13604.4 13604.4 13604.4 13604.4 13604.3 13604.2 13604.1 13603.9 13603.6 13603.4 13603.1
13602.7 13602.4 13602 13601.6 13601.1 13600.7 13600.2 13599.7 13599.3 13598.8 13598.2 13597.7 13597.2
13596.6 13596.1 13595.5 13595 13594.4 13593.8 13593.2 13592.6 13592 13591.4 13590.8 13590.2 13589.5
13588.9 13588.3 13587.6 13587 13585.6 13584.9 13584.8 13585.4 13585.6 13585 13584.5 13583.3 13582.2
13581.2 13579.6 13578.2 13576.3 13574.8 13573.4 13571.2 13568.8 13561.2 13553.7 13548.7 13539.1 21489.4

18106.9 14729 12738.2 12684.9 14400.7 15114.5 14478.2 13508.5 12616.5 11944.7 11676 11851.6 11893
12066.6 12634 12166.9 10303.4 9589.35 10786 13582.3 17507.1 9033.8 8910.13 11458.6 9245.99 30054.6
13621.2 17088.5 12525.9 12631.4 14363.4 9504.33 7718.52 10557.8 8259.72 13859.8 16578.2 8663.24 8810.94
16168.6 10162 10421.4 8418.28 15598.3 12849.3 7136.94 6325.33 9234.88 12535.1 13228.3 15607.9 6572.89
8896.18 17349.8 9318.35 10272.7 9792.05 19327.2 19869.3 11966.6 10903.3 8562.77 8160.99 7164.5 11897.2
15771
12740.4 12048.8 12508.7 12348 #recruits; first value is R0 (virgin)
 25333.9 25333.9 25333.2 25332.5 25331.9 25331.4 25323.6 25309 25288 25261 25228.5 25191.1 25149.3
25103.5 25054.1 25001.5 24946.2 24888.3 24828.3 24766.4 24702.8 24637.7 24571.4 24503.9 24435.4 24366
24295.9 24225.1 24153.7 24081.8 24009.4 23936.6 23863.4 23789.9 23716.2 23642.2 23567.2 23492.1 23416.8
23341.4 23265.9 23190.3 23118 22957.3 22877 22866.9 22932.2 22955.6 22890.2 22826.3 22694.6 22573.2
22464.9 22290.6 22136.9 21935.2 21782 21632.7 21407.6 21177.5 20455.4 19792.2 19370 18609.5 17733.7
16773.9
 15858.7 15174.6 13746.9 12364.6 11867.4 11834.9 10981.7 10457 9066.91 7889.7 6490.02 6129.03 5940.25
6064.36 5751.03 5367.4 5325.92 4939.35 4822.18 4646.34 4468.07 3935.13 3556.49 3147.82 3116.62 3246.11
3475.36 3459.64 3461.59 3581.02 3828.63 4464.6 4769.97 5104.87 4887.36 4463.57 4217.01 4067.59 3536.81
2867.4 2726.21 2823.43 2819.63 2521.09 2567.12 2776.73 2855.82 2508.83 2342.19 2290.63 2220.85 1824.11
1620.19 1651.85 1982.83 2372.96 2481.11 2321.33 2474.88 2765.22 2810.33 2798.38 3029.95 3706.38 4160.69
3949.83 3818.04 3349.59 2937.58 #spbio; first value is S0 (virgin)
 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 # in Bzero
 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 0 0 0 # in R project
 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 0 0 0 # in R/S project
Number of years with pre-specified catches
2
Catches for years with pre-specified catches
2009 2000
2010 1200
Number of future recruitments to override
-2
Process for overiding (-1 for average otherwise index in data list)
Which probability to product detailed results for (1=0.5,2=0.6,etc.)
3
Steepness and sigma-R and auto-correlations
 0.949306 0.4 0
Target SPR rate (FMSY Proxy)
0.300000
Discount rate (for cumulative catch)
0.100000
Truncate the series when 0.4B0 is reached (1=Yes)

```
0
# Set F to FMSY once 0.4B0 is reached (1=Yes; 2=Apply 40:10 rule after recovery)
0
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Defintion of recovery (1=now only;2=now or before)
2
# Projection type (1,2,3 or 4(years), 11(spr))
11
# Definition of the 40-10 rule
6.25 25
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# First Random number seed
-89102
# File with multiple parameter vectors
rebuild.uncert.dat
# User-specific projection (1=Yes); Output replaced (1->6)
0 5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2011 1 1
-1 -1 -1
# Fixed catch project (1=Yes); Output replaced (1-9); Approach (-1=Real)
0 2 -1
# Split of Fs
2009 0.452307 0.0794245 0.367972 0.0474743 0.4932 0.138997
-1 1 1 1 1 1 1
# Five pre-specified years (used to define Ttarget for option 4)
 0.20 0.30 0.40 0.50 0.60
 # Year for which a probability of recovery is needed
2014 2015 2016 2017 2018 2019 2020 2021
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
PetWgt.Csv
# Use bisection (0) or linear interpolation (1)
1
# Target Depletion
0.25
# CV of implementation error
0
```

Appendix B. Parameter vector input file for rebuilding analyses.

base 1 - A blank comment line - needed for the program to run
0 0 0 4.87529e-006 0.000678759 0.0238077 0.168393 0.428812 0.67624 0.887689 1.08158 1.26471 1.43681 1.59644 1.74262 1.87502 1.99387 2.09908 2.19199 2.27372 2.3453 2.40775 2.46207 2.50919 2.54998 2.58523 2.61563 2.64182 2.66436 2.68374 2.70038 2.71467 2.72692 2.73743 2.74643 2.75415 2.76075 2.76641 2.77125 2.7754 2.77894 #female fecundity; weighted by N in year Y_init across morphs and areas
0.00223969 0.0154754 0.0492871 0.0950751 0.198433 0.336981 0.500822 0.679875 0.865112 1.04924 1.22687 1.39447 1.55019 1.6935 1.82456 1.94378 2.0516 2.14679 2.23177 2.30716 2.37365 2.43201 2.48301 2.52743 2.56601 2.59942 2.62831 2.65323 2.67471 2.69319 2.70908 2.72273 2.73445 2.7445 2.75312 2.7605 2.76683 2.77225 2.77689 2.78086 2.78426
1.17336e-007 3.54765e-007 3.54765e-007 5.51273e-006 7.82484e-005 0.00130654 0.00964235 0.0398554 0.108612 0.219514 0.358231 0.501938 0.631245 0.735896 0.814218 0.869731 0.907781 0.933444 0.95155 0.963908 0.972429 0.978389 0.982625 0.985689 0.987944 0.98963 0.990911 0.991899 0.992669 0.993278 0.993764 0.994155 0.994472 0.994732 0.994945 0.995122 0.995269 0.995391 0.995493 0.99558 0.995652 0.995713
0.0152562 0.0356226 0.058373 0.118555 0.227685 0.367997 0.529468 0.702592 0.879496 1.05514 1.2271 1.39345 1.55163 1.69919 1.8345 1.95693 2.06615 2.16273 2.24792 2.32267 2.388 2.44489 2.49429 2.53708 2.57409 2.60602 2.63355 2.65725 2.67762 2.69513 2.71016 2.72306 2.73412 2.7436 2.75172 2.75868 2.76463 2.76973 2.7741 2.77783 2.78103
2.92678e-006 0.000125003 0.00189626 0.0148808 0.0704597 0.197008 0.385604 0.589606 0.760814 0.876742 0.942133 0.974199 0.988599 0.994825 0.997524 0.998732 0.999326 0.999633 0.999788 0.99987 0.999916 0.999942 0.999959 0.999969 0.999976 0.999981 0.999984 0.999987 0.999988 0.99999 0.999991 0.999992 0.999992 0.999993 0.999993 0.999993 0.999994 0.999994 0.999994 0.999994 0.999994
0.00198288 0.00699777 0.0223923 0.147266 0.274473 0.398989 0.531628 0.667469 0.808689 0.962327 1.12884 1.2999 1.4663 1.62248 1.76593 1.89588 2.01245 2.11541 2.20638 2.28634 2.35632 2.41734 2.4704 2.51641 2.55622 2.59061 2.62027 2.64582 2.6678 2.68669 2.70292 2.71684 2.72879 2.73903 2.7478 2.75532 2.76176 2.76727 2.77199 2.77603 2.77948
1.3657e-007 2.85353e-007 5.80957e-007 4.21094e-006 0.000673523 0.0186236 0.137666 0.418366 0.719824 0.899075 0.969779 0.99161 0.997646 0.999292 0.999764 0.999911 0.999962 0.999984 0.999993 0.999996 0.999998 0.999999 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.0035563 0.0139004 0.0506138 0.12998 0.237531 0.365165 0.507834 0.66553 0.839848 1.02353 1.20625 1.38119 1.54485 1.69549 1.83245 1.95574 2.06546 2.16232 2.24767 2.32251 2.38788 2.44481 2.49423 2.53704 2.57405 2.60599 2.63353 2.65722 2.6776 2.69511 2.71015 2.72304 2.7341 2.74358 2.75171 2.75867 2.76462 2.76972 2.77409 2.77782 2.78102
0.000319845 0.000817062 0.00242979 0.019844 0.134295 0.412277 0.728097 0.916316 0.981476 0.996631 0.999425 0.999898 0.99998 0.999995 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00742209 0.0311093 0.049553 0.0893624 0.185 0.313772 0.465839 0.631669 0.80304 0.974651 1.14462 1.31181 1.47355 1.62651 1.76813 1.89711 2.01317 2.11582 2.20662 2.28649 2.35642 2.41741 2.47045 2.51645 2.55625 2.59064 2.62029 2.64584 2.66781 2.6867 2.70293 2.71685 2.7288 2.73904 2.74781 2.75533 2.76177 2.76728 2.772 2.77604 2.77949
1.1128e-007 2.39361e-006 9.12663e-005 0.00116754 0.0139556 0.0725189 0.213696 0.424487 0.642557 0.810394 0.911498 0.961877 0.984038 0.993207 0.996964 0.998546 0.999246 0.999611 0.999787 0.999875 0.999922 0.999949 0.999965 0.999974 0.999981 0.999985 0.999988 0.99999 0.999991 0.999992 0.999993 0.999994 0.999994 0.999995 0.999995 0.999995 0.999996 0.999996 0.999996 0.999996 0.999996
0.00450419 0.0383035 0.0846485 0.15416 0.257929 0.378664 0.512463 0.664894 0.838615 1.023 1.20609 1.38115 1.54483 1.69548 1.83245 1.95574 2.06546 2.16232 2.24767 2.32251 2.38788 2.44481 2.49423 2.53704 2.57405 2.60599 2.63353 2.65722 2.6776 2.69511 2.71015 2.72304 2.7341 2.74358 2.75171 2.75867 2.76462 2.76972 2.77409 2.77782 2.78102
9.20058e-007 6.93433e-006 0.0002241 0.0070759 0.0900655 0.37002 0.724316 0.925352 0.985921 0.997805 0.999671 0.999947 0.99999 0.999998 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00136552 0.00553294 0.0170847 0.0440535 0.240718 0.355074 0.456919 0.542351 0.613161 0.672829 0.723346 0.765629 0.800512 0.829014 0.852249 0.87128 0.887044 0.895103 0.901208 0.905818 0.90929 0.9119 0.913859 0.915327 0.916428 0.917252 0.917869 0.91833 0.918675 0.918933 0.919126 0.919271 0.919379 0.919459 0.91952 0.919565 0.919599 0.919624 0.919643 0.919657 0.919667
1.02105e-007 2.2213e-007 4.81137e-007 5.89678e-007 9.22308e-005 0.00874665 0.0899119 0.288031 0.508811 0.671407 0.771148 0.828831 0.861943 0.880967 0.89169 0.897307 0.899643 0.905616 0.90991 0.913025 0.915301 0.916973 0.918207 0.919121 0.919798 0.920302 0.920678 0.920957 0.921166 0.921321 0.921437 0.921524 0.921589 0.921637 0.921673 0.9217 0.921721 0.921736 0.921747 0.921755 0.921762
0.0025337 0.0171633 0.0538248 0.11742 0.218145 0.322057 0.418027 0.504453 0.581254 0.646984 0.701198 0.744801 0.77936 0.806559 0.827943 0.844822 0.857009 0.865281 0.871511 0.876195 0.879711 0.882347

