Rebuilding analysis for canary rockfish based on the 2007 stock assessment

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Summary

Based on the 2007 stock assessment, this rebuilding analysis compares the results of applying a suite of potential future management actions to the U.S. canary rockfish stock. The base case assessment results estimated that the canary rockfish resource is at 32.4% of the unexploited equilibrium spawning biomass at the beginning of 2007. Uncertainty in that result is included through the integration over two alternate (and less likely) states of nature corresponding to lower and higher stock-recruitment steepness (h), the parameter largely governing productivity and recent rebuilding trajectory. The 2007-2008 OYs have been set at 44 mt based on the rebuilding SPR rate of 88.7% used in the 2002 and 2005 rebuilding analyses. This level of harvest does not correspond to overfishing (based on the 2007 assessment).

Beginning in 2009, various management options are considered ranging from zero fishing mortality to the largest removal that could occur without overfishing (ABC catches). In the absence of any future fishing mortality, the canary rockfish stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2019. In contrast, the stock is not projected to reach this level for 143 years (2152) if the ABC catches are removed. The current rebuilding harvest rate (SPR = 88.7%) would produce an OY of 155.2 mt in 2009 and has a 50% probability of rebuilding by 2021. The harvest rate that is consistent with the 2007-2008 OYs (44 mt) is SPR = 96.2%, and if continued, results in a 50% probability of recovery by 2020. Similarly, harvest rates based on a 2009 OY of 35-115 mt all result in a median year to rebuild of 2020, although they differ in the years for higher probabilities of recovery than 50%. A range of alternate management approaches to recovery based on past and recalculated reference points as well as harvest rates corresponding to short-term OYs are presented.

Introduction

The stock assessments conducted in 1999 for canary rockfish documented that the stock had declined below the overfished level in the northern (Columbia and U.S. Vancouver INPFC areas) and southern regions (Conception, Monterey and Eureka areas; Crone et al. 1999, Williams et al. 1999). Canary rockfish was determined to be in an "overfished" state on Jan. 1, 2000 and development of a rebuilding plan was initiated while preliminary rebuilding estimates were implemented through adjustments of annual management measures. The first rebuilding analysis for canary rockfish was conducted in 2000 based on the 1999 stock assessment (Methot 2000). This analysis has subsequently been updated on the basis of the 2002 (Methot and Piner), 2005 (Methot and Stewart) and now the 2007 stock assessment results (Stewart).

The first rebuilding analysis used results from the northern area assessment to project rates of potential stock recovery (Methot 2000). The stock was found to have long recovery times based on extremely low productivity. The initial rebuilding OY for 2001 and 2002 was set at 93 mt based upon a 50% probability of rebuilding by the year 2057 and maintaining a constant catch throughout the rebuilding period.

The rebuilding analysis was updated in 2002 (Methot and Piner, 2002) to incorporate the coast-wide assessment results. This analysis was the basis of a change from a constant catch to a constant harvest rate rebuilding strategy, as was done for other west coast groundfish rebuilding plans. The results of the 2002 assessment and rebuilding analysis indicated that the relative spawning biomass had reached a low of 6.6% in 2000 (compared to the unfished equilibrium level), the year of the overfished declaration. By 2002 it had increased to 7.9%. The rate of rebuilding was based on the model-estimated stock-recruitment relationship with a steepness of 0.33 and stochastic projections sampling lognormal deviations about this relationship. The time to rebuild from the year of declaration with no fishing, T_{MIN}, was estimated to be year 2057. The mean generation time was calculated to be 19 years. The maximum allowable time to rebuild, T_{MAX}, was therefore calculated to be the year 2076 (2057 plus one mean generation time). The year with a 50% probability of recovery, T_{TARGET}, was 2074 on the basis of a harvest rate that would achieve a 60% probability of rebuilding by 2076 (T_{MAX}). This rebuilding harvest rate produced an OY in 2003 of 41 mt. The 2002 analysis demonstrated the sensitivity of the target harvest rate (and short-term OYs) to the commercial vs. recreational allocation, because of the difference in selectivity between the two gear groups. Final calculations were based upon a 50:50 division of rebuilding OYs.

The 2005 rebuilding analysis (Methot 2005) recalculated all rebuilding reference points on the basis of two alternate models for selectivity (sex-specific or not) and a profile of values for stock-recruitment steepness for each model. Rebuilding projections therefore included uncertainty in selectivity, steepness and future recruitment strength. The stock was estimated to be at 9.4% of unexploited spawning biomass in 2005. The time to rebuild from the year of declaration (2000) with no fishing, T_{MIN}, was estimated to be year 2048. Mean generation time was estimated to be 23 years. The maximum allowable time to rebuild, T_{MAX}, was therefore calculated to be the year 2071 (2048 plus one mean generation time). The year with a 50% probability of recovery, T_{TARGET}, was 2063 on the basis of the same harvest rate selected in 2002 (SPR= 88.7%). This harvest rate was projected to achieve a 55.4% probability of rebuilding by 2071 (T_{MAX}). Because

of slightly below-average recruitments since the stock had been declared overfished, the projected year with a 50% probability of rebuilding to target stock size if fishing mortality were zero beginning in 2007 ($T_{F=0}$) was 2053. A list of reference points from the 2005 rebuilding analysis is presented in Table 1. The 2005 rebuilding analysis projected OYs based on three fishing fleets (trawl, non-trawl and recreational) maintaining a 50:50 split between commercial and recreation sectors, although this had not been realized in the actual removals during the intervening years since 2002.

2007 Assessment summary

The 2007 canary rockfish stock assessment estimated the unexploited spawning biomass (SB_0) to be 32,561 mt in the base case model (Stewart 2007). The stock was estimated to be at 32.4% of this level at the beginning of 2007. The steepness of the spawner-recruitment relationship, which largely determines the rate of increase in recruitment as the stock rebuilds, was 0.511 in the base model, with the degree of recruitment variability (σ_r) set at 0.50. Two alternative states of nature were presented, representing lower stock-recruitment steepness (0.345) and higher steepness (0.72); each of these states was assigned a probability equal to half that of the base case model (0.5), based on a meta-analysis of west coast rockfish (M. Dorn, Alaska Fisheries Science Center, personal communication). These alternate models estimated the stock to be at a much lower (12%) or higher (56%) relative stock size.

Important changes in the 2007 assessment included:

- Updating the catch history (1981-2006).
- Addition of the NWFSC trawl survey data (2003-2006).
- Addition of the coast-wide pre-recruit index.
- Inclusion of extensive re-aging and exchange between WDFW and NMFS ageing labs.
- Addition of new fishery age and length data from port and observer sampling programs.
- Change to using GLMM instead of design-based estimators of survey abundance.
- Partitioning of the Triennial trawl survey into two periods of catchability (1980-1992, 1995-2004) based on changes in survey timing during the summer.
- Application of time-varying fishery selectivity based on changes in management identified *a priori*.

Changes in the results of the 2007 assessment compared to those in 2005 were due primarily to the division of the triennial survey into two time series, and the application of time-varying selectivity for recent fishery removals. The net result of these changes was a loss of information from canary-specific data about steepness, which led to the use of a higher value (0.511) based on meta-analysis results instead of estimating the value directly in the base case assessment model.

Management performance under rebuilding

Following the 1999 declaration that the canary rockfish stock was overfished the canary OY was reduced by over 70% in 2000 and by the same margin again over the next three years. Managers employed several tools in an effort to constrain catches to these dramatically lower targets. These included: reductions in trip/bag limits for canary and co-occurring species, the institution of spatial closures, and new gear restrictions intended

to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. Over that period, the total mortality was near the OY, and well below the ABC. The total 7-year catch (644 mt) was only 13% above the sum of the OYs for 2000-2006. This level of removals represents only 35% of the sum of the ABCs for that period (Table 1).

Rebuilding calculations

This rebuilding analysis was conducted using software developed by A. Punt (version 2.11, September 2007) and includes the requested model runs outlined in a recent Council memorandum (4 September, 2007). 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. Recalculate 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 SB_0

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 32,561 mt in the base case assessment model, which dictates that the rebuilding target ($SB_{40\%}$) is 13,024 mt (Table 2).

2. Generation of future recruitment

The parameters of the stock recruitment relationship (unexploited equilibrium recruitment [natural log of R_0], steepness [h], and the degree of recruitment variability [σ_r]) from the 2007 stock assessment are used to generate future recruitments in the rebuilding analysis. These values are provided in Table 3.

3. Fishery selectivity and allocation

In order to project the effect of fishing on the canary rockfish rebuilding trajectory, it is necessary to specify the fishery selectivity and relative allocation among fleets. Unlike previous rebuilding analyses, this analysis projects forward using selectivity and allocation averaged over recent years (2003-2006). This choice was made because the realized fraction of the catch coming from the recreational sector has been substantially lower than the 50% value used in previous rebuilding projections (average fraction of the catch from recreational sources over 2003-2006 = 33.7%). This choice

also provides more consistency between assessment model results and short term-forecasts from the rebuilding analysis. Further, because the rebuilding software can only accommodate 5 fishing fleets, only the top five fleets in recent years (Oregon trawl, Washington trawl, Oregon-Washington non-trawl, northern California recreational and Oregon-Washington recreational fleets; based on total estimated catches) are included in forward projections. The effect of simplifying the fleet structure was relatively small and can be assessed via comparison of forecasts made in the assessment document and those made here. The resulting selectivity and weight at age are included in the basic input data files (Appendices A and B).

4. Inclusion of uncertainty

Uncertainty is included in this rebuilding analysis via integration of the three states of nature for stock-recruitment steepness reported in the 2007 assessment. Specifically, the model using a low value for steepness is given a probability of 25%, the base case 50% and the model using a high value for steepness 25%. This is achieved through the use of multiple parameter vectors in the rebuilding input files. Because these three states are discrete levels from a continuous probability distribution, it is expected that there will be a reasonably high degree of 'stair-stepping' in reported probabilities. This means that interpretation of the relative difference between 60% and 70% probabilities are probably not as meaningful as those between 70% and 80% where the upper tail is actually informing the difference. A similar pattern should exist in the lower tail as well. Addition of more parameter vectors would tend to smooth this pattern in the results, but is unlikely to substantially change the median values upon which decisions are generally made.

5. Recalculate reference points

With OYs already fixed for 2007-2008, the median year of recovery in the absence of fishing ($T_{F=0}$) was calculated by setting fishing mortality to zero in 2009 for all projections. The value for $T_{F=0}$ is 2019. The value for T_{MIN}, the median year for rebuilding to the target level in the absence of fishing since the year of declaration is also 2019. This calculation reflects below average recruitments from 2000-2007. That T_{MIN} is equal to $T_{F=0}$ indicates harvest during this six-year period has had little effect on the stock trajectory.

The estimated generation time has decreased slightly to 22 years from 23 years as estimated in the 2005 analysis, primarily due to a slight change in the estimated natural mortality of older females. Revised vectors of weight-at-age through the explicit estimation of growth parameters in the 2007 assessment may also have contributed to this difference. In conjunction with T_{MIN}, the mean generation time dictates the revised estimate of T_{MAX}, 2041. Applying the same harvest rate (SPR_{TARGET} = 88.7%) used to find T_{TARGET} in the 2005 rebuilding analysis leads to a revised T_{TARGET} of 2021. This harvest rate generates a P_{MAX} (probability of recovery by T_{MAX}) of 74.9%.

All reference points from the 2005 rebuilding analysis and those recalculated here are summarized in Table 2.

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 three approaches: 1) strategies based on selection of a harvest rate, 2) strategies based selection of a T_{TARGET} (year for 50% probability of recovery) or 3) strategies based on selection of an OY for the next year under consideration (2009). This rebuilding analysis presents 20 alternate strategies spread among these three approaches and attempting to include all past and present reference points. Alternatives 1-9 correspond to the requests made in the recent Council memorandum (4 September, 2007), and 10-20 correspond to trajectories based on OYs that generate harvest rates lower than the current SPR target. Specifically, the alternatives are:

1) Eliminate all harvest beginning in 2009 (F=0).
2) Apply the current rebuilding harvest rate target (SPR_{TARGET}).
3) Apply the harvest rate which generates the 2007-2008 OYs (44 mt).
4) Apply a harvest rate that achieves a 50% probability of recovery by T_{TARGET} from Amendment 16-4 (2063).
5) Apply the ABC harvest rate ($SPR_{50\%}$).

Apply the harvest rate that achieves a 50% probability of recovery for years distributed between $T_{F=0}$ (2019) and T_{MAX} (2041):

6) 2023
7) 2029
8) 2035
9) 2041

Apply a harvest rate which generates a 2009 OY of:

10) 35 mt
11 55 mt
12) 65 mt
13) 75 mt
14) 85 mt
15) 95 mt
16) 105 mt
17) 115 mt
18) 125 mt
19) 135 mt
20) 145 mt

Results

Summary results from alternatives 1-9 are presented in Table 4. Detailed results are presented in Tables 6-8 and Figures 1-3. In the absence of any future fishing mortality, the canary rockfish stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2019. In contrast, the stock is not projected to reach this level for 143 years (2152) if the ABC catches are removed (alternative 5). These two

scenarios bound the range of fishing mortality between none and the overfishing level. All other scenarios lie within this range.

Fishing at the current SPR target (alternative 2) results in an increase from the 44 mt OY in 2008 to 155.2 mt in 2009. Retaining the harvest rate target also increases the probability of median recovery by T_{MAX} (over the 2005 value) to 75.0% even though T_{MAX} is reduced from 2071 to 2041. The current rebuilding harvest rate (SPR = 88.7%) results in a median year to rebuild (T_{TARGET}) of 2021. The harvest rate that is consistent with the 2007-2008 OYs (44 mt) is SPR = 96.2%, and if continued (alternative 3), results in a 50% probability of recovery achieved by 2020. Fishing at a rate that generates a median year of rebuilding that is equal to the existing T_{TARGET} of 2063 (alternative 4) corresponds to a 2009 OY of 800 mt. This suggests the need to consider 'resetting' the reference points from the 2005 rebuilding analysis in light of the changes to the assessment parameters and estimated current status. Alternatives 6-9 show the SPR targets required to achieve a median year of rebuilding that ranges from T_{TARGET} to T_{MAX}. These runs correspond to harvest rates in excess of the SPR = 88.7% value used in 2002 and 2005.

Summary results from alternatives 10-20 are presented in Table 5. Detailed results are presented in Tables 9-11 and Figures 4-6. These alternatives show the results of selecting a harvest rate target that is lower than the SPR = 88.7% value used in 2002 and 2005 based on the OY it would generate in 2009. Harvest rates based on a 2009 OY of 35-115 mt all result in a median year to rebuild of 2020, although they differ in the years for higher probabilities of recovery than 50%. For alternatives with 2009 OYs higher than 115 mt (alternative 15) the 2010 OY is lower than the 2009 OY, due to the continued effects of recent poor recruitment slowing the medium-term rate of recovery.

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Tables

Table 1. Canary rockfish management performance under rebuilding.

Year	ABC (mt)	OY (mt)	Landings (mt)[1]	Total Catch (mt)
2000	287	200	60.6	208.4
2001	228	93	42.8	133.6
2002	228	93	48.6	106.8
2003	272	44	8.5	51.0
2004	256	47.3	10.7	46.5
2005	270	46.8	10.9	51.4
2006	279	47	8.2	47.1

[1]Excludes all at-sea whiting, recreational and research catches.
[2]Includes the Columbia and Vancouver INPFC areas only.

Table 2. Summary of rebuilding reference points for canary rockfish from the 2005 rebuilding analysis (and Amendment 16-4, table 4-2) and recalculated values based on the current rebuilding SPR_{TARGET} applied to the 2007 assessment results.

	Source	
Parameter	Amendment 16-4	2007 assessment
SB_0	34,155	32,561
Rebuilding target ($SB_{40\%}$)	13,662	13,024
SB_{2007}	NA	10,544
T_{MIN}	2048	2019
Mean generation time	23	22
T_{MAX}	2071	2041
$T_{F=0}$ (beginning in 2007)	2053	NA
$T_{F=0}$ (beginning in 2009)	NA	2019
P_{MAX}	55.4%	75.0%
T_{TARGET}	2063	2021
SPR_{TARGET}	88.7%	88.7%

Table 3. Stock-recruitment parameters for the three states of nature included in this rebuilding analysis.

	State of nature		
Parameter	Low steepness	Base case	High steepness
R_0 (1000s)	4,540	4,210	4,035
Steepness (h)	0.345	0.511	0.72
σ_r	0.50	0.50	0.50

Table 4. Results of rebuilding alternatives based on Council requests (memorandum, 4 September, 2007).

