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**Updated Rebuilding Analysis for Yelloweye Rockfish
Based on Stock Assessment in 2006**

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Introduction

The yelloweye rockfish (*Sebastes ruberrimus*) stock off the United States Pacific coast was declared to be at an “overfished” state in 2002 based on the first two full stock assessments Wallace (2001) and Methot *et al.* (2002). Both assessments were length-based models and used an earlier version of the Stock Synthesis program (Methot 1990). Wallace (2001) conducted two area assessments by using data from California and Oregon. Methot *et al.* (2002) incorporated Washington catch and age data, and treated the stock as one single assemblage off the California, Oregon, and Washington (W-O-C) coast. Results from Methot *et al.* (2002) indicated that the stock was depleted at 24% of B_0 in 2002. A subsequent rebuilding analysis was conducted (Methot and Piner 2002) and the estimated rebuilding parameters were adopted by the Pacific Fishery Management Council in 2004 (PFMC 2004). The parameters in the 2004 rebuilding plan are as follows:

Year stock declared overfished: 2002
Year rebuilding plan adopted: 2004
 B_0 : 3,875 mt
 B_{MSY} : 1,550 mt
 $B_{CURRENT}$ (% OF B_0): 24% in 2002
 T_{MIN} : 2027
 T_{MAX} : 2071
 P_{MAX} : 80%
 T_{TARGET} : 2058
Harvest control rule: $F = 0.0153$

Based on the harvest control rule ($F = 0.0153$), the optimum yields (OY) for 2004, 2005, and 2006 were determined to be 22, 26, and 27 metric tons, respectively. In 2005, Wallace *et al.* (2005) updated stock assessment by Methot *et al.* (2002) and subsequently Tsou and Wallace (2005) updated the rebuilding analysis by Methot and Piner (2002).

In 2006, The PFMC requested a full stock assessment for the yelloweye rockfish to incorporate new data sources and area-specific modeling in the assessment. The purpose of this document is to update rebuilding analysis based on this most recent stock assessment.

Highlights of 2006 assessment

The 2006 assessment for yelloweye rockfish (Wallace *et al.*, 2006) revised the historical fishery catch data prior to 1983, re-evaluated all abundance indices, incorporated the

IPHC yelloweye catch trend index and appended new age and size composition data. There are several features that influence the rebuilding analysis:

- There were four models constructed – one coastwide and three area-specific models. Though the stock assessment review panel (February 2006) adopted all four models, the assessment authors point out that relative to other area-specific models, the Washington model is much more uncertain. This uncertainty is associated with the lack of data that required additional model assumptions on growth, selectivities and fit to indices.
- The assessment start year was moved back from 1953 to 1923 in the coastwide, California, Oregon models.
- Selectivity functions were changed from double logistic to logistic functions.
- Natural mortality and recruitment steepness were revised. The values of these parameters used in three coastwide models are listed below. In this rebuilding analysis, we use the values in the 2006 assessment.

Assessment year	Natural mortality	Recruitment Steepness	Sigma R
2002	0.045	0.437	0.4
2005	0.045	0.437	0.4
2006	0.036	0.450	0.5

Rebuilding Calculations

We followed the guidelines from the PFMC Statistic and Scientific Committee (SSC) Terms of Reference for Groundfish Rebuilding Analyses dated 20 April 2005 and used the SSC Default Rebuilding Analysis as implemented by Punt (December 2005, version 2.9).

Life History and Selectivity parameters

Life history parameters, age structures, and historical estimates of spawning output and recruitments are taken from Wallace *et al.* (2006). The age-specific selectivity patterns are from Wallace *et al.* (2006), except for the coastwide rebuilding analysis in which we used averaged selectivity functions for seven fisheries, weighted by total catches of each fishery over the last five years.

Future Recruitment

To calculate recruitment during rebuilding period, four methods were considered: 1) random sampling of observed recruitment levels, 2) random sampling of observed recruits per spawner (R/S) levels, 3) using a Beverton-Holt stock-recruitment relationship, and 4) using a Ricker stock-recruitment relationship. We used the Beverton-Holt curve with a steepness of 0.45 and Sigma R = 0.5 because recruitments in 1993 - 2005 were estimated based on this relationship in the stock assessment (Figure 1). Also, this method will reproduce current low recruitment levels while the spawning biomass remains low and will predict smoother mean recruitment towards rebuilding.