0.884322 0.885801 0.886908 0.887736 0.888356 0.888819 0.889166 0.889425 0.889618 0.889763 0.889872 0.889952 0.890013 0.890058 0.890092 0.890117 0.890136 0.89015 0.890161
1.36297e-006 5.12941e-006 0.000150819 0.00803068 0.120189 0.424266 0.723509 0.884088 0.949028 0.973993 0.984196 0.988723 0.990823 0.991741 0.992002 0.991842 0.992045 0.992657 0.993087 0.993394 0.993615 0.993777 0.993895 0.993982 0.994046 0.994094 0.99413 0.994156 0.994176 0.99419 0.994201 0.994209 0.994216 0.99422 0.994224 0.994226 0.994228 0.994229 0.99423 0.994231 0.994232
0.00136552 0.00553295 0.0170862 0.0512975 0.241992 0.33237 0.410865 0.48373 0.555014 0.621447 0.679138 0.726863 0.76528 0.795787 0.819896 0.838989 0.854225 0.863563 0.870615 0.875925 0.879916 0.882912 0.885158 0.886841 0.888101 0.889044 0.88975 0.890277 0.890672 0.890967 0.891188 0.891353 0.891476 0.891569 0.891638 0.891689 0.891728 0.891756 0.891778 0.891794 0.891806
1.19964e-007 2.60983e-007 5.65324e-007 7.43859e-007 0.000863034 0.0625928 0.368394 0.705568 0.877387 0.944005 0.96955 0.980155 0.984892 0.987012 0.987787 0.987763 0.987197 0.988355 0.98916 0.989729 0.990138 0.990434 0.990651 0.99081 0.990927 0.991014 0.991078 0.991126 0.991161 0.991188 0.991208 0.991223 0.991234 0.991242 0.991248 0.991253 0.991256 0.991259 0.991261 0.991262 0.991263
0.00251835 0.0102905 0.0282833 0.120151 0.222586 0.316579 0.40647 0.493961 0.573841 0.641856 0.697387 0.741688 0.776584 0.803903 0.825265 0.842022 0.85422 0.86265 0.868995 0.873762 0.877338 0.880019 0.882027 0.883531 0.884656 0.885498 0.886127 0.886598 0.88695 0.887213 0.88741 0.887557 0.887667 0.88775 0.887811 0.887857 0.887891 0.887917 0.887936 0.887951 0.887961
0.000278474 0.000735982 0.00120641 0.00766725 0.158632 0.567455 0.859591 0.959489 0.986426 0.994136 0.996722 0.997718 0.998117 0.998239 0.998201 0.99805 0.998057 0.998237 0.998362 0.99845 0.998512 0.998558 0.998591 0.998615 0.998633 0.998647 0.998656 0.998664 0.998669 0.998673 0.998676 0.998678 0.99868 0.998681 0.998682 0.998683 0.998684 0.998684 0.998684 0.998684 0.998685
0.00136552 0.005533 0.017088 0.0524822 0.251414 0.322684 0.389557 0.463106 0.540492 0.611968 0.672599 0.721871 0.761059 0.791898 0.816076 0.835061 0.850062 0.859678 0.866929 0.872383 0.876479 0.879552 0.881855 0.88358 0.884871 0.885837 0.88656 0.8871 0.887505 0.887807 0.888033 0.888202 0.888328 0.888423 0.888493 0.888546 0.888586 0.888615 0.888637 0.888654 0.888666
7.76321e-008 1.6889e-007 3.65899e-007 4.77942e-007 0.0016443 0.12418 0.557766 0.857092 0.955505 0.983141 0.991716 0.994817 0.996055 0.996522 0.996592 0.996412 0.996038 0.996456 0.996741 0.996941 0.997083 0.997185 0.99726 0.997314 0.997354 0.997384 0.997406 0.997422 0.997434 0.997443 0.99745 0.997455 0.997458 0.997461 0.997463 0.997465 0.997466 0.997467 0.997468 0.997468 0.997468
0.00251834 0.0102836 0.0285116 0.174454 0.254144 0.327291 0.407223 0.492947 0.573013 0.641304 0.696996 0.741378 0.776312 0.803645 0.825006 0.841752 0.853952 0.862398 0.868754 0.873529 0.877112 0.879797 0.881809 0.883315 0.884442 0.885285 0.885915 0.886387 0.88674 0.887003 0.887201 0.887348 0.887458 0.887541 0.887602 0.887648 0.887683 0.887708 0.887727 0.887742 0.887753
7.7606e-007 2.05054e-006 3.30618e-006 0.000435334 0.0843968 0.53097 0.869103 0.967776 0.990387 0.996125 0.9979 0.998543 0.998781 0.998831 0.99877 0.998622 0.998611 0.998749 0.998844 0.998911 0.998958 0.998993 0.999017 0.999036 0.999049 0.999059 0.999066 0.999072 0.999076 0.999079 0.999081 0.999083 0.999084 0.999085 0.999086 0.999086 0.999087 0.999087 0.999087 0.999087 0.999088
0.150324 0.150324
6655.95 5657.95 4689.12 4265.31 4532.23 2884.95 1384.65 1136.3 763.097 566.562 346.76 311.828 156.65 38.8373 19.2256 8.11082 6.99515 1.66341 0.576062 0.648094 0.258535 0.112238 0.0361549 0.0103088 0.00468696 0.00335243 0.00162228 0.000353395 0.000181416 7.5933e-005 5.37151e-005 1.35773e-005 6.36678e-006 5.78906e-006 2.2484e-006 6.04507e-007 3.46524e-007 1.16792e-007 6.8162e-008 4.91794e-008 4.3854e-008
0.167536 0.167536
6713.48 5593.4 4556.56 4074.71 4262.75 2666.1 1199.56 843.294 477.207 318.461 182.957 150.104 65.672 14.5163 6.82351 2.86107 2.54202 0.623517 0.2178 0.245594 0.0957433 0.0389686 0.0115672 0.00307937 0.00132058 0.000917147 0.000436098 9.66802e-005 5.23196e-005 2.26639e-005 1.64726e-005 4.50797e-006 2.33585e-006 2.29076e-006 9.13661e-007 2.46111e-007 1.44723e-007 5.08731e-008 3.04547e-008 2.23463e-008 2.16376e-008
6655.95 5657.95 4689.12 4265.31 4532.23 2884.95 1384.65 1136.3 763.097 566.562 346.76 311.828 156.65
38.8373 19.2256 8.11082 6.99515 1.66341 0.576062 0.648094 0.258535
0.112238 0.0361549 0.0103088 0.00468696 0.00335243 0.00162228
0.000353395 0.000181416 7.59E-05 5.37E-05 1.36E-05 6.37E-06
5.79E-06 2.25E-06 6.05E-07 3.47E-07 1.17E-07 6.82E-08

4.92E-08 4.39E-08
6713.48 5593.4 4556.56 4074.71 4262.75 2666.1 1199.56 843.294 477.207 318.461 182.957 150.104 65.672
14.5163 6.82351 2.86107 2.54202 0.623517 0.2178 0.245594 0.0957433
0.0389686 0.0115672 0.00307937 0.00132058 0.000917147 0.000436098
9.67E-05 5.23E-05 2.27E-05 1.65E-05 4.51E-06 2.34E-06
2.29E-06 9.14E-07 2.46E-07 1.45E-07 5.09E-08 3.05E-08
2.23E-08 2.16E-08