Run	1	2	3	4	5	6	7	8	9
Basis	F=0 2009+	SPR = 88.7%	SPR from 2007-2008 44 mt OYs	SPR that achieves 50% prob. recovery by 2063	ABC harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2023	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2041
2009 OY (mt)	0.0	155.2	44.2	800.0	936.9	328.1	541.4	636.9	700.0
2009 ABC (mt)	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9
2010 OY (mt)	0.0	155.0	44.3	777.3	905.1	325.2	531.8	623.1	683.1
2010 ABC (mt)	941.4	935.4	939.7	910.4	905.1	928.7	920.4	916.7	914.2
50% prob. recovery by:	2019	2021	2020	2063	2152	2023	2029	2035	2041
SPR_{TARGET}	100%	88.7%	96.6%	55.1%	50.0%	77.8%	66.4%	62.0%	59.2%
Probability of recovery by reference points based on Amendment 16-4:									
2048 (T_{MIN})	76.4%	75.0%	75.4%	40.8%	28.6%	75.0%	72.0%	64.8%	56.9%
2053 ($T_{F=0}$ from 2007)	79.4%	75.3%	77.3%	44.2%	29.7%	75.0%	73.4%	67.9%	61.3%
2063 (T_{TARGET})	91.4%	78.8%	87.8%	50.0%	32.3%	75.0%	74.5%	72.0%	66.8%
2071 (T_{MAX})	97.1%	84.6%	94.8%	54.3%	34.7%	75.3%	74.8%	73.5%	70.0%
Probability of recovery by recalculated reference points:									
2013 (T_{MIN})	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
2019 ($T_{F=0}$ from 2009)	55.0%	36.6%	48.7%	25.0%	25.0%	27.6%	25.5%	25.0%	25.0%
2021 (T_{TARGET})	70.2%	50.0%	67.8%	25.0%	25.0%	37.5%	27.4%	26.0%	25.6%
2041 (T_{MAX})	75.0%	75.0%	75.0%	35.4%	26.9%	74.9%	68.5%	58.6%	50.0%

Table 5. Results of rebuilding alternatives based on fishing mortality rates calculated from 2009 OYs.

Run	10	*3*	11	12	13	14	15	16	17	18	19	20
Basis	SPR from 2009 OY of 35 mt	SPR from 2007-2008 44 mt OYs	SPR from 2009 OY of 55 mt	SPR from 2009 OY of 65 mt	SPR from 2009 OY of 75 mt	SPR from 2009 OY of 85 mt	SPR from 2009 OY of 95 mt	SPR from 2009 OY of 105 mt	SPR from 2009 OY of 115 mt	SPR from 2009 OY of 125 mt	SPR from 2009 OY of 135 mt	SPR from 2009 OY of 145 mt
2009 OY (mt)	35.2	44.2	55.2	64.7	75.6	85.3	95.0	104.8	114.7	125.0	134.8	145.0
2009 ABC (mt)	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9
2010 OY (mt)	35.3	44.3	55.3	64.8	75.7	85.4	95.1	104.8	114.7	124.9	134.7	144.8
2010 ABC (mt)	940.1	939.7	939.3	938.9	938.5	938.1	937.7	937.4	937.0	936.6	936.2	935.8
50% prob. recovery by:	2020	2020	2020	2020	2020	2020	2020	2020	2020	2021	2021	2021
SPR_{TARGET}	97.3%	96.2%	95.8%	95.1%	94.3%	93.6%	92.9%	92.2%	91.5%	90.8%	90.1%	89.4%
Probability of recovery by reference points based on Amendment 16-4:												
2048 (T_{MIN})	75.6%	75.4%	75.4%	75.4%	75.4%	75.2%	75.1%	75.0%	75.0%	75.0%	75.0%	75.0%
2053 ($T_{F=0}$ from 2007)	77.7%	77.3%	77.0%	76.7%	76.4%	76.3%	76.3%	76.2%	75.9%	75.6%	75.4%	75.4%
2063 (T_{TARGET})	88.3%	87.8%	86.7%	85.8%	84.5%	83.7%	82.6%	81.6%	81.0%	80.6%	80.1%	79.2%
2071 (T_{MAX})	95.2%	94.8%	94.2%	93.3%	92.4%	91.3%	90.4%	89.3	88.2%	86.8%	85.8%	85.0%
Probability of recovery by recalculated reference points:												
2013 (T_{MIN})	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
2019 ($T_{F=0}$ from 2009)	49.7%	48.7%	47.6%	46.2%	45.1%	44.6%	43.7%	42.4%	40.8%	39.6%	38.5%	37.5%
2021 (T_{TARGET})	68.5%	67.8%	67.1%	66.5%	65.5%	64.1%	62.6%	61.8%	60.5%	59.4%	58.9%	57.2%
2041 (T_{MAX})	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%

Table 6. Probability of recovery for rebuilding alternatives based on Council requests (memorandum, 4 September, 2007). Note that after 25 years the table is compressed.

Run	1	2	3	4	5	6	7	8	9
Basis	F=0 2009+	SPR = 88.7%	SPR from 2007-2008 44 mt OYs	SPR that achieves 50% prob. recovery by 2063	ABC harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2023	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2041
2007	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2008	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2009	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2010	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2011	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2012	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2013	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2014	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2015	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2016	0.251	0.250	0.251	0.250	0.250	0.250	0.250	0.250	0.250
2017	0.284	0.257	0.272	0.250	0.250	0.250	0.250	0.250	0.250
2018	0.407	0.288	0.360	0.250	0.250	0.258	0.250	0.250	0.250
2019	0.550	0.366	0.487	0.250	0.250	0.276	0.255	0.250	0.250
2020	0.660	0.473	0.599	0.250	0.250	0.320	0.260	0.256	0.251
2021	0.702	0.561	0.678	0.250	0.250	0.375	0.274	0.260	0.256
2022	0.732	0.633	0.714	0.253	0.250	0.440	0.293	0.267	0.261
2023	0.742	0.681	0.731	0.256	0.250	0.500	0.320	0.279	0.267
2024	0.746	0.707	0.742	0.257	0.250	0.560	0.344	0.290	0.275
2025	0.749	0.725	0.745	0.260	0.250	0.611	0.380	0.309	0.281
2026	0.749	0.735	0.747	0.265	0.250	0.647	0.401	0.321	0.293
2027	0.749	0.742	0.749	0.272	0.250	0.666	0.434	0.341	0.300
2028	0.750	0.746	0.749	0.278	0.250	0.687	0.465	0.358	0.313
2029	0.750	0.746	0.749	0.282	0.251	0.702	0.500	0.376	0.324
2030	0.750	0.747	0.750	0.287	0.252	0.713	0.526	0.402	0.336
2031	0.750	0.749	0.750	0.291	0.253	0.727	0.552	0.424	0.348
2041	0.750	0.750	0.750	0.354	0.269	0.749	0.685	0.586	0.500
2051	0.781	0.751	0.766	0.431	0.290	0.750	0.730	0.671	0.601
2061	0.895	0.776	0.854	0.494	0.317	0.750	0.745	0.714	0.660
2071	0.971	0.846	0.948	0.543	0.347	0.753	0.748	0.735	0.700

Table 7. Median spawning biomass (mt) for rebuilding alternatives based on Council requests (memorandum, 4 September, 2007). Note that after 25 years the table is compressed.

Run	1	2	3	4	5	6	7	8	9
Basis	F=0 2009+	SPR = 88.7%	SPR from 2007-2008 44 mt OYs	SPR that achieves 50% prob. recovery by 2063	ABC harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2023	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2041
2007	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544
2008	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841
2009	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073
2010	11,258	11,197	11,241	10,946	10,893	11,130	11,047	11,010	10,985
2011	11,383	11,260	11,348	10,753	10,647	11,123	10,955	10,880	10,831
2012	11,463	11,274	11,409	10,512	10,355	11,066	10,813	10,701	10,627
2013	11,524	11,268	11,450	10,251	10,045	10,987	10,649	10,501	10,403
2014	11,607	11,280	11,513	10,008	9,754	10,927	10,503	10,318	10,197
2015	11,751	11,351	11,636	9,816	9,516	10,920	10,408	10,186	10,041
2016	11,987	11,508	11,849	9,701	9,351	10,997	10,393	10,133	9,964
2017	12,328	11,765	12,165	9,669	9,269	11,164	10,462	10,163	9,969
2018	12,738	12,089	12,550	9,689	9,239	11,394	10,594	10,251	10,029
2019	13,181	12,432	12,964	9,737	9,237	11,648	10,744	10,357	10,113
2020	13,685	12,838	13,439	9,829	9,286	11,956	10,948	10,520	10,247
2021	14,236	13,293	13,963	9,959	9,361	12,312	11,192	10,721	10,419
2022	14,773	13,731	14,468	10,084	9,435	12,647	11,421	10,909	10,583
2023	15,350	14,210	15,017	10,235	9,536	13,024	11,686	11,130	10,775
2024	15,941	14,674	15,571	10,381	9,623	13,388	11,942	11,345	10,966
2025	16,500	15,133	16,099	10,493	9,693	13,735	12,165	11,515	11,105
2026	17,015	15,536	16,581	10,590	9,745	14,030	12,360	11,679	11,251
2027	17,517	15,959	17,061	10,704	9,812	14,366	12,582	11,852	11,391
2028	18,045	16,348	17,545	10,788	9,864	14,639	12,767	11,999	11,515
2029	18,600	16,811	18,074	10,933	9,958	15,004	13,020	12,211	11,699
2030	19,093	17,183	18,532	11,003	9,995	15,259	13,171	12,329	11,799
2031	19,528	17,519	18,934	11,046	9,996	15,504	13,316	12,432	11,877
2041	23,511	20,635	22,670	11,641	10,258	17,750	14,700	13,491	12,751
2051	26,282	22,743	25,229	12,043	10,419	19,302	15,662	14,238	13,357
2061	27,862	24,058	26,682	12,249	10,472	20,250	16,236	14,655	13,689
2071	28,903	24,832	27,667	12,531	10,621	20,841	16,739	15,097	14,073

Table 8. Median catches (mt) for rebuilding alternatives based on Council requests (memorandum, 4 September, 2007). Note that after 25 years the table is compressed.

Run	1	2	3	4	5	6	7	8	9
Basis	F=0 2009+	SPR = 88.7%	SPR from 2007-2008 44 mt OYs	SPR that achieves 50% prob. recovery by 2063	ABC harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2023	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2041
2007	0.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
2008	0.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
2009	0.0	155.2	44.2	800.0	936.9	328.1	541.4	636.9	700.0
2010	0.0	155.0	44.3	777.3	905.1	325.2	531.8	623.1	683.1
2011	0.0	157.5	45.3	771.1	893.1	328.4	532.7	621.9	680.2
2012	0.0	163.7	47.2	783.3	902.9	339.2	546.1	635.4	693.4
2013	0.0	171.5	49.7	803.0	921.3	353.4	564.7	654.9	713.1
2014	0.0	179.7	52.2	823.9	940.6	368.2	584.6	675.9	734.4
2015	0.0	186.9	54.5	839.3	954.6	380.5	600.1	691.6	750.1
2016	0.0	193.4	56.6	850.4	962.3	391.6	613.3	705.3	763.1
2017	0.0	198.7	58.3	856.3	964.9	400.5	623.4	713.8	770.8
2018	0.0	205.1	60.4	864.4	969.4	410.9	634.4	724.3	780.5
2019	0.0	210.6	62.2	872.1	973.8	419.7	644.2	733.9	789.5
2020	0.0	216.8	64.3	879.0	978.0	430.0	656.0	744.3	798.9
2021	0.0	222.0	66.0	887.2	983.3	439.1	665.6	753.8	807.8
2022	0.0	228.3	68.1	896.1	988.0	449.0	677.4	765.2	818.8
2023	0.0	234.0	70.0	896.4	985.8	457.1	683.5	769.3	821.3
2024	0.0	239.0	71.7	904.5	990.9	465.0	692.6	778.8	830.7
2025	0.0	245.3	73.8	909.0	991.7	474.5	702.3	786.9	837.4
2026	0.0	250.0	75.5	915.7	996.6	482.2	710.7	795.2	845.3
2027	0.0	257.0	77.8	925.8	1,003.8	493.4	724.0	807.6	856.9
2028	0.0	261.7	79.4	930.2	1,004.9	501.1	731.8	814.0	862.9
2029	0.0	267.3	81.3	933.5	1,004.4	510.2	739.9	821.5	868.6
2030	0.0	272.3	83.0	941.3	1,012.3	518.3	750.0	830.5	877.2
2031	0.0	276.5	84.5	945.0	1,011.2	524.4	755.7	836.3	882.5
2041	0.0	318.0	98.6	989.0	1,035.8	588.5	823.0	897.1	938.2
2051	0.0	346.9	108.4	1,014.5	1,044.0	632.8	867.8	937.3	972.9
2061	0.0	365.2	114.5	1,040.5	1,059.9	664.0	899.8	967.1	1,002.9
2071	0.0	377.7	119.1	1,051.2	1,063.8	680.5	921.2	985.9	1,019.3

Table 9. Probability of recovery for rebuilding alternatives based on fishing mortality rates calculated from 2009 OYs. Note that after 25 years the table is compressed.

Run	10	*3*	11	12	13	14	15	16	17	18	19	20
Basis	SPR from 2009 OY of 35 mt	SPR from 2007-2008 44 mt OYs	SPR from 2009 OY of 55 mt	SPR from 2009 OY of 65 mt	SPR from 2009 OY of 75 mt	SPR from 2009 OY of 85 mt	SPR from 2009 OY of 95 mt	SPR from 2009 OY of 105 mt	SPR from 2009 OY of 115 mt	SPR from 2009 OY of 125 mt	SPR from 2009 OY of 135 mt	SPR from 2009 OY of 145 mt
2007	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2008	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2009	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2010	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2011	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2012	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2013	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2014	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2015	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2016	0.251	0.251	0.251	0.251	0.251	0.251	0.250	0.250	0.250	0.250	0.250	0.250
2017	0.275	0.272	0.270	0.268	0.264	0.264	0.263	0.262	0.261	0.260	0.260	0.260
2018	0.369	0.360	0.350	0.342	0.337	0.330	0.324	0.316	0.309	0.304	0.298	0.293
2019	0.497	0.487	0.476	0.462	0.451	0.446	0.437	0.424	0.408	0.396	0.385	0.375
2020	0.610	0.599	0.592	0.576	0.564	0.553	0.533	0.524	0.510	0.493	0.484	0.479
2021	0.685	0.678	0.671	0.665	0.655	0.641	0.626	0.618	0.605	0.594	0.589	0.572
2022	0.716	0.714	0.705	0.698	0.695	0.689	0.685	0.677	0.670	0.664	0.653	0.645
2023	0.733	0.731	0.727	0.724	0.721	0.717	0.713	0.709	0.702	0.698	0.695	0.691
2024	0.742	0.742	0.739	0.738	0.734	0.731	0.729	0.726	0.722	0.721	0.714	0.712
2025	0.745	0.745	0.743	0.742	0.742	0.741	0.738	0.738	0.736	0.734	0.730	0.727
2026	0.748	0.747	0.746	0.746	0.745	0.745	0.744	0.743	0.742	0.739	0.738	0.736
2027	0.749	0.749	0.749	0.749	0.747	0.746	0.746	0.746	0.746	0.746	0.744	0.744
2028	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.746	0.746	0.746	0.746	0.746
2029	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.748	0.746	0.746
2030	0.750	0.750	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749
2031	0.750	0.750	0.750	0.750	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749
2041	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750
2051	0.767	0.766	0.765	0.763	0.760	0.759	0.754	0.754	0.754	0.753	0.752	0.752
2061	0.865	0.854	0.842	0.830	0.822	0.811	0.807	0.802	0.794	0.790	0.784	0.782
2071	0.952	0.948	0.942	0.933	0.924	0.913	0.904	0.893	0.882	0.868	0.858	0.850

Table 10. Median spawning biomass (mt) for rebuilding alternatives based on fishing mortality rates calculated from 2009 OYs. Note that after 25 years the table is compressed.

Run	10	*3*	11	12	13	14	15	16	17	18	19	20
Basis	SPR from 2009 OY of 35 mt	SPR from 2007-2008 44 mt OYs	SPR from 2009 OY of 55 mt	SPR from 2009 OY of 65 mt	SPR from 2009 OY of 75 mt	SPR from 2009 OY of 85 mt	SPR from 2009 OY of 95 mt	SPR from 2009 OY of 105 mt	SPR from 2009 OY of 115 mt	SPR from 2009 OY of 125 mt	SPR from 2009 OY of 135 mt	SPR from 2009 OY of 145 mt
2007	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544
2008	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841
2009	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073
2010	11,244	11,241	11,236	11,233	11,228	11,225	11,221	11,217	11,213	11,209	11,205	11,201
2011	11,355	11,348	11,339	11,332	11,323	11,315	11,308	11,300	11,292	11,284	11,276	11,268
2012	11,420	11,409	11,395	11,384	11,371	11,359	11,347	11,335	11,323	11,310	11,299	11,286
2013	11,465	11,450	11,432	11,417	11,398	11,383	11,366	11,350	11,334	11,317	11,301	11,284
2014	11,532	11,513	11,490	11,470	11,447	11,426	11,406	11,385	11,365	11,343	11,323	11,302
2015	11,660	11,636	11,608	11,583	11,555	11,530	11,505	11,480	11,455	11,428	11,403	11,377
2016	11,877	11,849	11,815	11,785	11,752	11,722	11,692	11,662	11,631	11,600	11,570	11,539
2017	12,198	12,165	12,125	12,091	12,051	12,016	11,981	11,946	11,910	11,873	11,838	11,802
2018	12,588	12,550	12,504	12,464	12,418	12,378	12,337	12,296	12,255	12,213	12,172	12,131
2019	13,008	12,964	12,910	12,864	12,811	12,765	12,718	12,671	12,623	12,575	12,528	12,480
2020	13,489	13,439	13,378	13,326	13,266	13,214	13,161	13,108	13,055	12,999	12,947	12,893
2021	14,018	13,963	13,896	13,838	13,771	13,712	13,653	13,594	13,534	13,473	13,414	13,354
2022	14,530	14,468	14,394	14,330	14,256	14,192	14,127	14,062	13,996	13,928	13,864	13,798
2023	15,085	15,017	14,935	14,865	14,784	14,714	14,643	14,571	14,500	14,425	14,355	14,283
2024	15,646	15,571	15,480	15,402	15,312	15,233	15,155	15,075	14,996	14,914	14,836	14,755
2025	16,180	16,099	16,001	15,916	15,820	15,735	15,650	15,565	15,479	15,390	15,306	15,219
2026	16,669	16,581	16,475	16,383	16,279	16,187	16,095	16,003	15,910	15,814	15,723	15,630
2027	17,153	17,061	16,949	16,854	16,744	16,648	16,552	16,455	16,358	16,257	16,160	16,059
2028	17,646	17,545	17,423	17,318	17,198	17,093	16,987	16,881	16,775	16,665	16,561	16,454
2029	18,180	18,074	17,945	17,835	17,708	17,597	17,486	17,374	17,262	17,147	17,037	16,924
2030	18,647	18,532	18,395	18,276	18,141	18,022	17,903	17,784	17,664	17,541	17,424	17,303
2031	19,054	18,934	18,789	18,665	18,523	18,398	18,273	18,148	18,022	17,893	17,770	17,645
2041	22,835	22,670	22,454	22,280	22,074	21,890	21,708	21,525	21,342	21,161	20,999	20,819
2051	25,448	25,229	24,969	24,749	24,498	24,278	24,056	23,838	23,618	23,391	23,177	22,956
2061	26,921	26,682	26,395	26,187	25,931	25,721	25,467	25,230	25,022	24,797	24,556	24,304
2071	27,918	27,667	27,381	27,127	26,837	26,588	26,325	26,073	25,817	25,580	25,329	25,097

Table 11. Median catches (mt) for rebuilding alternatives based on fishing mortality rates calculated from 2009 OYs. Note that after 25 years the table is compressed.