Minimum Possible Rebuild Time

Stock-recruitment steepness greatly affects the calculation of the minimum rebuild time (T_{MIN}). In the absence of fishing from 2002, T_{MIN} are estimated to be 2046, 2073, 2035, and 2026 for the coastwide, California, Oregon, and Washington models, respectively (Table 1). The rebuilding trade-off of various OY and PMX is summarized in Figure 2 and Tables 4 – 7.

The SSC Requested Runs

A set of six rebuilding runs was requested in the SSC Terms of Reference for species currently managed under rebuilding plans. We conducted all six runs for the coastwide model but did not do so for the area-specific models. This is because there has not been an area-specific rebuilding plan adopted by the PFMFC.

Run #	Prob (recovery)	By	Based on
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

To compute current SPR rate for three of the six SSC runs, effort was made to re-construct 2002 rebuilding analysis by using current rebuilding computer application (Punt 2005, version 2.8a). We could not get a solution using the materials and methods documented in the Methot and Piner (2002) without substantially increasing steepness of the spawner-recruitment curve. As documented in Tsou and Wallace (2005), a rough estimate of 0.519 for “current SPR” in runs 1, 3, and 5.

The results from this analysis indicate that the yelloweye rockfish stock is behind in rebuilding schedule and will take longer time to rebuild than as indicated in the 2002 rebuilding analysis (Methot and Piner 2002). New T_{MIN} of 2046 and T_{MAX} of 2096 are 19 and 25 years longer than the T_{MIN} of 2027 and T_{MAX} of 2071 reported in the previous analysis (Table 1). Probabilities of recovery by current T_{TARGET} (2058) and T_{MAX} (2071) based on current SPR are low (Table 2). Probability of recovery by re-estimated T_{MAX} (2080) with current SPR is also low. The current harvest control rule ($F = 0.0153$) is too high to rebuild the stock by current T_{TARGET} and current T_{MAX} . Based on SSC run 6

settings (Table 3), where T_{MAX} and SPR are re-estimated and $P_o = 80\%$, OY is projected to be 12.6 mt in 2007 and the coastwide stock is estimated to rebuild in year 2096.

Literature Cited

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Table 1. Rebuilding parameters and 10-year OY projects for coastwide and area-specific models.

	Coastwide		California		Oregon		Washington		
FMSY proxy		0.024		0.021		0.021		0.027	
FMSY SPR / SPR(F=0)		0.5		0.5		0.5		0.5	
Virgin SPR		52.195		52.189		53.349		44.960	
Generation time		50		47		49		46	
T _{MIN}		2046		2073		2035		2026	
T _{MAX}		2096		2120		2084		2072	
Virgin Spawning Output		6643		3421		2510		906	
Target Spawning Output		2657		1368		1004		362	
Current Spawning Output		1146		281		530		188	
Spawning Output (ydecl = 2002)		1019		249		456		180	
Natural mortality		0.036		0.036		0.036		0.040	
Steepness		0.45		0.45		0.45		0.45	
SigmaR		0.50		0.50		0.50		0.50	
		OY	Depletion	OY	Depletion	OY	Depletion	OY	Depletion
2007		12.6	18.0%	2.7	8.6%	6.4	22.5%	2.6	20.9%
2008		12.9	18.5%	2.8	8.9%	6.6	23.1%	2.7	21.8%
2009		13.2	18.9%	2.9	9.2%	6.7	23.7%	2.8	22.8%
2010		13.5	19.4%	2.9	9.5%	6.8	24.2%	2.9	23.7%
2011		13.8	19.8%	3.0	9.8%	6.9	24.7%	3.0	24.5%
2012		14.1	20.2%	3.1	10.1%	7.0	25.2%	3.0	25.4%
2013		14.3	20.5%	3.1	10.3%	7.1	25.6%	3.1	26.1%
2014		14.5	20.8%	3.2	10.6%	7.1	25.9%	3.2	26.8%
2015		14.7	21.1%	3.3	10.8%	7.2	26.2%	3.2	27.3%
2016		15.0	21.4%	3.3	11.0%	7.3	26.5%	3.3	27.9%

Note: OY projection is base on P_{MAX} = 0.8.