14344.6 13604.4 13604.4 13604.4 13604.4 13604.4 13604.3 13604.2 13604.1 13603.9 13603.6 13603.4 13603.1
13602.7 13602.4 13602 13601.6 13601.1 13600.7 13600.2 13599.7 13599.3 13598.8 13598.2 13597.7 13597.2
13596.6 13596.1 13595.5 13595 13594.4 13593.8 13593.2 13592.6 13592 13591.4 13590.8 13590.2 13589.5
13588.9 13588.3 13587.6 13587 13585.6 13584.9 13584.8 13585.4 13585.6 13585 13584.5 13583.3 13582.2
13581.2 13579.6 13578.2 13576.3 13574.8 13573.4 13571.2 13568.8 13561.2 13553.7 13548.7 13539.1 21489.4

18106.9 14729 12738.2 12684.9 14400.7 15114.5 14478.2 13508.5 12616.5 11944.7 11676 11851.6 11893
12066.6 12634 12166.9 10303.4 9589.35 10786 13582.3 17507.1 9033.8 8910.13 11458.6 9245.99 30054.6
13621.2 17088.5 12525.9 12631.4 14363.4 9504.33 7718.52 10557.8 8259.72 13859.8 16578.2 8663.24 8810.94
16168.6 10162 10421.4 8418.28 15598.3 12849.3 7136.94 6325.33 9234.88 12535.1 13228.3 15607.9 6572.89
8896.18 17349.8 9318.35 10272.7 9792.05 19327.2 19869.3 11966.6 10903.3 8562.77 8160.99 7164.5 11897.2
15771
12740.4 12048.8 12508.7 12348 #recruits; first value is R0 (virgin)
25333.9 25333.9 25333.2 25332.5 25331.9 25331.4 25323.6 25309 25288 25261 25228.5 25191.1 25149.3
25103.5 25054.1 25001.5 24946.2 24888.3 24828.3 24766.4 24702.8 24637.7 24571.4 24503.9 24435.4 24366
24295.9 24225.1 24153.7 24081.8 24009.4 23936.6 23863.4 23789.9 23716.2 23642.2 23567.2 23492.1 23416.8
23341.4 23265.9 23190.3 23118 22957.3 22877 22866.9 22932.2 22955.6 22890.2 22826.3 22694.6 22573.2
22464.9 22290.6 22136.9 21935.2 21782 21632.7 21407.6 21177.5 20455.4 19792.2 19370 18609.5 17733.7
16773.9
15858.7 15174.6 13746.9 12364.6 11867.4 11834.9 10981.7 10457 9066.91 7889.7 6490.02 6129.03 5940.25
6064.36 5751.03 5367.4 5325.92 4939.35 4822.18 4646.34 4468.07 3935.13 3556.49 3147.82 3116.62 3246.11
3475.36 3459.64 3461.59 3581.02 3828.63 4464.6 4769.97 5104.87 4887.36 4463.57 4217.01 4067.59 3536.81
2867.4 2726.21 2823.43 2819.63 2521.09 2567.12 2776.73 2855.82 2508.83 2342.19 2290.63 2220.85 1824.11
1620.19 1651.85 1982.83 2372.96 2481.11 2321.33 2474.88 2765.22 2810.33 2798.38 3029.95 3706.38 4160.69
3949.83 3818.04 3349.59 2937.58 #spbio; first value is S0 (virgin)
0.949306 0.4 0
base 2 - A blank comment line - needed for the program to run
0 0 0 4.87529e-006 0.000678759 0.0238077 0.168393 0.428812 0.67624 0.887689 1.08158 1.26471 1.43681
1.59644 1.74262 1.87502 1.99387 2.09908 2.19199 2.27372 2.3453 2.40775 2.46207 2.50919 2.54998 2.58523
2.61563 2.64182 2.66436 2.68374 2.70038 2.71467 2.72692 2.73743 2.74643 2.75415 2.76075 2.76641 2.77125
2.7754 2.77894 #female fecundity; weighted by N in year Y_init across morphs and areas
0.00223969 0.0154754 0.0492871 0.0950751 0.198433 0.336981 0.500822 0.679875 0.865112 1.04924 1.22687
1.39447 1.55019 1.6935 1.82456 1.94378 2.0516 2.14679 2.23177 2.30716 2.37365 2.43201 2.48301 2.52743
2.56601 2.59942 2.62831 2.65323 2.67471 2.69319 2.70908 2.72273 2.73445 2.7445 2.75312 2.7605 2.76683
2.77225 2.77689 2.78086 2.78426
1.17336e-007 3.54765e-007 3.54765e-007 5.51273e-006 7.82484e-005 0.00130654 0.00964235 0.0398554
0.108612 0.219514 0.358231 0.501938 0.631245 0.735896 0.814218 0.869731 0.907781 0.933444 0.95155
0.963908 0.972429 0.978389 0.982625 0.985689 0.987944 0.98963 0.990911 0.991899 0.992669 0.993278
0.993764 0.994155 0.994472 0.994732 0.994945 0.995122 0.995269 0.995391 0.995493 0.99558 0.995652
0.995713
0.0152562 0.0356226 0.058373 0.118555 0.227685 0.367997 0.529468 0.702592 0.879496 1.05514 1.2271
1.39345 1.55163 1.69919 1.8345 1.95693 2.06615 2.16273 2.24792 2.32267 2.388 2.44489 2.49429 2.53708
2.57409 2.60602 2.63355 2.65725 2.67762 2.69513 2.71016 2.72306 2.73412 2.7436 2.75172 2.75868 2.76463
2.76973 2.7741 2.77783 2.78103
2.92678e-006 0.000125003 0.00189626 0.0148808 0.0704597 0.197008 0.385604 0.589606 0.760814 0.876742
0.942133 0.974199 0.988599 0.994825 0.997524 0.998732 0.999326 0.999633 0.999788 0.99987 0.999916
0.999942 0.999959 0.999969 0.999976 0.999981 0.999984 0.999987 0.999988 0.99999 0.999991 0.999992
0.999992 0.999993 0.999993 0.999993 0.999994 0.999994 0.999994 0.999994 0.999994
0.00198288 0.00699777 0.0223923 0.147266 0.274473 0.398989 0.531628 0.667469 0.808689 0.962327 1.12884
1.2999 1.4663 1.62248 1.76593 1.89588 2.01245 2.11541 2.20638 2.28634 2.35632 2.41734 2.4704 2.51641
2.55622 2.59061 2.62027 2.64582 2.6678 2.68669 2.70292 2.71684 2.72879 2.73903 2.7478 2.75532 2.76176
2.76727 2.77199 2.77603 2.77948
1.3657e-007 2.85353e-007 5.80957e-007 4.21094e-006 0.000673523 0.0186236 0.137666 0.418366 0.719824