Run	10	*3*	11	12	13	14	15	16	17	18	19	20
Basis	SPR from 2009 OY of 35 mt	SPR from 2007-2008 44 mt OYs	SPR from 2009 OY of 55 mt	SPR from 2009 OY of 65 mt	SPR from 2009 OY of 75 mt	SPR from 2009 OY of 85 mt	SPR from 2009 OY of 95 mt	SPR from 2009 OY of 105 mt	SPR from 2009 OY of 115 mt	SPR from 2009 OY of 125 mt	SPR from 2009 OY of 135 mt	SPR from 2009 OY of 145 mt
2007	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
2008	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
2009	35.2	44.2	55.2	64.7	75.6	85.3	95.0	104.8	114.7	125.0	134.8	145.0
2010	35.3	44.3	55.3	64.8	75.7	85.4	95.1	104.8	114.7	124.9	134.7	144.8
2011	36.0	45.3	56.5	66.1	77.2	87.0	96.9	106.8	116.8	127.2	137.0	147.2
2012	37.6	47.2	58.9	68.9	80.5	90.6	100.9	111.2	121.5	132.3	142.5	153.1
2013	39.6	49.7	61.9	72.4	84.5	95.2	105.9	116.7	127.5	138.7	149.4	160.4
2014	41.6	52.2	65.1	76.1	88.8	100.0	111.2	122.5	133.8	145.5	156.7	168.2
2015	43.5	54.5	67.9	79.4	92.6	104.2	115.9	127.6	139.3	151.5	163.0	174.9
2016	45.1	56.6	70.4	82.4	96.0	108.0	120.1	132.2	144.4	156.9	168.8	181.1
2017	46.5	58.3	72.6	84.9	98.9	111.2	123.6	136.0	148.5	161.3	173.5	186.1
2018	48.2	60.4	75.2	87.9	102.4	115.1	127.8	140.6	153.5	166.7	179.2	192.1
2019	49.7	62.2	77.4	90.5	105.4	118.4	131.5	144.6	157.8	171.4	184.2	197.4
2020	51.3	64.3	80.0	93.4	108.7	122.2	135.6	149.1	162.6	176.5	189.6	203.2
2021	52.7	66.0	82.1	95.8	111.5	125.2	139.0	152.8	166.6	180.8	194.3	208.2
2022	54.4	68.1	84.7	98.8	115.0	129.2	143.3	157.4	171.6	186.2	200.0	214.1
2023	55.9	70.0	87.0	101.6	118.2	132.7	147.1	161.6	176.1	191.0	205.1	219.6
2024	57.3	71.7	89.1	103.9	120.9	135.7	150.5	165.3	180.0	195.2	209.6	224.3
2025	59.0	73.8	91.7	106.9	124.3	139.5	154.7	169.8	185.0	200.5	215.2	230.2
2026	60.3	75.5	93.7	109.2	126.9	142.4	157.8	173.2	188.6	204.5	219.4	234.7
2027	62.2	77.8	96.5	112.5	130.8	146.7	162.6	178.4	194.2	210.4	225.7	241.4
2028	63.5	79.4	98.5	114.8	133.4	149.6	165.7	181.8	197.9	214.4	230.0	245.9
2029	65.0	81.3	100.9	117.6	136.5	153.1	169.6	186.0	202.4	219.2	235.0	251.2
2030	66.4	83.0	102.9	119.9	139.2	156.1	172.9	189.7	206.4	223.5	239.5	256.0
2031	67.6	84.5	104.7	122.0	141.6	158.7	175.7	192.7	209.6	226.9	243.2	259.9
2041	78.9	98.6	122.1	142.0	164.6	184.3	203.8	223.1	242.4	262.1	280.5	299.3
2051	86.9	108.4	134.2	156.0	180.6	202.1	223.3	244.4	265.5	286.7	306.6	326.9
2061	91.8	114.5	141.5	164.6	190.6	213.1	235.5	257.7	279.5	301.7	322.5	344.0
2071	95.5	119.1	147.2	171.0	197.9	221.2	244.2	267.0	289.6	312.6	334.1	356.2

Figures

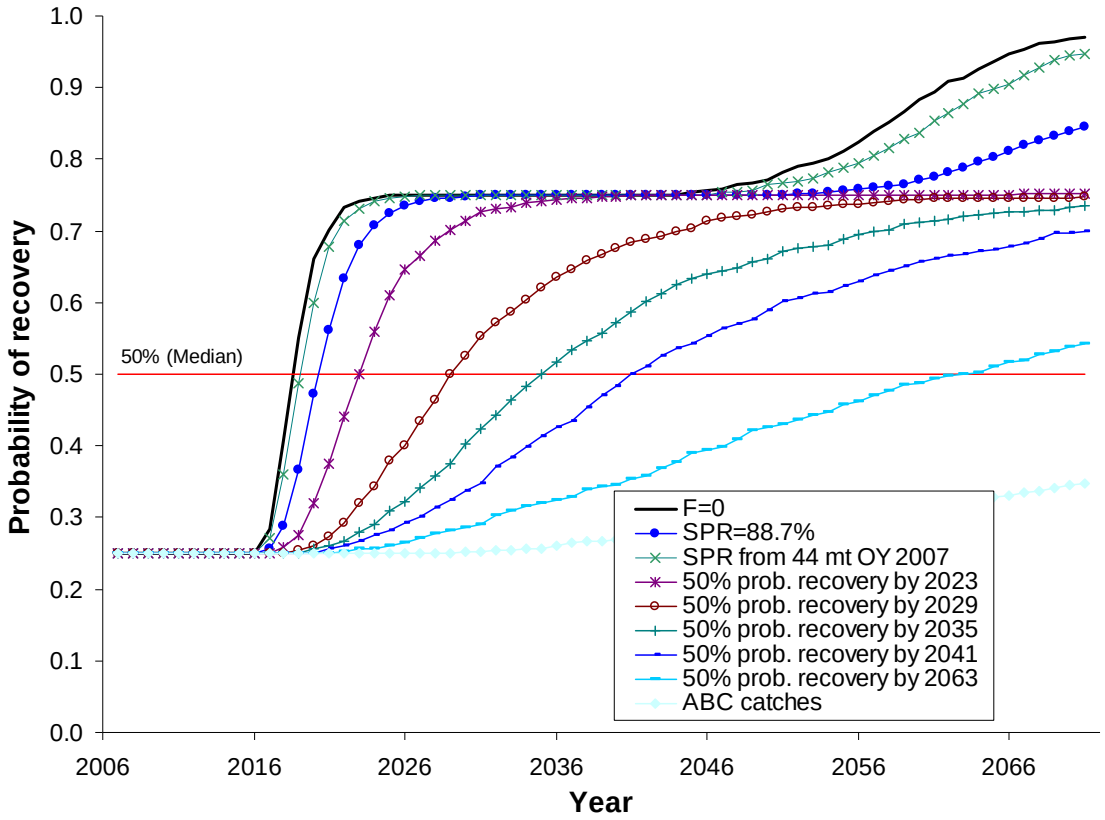

Figure 1. Probability of recovery for rebuilding alternatives (1-9) based on Council requests.

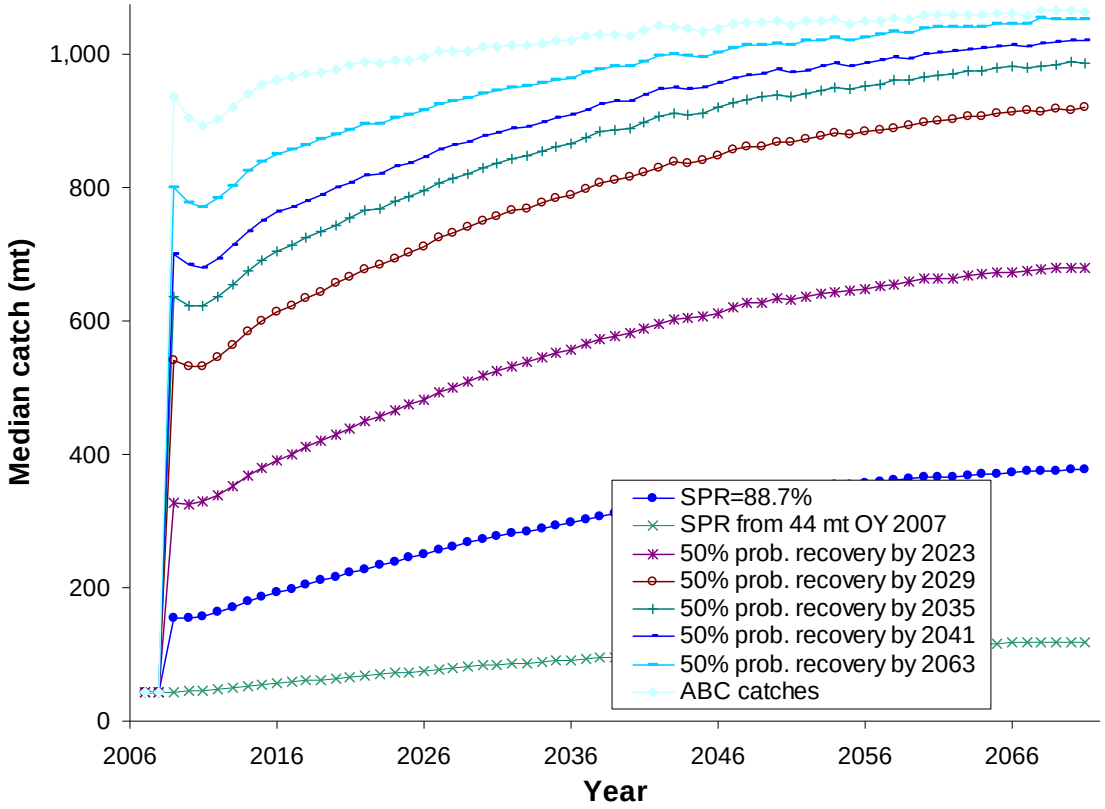

Figure 2. Projected median catch (mt) for rebuilding alternatives (1-9) based on Council requests.

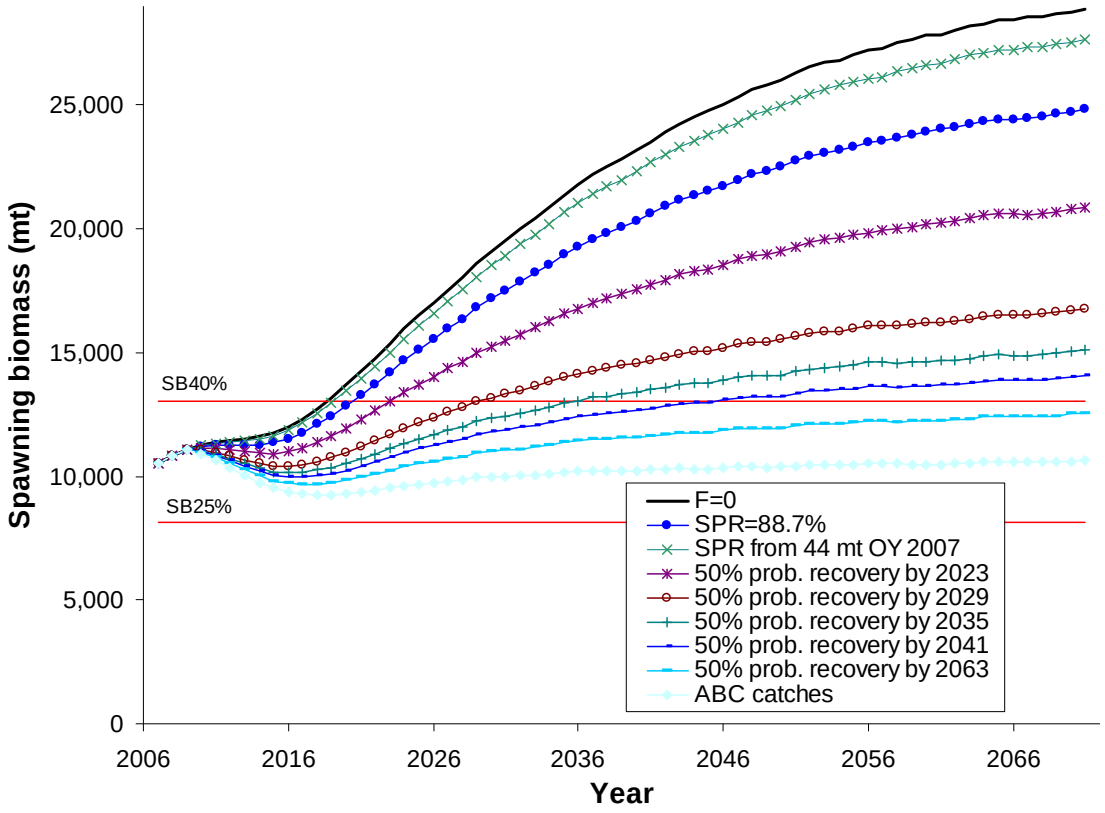

Figure 3. Projected median spawning biomass (mt) for rebuilding alternatives (1-9) based on Council requests.

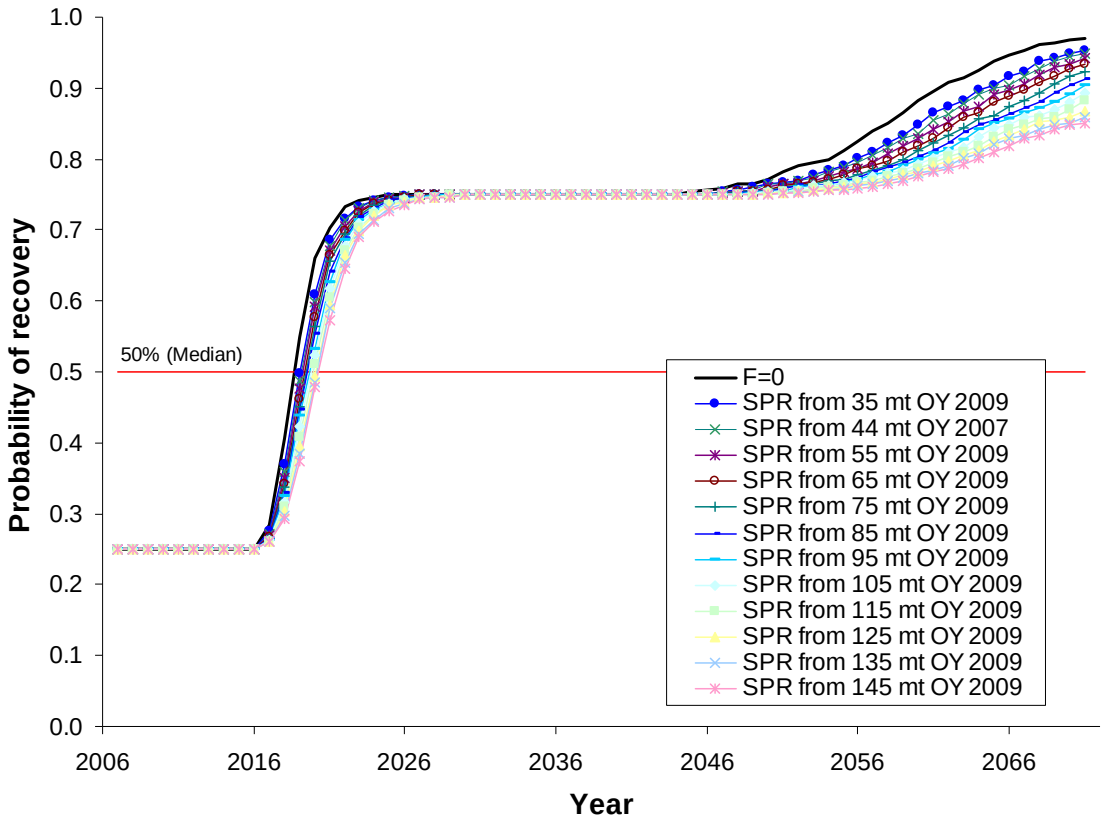

Figure 4. Probability of recovery for rebuilding alternatives (10-20) based on fishing mortality rates calculated from 2009 OYs.