Table 2. Summary of the SSC requested runs.

Run #	Prob (recovery)	By	Based on	SPR	2007 OY
1	0.000	2058	Current SPR	0.591	21.3
2	0.5	2058	estimated SPR	0.860	5.5
3	0.001	2071	Current SPR	0.591	21.3
4	0.8	2071	estimated SPR	0.812	7.7
5	0.006	2096	Current SPR	0.591	21.3
6	0.8	2096	estimated SPR	0.719	12.6

Table 3. Ten-year OY projects of the SSC requested runs.

	SSC runs 1, 3, 5	SSC run 2	SSC Run 4	SSC Run 6
P_0		0.5	0.8	0.8
Rebuild by T_{TARGET}		2058	--	--
Rebuild by T_{MAX}		--	2071	0
SPR	0.519	0.86	0.812	0.719
F		0.0044	0.0061	0.0101
2007	21.3	5.5	7.7	12.6
2008	21.7	5.6	7.9	12.9
2009	22.1	5.8	8.1	13.2
2010	22.4	5.9	8.3	13.5
2011	22.7	6.1	8.5	13.8
2012	23.0	6.2	8.7	14.1
2013	23.3	6.4	8.9	14.3
2014	23.5	6.5	9.0	14.5
2015	23.8	6.6	9.2	14.7
2016	24.0	6.7	9.4	15.0

Table 4. Ten-year OY projection and depletion levels under different P_{MAX} for the coastwide model.

	P= .5		P= .6		P= .7		P= .8		P= .9		Yr=Tmid		F=0	
2007	14.8	18%	14.1	18%	13.4	18%	12.6	18%	11.4	18%	10.2	18%	0.0	18%
2008	15.1	18%	14.5	18%	13.7	19%	12.9	19%	11.7	19%	10.5	19%	0.0	19%
2009	15.4	19%	14.8	19%	14.0	19%	13.2	19%	12.0	19%	10.7	19%	0.0	19%
2010	15.7	19%	15.1	19%	14.3	19%	13.5	19%	12.3	20%	11.0	20%	0.0	20%
2011	16.0	20%	15.4	20%	14.6	20%	13.8	20%	12.6	20%	11.2	20%	0.0	21%
2012	16.3	20%	15.6	20%	14.9	20%	14.1	20%	12.8	20%	11.4	20%	0.0	21%
2013	16.6	21%	15.9	21%	15.1	21%	14.3	21%	13.0	21%	11.7	21%	0.0	22%
2014	16.8	21%	16.1	21%	15.4	21%	14.5	21%	13.2	21%	11.9	21%	0.0	22%
2015	17.0	21%	16.4	21%	15.6	21%	14.7	21%	13.5	22%	12.1	22%	0.0	23%
2016	17.3	21%	16.6	22%	15.8	22%	15.0	22%	13.7	22%	12.2	22%	0.0	23%

Table 5. Ten-year OY projection and depletion levels under different P_{MAX} for the California model.

	P= .5		P= .6		P= .7		P= .8		P= .9		Yr=Tmid		F=0	
2007	3.3	9%	3.1	9%	3.0	9%	2.7	9%	2.5	9%	2.1	9%	0.0	9%
2008	3.4	9%	3.2	9%	3.0	9%	2.8	9%	2.5	9%	2.2	9%	0.0	9%
2009	3.5	9%	3.3	9%	3.1	9%	2.9	9%	2.6	9%	2.2	9%	0.0	9%
2010	3.6	9%	3.4	9%	3.2	10%	2.9	10%	2.7	10%	2.3	10%	0.0	10%
2011	3.6	10%	3.4	10%	3.3	10%	3.0	10%	2.7	10%	2.4	10%	0.0	10%
2012	3.7	10%	3.5	10%	3.3	10%	3.1	10%	2.8	10%	2.4	10%	0.0	10%
2013	3.8	10%	3.6	10%	3.4	10%	3.1	10%	2.9	10%	2.5	10%	0.0	11%
2014	3.9	10%	3.7	10%	3.5	11%	3.2	11%	2.9	11%	2.5	11%	0.0	11%
2015	3.9	11%	3.7	11%	3.5	11%	3.3	11%	3.0	11%	2.6	11%	0.0	11%
2016	4.0	11%	3.8	11%	3.6	11%	3.3	11%	3.0	11%	2.6	11%	0.0	12%