0.899075 0.969779 0.99161 0.997646 0.999292 0.999764 0.999911 0.999962 0.999984 0.999993 0.999996 0.999998 0.999999 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.0035563 0.0139004 0.0506138 0.12998 0.237531 0.365165 0.507834 0.66553 0.839848 1.02353 1.20625 1.38119 1.54485 1.69549 1.83245 1.95574 2.06546 2.16232 2.24767 2.32251 2.38788 2.44481 2.49423 2.53704 2.57405 2.60599 2.63353 2.65722 2.6776 2.69511 2.71015 2.72304 2.7341 2.74358 2.75171 2.75867 2.76462 2.76972 2.77409 2.77782 2.78102
0.000319845 0.000817062 0.00242979 0.019844 0.134295 0.412277 0.728097 0.916316 0.981476 0.996631 0.999425 0.999898 0.99998 0.999995 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00742209 0.0311093 0.049553 0.0893624 0.185 0.313772 0.465839 0.631669 0.80304 0.974651 1.14462 1.31181 1.47355 1.62651 1.76813 1.89711 2.01317 2.11582 2.20662 2.28649 2.35642 2.41741 2.47045 2.51645 2.55625 2.59064 2.62029 2.64584 2.66781 2.6867 2.70293 2.71685 2.7288 2.73904 2.74781 2.75533 2.76177 2.76728 2.772 2.77604 2.77949
1.1128e-007 2.39361e-006 9.12663e-005 0.00116754 0.0139556 0.0725189 0.213696 0.424487 0.642557 0.810394 0.911498 0.961877 0.984038 0.993207 0.996964 0.998546 0.999246 0.999611 0.999787 0.999875 0.999922 0.999949 0.999965 0.999974 0.999981 0.999985 0.999988 0.99999 0.999991 0.999992 0.999993 0.999994 0.999994 0.999995 0.999995 0.999995 0.999996 0.999996 0.999996 0.999996 0.999996
0.00450419 0.0383035 0.0846485 0.15416 0.257929 0.378664 0.512463 0.664894 0.838615 1.023 1.20609 1.38115 1.54483 1.69548 1.83245 1.95574 2.06546 2.16232 2.24767 2.32251 2.38788 2.44481 2.49423 2.53704 2.57405 2.60599 2.63353 2.65722 2.6776 2.69511 2.71015 2.72304 2.7341 2.74358 2.75171 2.75867 2.76462 2.76972 2.77409 2.77782 2.78102
9.20058e-007 6.93433e-006 0.0002241 0.0070759 0.0900655 0.37002 0.724316 0.925352 0.985921 0.997805 0.999671 0.999947 0.99999 0.999998 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00136552 0.00553294 0.0170847 0.0440535 0.240718 0.355074 0.456919 0.542351 0.613161 0.672829 0.723346 0.765629 0.800512 0.829014 0.852249 0.87128 0.887044 0.895103 0.901208 0.905818 0.90929 0.9119 0.913859 0.915327 0.916428 0.917252 0.917869 0.91833 0.918675 0.918933 0.919126 0.919271 0.919379 0.919459 0.91952 0.919565 0.919599 0.919624 0.919643 0.919657 0.919667
1.02105e-007 2.2213e-007 4.81137e-007 5.89678e-007 9.22308e-005 0.00874665 0.0899119 0.288031 0.508811 0.671407 0.771148 0.828831 0.861943 0.880967 0.89169 0.897307 0.899643 0.905616 0.90991 0.913025 0.915301 0.916973 0.918207 0.919121 0.919798 0.920302 0.920678 0.920957 0.921166 0.921321 0.921437 0.921524 0.921589 0.921637 0.921673 0.9217 0.921721 0.921736 0.921747 0.921755 0.921762
0.0025337 0.0171633 0.0538248 0.11742 0.218145 0.322057 0.418027 0.504453 0.581254 0.646984 0.701198 0.744801 0.77936 0.806559 0.827943 0.844822 0.857009 0.865281 0.871511 0.876195 0.879711 0.882347 0.884322 0.885801 0.886908 0.887736 0.888356 0.888819 0.889166 0.889425 0.889618 0.889763 0.889872 0.889952 0.890013 0.890058 0.890092 0.890117 0.890136 0.89015 0.890161
1.36297e-006 5.12941e-006 0.000150819 0.00803068 0.120189 0.424266 0.723509 0.884088 0.949028 0.973993 0.984196 0.988723 0.990823 0.991741 0.992002 0.991842 0.992045 0.992657 0.993087 0.993394 0.993615 0.993777 0.993895 0.993982 0.994046 0.994094 0.99413 0.994156 0.994176 0.99419 0.994201 0.994209 0.994216 0.99422 0.994224 0.994226 0.994228 0.994229 0.99423 0.994231 0.994232
0.00136552 0.00553295 0.0170862 0.0512975 0.241992 0.33237 0.410865 0.48373 0.555014 0.621447 0.679138 0.726863 0.76528 0.795787 0.819896 0.838989 0.854225 0.863563 0.870615 0.875925 0.879916 0.882912 0.885158 0.886841 0.888101 0.889044 0.88975 0.890277 0.890672 0.890967 0.891188 0.891353 0.891476 0.891569 0.891638 0.891689 0.891728 0.891756 0.891778 0.891794 0.891806
1.19964e-007 2.60983e-007 5.65324e-007 7.43859e-007 0.000863034 0.0625928 0.368394 0.705568 0.877387 0.944005 0.96955 0.980155 0.984892 0.987012 0.987787 0.987763 0.987197 0.988355 0.98916 0.989729 0.990138 0.990434 0.990651 0.99081 0.990927 0.991014 0.991078 0.991126 0.991161 0.991188 0.991208 0.991223 0.991234 0.991242 0.991248 0.991253 0.991256 0.991259 0.991261 0.991262 0.991263
0.00251835 0.0102905 0.0282833 0.120151 0.222586 0.316579 0.40647 0.493961 0.573841 0.641856 0.697387 0.741688 0.776584 0.803903 0.825265 0.842022 0.85422 0.86265 0.868995 0.873762 0.877338 0.880019 0.882027 0.883531 0.884656 0.885498 0.886127 0.886598 0.88695 0.887213 0.88741 0.887557 0.887667 0.88775 0.887811 0.887857 0.887891 0.887917 0.887936 0.887951 0.887961
0.000278474 0.000735982 0.00120641 0.00766725 0.158632 0.567455 0.859591 0.959489 0.986426 0.994136 0.996722 0.997718 0.998117 0.998239 0.998201 0.99805 0.998057 0.998237 0.998362 0.99845 0.998512 0.998558 0.998591 0.998615 0.998633 0.998647 0.998656 0.998664 0.998669 0.998673 0.998676 0.998678 0.99868 0.998681 0.998682 0.998683 0.998684 0.998684 0.998684 0.998684 0.998685
0.00136552 0.005533 0.017088 0.0524822 0.251414 0.322684 0.389557 0.463106 0.540492 0.611968 0.672599 0.721871 0.761059 0.791898 0.816076 0.835061 0.850062 0.859678 0.866929 0.872383 0.876479 0.879552 0.881855 0.88358 0.884871 0.885837 0.88656 0.8871 0.887505 0.887807 0.888033 0.888202 0.888328 0.888423 0.888493 0.888546 0.888586 0.888615 0.888637 0.888654 0.888666
7.76321e-008 1.6889e-007 3.65899e-007 4.77942e-007 0.0016443 0.12418 0.557766 0.857092 0.955505 0.983141 0.991716 0.994817 0.996055 0.996522 0.996592 0.996412 0.996038 0.996456 0.996741 0.996941 0.997083 0.997185 0.99726 0.997314 0.997354 0.997384 0.997406 0.997422 0.997434 0.997443 0.99745

0.997455 0.997458 0.997461 0.997463 0.997465 0.997466 0.997467 0.997468 0.997468 0.997468
0.00251834 0.0102836 0.0285116 0.174454 0.254144 0.327291 0.407223 0.492947 0.573013 0.641304 0.696996 0.741378 0.776312 0.803645 0.825006 0.841752 0.853952 0.862398 0.868754 0.873529 0.877112 0.879797 0.881809 0.883315 0.884442 0.885285 0.885915 0.886387 0.88674 0.887003 0.887201 0.887348 0.887458 0.887541 0.887602 0.887648 0.887683 0.887708 0.887727 0.887742 0.887753
7.7606e-007 2.05054e-006 3.30618e-006 0.000435334 0.0843968 0.53097 0.869103 0.967776 0.990387 0.996125 0.9979 0.998543 0.998781 0.998831 0.99877 0.998622 0.998611 0.998749 0.998844 0.998911 0.998958 0.998993 0.999017 0.999036 0.999049 0.999059 0.999066 0.999072 0.999076 0.999079 0.999081 0.999083 0.999084 0.999085 0.999086 0.999086 0.999087 0.999087 0.999087 0.999087 0.999088
0.150324 0.150324
6655.95 5657.95 4689.12 4265.31 4532.23 2884.95 1384.65 1136.3 763.097 566.562 346.76 311.828 156.65 38.8373 19.2256 8.11082 6.99515 1.66341 0.576062 0.648094 0.258535 0.112238 0.0361549 0.0103088 0.00468696 0.00335243 0.00162228 0.000353395 0.000181416 7.5933e-005 5.37151e-005 1.35773e-005 6.36678e-006 5.78906e-006 2.2484e-006 6.04507e-007 3.46524e-007 1.16792e-007 6.8162e-008 4.91794e-008 4.3854e-008
0.167536 0.167536
6713.48 5593.4 4556.56 4074.71 4262.75 2666.1 1199.56 843.294 477.207 318.461 182.957 150.104 65.672 14.5163 6.82351 2.86107 2.54202 0.623517 0.2178 0.245594 0.0957433 0.0389686 0.0115672 0.00307937 0.00132058 0.000917147 0.000436098 9.66802e-005 5.23196e-005 2.26639e-005 1.64726e-005 4.50797e-006 2.33585e-006 2.29076e-006 9.13661e-007 2.46111e-007 1.44723e-007 5.08731e-008 3.04547e-008 2.23463e-008 2.16376e-008
6655.95 5657.95 4689.12 4265.31 4532.23 2884.95 1384.65 1136.3 763.097 566.562 346.76 311.828 156.65
38.8373 19.2256 8.11082 6.99515 1.66341 0.576062 0.648094 0.258535
0.112238 0.0361549 0.0103088 0.00468696 0.00335243 0.00162228
0.000353395 0.000181416 7.59E-05 5.37E-05 1.36E-05 6.37E-06
5.79E-06 2.25E-06 6.05E-07 3.47E-07 1.17E-07 6.82E-08
4.92E-08 4.39E-08
6713.48 5593.4 4556.56 4074.71 4262.75 2666.1 1199.56 843.294 477.207 318.461 182.957 150.104 65.672
14.5163 6.82351 2.86107 2.54202 0.623517 0.2178 0.245594 0.0957433
0.0389686 0.0115672 0.00307937 0.00132058 0.000917147 0.000436098
9.67E-05 5.23E-05 2.27E-05 1.65E-05 4.51E-06 2.34E-06
2.29E-06 9.14E-07 2.46E-07 1.45E-07 5.09E-08 3.05E-08
2.23E-08 2.16E-08

14344.6 13604.4 13604.4 13604.4 13604.4 13604.4 13604.3 13604.2 13604.1 13603.9 13603.6 13603.4 13603.1 13602.7 13602.4 13602 13601.6 13601.1 13600.7 13600.2 13599.7 13599.3 13598.8 13598.2 13597.7 13597.2 13596.6 13596.1 13595.5 13595 13594.4 13593.8 13593.2 13592.6 13592 13591.4 13590.8 13590.2 13589.5 13588.9 13588.3 13587.6 13587 13585.6 13584.9 13584.8 13585.4 13585.6 13585 13584.5 13583.3 13582.2 13581.2 13579.6 13578.2 13576.3 13574.8 13573.4 13571.2 13568.8 13561.2 13553.7 13548.7 13539.1 21489.4