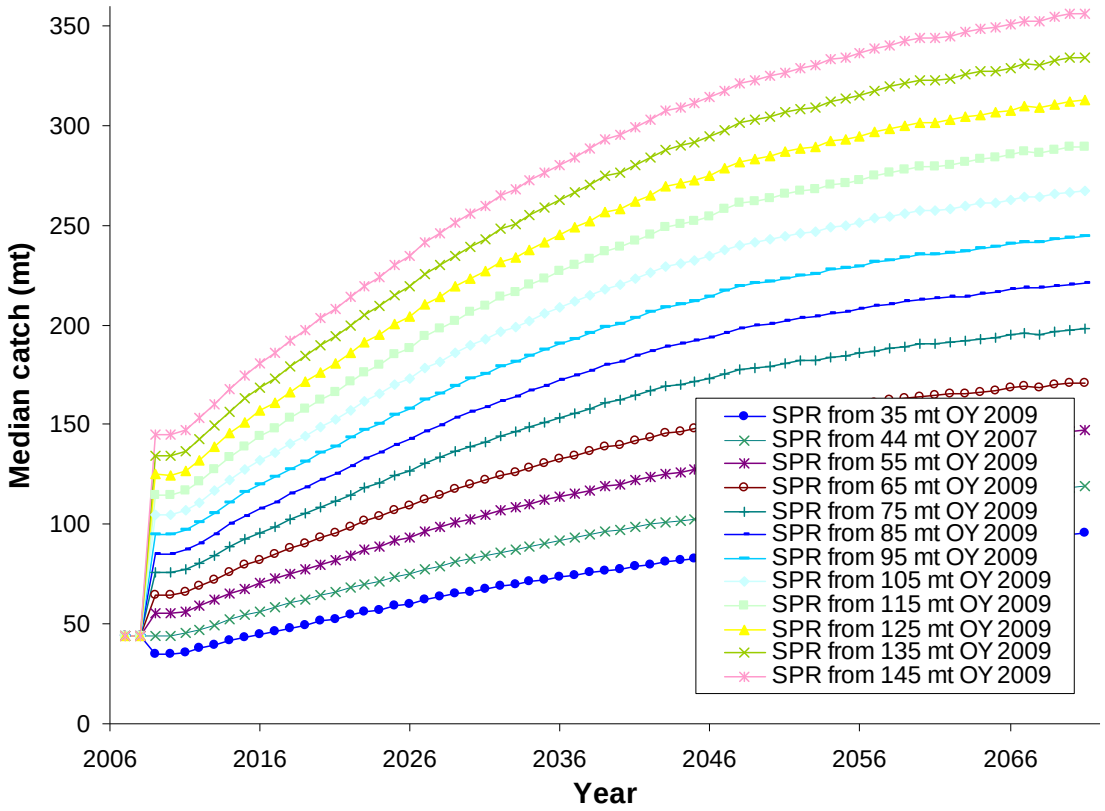

Figure 5. Projected median catch (mt) for rebuilding alternatives (10-20) based on fishing mortality rates calculated from 2009 OYs.

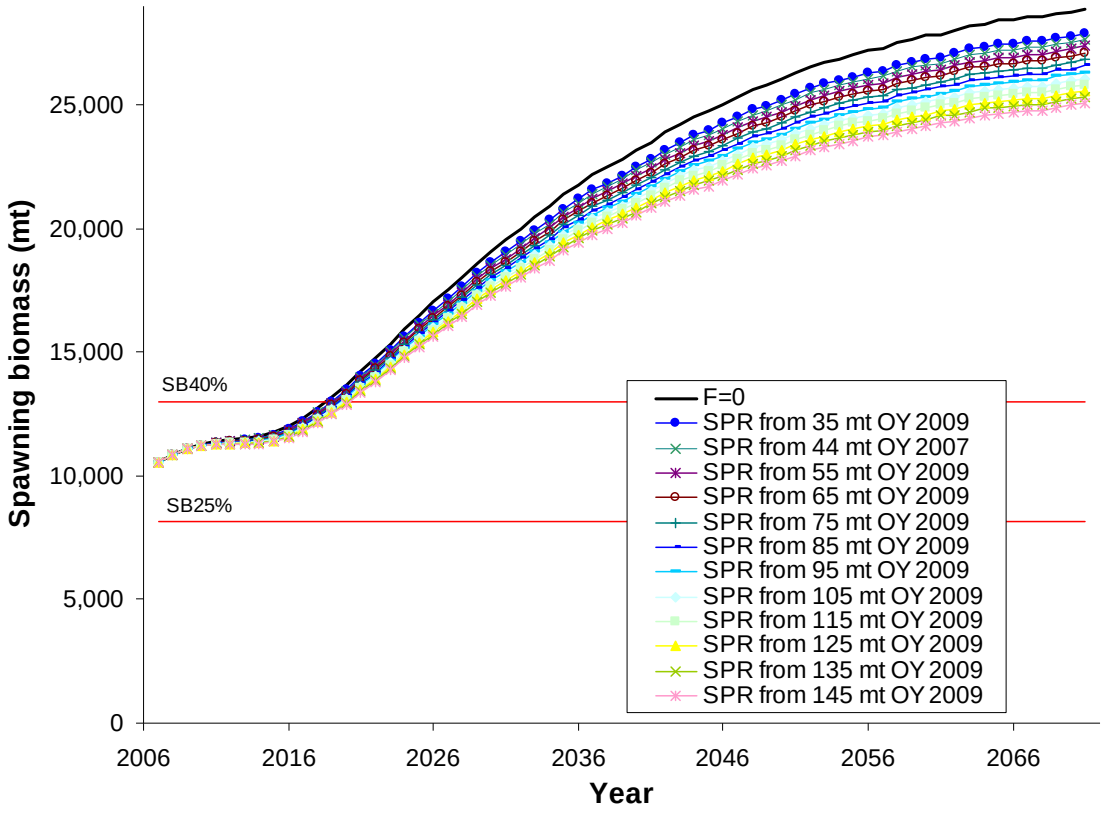

Figure 6. Projected median spawning biomass (mt) for rebuilding alternatives (10-20) based on fishing mortality rates calculated from 2009 OYs.

Appendix A. Basic input file for rebuilding analyses.

#Title
Canary rebuilding analysis 2007
Number of sexes
2
Age range to consider (minimum age; maximum age)
0 40
Number of fleets
5
First year of projection (Yinit)
2007
First Year of rebuilding period (Ydecl)
2000
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
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 #runnumber: 157 Canary_07.dat Canary_07.ctl 4393.42 32561 10543.9
0 0 4.01976e-005 0.000437851 0.00402875 0.0224513 0.083262 0.218854 0.437692 0.715599 1.01587 1.30959 1.58127 1.82554 2.0423 2.23362 2.40214 2.55046 2.68093 2.79561 2.89636 2.98479 3.06234 3.13029 3.18977 3.2418 3.28728 3.32701 3.36168 3.39193 3.41831 3.4413 3.46133 3.47877 3.49396 3.50718 3.51869 3.5287 3.53741 3.54498 3.55157 #female fecundity; weighted by N in year Y_init across morphs and areas
Age specific selectivity and weight adjusted for discard and discard mortality
#wt and selex for gender,fleet: 1 3
0.0367773 0.0367773 0.0561806 0.23394 0.448076 0.634397 0.81376 0.989351 1.16946 1.35796 1.55009 1.73927 1.92193 2.09638 2.26105 2.41431 2.55496 2.68247 2.79693 2.89894 2.98935 3.06918 3.13946 3.20119 3.25532 3.30271 3.34417 3.3804 3.41204 3.43964 3.46371 3.4847 3.50298 3.51891 3.53277 3.54484 3.55534 3.56448 3.57243 3.57934 3.58536
0 0.000123399 0.00012402 0.000435622 0.0122939 0.103285 0.345187 0.64784 0.858975 0.941709 0.93984 0.897823 0.842212 0.787198 0.739381 0.700711 0.670702 0.647922 0.630794 0.617936 0.608245 0.60089 0.595258 0.590902 0.587499 0.584813

0.582672 0.58095 0.579553 0.578412 0.577472 0.576694 0.576045 0.575502 0.575045
0.574659 0.574332 0.574054 0.573816 0.573614 0.57344
#wt and selex for gender,fleet: 1 4
0.0367773 0.0367773 0.0562504 0.231639 0.444824 0.634203 0.817598 0.996595
1.17914 1.37255 1.5748 1.7767 1.96989 2.15002 2.31551 2.46612 2.60221 2.72448
2.83379 2.93113 3.01749 3.09391 3.16134 3.22073 3.27293 3.31874 3.35889 3.39403
3.42477 3.45162 3.47507 3.49553 3.51337 3.52892 3.54247 3.55427 3.56454 3.57348
3.58126 3.58803 3.59392
0 0.000123399 0.000124219 0.000444908 0.0114748 0.0939603 0.317479 0.612191
0.837023 0.948071 0.986614 0.996457 0.998089 0.997868 0.997327 0.996789 0.996318
0.995922 0.995594 0.995325 0.995105 0.994925 0.994777 0.994656 0.994556 0.994473
0.994404 0.994346 0.994297 0.994256 0.994222 0.994192 0.994167 0.994146 0.994128
0.994112 0.994099 0.994087 0.994077 0.994069 0.994062
#wt and selex for gender,fleet: 1 7
0.0367773 0.0367773 0.0632527 0.194498 0.374883 0.584609 0.80995 1.04028 1.26819
1.48873 1.69864 1.89587 2.07923 2.24819 2.40271 2.54308 2.66987 2.78382 2.88576
2.97658 3.05722 3.12857 3.19153 3.24694 3.2956 3.33826 3.37559 3.40822 3.43672
3.46157 3.48324 3.50212 3.51855 3.53286 3.54531 3.55614 3.56556 3.57375 3.58088
3.58707 3.59245
0 0.000123398 0.000170931 0.000926685 0.0050456 0.0184818 0.0486662 0.100326
0.172735 0.260284 0.35508 0.449561 0.538022 0.617019 0.68509 0.742185 0.789117
0.82712 0.857552 0.881722 0.900802 0.915791 0.927521 0.936669 0.943783 0.949297
0.95356 0.956846 0.959373 0.96131 0.962792 0.963922 0.964781 0.965434 0.965928
0.966301 0.966582 0.966793 0.966951 0.967069 0.967156
#wt and selex for gender,fleet: 1 9
0.0367773 0.0367773 0.0969633 0.214801 0.335665 0.479169 0.649093 0.828738
1.01561 1.21318 1.42347 1.64285 1.86145 2.06833 2.25667 2.42452 2.5728 2.70343
2.81843 2.91966 3.00872 3.08703 3.15582 3.2162 3.26913 3.3155 3.35607 3.39154
3.42254 3.4496 3.47321 3.4938 3.51175 3.52739 3.54102 3.55288 3.5632 3.57219
3.58001 3.58681 3.59272
0 0.000123401 0.00150185 0.119822 0.621721 0.920996 0.870199 0.680724 0.483383
0.333759 0.236853 0.179073 0.145965 0.127237 0.116594 0.11045 0.106821 0.104619
0.103244 0.10236 0.101775 0.101377 0.101099 0.1009 0.100755 0.100647 0.100565
0.100501 0.100452 0.100412 0.100381 0.100355 0.100334 0.100317 0.100303 0.100291
0.100281 0.100273 0.100266 0.10026 0.100254
#wt and selex for gender,fleet: 1 10
0.0367773 0.0367773 0.0930704 0.225321 0.35427 0.491479 0.636101 0.77209
0.907143 1.06942 1.30093 1.59989 1.88645 2.11691 2.30323 2.46172 2.60077 2.72416
2.8339 2.9314 3.01783 3.09426 3.16169 3.22106 3.27325 3.31905 3.35918 3.39432
3.42505 3.45189 3.47533 3.49579 3.51362 3.52917 3.54271 3.5545 3.56477 3.57371
3.58149 3.58826 3.59414
0 0.000123401 0.000576464 0.0589803 0.450716 0.846958 0.823216 0.543855 0.27761
0.126181 0.0612489 0.0376 0.0297142 0.0271812 0.0263689 0.0261021 0.0260108
0.0259778 0.0259652 0.02596 0.0259577 0.0259567 0.0259562 0.0259559 0.0259557
0.0259556 0.0259556 0.0259556 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555
0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555

#wt and selex for gender,fleet: 2 3
0.0367773 0.0367773 0.0674364 0.286834 0.486865 0.664163 0.82959 0.98622 1.13897 1.28923 1.43338 1.56679 1.68702 1.79375 1.88761 1.96954 2.04056 2.10174 2.15416 2.19886 2.23683 2.26899 2.29614 2.31903 2.33828 2.35446 2.36804 2.37943 2.38896 2.39695 2.40363 2.40922 2.4139 2.41781 2.42108 2.42381 2.42609 2.42799 2.42958 2.43091 2.43202
0 0.000123399 0.000125488 0.000914953 0.0217441 0.139238 0.39002 0.667305 0.856726 0.94241 0.961463 0.947869 0.920669 0.889391 0.858793 0.831095 0.807092 0.786815 0.769935 0.755998 0.744537 0.735125 0.727397 0.721046 0.71582 0.711513 0.707958 0.70502 0.702588 0.700573 0.698902 0.697514 0.696361 0.695402 0.694604 0.693939 0.693386 0.692925 0.692541 0.69222 0.691953
#wt and selex for gender,fleet: 2 4
0.0367773 0.0367773 0.0676428 0.283241 0.484172 0.664575 0.833515 0.992786 1.1468 1.29863 1.44658 1.58583 1.71231 1.82431 1.92196 2.00626 2.07856 2.14025 2.1927 2.23713 2.27469 2.30637 2.33304 2.35546 2.37429 2.39008 2.40332 2.41441 2.4237 2.43147 2.43797 2.4434 2.44794 2.45174 2.45491 2.45756 2.45977 2.46162 2.46317 2.46446 2.46553
0 0.000123399 0.00012601 0.000914578 0.0200932 0.126599 0.359224 0.630119 0.830699 0.936296 0.979207 0.99357 0.997676 0.998611 0.99865 0.998459 0.998224 0.998 0.997801 0.997629 0.997482 0.997358 0.997254 0.997167 0.997094 0.997033 0.996982 0.99694 0.996904 0.996874 0.99685 0.996829 0.996812 0.996798 0.996786 0.996776 0.996767 0.99676 0.996754 0.99675 0.996745
#wt and selex for gender,fleet: 2 7
0.0367773 0.0367773 0.0784031 0.228888 0.417876 0.623287 0.830662 1.03074 1.2181 1.38988 1.54483 1.68281 1.80436 1.91052 2.00255 2.08183 2.14979 2.20778 2.25709 2.2989 2.33425 2.36407 2.3892 2.41033 2.42808 2.44297 2.45546 2.46593 2.47469 2.48202 2.48815 2.49328 2.49757 2.50116 2.50415 2.50665 2.50874 2.51049 2.51195 2.51317 2.51418
0 0.000123398 0.000208139 0.00135743 0.00698172 0.0229608 0.0542377 0.101567 0.161412 0.228089 0.296004 0.360911 0.420205 0.472673 0.518078 0.556774 0.58941 0.616748 0.639547 0.658513 0.674266 0.687342 0.698196 0.707206 0.714688 0.720905 0.726072 0.73037 0.733946 0.736923 0.739403 0.741468 0.743189 0.744624 0.74582 0.746817 0.747649 0.748343 0.748922 0.749405 0.749808
#wt and selex for gender,fleet: 2 9
0.0367774 0.0367774 0.11628 0.239547 0.364627 0.513323 0.678619 0.844229 1.00735 1.1675 1.32314 1.4715 1.60926 1.7337 1.84345 1.93852 2.01988 2.08896 2.14732 2.19645 2.23774 2.27239 2.30143 2.32575 2.34611 2.36314 2.37738 2.38929 2.39925 2.40757 2.41452 2.42033 2.42518 2.42923 2.43262 2.43544 2.4378 2.43977 2.44142 2.44279 2.44394
0 0.000123402 0.00379243 0.199295 0.733113 0.937519 0.850458 0.671613 0.499223 0.368446 0.279519 0.221834 0.18491 0.161139 0.145586 0.135188 0.128072 0.123086 0.119513 0.116899 0.11495 0.113474 0.112339 0.111456 0.110761 0.110209 0.109767 0.109411 0.109123 0.108888 0.108696 0.108538 0.108408 0.108302 0.108213 0.10814 0.10808 0.108029 0.107988 0.107953 0.107924
#wt and selex for gender,fleet: 2 10