Table 6. Ten-year OY projection and depletion levels under different P_{MAX} for the Oregon model.

	P= .5		P= .6		P= .7		P= .8		P= .9		Yr=Tmid		F=0	
2007	7.5	22%	7.2	22%	6.9	22%	6.4	22%	5.8	22%	5.5	22%	0.0	22%
2008	7.7	23%	7.3	23%	7.0	23%	6.6	23%	6.0	23%	5.6	23%	0.0	23%
2009	7.8	24%	7.5	24%	7.1	24%	6.7	24%	6.1	24%	5.7	24%	0.0	24%
2010	7.9	24%	7.6	24%	7.2	24%	6.8	24%	6.2	24%	5.8	24%	0.0	25%
2011	8.0	25%	7.7	25%	7.3	25%	6.9	25%	6.3	25%	5.9	25%	0.0	26%
2012	8.1	25%	7.8	25%	7.4	25%	7.0	25%	6.4	25%	6.0	25%	0.0	26%
2013	8.2	25%	7.9	25%	7.5	25%	7.1	26%	6.5	26%	6.1	26%	0.0	27%
2014	8.3	26%	7.9	26%	7.6	26%	7.1	26%	6.5	26%	6.1	26%	0.0	28%
2015	8.3	26%	8.0	26%	7.7	26%	7.2	26%	6.6	26%	6.2	27%	0.0	28%
2016	8.4	26%	8.1	26%	7.7	26%	7.3	27%	6.7	27%	6.3	27%	0.0	29%

Table 7. Ten-year OY projection and depletion levels under different P_{MAX} for the Washington model.

	P= .5		P= .6		P= .7		P= .8		P= .9		Yr=Tmid		F=0	
2007	3.0	21%	2.9	21%	2.8	21%	2.6	21%	2.4	21%	2.1	21%	0.0	21%
2008	3.1	22%	3.0	22%	2.9	22%	2.7	22%	2.4	22%	2.2	22%	0.0	22%
2009	3.2	23%	3.1	23%	3.0	23%	2.8	23%	2.5	23%	2.3	23%	0.0	23%
2010	3.3	24%	3.2	24%	3.1	24%	2.9	24%	2.6	24%	2.3	24%	0.0	24%
2011	3.4	24%	3.3	24%	3.1	24%	3.0	25%	2.7	25%	2.4	25%	0.0	26%
2012	3.5	25%	3.3	25%	3.2	25%	3.0	25%	2.8	25%	2.5	26%	0.0	27%
2013	3.6	26%	3.4	26%	3.3	26%	3.1	26%	2.8	26%	2.5	26%	0.0	28%
2014	3.6	26%	3.5	27%	3.4	27%	3.2	27%	2.9	27%	2.6	27%	0.0	29%
2015	3.7	27%	3.5	27%	3.4	27%	3.2	27%	2.9	28%	2.7	28%	0.0	30%
2016	3.8	27%	3.6	28%	3.5	28%	3.3	28%	3.0	28%	2.7	28%	0.0	31%