18106.9 14729 12738.2 12684.9 14400.7 15114.5 14478.2 13508.5 12616.5 11944.7 11676 11851.6 11893 12066.6 12634 12166.9 10303.4 9589.35 10786 13582.3 17507.1 9033.8 8910.13 11458.6 9245.99 30054.6 13621.2 17088.5 12525.9 12631.4 14363.4 9504.33 7718.52 10557.8 8259.72 13859.8 16578.2 8663.24 8810.94 16168.6 10162 10421.4 8418.28 15598.3 12849.3 7136.94 6325.33 9234.88 12535.1 13228.3 15607.9 6572.89 8896.18 17349.8 9318.35 10272.7 9792.05 19327.2 19869.3 11966.6 10903.3 8562.77 8160.99 7164.5 11897.2 15771
12740.4 12048.8 12508.7 12348 #recruits; first value is R0 (virgin)
25333.9 25333.9 25333.2 25332.5 25331.9 25331.4 25323.6 25309 25288 25261 25228.5 25191.1 25149.3 25103.5 25054.1 25001.5 24946.2 24888.3 24828.3 24766.4 24702.8 24637.7 24571.4 24503.9 24435.4 24366 24295.9 24225.1 24153.7 24081.8 24009.4 23936.6 23863.4 23789.9 23716.2 23642.2 23567.2 23492.1 23416.8 23341.4 23265.9 23190.3 23118 22957.3 22877 22866.9 22932.2 22955.6 22890.2 22826.3 22694.6 22573.2 22464.9 22290.6 22136.9 21935.2 21782 21632.7 21407.6 21177.5 20455.4 19792.2 19370 18609.5 17733.7 16773.9
15858.7 15174.6 13746.9 12364.6 11867.4 11834.9 10981.7 10457 9066.91 7889.7 6490.02 6129.03 5940.25 6064.36 5751.03 5367.4 5325.92 4939.35 4822.18 4646.34 4468.07 3935.13 3556.49 3147.82 3116.62 3246.11

3475.36 3459.64 3461.59 3581.02 3828.63 4464.6 4769.97 5104.87 4887.36 4463.57 4217.01 4067.59 3536.81 2867.4 2726.21 2823.43 2819.63 2521.09 2567.12 2776.73 2855.82 2508.83 2342.19 2290.63 2220.85 1824.11 1620.19 1651.85 1982.83 2372.96 2481.11 2321.33 2474.88 2765.22 2810.33 2798.38 3029.95 3706.38 4160.69 3949.83 3818.04 3349.59 2937.58 #spbio; first value is S0 (virgin)
0.949306 0.4 0
state of nature - low - A blank comment line - needed for the program to run
0 0 0 5.08018e-006 0.000697557 0.0241158 0.169298 0.429783 0.676999 0.888348 1.08228 1.26557 1.43792 1.59787 1.74442 1.87724 1.99652 2.1022 2.19558 2.27777 2.34978 2.41265 2.46737 2.51486 2.556 2.59156 2.62225 2.64871 2.67149 2.69108 2.70791 2.72237 2.73478 2.74543 2.75456 2.76238 2.76908 2.77483 2.77974 2.78396 2.78756 #female fecundity; weighted by N in year Y_init across morphs and areas
0.00223955 0.0156019 0.0494767 0.095575 0.198909 0.337286 0.500881 0.679688 0.864731 1.04875 1.22637 1.39407 1.55 1.69361 1.82508 1.94476 2.05309 2.14886 2.23442 2.31035 2.37737 2.43622 2.48768 2.53253 2.57148 2.60525 2.63445 2.65965 2.68139 2.7001 2.7162 2.73003 2.74191 2.7521 2.76085 2.76835 2.77478 2.78029 2.785 2.78904 2.7925
1.21E-07 3.69409e-007 5.83914e-006 8.31337e-005 0.00136372 0.0099471 0.040792 0.110564 0.222605 0.362259 0.506495 0.635891 0.74028 0.818132 0.873102 0.910626 0.935829 0.95353 0.965558 0.973816 0.979569 0.983644 0.986581 0.988735 0.990342 0.99156 0.992496 0.993225 0.993801 0.994259 0.994628 0.994927 0.995171 0.995372 0.995538 0.995676 0.995791 0.995887 0.995968 0.996036 0.996093
0.0136721 0.035468 0.0585935 0.119031 0.228053 0.368093 0.529214 0.701985 0.878627 1.05426 1.22654 1.39345 1.55226 1.70043 1.83631 1.95927 2.06901 2.1661 2.25177 2.32698 2.39274 2.45004 2.49983 2.54298 2.58031 2.61255 2.64034 2.66429 2.68489 2.7026 2.71781 2.73087 2.74207 2.75168 2.75991 2.76697 2.77302 2.7782 2.78263 2.78643 2.78968
3.56E-06 0.000134239 0.0020226 0.0157146 0.0735043 0.20359 0.395402 0.600606 0.770616 0.883887 0.946547 0.976632 0.989864 0.995477 0.997869 0.998923 0.999435 0.999696 0.999826 0.999894 0.999932 0.999954 0.999967 0.999976 0.999981 0.999985 0.999988 0.99999 0.999991 0.999992 0.999993 0.999994 0.999994 0.999994 0.999995 0.999995 0.999995 0.999995 0.999996 0.999996 0.999996
0.00198157 0.00702431 0.0231065 0.150742 0.274971 0.399164 0.531483 0.667091 0.808296 0.962182 1.1291 1.30056 1.46736 1.62392 1.76778 1.89816 2.01518 2.11861 2.21004 2.29046 2.36087 2.42232 2.47576 2.52214 2.56229 2.597 2.62694 2.65275 2.67496 2.69406 2.71048 2.72457 2.73667 2.74705 2.75594 2.76357 2.7701 2.7757 2.78049 2.7846 2.78811
1.21E-07 2.54099e-007 5.20896e-007 4.3916e-006 0.000703457 0.0191468 0.140101 0.422821 0.723984 0.901509 0.970839 0.992005 0.997786 0.999343 0.999784 0.999919 0.999966 0.999986 0.999994 0.999997 0.999998 0.999999 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00356093 0.0139472 0.0508497 0.13035 0.237687 0.364975 0.50737 0.665202 0.839961 1.02402 1.20699 1.38219 1.54615 1.69716 1.83452 1.95825 2.06842 2.16575 2.25156 2.32685 2.39265 2.44998 2.49978 2.54295 2.58028 2.61252 2.64033 2.66427 2.68487 2.70258 2.7178 2.73085 2.74206 2.75167 2.7599 2.76696 2.77301 2.77819 2.78262 2.78642 2.78967
0.000341666 0.000874678 0.00259498 0.0209529 0.13929 0.421826 0.73703 0.920821 0.982877 0.996954 0.999491 0.999911 0.999983 0.999996 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00759672 0.0311771 0.0495732 0.0896266 0.185196 0.313838 0.465786 0.631564 0.802986 0.974749 1.14496 1.31244 1.47453 1.62788 1.76992 1.89935 2.01587 2.119 2.21027 2.2906 2.36097 2.42238 2.47581 2.52217 2.56232 2.59702 2.62696 2.65276 2.67497 2.69407 2.71049 2.72458 2.73668 2.74706 2.75595 2.76358 2.77011 2.77571 2.7805 2.7846 2.78812
1.14E-07 2.56086e-006 9.81955e-005 0.00124738 0.014521 0.0742196 0.216515 0.427546 0.645026 0.812042 0.912487 0.962437 0.984346 0.993376 0.997059 0.998601 0.999279 0.999631 0.999799 0.999883 0.999928 0.999953 0.999967 0.999977 0.999982 0.999986 0.999989 0.999991 0.999992 0.999993 0.999994 0.999995 0.999995 0.999995 0.999996 0.999996 0.999996 0.999996 0.999996 0.999996 0.999997
0.00429921 0.0363797 0.0846719 0.154433 0.257924 0.378307 0.511949 0.664662 0.838829 1.02352 1.20685 1.38216 1.54615 1.69715 1.83452 1.95825 2.06842 2.16575 2.25156 2.32685 2.39265 2.44998 2.49978 2.54295 2.58028 2.61252 2.64033 2.66427 2.68487 2.70258 2.7178 2.73085 2.74206 2.75167 2.7599 2.76696 2.77301 2.77819 2.78262 2.78642 2.78967
1.24E-06 8.07123e-006 0.000243219 0.00753464 0.0937195 0.378694 0.732463 0.929082 0.98696 0.998024 0.999712 0.999955 0.999992 0.999998 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00136558 0.00554669 0.0171479 0.0443964 0.240757 0.354958 0.45666 0.541973 0.612694 0.672286 0.722722 0.764917 0.799703 0.828108 0.851245 0.870182 0.885854 0.893888 0.899973 0.904566 0.908024 0.910623 0.912573 0.914034 0.915129 0.915948 0.916562 0.91702 0.917363 0.91762 0.917812 0.917955 0.918062 0.918142 0.918202 0.918247 0.91828 0.918305 0.918324 0.918338 0.918348
1.05E-07 2.29664e-007 4.97437e-007 6.09551e-007 9.73493e-005 0.00902805 0.0915969 0.291218 0.512246 0.674338 0.773493 0.83073 0.863544 0.882378 0.892985 0.898534 0.900833 0.906745 0.910992 0.914073 0.916323 0.917975 0.919195 0.920097 0.920766 0.921264 0.921634 0.92191 0.922115 0.922269 0.922383 0.922469 0.922533 0.92258 0.922616 0.922643 0.922663 0.922677 0.922688 0.922697 0.922703