0.0367773 0.0367773 0.116746 0.252196 0.383079 0.521663 0.661344 0.789074
0.912109 1.04538 1.20469 1.39146 1.58039 1.74389 1.87469 1.97818 2.06128 2.12914
2.18521 2.23186 2.27083 2.30343 2.33072 2.35358 2.37273 2.38875 2.40217 2.41339
2.42277 2.43062 2.43718 2.44267 2.44725 2.45108 2.45428 2.45695 2.45918 2.46104
2.4626 2.4639 2.46498
0 0.000123401 0.00140414 0.1069 0.57042 0.886137 0.798567 0.52779 0.288994
0.147828 0.079565 0.0495034 0.0366351 0.0310609 0.0285576 0.0273762 0.0267865
0.0264748 0.0263006 0.0261981 0.0261347 0.0260939 0.0260666 0.0260477 0.0260342
0.0260244 0.0260171 0.0260116 0.0260073 0.026004 0.0260013 0.0259992 0.0259976
0.0259962 0.0259951 0.0259942 0.0259935 0.0259929 0.0259924 0.025992 0.0259916
M and current age-structure in year Yinit: 2007
gender = 1
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.064613 0.069226 0.073839 0.078452 0.0830651
0.0876781 0.0922911 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
1403.67 538.714 524.26 653.583 375.426 529.451 715.062 357.744 743.587 392.015
338.845 444.835 454.442 576.254 382.705 401.111 442.08 355.032 312.683 241.156
156.134 110.069 50.4695 126.197 28.4389 27.3823 36.0401 15.0185 8.46823 15.9241
10.0754 5.03785 7.71588 3.78707 3.77586 3.25371 2.12318 1.38079 1.15342 1.31853
9.42277
gender = 2
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06
1403.67 538.714 524.26 653.579 375.356 529.123 714.46 357.354 746.058 396.823
347.314 463.913 484.821 630.993 431.755 469 536.549 448.917 413.046 333.174
225.256 165.56 79.2889 208.663 50.041 51.5833 72.5138 32.0366 18.9086 36.7784
23.8657 12.1775 19.0178 9.51033 9.6591 8.47399 5.61364 3.68723 3.09525 3.54388
30.1596
Age-structure at Ydecl= 2000
549.584 1153.32 616.799 544.778 736.868 774.549 1007.84 688.079 741.434 837.164
686.34 614.713 480.163 313.516 221.921 101.72 254.282 57.2928 55.1573 72.5904
30.2477 17.0544 32.0687 20.2898 10.145 15.5376 7.62598 7.6033 6.55181 4.27531
2.78037 2.32252 2.65499 2.94014 1.9282 1.33608 1.10025 1.03914 1.07639 1.11117
8.44202
549.584 1153.32 616.799 544.756 735.944 771.847 1001.91 682.497 738.342 842.071
702.996 645.832 520.379 351.545 258.231 123.616 325.208 77.9704 80.3575 112.946
49.8932 29.4451 57.2679 37.159 18.9594 29.6081 14.8057 15.0369 13.1917 8.73874
5.73981 4.81823 5.51654 6.11011 4.01126 2.78885 2.30995 2.20016 2.30598 2.41856
24.8011
Year for Tmin Age-structure (set to Ydecl by SS2)
2000
Number of simulations
1000

recruitment and biomass
Number of historical assessment years
93
Historical data
year recruitment spawner in B0 in R project in R/S project
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 #years (with first value representing R0)
4209.78 4209.78 4204.09 4195.12 4185.7 4179.91 4174.1 4169.67 4166.09 4161.82 4158.26 4153.99 4147.33 4142.32 4137.34 4132.98 4127.29 4121.78 4118.76 4117.04 4115.71 4114.19 4112.94 4112.13 4112.25 4112.85 4112.16 4110.59 4109.89 4096.71 4072.46 4014.19 3978.35 3959.66 3947.34 3935.32 3917.64 3901.27 3885.57 3872.69 3855.67 3838.12 3820.13 3788.52 3756.27 3527.33 3495.79 2997.06 2570.55 2418.4 2597.3 3288.48 4359.05 3386.59 2510.37 2497.15 3122.75 3817.47 3490.46 2744.94 4363.78 2198.36 3345.54 3985.7 1581.22 2069.54 3591.11 1940.53 1429.23 4571.72 1367.16 2321.15 2630.93 3287.32 3478.27 3267.19 3429.34 2676.09 2231.65 2982.15 2116.49 1877.04 1304.53 1390.89 2449.28 1099.17 2060.68 1432.32 954.874 1565.13 1182.28 1144.05 2807.34 #recruits; first value is R0 (virgin)
32561 32561.1 32377.9 32092.2 31796.4 31616.6 31437.9 31302.3 31193.5 31064.8 30957.8 30830.2 30632.8 30485.6 30340.6 30214.1 30050.4 29893.4 29807.7 29758.9 29721.5 29678.8 29643.7 29620.9 29624.2 29641 29621.6 29577.8 29558.2 29193 28538.7 27051.6 26192.2 25759.7 25480 25211.3 24823.5 24471.9 24141.3 23874.6 23528.6 23179 22828.2 22229.1 21640.1 21128.7 20619.1 20258.5 19899.2 19623.5 19587 19449.7 18491.5 18254.9 17839.6 17678.5 17472.2 17220.5 16919.9 16284.8 15978.8 15696.9 15588.1 15231.7 14471.9 13621.7 12575.5 11787.1 10205.8 8894.73 8676.1 8333.51 8113.88 7485.25 6867 6126.79 5615.83 4939.22 4426.46 4201.98 4462.87 4841.18 5144.2 5498.56 5826.36 6364.22 7149.2 7910.33 8603.13 9225.52 9749.45 10182.7 10543.9 #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 # 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 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 0 0 0 # in R/S project
Number of years with pre-specified catches
2
catches for years with pre-specified catches go next
2007 44
2008 44

```
# Number of future recruitments to override
0
# 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.)
7
# Steepness sigma-R Auto-correlation
0.511 0.5 0
# Target SPR rate (FMSY Proxy); manually change to SPR_MSY if not using
SPR_target
0.5
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.75
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
# Definition of the 40-10 rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# Random number seed
-99004
# Conduct projections for multiple starting values (0=No;else yes)
1
# File with multiple parameter vectors
rebuild.ss2
# Number of parameter vectors: value is placeholder only, user needs to change it
4
# User-specific projection (1=Yes); Output replaced (1->9)
1  5  0  0.1
```

```
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2009 3 .887
-1 -1 -1
# Split of Fs
2007 0.000278016 0.000603547 0.000333243 0.001256765 0.00252228
-1  99  99  99  99  99
# placeholder
2021 2035 2048 2053 2063
# year for probability of recovery
2035
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
none
# Use bisection (0) or linear interpolation (1)
1
# Target Depletion
0.4
# Project with Historical recruitments when computing Tmin (1=Yes)
1
# CV of implementation error
0
```

Appendix B. Parameter vector input file for rebuilding analyses.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
0 0 3.98654e-005 0.000430292 0.00405503 0.0228594 0.0849975 0.222879 0.443985 0.723219 1.02371 1.31683 1.5874 1.83025 2.0454 2.23499 2.4017 2.54816 2.67676 2.78959 2.88852 2.97519 3.05105 3.1174 3.17537 3.22598 3.27014 3.30864 3.34219 3.3714 3.39683 3.41895 3.43819 3.45492 3.46946 3.48209 3.49307 3.5026 3.51088 3.51807 3.52431 #female fecundity; weighted by N in year Y_init across morphs and areas
0.0367773 0.0367773 0.0552584 0.238092 0.455675 0.640631 0.817178 0.990531 1.16995 1.35807 1.5491 1.73684 1.91835 2.09204 2.25618 2.40893 2.54894 2.67561 2.78905 2.88989 2.97904 3.05756 3.1265 3.18692 3.23978 3.28596 3.32627 3.36143 3.39206 3.41874 3.44196 3.46217 3.47974 3.49501 3.50829 3.51983 3.52985 3.53855 3.54611 3.55267 3.55837 #wt and selex for gender,fleet: 1 3
0 0.000123399 0.000123885 0.000435367 0.013247 0.112131 0.36758 0.672224 0.871733 0.94027 0.92642 0.874904 0.812304 0.752681 0.702131 0.661994 0.631282 0.608225 0.591039 0.578225 0.568622 0.561366 0.555829 0.551559 0.54823 0.545609 0.543523 0.541847 0.54049 0.539382 0.538471 0.537717 0.537089 0.536564 0.536123 0.53575 0.535435 0.535168 0.53494 0.534745 0.534579
0.0367773 0.0367773 0.0550624 0.222582 0.479476 0.658428 0.824717 0.990195 1.16975 1.36818 1.576 1.78052 1.97402 2.15339 2.31766 2.46681 2.60129 2.72185 2.82942 2.925 3.00965 3.08439 3.15022 3.20808 3.25884 3.3033 3.3422 3.37619 3.40586 3.43173 3.45429 3.47393 3.49103 3.5059 3.51884 3.53009 3.53987 3.54836 3.55574 3.56215 3.56772 #wt and selex for gender,fleet: 1 4
0 0.000123399 0.000123449 0.000244194 0.00939853 0.102971 0.371622 0.692607 0.894696 0.973166 0.994001 0.997752 0.997788 0.997215 0.996621 0.996107 0.995682 0.995338 0.995062 0.99484 0.994661 0.994518 0.994402 0.994307 0.99423 0.994166 0.994114 0.99407 0.994033 0.994003 0.993977 0.993955 0.993936 0.993921 0.993907 0.993896 0.993886 0.993877 0.99387 0.993864 0.993859
0.0367773 0.0367773 0.0645306 0.195112 0.374892 0.585216 0.811312 1.04221 1.27043 1.49097 1.70059 1.89725 2.07981 2.24776 2.40108 2.54013 2.6655 2.77795 2.87836 2.96765 3.04676 3.11663 3.17815 3.23219 3.27956 3.321 3.3572 3.38879 3.41632 3.44029 3.46115 3.4793 3.49507 3.50878 3.52068 3.53102 3.54 3.5478 3.55457 3.56044 3.56554 #wt and selex for gender,fleet: 1 7
0 0.000123398 0.000191947 0.00123613 0.0065322 0.022802 0.0575983 0.114809 0.192419 0.283775 0.380537 0.475231 0.562547 0.639527 0.705138 0.759656 0.804107 0.839843 0.868279 0.890731 0.908358 0.922132 0.932855 0.941175 0.947608 0.952567 0.956379 0.959298 0.961528 0.963226 0.964514 0.965489 0.966224 0.966776 0.96719 0.967498 0.967727 0.967896 0.968021 0.968112 0.968178
0.0367773 0.0367773 0.0976356 0.215779 0.335178 0.478598 0.647828 0.826363 1.01235 1.20956 1.42028 1.64079 1.86064 2.06826 2.2566 2.42379 2.57094 2.70015 2.81357 2.91315 3.00056 3.07724 3.14446 3.20333 3.25484 3.29988 3.33921 3.37353 3.40347 3.42955 3.45228 3.47206 3.48927 3.50424 3.51725 3.52857 3.5384 3.54694 3.55436 3.5608 3.56639 #wt and selex for gender,fleet: 1 9

0 0.000123402 0.00144085 0.126225 0.6395 0.921546 0.853588 0.65522 0.457294
0.311079 0.218139 0.163518 0.132573 0.115226 0.105437 0.0998166 0.0965104
0.0945102 0.0932637 0.0924631 0.0919336 0.0915735 0.0913221 0.0911423 0.0910109
0.0909128 0.0908384 0.0907809 0.0907359 0.0907002 0.0906716 0.0906485 0.0906295
0.090614 0.0906011 0.0905903 0.0905813 0.0905737 0.0905672 0.0905618 0.0905572
0.0367773 0.0367773 0.0931349 0.226308 0.354684 0.491412 0.63491 0.769936
0.904352 1.06527 1.29406 1.59241 1.8824 2.11602 2.3034 2.46149 2.59938 2.72127
2.82936 2.92515 3.00988 3.08464 3.15048 3.20833 3.25909 3.30354 3.34243 3.37641
3.40607 3.43194 3.45449 3.47412 3.49122 3.50609 3.51903 3.53027 3.54005 3.54854
3.55592 3.56233 3.56789 #wt and selex for gender,fleet: 1 10
0 0.000123401 0.000579188 0.0621043 0.463754 0.850204 0.811638 0.529483
0.268675 0.121758 0.0586681 0.035497 0.0276704 0.0251159 0.0242817 0.0240023
0.0239046 0.0238686 0.0238545 0.0238486 0.023846 0.0238448 0.0238441 0.0238438
0.0238436 0.0238435 0.0238434 0.0238434 0.0238434 0.0238433 0.0238433 0.0238433
0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433
0.0238433
0.0367773 0.0367773 0.0660735 0.288759 0.490034 0.666271 0.830184 0.98605 1.1394
1.29079 1.43549 1.56874 1.68852 1.7948 1.88829 1.96988 2.04059 2.10145 2.15354
2.1979 2.23553 2.26734 2.29417 2.31675 2.33572 2.35163 2.36496 2.37612 2.38546
2.39327 2.39979 2.40524 2.40979 2.41358 2.41675 2.41939 2.4216 2.42344 2.42497
2.42625 2.42732 #wt and selex for gender,fleet: 2 3
0 0.000123399 0.000125016 0.000897363 0.0229917 0.149571 0.414495 0.694992
0.874721 0.947624 0.956018 0.934015 0.900064 0.863478 0.828877 0.798265 0.77219
0.750457 0.732559 0.71791 0.70595 0.696188 0.688212 0.681687 0.676337 0.671944
0.668328 0.665348 0.662887 0.660853 0.659168 0.657773 0.656615 0.655655 0.654857
0.654193 0.653642 0.653183 0.652801 0.652483 0.652219
0.0367773 0.0367773 0.0653412 0.290605 0.512633 0.681678 0.836177 0.985179
1.13744 1.29393 1.44747 1.59019 1.7181 1.83041 1.92785 2.01173 2.0835 2.14463
2.19651 2.24038 2.27741 2.30858 2.33479 2.35679 2.37523 2.39067 2.4036 2.41441
2.42345 2.431 2.4373 2.44257 2.44696 2.45063 2.45369 2.45624 2.45837 2.46014
2.46162 2.46286 2.46389 #wt and selex for gender,fleet: 2 4
0 0.000123399 0.000123618 0.00047225 0.0174057 0.140667 0.421839 0.7175
0.897027 0.970066 0.992256 0.99761 0.998516 0.998401 0.99809 0.997771 0.997486
0.997242 0.997035 0.996863 0.99672 0.996601 0.996503 0.996421 0.996353 0.996297
0.99625 0.996212 0.99618 0.996153 0.996131 0.996112 0.996097 0.996084 0.996073
0.996065 0.996057 0.996051 0.996046 0.996042 0.996038
0.0367773 0.0367773 0.0795034 0.227294 0.415185 0.620913 0.829076 1.03005
1.21824 1.39069 1.5461 1.68434 1.80596 1.91202 2.00383 2.0828 2.15037 2.20795
2.25683 2.29819 2.33312 2.36254 2.38728 2.40805 2.42548 2.44008 2.4523 2.46252
2.47107 2.47821 2.48417 2.48916 2.49331 2.49678 2.49968 2.50209 2.50411 2.50579
2.50719 2.50836 2.50933 #wt and selex for gender,fleet: 2 7
0 0.000123398 0.000244049 0.0017938 0.0088778 0.0279557 0.0637563 0.116143
0.180618 0.250894 0.321197 0.387394 0.447121 0.499424 0.544291 0.582243 0.614048
0.640543 0.662535 0.680752 0.695828 0.708301 0.718623 0.727169 0.734249 0.740117
0.744985 0.749026 0.752381 0.75517 0.757487 0.759415 0.761019 0.762353 0.763464
0.764389 0.765159 0.765801 0.766335 0.76678 0.767151