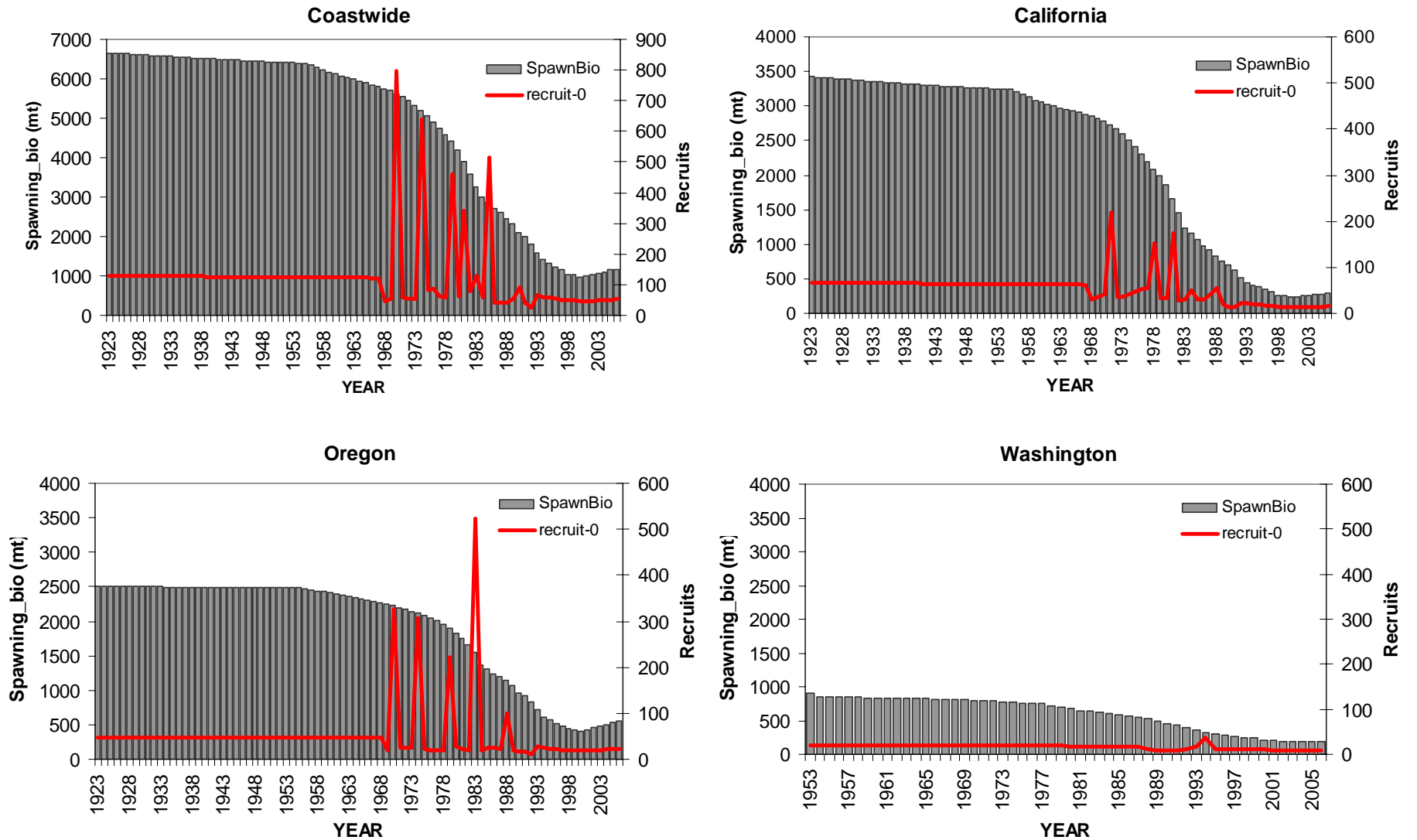


Figure 1. Spawning biomass and age-0 recruits in coastwide and area-specific models.