0.00253508 0.0165464 0.0535016 0.117153 0.217695 0.321428 0.417327 0.503847 0.580767 0.646542 0.700728 0.744262 0.778733 0.805838 0.827127 0.843914 0.856043 0.86429 0.8705 0.875166 0.878668 0.881293 0.883259 0.884731 0.885832 0.886656 0.887272 0.887733 0.888077 0.888335 0.888527 0.888671 0.888778 0.888859 0.888919 0.888963 0.888997 0.889022 0.889041 0.889055 0.889065
1.85E-06 6.72303e-006 0.000176968 0.00891607 0.127502 0.438009 0.73516 0.890857 0.95261 0.976016 0.985491 0.989668 0.991595 0.99243 0.992658 0.992497 0.99268 0.993247 0.993646 0.99393 0.994135 0.994284 0.994394 0.994474 0.994534 0.994578 0.994611 0.994635 0.994653 0.994667 0.994677 0.994684 0.99469 0.994694 0.994697 0.9947 0.994701 0.994703 0.994704 0.994704 0.994705
0.00136558 0.00554671 0.0171503 0.0537175 0.241676 0.33206 0.410632 0.483593 0.554926 0.621334 0.678946 0.726568 0.764877 0.795277 0.819287 0.838288 0.85344 0.862743 0.869764 0.875051 0.879023 0.882003 0.884238 0.885911 0.887163 0.888101 0.888802 0.889326 0.889718 0.890011 0.89023 0.890394 0.890516 0.890607 0.890676 0.890727 0.890765 0.890794 0.890815 0.890831 0.890843
1.07E-07 2.32172e-007 5.02912e-007 6.77035e-007 0.00091385 0.0642331 0.372516 0.708869 0.879185 0.94496 0.970119 0.980546 0.9852 0.987281 0.988041 0.988017 0.987461 0.988596 0.989385 0.989943 0.990344 0.990634 0.990846 0.991001 0.991116 0.991201 0.991264 0.991311 0.991345 0.991371 0.991391 0.991405 0.991416 0.991424 0.99143 0.991434 0.991438 0.99144 0.991442 0.991444 0.991445
0.00252164 0.0103241 0.0285062 0.120042 0.222116 0.316173 0.406275 0.49394 0.573851 0.6418 0.697224 0.741408 0.776191 0.803406 0.824673 0.841346 0.853483 0.861878 0.868193 0.872937 0.876495 0.879161 0.881158 0.882652 0.88377 0.884607 0.885232 0.8857 0.886049 0.88631 0.886506 0.886652 0.886761 0.886842 0.886903 0.886949 0.886983 0.887008 0.887027 0.887041 0.887052
0.000297378 0.000787199 0.00129258 0.00838086 0.165539 0.577334 0.864839 0.961477 0.987204 0.994502 0.996935 0.99787 0.998242 0.998355 0.998317 0.998173 0.998179 0.998348 0.998465 0.998548 0.998607 0.99865 0.998681 0.998704 0.998721 0.998733 0.998742 0.998749 0.998754 0.998758 0.998761 0.998763 0.998764 0.998766 0.998767 0.998767 0.998768 0.998768 0.998768 0.998769 0.998769
0.00136558 0.00554675 0.0171512 0.0535576 0.251261 0.322388 0.389313 0.463016 0.540484 0.611935 0.672478 0.721637 0.76071 0.791441 0.815519 0.834414 0.849334 0.858911 0.86613 0.871559 0.875635 0.878691 0.880981 0.882696 0.883979 0.884939 0.885657 0.886194 0.886596 0.886896 0.88712 0.887288 0.887413 0.887507 0.887577 0.887629 0.887668 0.887697 0.887719 0.887735 0.887748
7.88E-08 1.71737e-007 3.72053e-007 4.88839e-007 0.00173399 0.127314 0.5634 0.860241 0.956818 0.983727 0.992031 0.995023 0.996215 0.996662 0.996728 0.996551 0.996189 0.996591 0.996867 0.997059 0.997196 0.997295 0.997366 0.997419 0.997457 0.997486 0.997507 0.997522 0.997534 0.997543 0.997549 0.997554 0.997558 0.99756 0.997562 0.997564 0.997565 0.997566 0.997566 0.997567 0.997567
0.00252163 0.0103163 0.0283984 0.174021 0.253577 0.32667 0.406904 0.492915 0.573044 0.641271 0.696851 0.741114 0.775933 0.80316 0.824427 0.841088 0.853228 0.861638 0.867965 0.872716 0.87628 0.878951 0.880951 0.882447 0.883567 0.884405 0.885031 0.885499 0.885849 0.886111 0.886307 0.886453 0.886562 0.886644 0.886705 0.88675 0.886784 0.88681 0.886829 0.886843 0.886854
1.05E-06 2.78588e-006 4.47252e-006 0.000480677 0.0886587 0.541783 0.874719 0.969585 0.990999 0.996388 0.998046 0.998646 0.998867 0.998913 0.998854 0.998715 0.998704 0.998833 0.998922 0.998985 0.999029 0.999061 0.999084 0.999101 0.999114 0.999123 0.99913 0.999135 0.999139 0.999142 0.999144 0.999145 0.999146 0.999147 0.999148 0.999148 0.999149 0.999149 0.999149 0.999149 0.99915
0.147626 #mean M for year Yinit: 2009 sex: 1
6202.42 5359.11 4431.24 3679.16 3601.02 2333.81 1146.53 948.907 637.469 466.274 280.965 249.454 124.027 30.521 14.9823 6.2642 5.43346 1.27773 0.444453 0.502499 0.201598 0.0870718 0.0281629 0.00803473 0.00366989 0.00262857 0.00127534 0.000277745 0.000143025 5.99201e-005 4.26053e-005 1.07208e-005 5.0654e-006 4.61137e-006 1.79123e-006 4.82377e-007 2.77562e-007 9.35018e-008 5.46788e-008 3.95322e-008 3.52858e-008 #numbers for year Yinit: 2009 sex: 1
0.164025 #mean M for year Yinit: 2009 sex: 2
6253.48 5300.83 4311.81 3522.54 3398.48 2164.51 987.349 685.895 382.975 252.027 143.766 117.502 51.3169 11.3515 5.32985 2.22862 2.00207 0.487729 0.171655 0.194945 0.076562 0.0310635 0.00927092 0.00247203 0.00106643 0.000742563 0.000354372 7.86107e-005 4.26984e-005 1.85228e-005 1.35399e-005 3.68962e-006 1.92669e-006 1.89318e-006 7.55861e-007 2.04176e-007 1.20672e-007 4.24456e-008 2.54835e-008 1.8755e-008 1.82222e-008 #numbers for year Yinit: 2009 sex: 2
6202.42 5359.11 4431.24 3679.16 3601.02 2333.81 1146.53 948.907 637.469 466.274 280.965 249.454 124.027

30.521 14.9823 6.2642 5.43346 1.27773 0.444453 0.502499 0.201598 0.0870718 0.0281629 0.00803473 0.00366989 0.00262857 0.00127534 0.000277745 0.000143025 5.99201e-005 4.26053e-005 1.07208e-005 5.0654e-006 4.61137e-006 1.79123e-006 4.82377e-007 2.77562e-007 9.35018e-008 5.46788e-008 3.95322e-008 3.52858e-008 #numbers for year Ydeclare: 2009 sex: 1
6253.48 5300.83 4311.81 3522.54 3398.48 2164.51 987.349 685.895 382.975 252.027 143.766 117.502 51.3169 11.3515 5.32985 2.22862 2.00207 0.487729 0.171655 0.194945 0.076562 0.0310635 0.00927092 0.00247203 0.00106643 0.000742563 0.000354372 7.86107e-005 4.26984e-005 1.85228e-005 1.35399e-005 3.68962e-006 1.92669e-006 1.89318e-006 7.55861e-007 2.04176e-007 1.20672e-007 4.24456e-008 2.54835e-008 1.8755e-008 1.82222e-008 #numbers for year Ydeclare: 2009 sex: 2