0.0367773 0.0367773 0.115843 0.238634 0.36303 0.512725 0.678496 0.844385 1.00799
1.16882 1.32531 1.47461 1.61319 1.73819 1.84819 1.94324 2.02437 2.09308 2.15098
2.19964 2.24043 2.2746 2.30319 2.32708 2.34706 2.36374 2.37767 2.38929 2.39899
2.40709 2.41384 2.41948 2.42418 2.4281 2.43136 2.43409 2.43636 2.43826 2.43983
2.44115 2.44225 #wt and selex for gender,fleet: 2 9
0 0.000123402 0.00359569 0.207867 0.751099 0.93633 0.832413 0.644686 0.47081
0.34238 0.256799 0.202167 0.167643 0.145647 0.131375 0.121898 0.115447 0.110947
0.107733 0.105389 0.103647 0.102329 0.101318 0.100533 0.0999154 0.0994259
0.0990346 0.0987198 0.0984649 0.0982577 0.0980885 0.0979498 0.0978359 0.0977421
0.0976647 0.0976007 0.0975478 0.0975039 0.0974675 0.0974373 0.0974122
0.0367773 0.0367773 0.115435 0.251197 0.382068 0.521296 0.661455 0.789834
0.913878 1.04806 1.20783 1.39475 1.58394 1.74782 1.87887 1.98237 2.06528 2.1328
2.18846 2.23466 2.27316 2.30531 2.33218 2.35465 2.37342 2.38912 2.40223 2.41318
2.42233 2.42996 2.43634 2.44165 2.44609 2.44979 2.45288 2.45546 2.4576 2.45939
2.46089 2.46213 2.46317 #wt and selex for gender,fleet: 2 10
0 0.000123401 0.00137434 0.110631 0.584348 0.889723 0.787129 0.511476 0.276263
0.139907 0.0747348 0.0462073 0.0340195 0.0287345 0.0263534 0.0252245 0.0246579
0.0243567 0.0241873 0.024087 0.0240247 0.0239843 0.0239572 0.0239383 0.0239249
0.023915 0.0239077 0.0239021 0.0238978 0.0238944 0.0238917 0.0238896 0.0238879
0.0238866 0.0238854 0.0238845 0.0238838 0.0238832 0.0238827 0.0238823 0.0238819
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0648671 0.0697341 0.0746012 0.0794683
0.0843353 0.0892024 0.0940695 0.0989365 0.0989365 0.0989365 0.0989365 0.0989365
0.0989365 0.0989365 0.0989365 0.0989365 0.0989365 0.0989365 0.0989365 0.0989365
0.0989365 0.0989365 0.0989365 0.0989365 0.0989365 0.0989365 0.0989365 0.0989365
0.0989365 0.0989365 0.0989365 0.0989365 0.0989365 0.0989365
495.349 172.634 172.859 217.201 118.648 164.566 220.628 112.088 248.202 131.62
120.471 160.162 163.446 215.066 146.016 156.866 174.147 139.309 121.12 92.5398
57.841 43.0955 18.4531 51.3507 11.0319 10.8291 14.5402 6.07902 3.43996 6.77431
4.36804 2.09952 3.58688 1.66073 1.81515 1.55671 1.02642 0.66062 0.548104 0.645864
4.92474
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06
495.349 172.634 172.859 217.195 118.577 164.249 220.074 111.735 248.505 132.954
123.051 166.348 173.882 234.885 164.231 183.176 211.903 177.896 162.966 131.085
85.7093 66.363 29.4995 85.8524 19.509 20.3446 28.855 12.6084 7.34457 14.7043
9.56665 4.62571 7.96146 3.71739 4.10235 3.55408 2.36309 1.52805 1.2695 1.49512
13.5082
175.463 395.85 214.835 203.565 284.099 300.758 404.704 280.419 307.659 348.263
283.566 250.271 193.445 121.842 91.0946 38.9677 108.365 23.2695 22.8341 30.6521
12.8129 7.24953 14.2751 9.2038 4.42359 7.55704 3.49879 3.824 3.27946 2.16228
1.39165 1.15461 1.36053 1.66916 0.975746 0.670285 0.556064 0.533989 0.570153
0.616103 4.78225 #numbers in year Ydecl 2000
175.463 395.85 214.835 203.546 283.21 298.217 399.327 275.568 303.776 348.376
290.71 265.21 212.704 138.782 107.288 47.6357 138.511 31.4534 32.7832 46.4775
20.3019 11.8231 23.6656 15.3943 7.44253 12.8082 5.97989 6.59865 5.71642 3.80063

2.45751 2.04161 2.40439 2.94699 1.72355 1.18766 0.990702 0.958842 1.03466 1.13374
11.7454 #numbers in year Ydecl 2000
R0 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 #years
4539.59 4539.59 4528.29 4510.52 4491.95 4480.55 4469.15 4460.46 4453.46 4445.14
4438.12 4429.67 4416.49 4406.38 4396.23 4387.12 4375.37 4363.88 4357 4352.5
4348.67 4344.39 4340.55 4337.45 4336.03 4335.43 4332.43 4327.85 4325.01 4299.57
4254.32 4148.78 4083.94 4049.24 4025.59 4002.7 3970.24 3939.51 3909.79 3884.24
3851.37 3817.17 3781.4 3723.86 3664.89 3635.69 3619.23 2974.57 2482.13 2302.38
2460.71 3152.24 4707.14 3320.09 2405.49 2431.27 3104.83 3799.65 3532.03 2564.44
4374.94 1999.17 3196.96 3766.99 1432.9 1865.91 3191.77 1652.87 1154.82 3717.84
955.468 1657.96 1684.37 2038.36 2011.9 1764.63 1729.2 1266.04 988.399 1252.28
836.945 725.803 487.498 484.461 840.656 350.926 642.915 447.226 302.017 520.223
389.855 366.617 990.698
34261.8 34261.9 34082.7 33802.9 33513 33336.3 33160.7 33027.5 32920.5 32793.7
32687.4 32559.6 32361.5 32210.3 32059.2 31924.3 31751.1 31582.6 31482.2 31416.7
31361.1 31299 31243.3 31198.6 31178 31169.4 31126.1 31060.2 31019.4 30656.3
30020.7 28588.1 27740.9 27297.3 26998.9 26712.9 26312.1 25937.8 25580.4 25276.7
24890.8 24494.8 24086.7 23442.6 22798 22228 21660.8 21235.2 20809 20455.2 20334.4
20116.7 19138 18838.3 18367.2 18145 17874.8 17557.8 17198.9 16526.4 16171.5
15845.7 15687.5 15296.1 14520.8 13623.4 12536.3 11705.3 10085.7 8729.99 8451.08
8041.33 7745.04 7035.64 6321.92 5473.78 4835.09 4009.08 3320.91 2882.1 2877.37
2931.74 2848.54 2760.97 2609.55 2644.29 2918.23 3184.11 3416.71 3628.46 3795.11
3918.33 4008.52
0.345 0.5 0
 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32 33 34 35 36 37 38 39 40
 0 0 4.01976e-005 0.000437851 0.00402875 0.0224513 0.083262 0.218854 0.437692
0.715599 1.01587 1.30959 1.58127 1.82554 2.0423 2.23362 2.40214 2.55046 2.68093
2.79561 2.89636 2.98479 3.06234 3.13029 3.18977 3.2418 3.28728 3.32701 3.36168
3.39193 3.41831 3.4413 3.46133 3.47877 3.49396 3.50718 3.51869 3.5287 3.53741
3.54498 3.55157 #female fecundity; weighted by N in year Y_init across morphs and
areas
 0.0367773 0.0367773 0.0561806 0.23394 0.448076 0.634397 0.81376 0.989351 1.16946
1.35796 1.55009 1.73927 1.92193 2.09638 2.26105 2.41431 2.55496 2.68247 2.79693
2.89894 2.98935 3.06918 3.13946 3.20119 3.25532 3.30271 3.34417 3.3804 3.41204
3.43964 3.46371 3.4847 3.50298 3.51891 3.53277 3.54484 3.55534 3.56448 3.57243
3.57934 3.58536 #wt and selex for gender,fleet: 1 3
 0 0.000123399 0.00012402 0.000435622 0.0122939 0.103285 0.345187 0.64784
0.858975 0.941709 0.93984 0.897823 0.842212 0.787198 0.739381 0.700711 0.670702
0.647922 0.630794 0.617936 0.608245 0.60089 0.595258 0.590902 0.587499 0.584813

0.582672 0.58095 0.579553 0.578412 0.577472 0.576694 0.576045 0.575502 0.575045
0.574659 0.574332 0.574054 0.573816 0.573614 0.57344
 0.0367773 0.0367773 0.0562504 0.231639 0.444824 0.634203 0.817598 0.996595
1.17914 1.37255 1.5748 1.7767 1.96989 2.15002 2.31551 2.46612 2.60221 2.72448
2.83379 2.93113 3.01749 3.09391 3.16134 3.22073 3.27293 3.31874 3.35889 3.39403
3.42477 3.45162 3.47507 3.49553 3.51337 3.52892 3.54247 3.55427 3.56454 3.57348
3.58126 3.58803 3.59392 #wt and selex for gender,fleet: 1 4
 0 0.000123399 0.000124219 0.000444908 0.0114748 0.0939603 0.317479 0.612191
0.837023 0.948071 0.986614 0.996457 0.998089 0.997868 0.997327 0.996789 0.996318
0.995922 0.995594 0.995325 0.995105 0.994925 0.994777 0.994656 0.994556 0.994473
0.994404 0.994346 0.994297 0.994256 0.994222 0.994192 0.994167 0.994146 0.994128
0.994112 0.994099 0.994087 0.994077 0.994069 0.994062
 0.0367773 0.0367773 0.0632527 0.194498 0.374883 0.584609 0.80995 1.04028 1.26819
1.48873 1.69864 1.89587 2.07923 2.24819 2.40271 2.54308 2.66987 2.78382 2.88576
2.97658 3.05722 3.12857 3.19153 3.24694 3.2956 3.33826 3.37559 3.40822 3.43672
3.46157 3.48324 3.50212 3.51855 3.53286 3.54531 3.55614 3.56556 3.57375 3.58088
3.58707 3.59245 #wt and selex for gender,fleet: 1 7
 0 0.000123398 0.000170931 0.000926685 0.0050456 0.0184818 0.0486662 0.100326
0.172735 0.260284 0.35508 0.449561 0.538022 0.617019 0.68509 0.742185 0.789117
0.82712 0.857552 0.881722 0.900802 0.915791 0.927521 0.936669 0.943783 0.949297
0.95356 0.956846 0.959373 0.96131 0.962792 0.963922 0.964781 0.965434 0.965928
0.966301 0.966582 0.966793 0.966951 0.967069 0.967156
 0.0367773 0.0367773 0.0969633 0.214801 0.335665 0.479169 0.649093 0.828738
1.01561 1.21318 1.42347 1.64285 1.86145 2.06833 2.25667 2.42452 2.5728 2.70343
2.81843 2.91966 3.00872 3.08703 3.15582 3.2162 3.26913 3.3155 3.35607 3.39154
3.42254 3.4496 3.47321 3.4938 3.51175 3.52739 3.54102 3.55288 3.5632 3.57219
3.58001 3.58681 3.59272 #wt and selex for gender,fleet: 1 9
 0 0.000123401 0.00150185 0.119822 0.621721 0.920996 0.870199 0.680724 0.483383
0.333759 0.236853 0.179073 0.145965 0.127237 0.116594 0.11045 0.106821 0.104619
0.103244 0.10236 0.101775 0.101377 0.101099 0.1009 0.100755 0.100647 0.100565
0.100501 0.100452 0.100412 0.100381 0.100355 0.100334 0.100317 0.100303 0.100291
0.100281 0.100273 0.100266 0.10026 0.100254
 0.0367773 0.0367773 0.0930704 0.225321 0.35427 0.491479 0.636101 0.77209
0.907143 1.06942 1.30093 1.59989 1.88645 2.11691 2.30323 2.46172 2.60077 2.72416
2.8339 2.9314 3.01783 3.09426 3.16169 3.22106 3.27325 3.31905 3.35918 3.39432
3.42505 3.45189 3.47533 3.49579 3.51362 3.52917 3.54271 3.5545 3.56477 3.57371
3.58149 3.58826 3.59414 #wt and selex for gender,fleet: 1 10
 0 0.000123401 0.000576464 0.0589803 0.450716 0.846958 0.823216 0.543855 0.27761
0.126181 0.0612489 0.0376 0.0297142 0.0271812 0.0263689 0.0261021 0.0260108
0.0259778 0.0259652 0.02596 0.0259577 0.0259567 0.0259562 0.0259559 0.0259557
0.0259556 0.0259556 0.0259556 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555
0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555
 0.0367773 0.0367773 0.0674364 0.286834 0.486865 0.664163 0.82959 0.98622 1.13897
1.28923 1.43338 1.56679 1.68702 1.79375 1.88761 1.96954 2.04056 2.10174 2.15416
2.19886 2.23683 2.26899 2.29614 2.31903 2.33828 2.35446 2.36804 2.37943 2.38896

2.39695 2.40363 2.40922 2.4139 2.41781 2.42108 2.42381 2.42609 2.42799 2.42958
2.43091 2.43202 #wt and selex for gender,fleet: 2 3
0 0.000123399 0.000125488 0.000914953 0.0217441 0.139238 0.39002 0.667305
0.856726 0.94241 0.961463 0.947869 0.920669 0.889391 0.858793 0.831095 0.807092
0.786815 0.769935 0.755998 0.744537 0.735125 0.727397 0.721046 0.71582 0.711513
0.707958 0.70502 0.702588 0.700573 0.698902 0.697514 0.696361 0.695402 0.694604
0.693939 0.693386 0.692925 0.692541 0.69222 0.691953
0.0367773 0.0367773 0.0676428 0.283241 0.484172 0.664575 0.833515 0.992786
1.1468 1.29863 1.44658 1.58583 1.71231 1.82431 1.92196 2.00626 2.07856 2.14025
2.1927 2.23713 2.27469 2.30637 2.33304 2.35546 2.37429 2.39008 2.40332 2.41441
2.4237 2.43147 2.43797 2.4434 2.44794 2.45174 2.45491 2.45756 2.45977 2.46162
2.46317 2.46446 2.46553 #wt and selex for gender,fleet: 2 4
0 0.000123399 0.00012601 0.000914578 0.0200932 0.126599 0.359224 0.630119
0.830699 0.936296 0.979207 0.99357 0.997676 0.998611 0.99865 0.998459 0.998224
0.998 0.997801 0.997629 0.997482 0.997358 0.997254 0.997167 0.997094 0.997033
0.996982 0.99694 0.996904 0.996874 0.99685 0.996829 0.996812 0.996798 0.996786
0.996776 0.996767 0.99676 0.996754 0.99675 0.996745
0.0367773 0.0367773 0.0784031 0.228888 0.417876 0.623287 0.830662 1.03074 1.2181
1.38988 1.54483 1.68281 1.80436 1.91052 2.00255 2.08183 2.14979 2.20778 2.25709
2.2989 2.33425 2.36407 2.3892 2.41033 2.42808 2.44297 2.45546 2.46593 2.47469
2.48202 2.48815 2.49328 2.49757 2.50116 2.50415 2.50665 2.50874 2.51049 2.51195
2.51317 2.51418 #wt and selex for gender,fleet: 2 7
0 0.000123398 0.000208139 0.00135743 0.00698172 0.0229608 0.0542377 0.101567
0.161412 0.228089 0.296004 0.360911 0.420205 0.472673 0.518078 0.556774 0.58941
0.616748 0.639547 0.658513 0.674266 0.687342 0.698196 0.707206 0.714688 0.720905
0.726072 0.73037 0.733946 0.736923 0.739403 0.741468 0.743189 0.744624 0.74582
0.746817 0.747649 0.748343 0.748922 0.749405 0.749808
0.0367774 0.0367774 0.11628 0.239547 0.364627 0.513323 0.678619 0.844229 1.00735
1.1675 1.32314 1.4715 1.60926 1.7337 1.84345 1.93852 2.01988 2.08896 2.14732
2.19645 2.23774 2.27239 2.30143 2.32575 2.34611 2.36314 2.37738 2.38929 2.39925
2.40757 2.41452 2.42033 2.42518 2.42923 2.43262 2.43544 2.4378 2.43977 2.44142
2.44279 2.44394 #wt and selex for gender,fleet: 2 9
0 0.000123402 0.00379243 0.199295 0.733113 0.937519 0.850458 0.671613 0.499223
0.368446 0.279519 0.221834 0.18491 0.161139 0.145586 0.135188 0.128072 0.123086
0.119513 0.116899 0.11495 0.113474 0.112339 0.111456 0.110761 0.110209 0.109767
0.109411 0.109123 0.108888 0.108696 0.108538 0.108408 0.108302 0.108213 0.10814
0.10808 0.108029 0.107988 0.107953 0.107924
0.0367773 0.0367773 0.116746 0.252196 0.383079 0.521663 0.661344 0.789074
0.912109 1.04538 1.20469 1.39146 1.58039 1.74389 1.87469 1.97818 2.06128 2.12914
2.18521 2.23186 2.27083 2.30343 2.33072 2.35358 2.37273 2.38875 2.40217 2.41339
2.42277 2.43062 2.43718 2.44267 2.44725 2.45108 2.45428 2.45695 2.45918 2.46104
2.4626 2.4639 2.46498 #wt and selex for gender,fleet: 2 10
0 0.000123401 0.00140414 0.1069 0.57042 0.886137 0.798567 0.52779 0.288994
0.147828 0.079565 0.0495034 0.0366351 0.0310609 0.0285576 0.0273762 0.0267865
0.0264748 0.0263006 0.0261981 0.0261347 0.0260939 0.0260666 0.0260477 0.0260342

0.0260244 0.0260171 0.0260116 0.0260073 0.026004 0.0260013 0.0259992 0.0259976
0.0259962 0.0259951 0.0259942 0.0259935 0.0259929 0.0259924 0.025992 0.0259916
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.064613 0.069226 0.073839 0.078452 0.0830651
0.0876781 0.0922911 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
1403.67 538.714 524.26 653.583 375.426 529.451 715.062 357.744 743.587 392.015
338.845 444.835 454.442 576.254 382.705 401.111 442.08 355.032 312.683 241.156
156.134 110.069 50.4695 126.197 28.4389 27.3823 36.0401 15.0185 8.46823 15.9241
10.0754 5.03785 7.71588 3.78707 3.77586 3.25371 2.12318 1.38079 1.15342 1.31853
9.42277
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06
1403.67 538.714 524.26 653.579 375.356 529.123 714.46 357.354 746.058 396.823
347.314 463.913 484.821 630.993 431.755 469 536.549 448.917 413.046 333.174
225.256 165.56 79.2889 208.663 50.041 51.5833 72.5138 32.0366 18.9086 36.7784
23.8657 12.1775 19.0178 9.51033 9.6591 8.47399 5.61364 3.68723 3.09525 3.54388
30.1596
549.584 1153.32 616.799 544.778 736.868 774.549 1007.84 688.079 741.434 837.164
686.34 614.713 480.163 313.516 221.921 101.72 254.282 57.2928 55.1573 72.5904
30.2477 17.0544 32.0687 20.2898 10.145 15.5376 7.62598 7.6033 6.55181 4.27531
2.78037 2.32252 2.65499 2.94014 1.9282 1.33608 1.10025 1.03914 1.07639 1.11117
8.44202 #numbers in year Ydecl 2000
549.584 1153.32 616.799 544.756 735.944 771.847 1001.91 682.497 738.342 842.071
702.996 645.832 520.379 351.545 258.231 123.616 325.208 77.9704 80.3575 112.946
49.8932 29.4451 57.2679 37.159 18.9594 29.6081 14.8057 15.0369 13.1917 8.73874
5.73981 4.81823 5.51654 6.11011 4.01126 2.78885 2.30995 2.20016 2.30598 2.41856
24.8011 #numbers in year Ydecl 2000
R0 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 #years
4209.78 4209.78 4204.09 4195.12 4185.7 4179.91 4174.1 4169.67 4166.09 4161.82
4158.26 4153.99 4147.33 4142.32 4137.34 4132.98 4127.29 4121.78 4118.76 4117.04
4115.71 4114.19 4112.94 4112.13 4112.25 4112.85 4112.16 4110.59 4109.89 4096.71
4072.46 4014.19 3978.35 3959.66 3947.34 3935.32 3917.64 3901.27 3885.57 3872.69
3855.67 3838.12 3820.13 3788.52 3756.27 3527.33 3495.79 2997.06 2570.55 2418.4
2597.3 3288.48 4359.05 3386.59 2510.37 2497.15 3122.75 3817.47 3490.46 2744.94
4363.78 2198.36 3345.54 3985.7 1581.22 2069.54 3591.11 1940.53 1429.23 4571.72
1367.16 2321.15 2630.93 3287.32 3478.27 3267.19 3429.34 2676.09 2231.65 2982.15
2116.49 1877.04 1304.53 1390.89 2449.28 1099.17 2060.68 1432.32 954.874 1565.13
1182.28 1144.05 2807.34

32561 32561.1 32377.9 32092.2 31796.4 31616.6 31437.9 31302.3 31193.5 31064.8
30957.8 30830.2 30632.8 30485.6 30340.6 30214.1 30050.4 29893.4 29807.7 29758.9
29721.5 29678.8 29643.7 29620.9 29624.2 29641 29621.6 29577.8 29558.2 29193
28538.7 27051.6 26192.2 25759.7 25480 25211.3 24823.5 24471.9 24141.3 23874.6
23528.6 23179 22828.2 22229.1 21640.1 21128.7 20619.1 20258.5 19899.2 19623.5
19587 19449.7 18491.5 18254.9 17839.6 17678.5 17472.2 17220.5 16919.9 16284.8
15978.8 15696.9 15588.1 15231.7 14471.9 13621.7 12575.5 11787.1 10205.8 8894.73
8676.1 8333.51 8113.88 7485.25 6867 6126.79 5615.83 4939.22 4426.46 4201.98
4462.87 4841.18 5144.2 5498.56 5826.36 6364.22 7149.2 7910.33 8603.13 9225.52
9749.45 10182.7 10543.9
0.511 0.5 0
 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32 33 34 35 36 37 38 39 40
 0 0 4.01976e-005 0.000437851 0.00402875 0.0224513 0.083262 0.218854 0.437692
0.715599 1.01587 1.30959 1.58127 1.82554 2.0423 2.23362 2.40214 2.55046 2.68093
2.79561 2.89636 2.98479 3.06234 3.13029 3.18977 3.2418 3.28728 3.32701 3.36168
3.39193 3.41831 3.4413 3.46133 3.47877 3.49396 3.50718 3.51869 3.5287 3.53741
3.54498 3.55157 #female fecundity; weighted by N in year Y_init across morphs and
areas
 0.0367773 0.0367773 0.0561806 0.23394 0.448076 0.634397 0.81376 0.989351 1.16946
1.35796 1.55009 1.73927 1.92193 2.09638 2.26105 2.41431 2.55496 2.68247 2.79693
2.89894 2.98935 3.06918 3.13946 3.20119 3.25532 3.30271 3.34417 3.3804 3.41204
3.43964 3.46371 3.4847 3.50298 3.51891 3.53277 3.54484 3.55534 3.56448 3.57243
3.57934 3.58536 #wt and selex for gender,fleet: 1 3
 0 0.000123399 0.00012402 0.000435622 0.0122939 0.103285 0.345187 0.64784
0.858975 0.941709 0.93984 0.897823 0.842212 0.787198 0.739381 0.700711 0.670702
0.647922 0.630794 0.617936 0.608245 0.60089 0.595258 0.590902 0.587499 0.584813
0.582672 0.58095 0.579553 0.578412 0.577472 0.576694 0.576045 0.575502 0.575045
0.574659 0.574332 0.574054 0.573816 0.573614 0.57344
 0.0367773 0.0367773 0.0562504 0.231639 0.444824 0.634203 0.817598 0.996595
1.17914 1.37255 1.5748 1.7767 1.96989 2.15002 2.31551 2.46612 2.60221 2.72448
2.83379 2.93113 3.01749 3.09391 3.16134 3.22073 3.27293 3.31874 3.35889 3.39403
3.42477 3.45162 3.47507 3.49553 3.51337 3.52892 3.54247 3.55427 3.56454 3.57348
3.58126 3.58803 3.59392 #wt and selex for gender,fleet: 1 4
 0 0.000123399 0.000124219 0.000444908 0.0114748 0.0939603 0.317479 0.612191
0.837023 0.948071 0.986614 0.996457 0.998089 0.997868 0.997327 0.996789 0.996318
0.995922 0.995594 0.995325 0.995105 0.994925 0.994777 0.994656 0.994556 0.994473
0.994404 0.994346 0.994297 0.994256 0.994222 0.994192 0.994167 0.994146 0.994128
0.994112 0.994099 0.994087 0.994077 0.994069 0.994062
 0.0367773 0.0367773 0.0632527 0.194498 0.374883 0.584609 0.80995 1.04028 1.26819
1.48873 1.69864 1.89587 2.07923 2.24819 2.40271 2.54308 2.66987 2.78382 2.88576
2.97658 3.05722 3.12857 3.19153 3.24694 3.2956 3.33826 3.37559 3.40822 3.43672
3.46157 3.48324 3.50212 3.51855 3.53286 3.54531 3.55614 3.56556 3.57375 3.58088
3.58707 3.59245 #wt and selex for gender,fleet: 1 7
 0 0.000123398 0.000170931 0.000926685 0.0050456 0.0184818 0.0486662 0.100326
0.172735 0.260284 0.35508 0.449561 0.538022 0.617019 0.68509 0.742185 0.789117

0.82712 0.857552 0.881722 0.900802 0.915791 0.927521 0.936669 0.943783 0.949297
0.95356 0.956846 0.959373 0.96131 0.962792 0.963922 0.964781 0.965434 0.965928
0.966301 0.966582 0.966793 0.966951 0.967069 0.967156
0.0367773 0.0367773 0.0969633 0.214801 0.335665 0.479169 0.649093 0.828738
1.01561 1.21318 1.42347 1.64285 1.86145 2.06833 2.25667 2.42452 2.5728 2.70343
2.81843 2.91966 3.00872 3.08703 3.15582 3.2162 3.26913 3.3155 3.35607 3.39154
3.42254 3.4496 3.47321 3.4938 3.51175 3.52739 3.54102 3.55288 3.5632 3.57219
3.58001 3.58681 3.59272 #wt and selex for gender,fleet: 1 9
0 0.000123401 0.00150185 0.119822 0.621721 0.920996 0.870199 0.680724 0.483383
0.333759 0.236853 0.179073 0.145965 0.127237 0.116594 0.11045 0.106821 0.104619
0.103244 0.10236 0.101775 0.101377 0.101099 0.1009 0.100755 0.100647 0.100565
0.100501 0.100452 0.100412 0.100381 0.100355 0.100334 0.100317 0.100303 0.100291
0.100281 0.100273 0.100266 0.10026 0.100254
0.0367773 0.0367773 0.0930704 0.225321 0.35427 0.491479 0.636101 0.77209
0.907143 1.06942 1.30093 1.59989 1.88645 2.11691 2.30323 2.46172 2.60077 2.72416
2.8339 2.9314 3.01783 3.09426 3.16169 3.22106 3.27325 3.31905 3.35918 3.39432
3.42505 3.45189 3.47533 3.49579 3.51362 3.52917 3.54271 3.5545 3.56477 3.57371
3.58149 3.58826 3.59414 #wt and selex for gender,fleet: 1 10
0 0.000123401 0.000576464 0.0589803 0.450716 0.846958 0.823216 0.543855 0.27761
0.126181 0.0612489 0.0376 0.0297142 0.0271812 0.0263689 0.0261021 0.0260108
0.0259778 0.0259652 0.02596 0.0259577 0.0259567 0.0259562 0.0259559 0.0259557
0.0259556 0.0259556 0.0259556 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555
0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555
0.0367773 0.0367773 0.0674364 0.286834 0.486865 0.664163 0.82959 0.98622 1.13897
1.28923 1.43338 1.56679 1.68702 1.79375 1.88761 1.96954 2.04056 2.10174 2.15416
2.19886 2.23683 2.26899 2.29614 2.31903 2.33828 2.35446 2.36804 2.37943 2.38896
2.39695 2.40363 2.40922 2.4139 2.41781 2.42108 2.42381 2.42609 2.42799 2.42958
2.43091 2.43202 #wt and selex for gender,fleet: 2 3
0 0.000123399 0.000125488 0.000914953 0.0217441 0.139238 0.39002 0.667305
0.856726 0.94241 0.961463 0.947869 0.920669 0.889391 0.858793 0.831095 0.807092
0.786815 0.769935 0.755998 0.744537 0.735125 0.727397 0.721046 0.71582 0.711513
0.707958 0.70502 0.702588 0.700573 0.698902 0.697514 0.696361 0.695402 0.694604
0.693939 0.693386 0.692925 0.692541 0.69222 0.691953
0.0367773 0.0367773 0.0676428 0.283241 0.484172 0.664575 0.833515 0.992786
1.1468 1.29863 1.44658 1.58583 1.71231 1.82431 1.92196 2.00626 2.07856 2.14025
2.1927 2.23713 2.27469 2.30637 2.33304 2.35546 2.37429 2.39008 2.40332 2.41441
2.4237 2.43147 2.43797 2.4434 2.44794 2.45174 2.45491 2.45756 2.45977 2.46162
2.46317 2.46446 2.46553 #wt and selex for gender,fleet: 2 4
0 0.000123399 0.00012601 0.000914578 0.0200932 0.126599 0.359224 0.630119
0.830699 0.936296 0.979207 0.99357 0.997676 0.998611 0.99865 0.998459 0.998224
0.998 0.997801 0.997629 0.997482 0.997358 0.997254 0.997167 0.997094 0.997033
0.996982 0.99694 0.996904 0.996874 0.99685 0.996829 0.996812 0.996798 0.996786
0.996776 0.996767 0.99676 0.996754 0.99675 0.996745
0.0367773 0.0367773 0.0784031 0.228888 0.417876 0.623287 0.830662 1.03074 1.2181
1.38988 1.54483 1.68281 1.80436 1.91052 2.00255 2.08183 2.14979 2.20778 2.25709
2.2989 2.33425 2.36407 2.3892 2.41033 2.42808 2.44297 2.45546 2.46593 2.47469

2.48202 2.48815 2.49328 2.49757 2.50116 2.50415 2.50665 2.50874 2.51049 2.51195
2.51317 2.51418 #wt and selex for gender,fleet: 2 7
0 0.000123398 0.000208139 0.00135743 0.00698172 0.0229608 0.0542377 0.101567
0.161412 0.228089 0.296004 0.360911 0.420205 0.472673 0.518078 0.556774 0.58941
0.616748 0.639547 0.658513 0.674266 0.687342 0.698196 0.707206 0.714688 0.720905
0.726072 0.73037 0.733946 0.736923 0.739403 0.741468 0.743189 0.744624 0.74582
0.746817 0.747649 0.748343 0.748922 0.749405 0.749808
0.0367774 0.0367774 0.11628 0.239547 0.364627 0.513323 0.678619 0.844229 1.00735
1.1675 1.32314 1.4715 1.60926 1.7337 1.84345 1.93852 2.01988 2.08896 2.14732
2.19645 2.23774 2.27239 2.30143 2.32575 2.34611 2.36314 2.37738 2.38929 2.39925
2.40757 2.41452 2.42033 2.42518 2.42923 2.43262 2.43544 2.4378 2.43977 2.44142
2.44279 2.44394 #wt and selex for gender,fleet: 2 9
0 0.000123402 0.00379243 0.199295 0.733113 0.937519 0.850458 0.671613 0.499223
0.368446 0.279519 0.221834 0.18491 0.161139 0.145586 0.135188 0.128072 0.123086
0.119513 0.116899 0.11495 0.113474 0.112339 0.111456 0.110761 0.110209 0.109767
0.109411 0.109123 0.108888 0.108696 0.108538 0.108408 0.108302 0.108213 0.10814
0.10808 0.108029 0.107988 0.107953 0.107924
0.0367773 0.0367773 0.116746 0.252196 0.383079 0.521663 0.661344 0.789074
0.912109 1.04538 1.20469 1.39146 1.58039 1.74389 1.87469 1.97818 2.06128 2.12914
2.18521 2.23186 2.27083 2.30343 2.33072 2.35358 2.37273 2.38875 2.40217 2.41339
2.42277 2.43062 2.43718 2.44267 2.44725 2.45108 2.45428 2.45695 2.45918 2.46104
2.4626 2.4639 2.46498 #wt and selex for gender,fleet: 2 10
0 0.000123401 0.00140414 0.1069 0.57042 0.886137 0.798567 0.52779 0.288994
0.147828 0.079565 0.0495034 0.0366351 0.0310609 0.0285576 0.0273762 0.0267865
0.0264748 0.0263006 0.0261981 0.0261347 0.0260939 0.0260666 0.0260477 0.0260342
0.0260244 0.0260171 0.0260116 0.0260073 0.026004 0.0260013 0.0259992 0.0259976
0.0259962 0.0259951 0.0259942 0.0259935 0.0259929 0.0259924 0.025992 0.0259916
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.064613 0.069226 0.073839 0.078452 0.0830651
0.0876781 0.0922911 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
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0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
1403.67 538.714 524.26 653.583 375.426 529.451 715.062 357.744 743.587 392.015
338.845 444.835 454.442 576.254 382.705 401.111 442.08 355.032 312.683 241.156
156.134 110.069 50.4695 126.197 28.4389 27.3823 36.0401 15.0185 8.46823 15.9241
10.0754 5.03785 7.71588 3.78707 3.77586 3.25371 2.12318 1.38079 1.15342 1.31853
9.42277
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06
1403.67 538.714 524.26 653.579 375.356 529.123 714.46 357.354 746.058 396.823
347.314 463.913 484.821 630.993 431.755 469 536.549 448.917 413.046 333.174
225.256 165.56 79.2889 208.663 50.041 51.5833 72.5138 32.0366 18.9086 36.7784
23.8657 12.1775 19.0178 9.51033 9.6591 8.47399 5.61364 3.68723 3.09525 3.54388
30.1596