13931.1 13225.9 13225.9 13225.9 13225.9 13225.9 13225.8 13225.7 13225.5 13225.3 13225.1 13224.8 13224.4 13224.1 13223.7 13223.2 13222.8 13222.3 13221.8 13221.3 13220.8 13220.2 13219.7 13219.1 13218.5 13217.9 13217.3 13216.7 13216.1 13215.5 13214.8 13214.2 13213.5 13212.9 13212.2 13211.5 13210.8 13210.1 13209.4 13208.7 13208 13207.3 13206.6 13205.1 13204.3 13204.2 13204.8 13205 13204.4 13203.8 13202.5 13201.3 13200.2 13198.4 13196.9 13194.8 13193.1 13191.5 13189.1 13186.5 13178.1 13169.9 13164.4 13153.8 20403.5 17337.5 14186.3 12305.7 12261.1 13895.9 14575 13981.6 13065.4 12221.6 11583.2 11335.5 11512.6 11558.5 11734.3 12308.2 11862.8 10038.9 9350.15 10502.3 13269.1 17068.2 8811.9 8679.12 11189 8982.84 29339.4 13250.6 16673.8 12207.1 12311.8 14027.8 9276.34 7530.83 10325.8 8062.1 13527.9 16206.5 8474.79 8572.82 15838.9 9926.59 10193.9 8228.02 15284 12584.9 6994.93 6182.61 9037.31 12239.3 13005.3 15278.6 6407.43 8630.19 16980.5 9027.18 9969.22 9480.62 18568.1 18894.4 11216.1 10022.7 7674 7040.85 5965.18 9554.26 12415.7 10911.6 11335.2 11826.7 11522.2 #Recruits
25740 25740 25739.3 25738.6 25738 25737.4 25729.7 25715.1 25694 25666.9 25634.3 25596.8 25554.7 25508.6 25458.9 25405.9 25350.1 25291.7 25231.1 25168.5 25104.2 25038.3 24971.1 24902.7 24833.3 24762.9 24691.8 24619.9 24547.4 24474.4 24400.8 24326.8 24252.5 24177.8 24102.7 24027.4 23951.2 23874.7 23798.1 23721.4 23644.5 23567.5 23493.8 23331.7 23249.9 23238.3 23302.3 23324.4 23257.9 23192.9 23060 22937.5 22827.9 22652.2 22497 22293.6 22138.4 21987.1 21759.4 21526.5 20800.7 20133 19705.6 18938.9 18055.8 17087.5 16163 15468.8 14029 12630.2 12100.3 12019.7 11118.2 10559.7 9144.69 7947.69 6527.58 6147.56 5942.12 6054.29 5732.77 5344.13 5299.41 4911.04 4792.52 4616.12 4438.43 3907.31 3530.36 3122.92 3091.81 3219.71 3446.85 3431.25 3434.34 3554.72 3800.29 4430.55 4732.28 5066.29 4850.72 4429.71 4185.93 4040.32 3514.67 2849.52 2709.86 2806.15 2801.68 2503.87 2550.15 2759.73 2839.81 2494.91 2330.19 2279.56 2210.86 1815.92 1612.97 1643.79 1974.17 2364.09 2471.3 2309.66 2459.47 2743.88 2781.48 2759.25 2969.11 3605.01 4002.01 3720.66 3507.41 2940.78 2407.76 #SpawnBio
0.942451 0.4 0 # spawn-recr steepness, sigmaR, autocorr
state of nature - high - A blank comment line - needed for the program to run
0 0 0 4.69306e-006 0.000661944 0.023534 0.167614 0.428014 0.675643 0.887191 1.08105 1.26405 1.43594 1.59528 1.74113 1.87315 1.9916 2.09639 2.18889 2.2702 2.34137 2.40343 2.45739 2.50418 2.54465 2.57961 2.60975 2.6357 2.65802 2.6772 2.69367 2.70779 2.71991 2.73029 2.73918 2.74679 2.75331 2.75889 2.76366 2.76775 2.77124 #female fecundity; weighted by N in year Y_init across morphs and areas
0.00223882 0.0153463 0.0491016 0.0946076 0.197985 0.336691 0.500758 0.680039 0.865456 1.04968 1.22732 1.39483 1.55037 1.6934 1.82411 1.94291 2.05028 2.14497 2.22944 2.30433 2.37035 2.42827 2.47887 2.52291 2.56114 2.59424 2.62284 2.6475 2.66875 2.68702 2.70273 2.71621 2.72778 2.7377 2.7462 2.75349 2.75972 2.76506 2.76963 2.77354 2.77688
1.14E-07 3.43146e-007 5.24372e-006 7.42059e-005 0.00125935 0.00939314 0.0390986 0.107053 0.217065 0.355055 0.498348 0.627574 0.732412 0.811082 0.867007 0.905461 0.93148 0.949907 0.962527 0.97126 0.977387 0.981756 0.984924 0.987262 0.989014 0.990348 0.991377 0.992182 0.992819 0.993327 0.993737 0.99407 0.994343 0.994567 0.994753 0.994907 0.995035 0.995143 0.995234 0.99531 0.995374
0.0163937 0.0356885 0.0581426 0.11808 0.227299 0.367858 0.529657 0.70312 0.880291 1.05599 1.22771 1.39358 1.5512 1.69821 1.83302 1.95497 2.06372 2.15983 2.24457 2.31891 2.38383 2.44034 2.48939 2.53187 2.56857 2.60023 2.62751 2.65098 2.67115 2.68848 2.70334 2.71609 2.72702 2.73638 2.7444 2.75127 2.75714 2.76217 2.76647 2.77015 2.77329
2.56E-06 0.000118158 0.00179801 0.0142198 0.0679998 0.191589 0.377389 0.580213 0.752287 0.870411 0.938153 0.971971 0.987423 0.994211 0.997196 0.998547 0.99922 0.999571 0.999749 0.999845 0.999899 0.999931 0.99995 0.999963 0.999971 0.999977 0.999981 0.999983 0.999986 0.999987 0.999989 0.99999 0.99999 0.999991 0.999991 0.999992 0.999992 0.999992 0.999993 0.999993 0.999993
0.00198376 0.00697255 0.0216469 0.142704 0.274093 0.398879 0.531753 0.66775 0.808968 0.962424 1.12864 1.29938 1.46546 1.6213 1.76439 1.89396 2.01012 2.11266 2.2032 2.28275 2.35232 2.41297 2.46566 2.51134 2.55084 2.58495 2.61435 2.63966 2.66142 2.68012 2.69617 2.70994 2.72175 2.73187 2.74053 2.74795 2.7543 2.75974 2.76439 2.76837 2.77177
1.61E-07 3.36397e-007 6.79839e-007 4.10143e-006 0.000647374 0.0181904 0.13577 0.415068 0.716825 0.897327 0.969009 0.991317 0.997539 0.999252 0.999748 0.999904 0.999958 0.999983 0.999992 0.999996 0.999998 0.999999 0.999999 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

0.00355131 0.013844 0.0503325 0.129617 0.237363 0.365292 0.508203 0.665814 0.839793 1.02319 1.20569 1.38041 1.54379 1.69411 1.83071 1.95361 2.06291 2.15935 2.24428 2.31871 2.3837 2.44025 2.48932 2.53181 2.56853 2.6002 2.62748 2.65095 2.67113 2.68846 2.70332 2.71607 2.727 2.73637 2.74439 2.75125 2.75713 2.76216 2.76646 2.77014 2.77328
0.000303849 0.000774328 0.00230038 0.0189384 0.130224 0.404525 0.720827 0.91262 0.980313 0.99636 0.999369 0.999886 0.999977 0.999995 0.999998 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00725646 0.0310402 0.0495362 0.0891253 0.184823 0.313702 0.465857 0.631706 0.803003 0.974464 1.14425 1.31122 1.4727 1.62534 1.76661 1.89521 2.01086 2.11308 2.20345 2.2829 2.35243 2.41304 2.46572 2.51138 2.55087 2.58497 2.61437 2.63968 2.66144 2.68014 2.69619 2.70996 2.72176 2.73188 2.74054 2.74796 2.75431 2.75975 2.7644 2.76838 2.77178
1.09E-07 2.25532e-006 8.55723e-005 0.00110222 0.013506 0.0712535 0.211833 0.422827 0.641569 0.809946 0.911297 0.961761 0.983959 0.993153 0.996928 0.998522 0.999229 0.999601 0.99978 0.999871 0.999919 0.999947 0.999963 0.999973 0.99998 0.999984 0.999987 0.999989 0.999991 0.999992 0.999993 0.999993 0.999994 0.999994 0.999995 0.999995 0.999995 0.999995 0.999996 0.999996 0.999996
0.00463425 0.0392905 0.0846296 0.153985 0.257944 0.378893 0.512763 0.664997 0.838429 1.0226 1.20551 1.38037 1.54378 1.69411 1.83071 1.95361 2.06291 2.15935 2.24428 2.31871 2.3837 2.44025 2.48932 2.53181 2.56853 2.6002 2.62748 2.65095 2.67113 2.68846 2.70332 2.71607 2.727 2.73637 2.74439 2.75125 2.75713 2.76216 2.76646 2.77014 2.77328
7.60E-07 6.20846e-006 0.00020793 0.00669875 0.0872422 0.363714 0.718634 0.922791 0.985204 0.997652 0.999641 0.999941 0.999989 0.999997 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.00136514 0.00552141 0.0170346 0.0437793 0.24068 0.355167 0.457128 0.542657 0.613536 0.673264 0.723846 0.766204 0.801168 0.829756 0.853076 0.872193 0.888039 0.896118 0.902241 0.906865 0.910349 0.912968 0.914935 0.91641 0.917515 0.918343 0.918963 0.919426 0.919774 0.920033 0.920227 0.920373 0.920481 0.920562 0.920623 0.920669 0.920703 0.920728 0.920747 0.920761 0.920772
9.96E-08 2.16433e-007 4.68831e-007 5.74622e-007 8.80991e-005 0.008513 0.0884847 0.285289 0.505815 0.66882 0.769058 0.827123 0.860492 0.87968 0.890503 0.896178 0.898543 0.904572 0.908906 0.912052 0.914352 0.916042 0.917289 0.918213 0.918898 0.919408 0.919788 0.920071 0.920282 0.920439 0.920557 0.920645 0.920711 0.92076 0.920796 0.920824 0.920844 0.920859 0.920871 0.92088 0.920886
0.00253168 0.017506 0.0540501 0.117658 0.218545 0.322617 0.418653 0.504993 0.581675 0.647349 0.701573 0.745228 0.77986 0.807139 0.828605 0.845565 0.857803 0.866095 0.872342 0.87704 0.880567 0.883213 0.885196 0.886681 0.887793 0.888625 0.889248 0.889713 0.890062 0.890322 0.890517 0.890663 0.890772 0.890853 0.890914 0.89096 0.890994 0.891019 0.891038 0.891053 0.891063
1.09E-06 4.19533e-006 0.000131655 0.00733279 0.114084 0.412311 0.713048 0.877872 0.945689 0.97209 0.98297 0.987825 0.990087 0.991084 0.991375 0.991216 0.991439 0.992092 0.992552 0.99288 0.993118 0.993291 0.993417 0.993511 0.99358 0.993631 0.993669 0.993697 0.993719 0.993734 0.993746 0.993755 0.993761 0.993766 0.99377 0.993773 0.993775 0.993776 0.993777 0.993778 0.993779
0.00136514 0.00552141 0.0170354 0.049122 0.242213 0.332607 0.411047 0.483829 0.555063 0.621508 0.679257 0.727065 0.765573 0.79617 0.820366 0.839539 0.85485 0.864219 0.871295 0.876625 0.880633 0.883642 0.885898 0.887589 0.888856 0.889804 0.890514 0.891044 0.891442 0.891739 0.891961 0.892127 0.892251 0.892344 0.892414 0.892466 0.892504 0.892533 0.892555 0.892571 0.892584
1.42E-07 3.08e-007 6.67196e-007 8.60248e-007 0.000823234 0.0612427 0.364877 0.702666 0.875766 0.943126 0.969018 0.979785 0.984599 0.986754 0.987542 0.987517 0.986941 0.988119 0.98894 0.98952 0.989937 0.990239 0.99046 0.990622 0.990742 0.99083 0.990896 0.990945 0.990981 0.991009 0.991029 0.991044 0.991055 0.991064 0.99107 0.991075 0.991078 0.991081 0.991083 0.991084 0.991085
0.00251524 0.0102634 0.0280978 0.120219 0.223007 0.316932 0.40663 0.493957 0.573795 0.641856 0.697472 0.741869 0.77686 0.804269 0.825712 0.842544 0.854794 0.863255 0.869624 0.874411 0.878003 0.880697 0.882715 0.884226 0.885358 0.886204 0.886838 0.887312 0.887666 0.887931 0.888129 0.888278 0.888388 0.888471 0.888533 0.88858 0.888614 0.88864 0.888659 0.888674 0.888685
0.000264644 0.000698602 0.0011433 0.00710523 0.152878 0.558986 0.854997 0.95772 0.985726 0.993803 0.996526 0.997579 0.998002 0.998132 0.998093 0.997935 0.997944 0.998134 0.998265 0.998358 0.998424 0.998472 0.998507 0.998533 0.998552 0.998566 0.998576 0.998584 0.99859 0.998594 0.998597 0.998599 0.998601 0.998603 0.998604 0.998604 0.998605 0.998605 0.998606 0.998606 0.998606
0.00136514 0.00552147 0.0170379 0.0516445 0.25151 0.32289 0.38972 0.46314 0.540453 0.611944 0.672646 0.72201 0.761294 0.792226 0.81649 0.835554 0.850627 0.860277 0.867554 0.87303 0.877144 0.880231 0.882545 0.884279 0.885577 0.886548 0.887275 0.887819 0.888226 0.888531 0.888758 0.888928 0.889056 0.889151 0.889222 0.889275 0.889315 0.889345 0.889367 0.889383 0.889396
7.68E-08 1.66941e-007 3.61701e-007 4.70334e-007 0.00157565 0.121714 0.553226 0.854502 0.954407 0.982644 0.991446 0.994638 0.995916 0.996398 0.996472 0.996287 0.995904 0.996334 0.996628 0.996835 0.996981 0.997087 0.997164 0.99722 0.997261 0.997292 0.997315 0.997331 0.997344 0.997353 0.99736 0.997365 0.997369 0.997372 0.997374 0.997376 0.997377 0.997378 0.997379 0.997379 0.99738
0.00251523 0.0102573 0.0285506 0.174728 0.254572 0.32776 0.407445 0.49293 0.572936 0.641278 0.69706