549.584 1153.32 616.799 544.778 736.868 774.549 1007.84 688.079 741.434 837.164 686.34 614.713 480.163 313.516 221.921 101.72 254.282 57.2928 55.1573 72.5904 30.2477 17.0544 32.0687 20.2898 10.145 15.5376 7.62598 7.6033 6.55181 4.27531 2.78037 2.32252 2.65499 2.94014 1.9282 1.33608 1.10025 1.03914 1.07639 1.11117 8.44202 #numbers in year Ydecl 2000
549.584 1153.32 616.799 544.756 735.944 771.847 1001.91 682.497 738.342 842.071 702.996 645.832 520.379 351.545 258.231 123.616 325.208 77.9704 80.3575 112.946 49.8932 29.4451 57.2679 37.159 18.9594 29.6081 14.8057 15.0369 13.1917 8.73874 5.73981 4.81823 5.51654 6.11011 4.01126 2.78885 2.30995 2.20016 2.30598 2.41856 24.8011 #numbers in year Ydecl 2000
R0 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 #years
4209.78 4209.78 4204.09 4195.12 4185.7 4179.91 4174.1 4169.67 4166.09 4161.82 4158.26 4153.99 4147.33 4142.32 4137.34 4132.98 4127.29 4121.78 4118.76 4117.04 4115.71 4114.19 4112.94 4112.13 4112.25 4112.85 4112.16 4110.59 4109.89 4096.71 4072.46 4014.19 3978.35 3959.66 3947.34 3935.32 3917.64 3901.27 3885.57 3872.69 3855.67 3838.12 3820.13 3788.52 3756.27 3527.33 3495.79 2997.06 2570.55 2418.4 2597.3 3288.48 4359.05 3386.59 2510.37 2497.15 3122.75 3817.47 3490.46 2744.94 4363.78 2198.36 3345.54 3985.7 1581.22 2069.54 3591.11 1940.53 1429.23 4571.72 1367.16 2321.15 2630.93 3287.32 3478.27 3267.19 3429.34 2676.09 2231.65 2982.15 2116.49 1877.04 1304.53 1390.89 2449.28 1099.17 2060.68 1432.32 954.874 1565.13 1182.28 1144.05 2807.34
32561 32561.1 32377.9 32092.2 31796.4 31616.6 31437.9 31302.3 31193.5 31064.8 30957.8 30830.2 30632.8 30485.6 30340.6 30214.1 30050.4 29893.4 29807.7 29758.9 29721.5 29678.8 29643.7 29620.9 29624.2 29641 29621.6 29577.8 29558.2 29193 28538.7 27051.6 26192.2 25759.7 25480 25211.3 24823.5 24471.9 24141.3 23874.6 23528.6 23179 22828.2 22229.1 21640.1 21128.7 20619.1 20258.5 19899.2 19623.5 19587 19449.7 18491.5 18254.9 17839.6 17678.5 17472.2 17220.5 16919.9 16284.8 15978.8 15696.9 15588.1 15231.7 14471.9 13621.7 12575.5 11787.1 10205.8 8894.73 8676.1 8333.51 8113.88 7485.25 6867 6126.79 5615.83 4939.22 4426.46 4201.98 4462.87 4841.18 5144.2 5498.56 5826.36 6364.22 7149.2 7910.33 8603.13 9225.52 9749.45 10182.7 10543.9
0.511 0.5 0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
0 0 4.0526e-005 0.000445166 0.00402746 0.0222492 0.0822715 0.216378 0.433593 0.7104 1.01031 1.30428 1.57663 1.82181 2.03965 2.23215 2.40192 2.55152 2.68329 2.79927 2.90129 2.99095 3.06969 3.13877 3.19932 3.25235 3.29877 3.33936 3.37484 3.40584 3.43289 3.45651 3.47711 3.49507 3.51073 3.52437 3.53626 3.54662 3.55564 3.56349 3.57033 #female fecundity; weighted by N in year Y_init across morphs and areas

0.0367773 0.0367773 0.056937 0.232366 0.443859 0.630829 0.811818 0.988805
1.16926 1.35781 1.5506 1.74088 1.92455 2.09972 2.26486 2.41852 2.5596 2.68763
2.80273 2.90547 2.9967 3.07738 3.14854 3.21114 3.26613 3.31435 3.35659 3.39357
3.42589 3.45414 3.47881 3.50035 3.51913 3.53552 3.5498 3.56225 3.57309 3.58254
3.59077 3.59794 3.60418 #wt and selex for gender,fleet: 1 3
0 0.000123399 0.000124158 0.000443174 0.0118285 0.0980882 0.3306 0.630359
0.848524 0.941114 0.948071 0.913548 0.863988 0.813442 0.768662 0.73194 0.703136
0.681086 0.664396 0.6518 0.642266 0.635005 0.62943 0.625108 0.621726 0.619052
0.616918 0.6152 0.613805 0.612664 0.611723 0.610944 0.610294 0.609749 0.609291
0.608903 0.608575 0.608295 0.608056 0.607852 0.607677
0.0367773 0.0367773 0.0578791 0.229377 0.425865 0.618886 0.810697 0.998554
1.18556 1.37769 1.5761 1.77511 1.96725 2.14751 2.3137 2.46527 2.60245 2.72588
2.83639 2.93493 3.0225 3.10008 3.16864 3.2291 3.28231 3.32908 3.37011 3.40609
3.43758 3.46514 3.48923 3.51027 3.52865 3.54468 3.55867 3.57087 3.5815 3.59077
3.59884 3.60587 3.61199 #wt and selex for gender,fleet: 1 4
0 0.000123399 0.000127094 0.000705021 0.013305 0.0901424 0.286847 0.557124
0.787215 0.919997 0.975586 0.993331 0.997621 0.998126 0.997751 0.997232 0.99674
0.996312 0.995949 0.995648 0.995398 0.995192 0.995022 0.994881 0.994764 0.994667
0.994586 0.994518 0.99446 0.994412 0.994371 0.994336 0.994307 0.994281 0.99426
0.994241 0.994225 0.994211 0.9942 0.994189 0.994181
0.0367773 0.0367773 0.0626237 0.194296 0.375752 0.585339 0.81022 1.04008 1.26763
1.48796 1.69785 1.89525 2.07896 2.24844 2.40362 2.54477 2.67244 2.78732 2.89024
2.98207 3.06371 3.13606 3.19998 3.25631 3.30585 3.34934 3.38744 3.42079 3.44994
3.4754 3.49762 3.517 3.5339 3.54862 3.56145 3.57262 3.58235 3.59082 3.59819
3.60461 3.61019 #wt and selex for gender,fleet: 1 7
0 0.000123398 0.000159571 0.000755738 0.00419059 0.0159133 0.0432229 0.0913469
0.160405 0.245499 0.339064 0.433491 0.522804 0.603231 0.673007 0.731861 0.780459
0.819958 0.851685 0.876947 0.896927 0.91265 0.92497 0.934588 0.942071 0.947873
0.952359 0.955815 0.958468 0.9605 0.962049 0.963228 0.96412 0.964793 0.9653
0.965679 0.965961 0.96617 0.966324 0.966436 0.966517
0.0367773 0.0367773 0.097057 0.21454 0.336076 0.479428 0.64956 0.829795 1.01717
1.21491 1.42483 1.64338 1.86111 2.06749 2.25588 2.42425 2.57338 2.70504 2.82117
2.92358 3.01382 3.09329 3.1632 3.22465 3.27859 3.32591 3.36737 3.40366 3.43542
3.46318 3.48743 3.50861 3.5271 3.54322 3.55728 3.56954 3.58023 3.58954 3.59765
3.60471 3.61086 #wt and selex for gender,fleet: 1 9
0 0.000123401 0.00157081 0.117084 0.611853 0.920211 0.879846 0.696833 0.500873
0.34962 0.250304 0.190422 0.15579 0.136049 0.12476 0.11821 0.114325 0.11196
0.11048 0.109526 0.108894 0.108463 0.108163 0.107948 0.10779 0.107673 0.107584
0.107516 0.107462 0.107419 0.107385 0.107358 0.107335 0.107316 0.107301 0.107288
0.107277 0.107268 0.107261 0.107254 0.107248
0.0367773 0.0367773 0.0936734 0.224818 0.353972 0.491351 0.636437 0.772858
0.908337 1.0719 1.30579 1.60504 1.88883 2.117 2.30262 2.46142 2.60128 2.72571
2.83661 2.93529 3.02291 3.10049 3.16905 3.22949 3.28269 3.32944 3.37046 3.40642
3.43791 3.46545 3.48953 3.51057 3.52894 3.54497 3.55895 3.57114 3.58177 3.59103
3.5991 3.60613 3.61225 #wt and selex for gender,fleet: 1 10

0 0.000123401 0.000600335 0.0583008 0.445043 0.844971 0.829544 0.552667
0.283678 0.129589 0.0634832 0.0394992 0.0315569 0.0290291 0.0282273 0.0279671
0.0278792 0.0278479 0.0278361 0.0278313 0.0278292 0.0278283 0.0278278 0.0278276
0.0278275 0.0278274 0.0278273 0.0278273 0.0278273 0.0278273 0.0278273 0.0278273
0.0278273 0.0278273 0.0278273 0.0278273 0.0278273 0.0278273 0.0278273 0.0278273
0.0278273
0.0367773 0.0367773 0.0685406 0.286077 0.485042 0.662956 0.829384 0.986649
1.13917 1.2888 1.43268 1.56634 1.6871 1.79437 1.88872 1.97107 2.04247 2.104
2.15675 2.20177 2.24004 2.27248 2.29991 2.32304 2.34253 2.35892 2.37269 2.38425
2.39394 2.40207 2.40888 2.41458 2.41935 2.42334 2.42668 2.42948 2.43182 2.43377
2.43541 2.43677 2.43792 #wt and selex for gender,fleet: 2 3
0 0.000123399 0.000125938 0.000938663 0.0211008 0.133095 0.374496 0.648641
0.843641 0.937662 0.963995 0.956322 0.934073 0.906906 0.879606 0.85447 0.832415
0.813604 0.797826 0.784716 0.773881 0.764945 0.757582 0.751511 0.746503 0.742366
0.738944 0.73611 0.733761 0.731811 0.730192 0.728845 0.727724 0.726791 0.726013
0.725365 0.724825 0.724374 0.723998 0.723684 0.723422
0.0367773 0.0367773 0.0712401 0.27449 0.467944 0.653099 0.829501 0.995694
1.15316 1.30429 1.44928 1.58565 1.71037 1.82167 1.91923 2.00376 2.07642 2.13854
2.19141 2.23628 2.27424 2.3063 2.33332 2.35607 2.37519 2.39126 2.40473 2.41603
2.42551 2.43344 2.44009 2.44565 2.4503 2.4542 2.45745 2.46018 2.46246 2.46436
2.46595 2.46728 2.4684 #wt and selex for gender,fleet: 2 4
0 0.000123399 0.000133395 0.0014141 0.0223142 0.119915 0.323984 0.571924
0.775664 0.900147 0.960796 0.985758 0.994831 0.997796 0.998617 0.998726 0.998613
0.998442 0.998266 0.998105 0.997963 0.99784 0.997735 0.997647 0.997572 0.997509
0.997456 0.997411 0.997374 0.997343 0.997317 0.997295 0.997277 0.997261 0.997249
0.997238 0.997229 0.997222 0.997215 0.99721 0.997206
0.0367773 0.0367773 0.0776928 0.230191 0.42043 0.625796 0.832684 1.03214 1.21893
1.39023 1.54486 1.68266 1.80418 1.91042 2.00263 2.08216 2.1504 2.20872 2.25836
2.3005 2.33617 2.36631 2.39172 2.41312 2.43112 2.44624 2.45893 2.46957 2.47849
2.48597 2.49223 2.49747 2.50186 2.50553 2.5086 2.51117 2.51331 2.51511 2.51661
2.51787 2.51892 #wt and selex for gender,fleet: 2 7
0 0.000123398 0.000188464 0.00111219 0.00587758 0.0199766 0.0484541 0.092622
0.149571 0.21402 0.280501 0.344696 0.403835 0.456532 0.502401 0.541681 0.574947
0.60291 0.626301 0.64581 0.662051 0.675561 0.686795 0.696137 0.703907 0.710372
0.715754 0.720236 0.72397 0.727082 0.729677 0.731841 0.733646 0.735153 0.736411
0.73746 0.738337 0.739069 0.73968 0.740191 0.740617
0.0367774 0.0367774 0.116952 0.240334 0.365728 0.513783 0.67881 0.844384 1.00739
1.1673 1.32256 1.47046 1.6078 1.73195 1.84159 1.93673 2.01829 2.08765 2.14635
2.19584 2.2375 2.27249 2.30187 2.3265 2.34715 2.36444 2.37892 2.39105 2.40119
2.40968 2.41678 2.42271 2.42768 2.43183 2.4353 2.4382 2.44063 2.44265 2.44435
2.44577 2.44695 #wt and selex for gender,fleet: 2 9
0 0.000123402 0.00398053 0.195654 0.723471 0.937923 0.860826 0.688083 0.517428
0.385737 0.294985 0.235476 0.197046 0.172126 0.155723 0.144706 0.137135 0.131813
0.127989 0.125186 0.123093 0.121504 0.120281 0.119328 0.118577 0.11798 0.117502
0.117116 0.116803 0.116548 0.11634 0.116168 0.116027 0.115911 0.115815 0.115735
0.115669 0.115614 0.115568 0.11553 0.115498

0.0367774 0.0367774 0.117862 0.252785 0.383646 0.521874 0.661257 0.788657
0.911342 1.04469 1.20473 1.39225 1.58108 1.74386 1.87401 1.97716 2.0602 2.1282
2.18451 2.23146 2.27074 2.30367 2.33128 2.35443 2.37384 2.39012 2.40376 2.41518
2.42475 2.43275 2.43946 2.44506 2.44975 2.45368 2.45696 2.4597 2.462 2.46392
2.46552 2.46686 2.46798 #wt and selex for gender,fleet: 2 10
0 0.000123401 0.00148282 0.106367 0.564462 0.884114 0.80459 0.536986 0.296504
0.152759 0.0828195 0.0519398 0.0387227 0.0330095 0.0304527 0.0292513 0.0286546
0.0283408 0.0281663 0.0280641 0.0280012 0.0279609 0.027934 0.0279155 0.0279023
0.0278927 0.0278856 0.0278802 0.027876 0.0278728 0.0278703 0.0278682 0.0278666
0.0278653 0.0278642 0.0278634 0.0278627 0.0278621 0.0278616 0.0278612 0.0278609
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0645226 0.0690451 0.0735677 0.0780903
0.0826128 0.0871354 0.091658 0.0961806 0.0961806 0.0961806 0.0961806 0.0961806
0.0961806 0.0961806 0.0961806 0.0961806 0.0961806 0.0961806 0.0961806 0.0961806
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0.0961806 0.0961806 0.0961806 0.0961806 0.0961806 0.0961806
1872.31 800.151 785.46 991.048 595.704 881.818 1256.68 633.245 1319.24 697.36
587.718 766.839 785.819 973.277 642.806 662.911 723.766 579.106 509.333 390.824
258.115 175.186 84.1945 197.675 46.0065 44.2173 58.0865 24.2845 13.8811 25.5321
16.0735 8.22326 11.9564 6.05048 5.77692 4.95682 3.24554 2.12355 1.77436 1.97948
13.8358
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06
1872.31 800.151 785.46 991.045 595.641 881.51 1256.08 632.854 1324.23 706.207
602.828 800.36 838.713 1066.2 725.636 775.221 877.614 729.912 668.668 534.989
368.143 260.157 130.429 321.615 79.4163 81.511 114.311 50.774 30.523 58.4453
38.0042 19.9796 29.81 15.4587 15.1144 13.2675 8.85834 5.87672 4.94982 5.54259
45.892
968.876 2033.35 1087.86 933.635 1248.91 1313.6 1670.27 1135.74 1205.88 1350.16
1103.5 987.336 767.462 511.239 348.451 167.43 393.039 91.4657 87.9021 115.467
48.2723 27.5918 50.7495 31.9483 16.3447 23.7645 12.0258 11.482 9.85198 6.45067
4.22066 3.52661 3.93428 4.17467 2.85016 2.0018 1.64696 1.54244 1.57494 1.60483
12.1031 #numbers in year Ydecl 2000
968.876 2033.35 1087.86 933.612 1247.97 1310.82 1664.14 1129.83 1204.31 1361.04
1130.59 1034.83 827.435 569.127 402.052 201.517 496.809 122.659 125.879 176.518
78.3987 47.127 90.2345 58.6731 30.8447 46.0199 23.8642 23.3323 20.481 13.6744
9.07168 7.64079 8.55578 9.09173 6.2169 4.3812 3.62457 3.42205 3.53416 3.65768
36.9112 #numbers in year Ydecl 2000
R0 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 #years
4035.12 4035.12 4032.81 4029.15 4025.3 4022.93 4020.55 4018.73 4017.26 4015.51
4014.06 4012.32 4009.6 4007.58 4005.59 4003.88 4001.62 3999.46 3998.35 3997.79

3997.41 3996.97 3996.64 3996.52 3996.78 3997.26 3997.2 3996.79 3996.73 3991.44
3981.47 3956.83 3941.55 3933.64 3928.48 3923.41 3915.83 3908.85 3902.2 3896.91
3889.86 3882.66 3875.38 3861.96 3848.27 3563.11 3488.03 3026.4 2630.11 2491.66
2673.61 3332.31 4231.22 3418.14 2584.74 2557.82 3163.89 3838.36 3512.7 2876.95
4427.7 2348.76 3500.45 4211.27 1722.7 2253.97 3977.34 2212.31 1686.13 5407.71
1780.76 2972.86 3602.74 4547.09 4986.73 4828.35 5212.89 4183.98 3595.03 4880.78
3571.91 3178.92 2235.64 2453.13 4318.17 1937.75 3613.22 2383.46 1514.91 2373.18
1771.28 1699.26 3744.62
31498.2 31498.3 31313.4 31025.3 30727.2 30546.4 30366.6 30230.3 30121.2 29992
29885.3 29758.6 29562.7 29418.8 29278.4 29158 29001.2 28852.3 28776.2 28738.2
28712.5 28682.2 28660.3 28651.6 28669.8 28702.1 28698.3 28670.1 28665.9 28311.2
27664.2 26171.8 25316.5 24893.1 24623 24363.2 23983.4 23642.4 23325.7 23079 22757
22436.5 22120 21556.7 21006.8 20537.5 20072 19758.4 19447.2 19222.9 19241.5
19158.4 18243.6 18056.2 17684.5 17567.4 17403.4 17191.5 16926.5 16316.5 16031.8
15767.9 15678.8 15337.4 14588.3 13755.1 12725.7 11960.2 10402 9123.52 8952.23
8664.79 8509.34 7951.92 7417.57 6775.38 6382.92 5848.5 5507.27 5494.32 6020.95
6729.04 7428.98 8241.37 9072.59 10144.2 11476.8 12778.6 13984.5 15075.8 16018.6
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