0.741542 0.776573 0.803995 0.825438 0.842259 0.854512 0.862989 0.86937 0.874166 0.877764 0.880463
0.882484 0.883998 0.885132 0.88598 0.886614 0.887089 0.887444 0.887709 0.887908 0.888056 0.888167
0.88825 0.888312 0.888359 0.888393 0.888419 0.888439 0.888453 0.888464
6.38E-07 1.68456e-006 2.72367e-006 0.000402289 0.0811227 0.522385 0.864544 0.966283 0.989875 0.995903
0.997774 0.998455 0.998706 0.99876 0.998696 0.998541 0.99853 0.998675 0.998776 0.998846 0.998896
0.998932 0.998959 0.998978 0.998992 0.999003 0.999011 0.999016 0.999021 0.999024 0.999026 0.999028
0.999029 0.99903 0.999031 0.999032 0.999032 0.999032 0.999033 0.999033 0.999033
0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388
0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388
0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388
0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 0.151388 #mean M for year Yinit: 2009 sex:
1
6944.24 5852.41 4861.17 4763.91 5505.62 3459.48 1628.8 1325.45 887.481 665.673 412.186 374.354 189.61
47.2956 23.5842 10.0327 8.60304 2.06726 0.712878 0.798243 0.316811 0.138139 0.0443359 0.0126289
0.00571535 0.00408264 0.00197056 0.000429158 0.000219746 9.18681e-005 6.47175e-005 1.64199e-005
7.64654e-006 6.94858e-006 2.69952e-006 7.24419e-007 4.14115e-007 1.39606e-007 8.13647e-008 5.86161e-008
5.22362e-008 #numbers for year Yinit: 2009 sex: 1
0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252
0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252
0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252
0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 0.169252 #mean M for year Yinit: 2009 sex:
2
7006.55 5783.12 4718.61 4542.96 5164.32 3187.56 1416.49 1003.17 572.744 386.37 223.259 183.746 80.4955
17.7784 8.36505 3.51743 3.09269 0.763652 0.264874 0.296679 0.114888 0.0468791 0.0138481 0.00368023
0.00156949 0.00108767 0.000515502 0.000114193 6.16191e-005 2.66512e-005 1.92805e-005 5.29594e-006
2.72535e-006 2.67023e-006 1.06474e-006 2.86042e-007 1.67585e-007 5.8869e-008 3.51654e-008 2.57434e-008
2.48647e-008 #numbers for year Yinit: 2009 sex: 2
6944.24 5852.41 4861.17 4763.91 5505.62 3459.48 1628.8 1325.45 887.481 665.673 412.186 374.354 189.61
47.2956 23.5842 10.0327 8.60304 2.06726 0.712878 0.798243 0.316811 0.138139 0.0443359 0.0126289
0.00571535 0.00408264 0.00197056 0.000429158 0.000219746 9.18681e-005 6.47175e-005 1.64199e-005
7.64654e-006 6.94858e-006 2.69952e-006 7.24419e-007 4.14115e-007 1.39606e-007 8.13647e-008 5.86161e-008
5.22362e-008 #numbers for year Ydeclare: 2009 sex: 1
7006.55 5783.12 4718.61 4542.96 5164.32 3187.56 1416.49 1003.17 572.744 386.37 223.259 183.746 80.4955
17.7784 8.36505 3.51743 3.09269 0.763652 0.264874 0.296679 0.114888 0.0468791 0.0138481 0.00368023
0.00156949 0.00108767 0.000515502 0.000114193 6.16191e-005 2.66512e-005 1.92805e-005 5.29594e-006
2.72535e-006 2.67023e-006 1.06474e-006 2.86042e-007 1.67585e-007 5.8869e-008 3.51654e-008 2.57434e-008
2.48647e-008 #numbers for year Ydeclare: 2009 sex: 2

14488.4 13734.4 13734.4 13734.4 13734.4 13734.4 13734.4 13734.3 13734.2 13734 13733.8 13733.6 13733.4
13733.1 13732.8 13732.5 13732.1 13731.8 13731.4 13731.1 13730.7 13730.3 13729.9 13729.4 13729 13728.6
13728.1 13727.7 13727.2 13726.8 13726.3 13725.8 13725.4 13724.9 13724.4 13723.9 13723.4 13722.9 13722.4
13721.9 13721.4 13720.8 13720.3 13719.2 13718.6 13718.6 13719.1 13719.2 13718.8 13718.3 13717.4 13716.5
13715.7 13714.4 13713.2 13711.7 13710.5 13709.3 13707.5 13705.6 13699.4 13693.3 13689.2 13681.4 22063.9
18497.7 14997.7 12950.5 12894.8 14647.1 15367.2 14703.5 13709 12793.9 12109 11830 12006.4 12043.5
12216.1 12774.7 12299.1 10424.5 9696.6 10924.4 13707.2 17707.4 9126.82 9016.62 11571.4 9380.84 30360.1
13794.8 17264.2 12672.5 12780 14507.8 9605.34 7802.92 10657.3 8349.21 14017.9 16739.2 8739.09 8934.87
16304.7 10270.8 10524.6 8505.95 15731.5 12964.5 7194.77 6392.69 9323.3 12676.1 13294.8 15744.9 6656.91
9051.35 17503.5 9493.5 10447.3 9982.87 19854.5 20619 12590.5 11679.2 9382.8 9241.44 8354.8 14285.1
19223.9 14269.5 12513 12947.8 12876 #Recruits
25120.2 25120.2 25119.5 25118.9 25118.3 25117.7 25109.9 25095.3 25074.3 25047.3 25014.9 24977.5 24935.8
24890 24840.7 24788.3 24733.1 24675.4 24615.6 24553.9 24490.6 24425.8 24359.8 24292.6 24224.5 24155.5
24085.8 24015.4 23944.5 23873 23801.1 23728.9 23656.2 23583.3 23510.1 23436.6 23362.2 23287.7 23213
23138.2 23063.3 22988.3 22916.6 22756.5 22676.9 22667.5 22733.6 22757.6 22692.8 22629.4 22498.2 22377.3
22269.6 22095.8 21942.8 21741.7 21589.2 21440.8 21216.7 20987.8 20266.8 19605.2 19185 18426.8 17553.6
16596.8 15685.2 15005.2 13582.1 12206.8 11727.2 11723.6 10900.3 10397.8 9024.09 7859.45 6471.46 6120.94
5940.86 6071.15 5761.74 5380.55 5340.85 4955.06 4838.52 4662.71 4483.89 3949.7 3570.13 3160.68 3128.96
3258.72 3489.21 3473.43 3474.71 3593.32 3841.11 4480.09 4787.49 5123.42 4905.3 4480.28 4232.57 4081.63
3548.19 2876.22 2733.96 2831.72 2828.58 2529.55 2575.33 2785.15 2864.07 2515.91 2347.73 2295.38 2225.11
1827.14 1622.37 1654.12 1984.58 2373.89 2482.63 2324.61 2481.22 2776.93 2829.49 2827.81 3080.3 3796.47
4308.57 4169.94 4122.46 3755.23 3468.06 #SpawnBio
0.959023 0.4 0 # spawn-recr steepness, sigmaR, autocorr