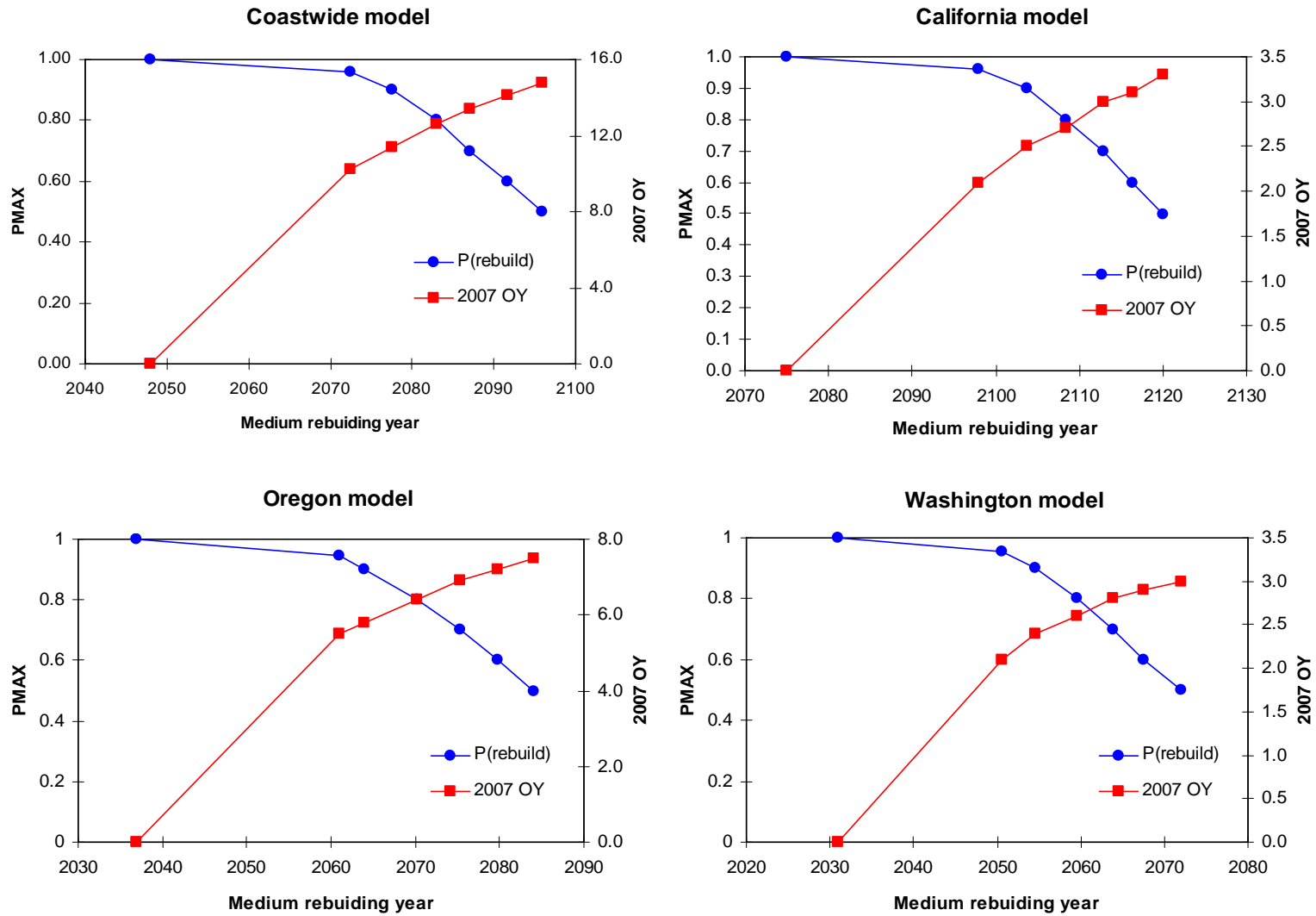


Figure 2. Trade-off between OY in 2007 and medium rebuilding time before T_{MAX} .

Appendix A. Input data for coastwide model

```

#Title
Yelloweye_CST_06
# Number of sexes
1
# Age range to consider (minimum age; maximum age)
0 70
# Number of fleets
3
# First year of projection (Yinit, last year of assessment)
2005
# Year declared overfished (Ydecl, the first year of zero OY)
2002
# 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 (64 or 51: #of years beyond Tstart to Tmax 2071 or Ttarget
2058, from previous rebuilding plan)
-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     41     42     43     44     45     46     47     48     49     50     51     52
      53     54     55     56     57     58     59     60     61     62     63     64     65
      66     67     68     69     70
0.00001  0.00001  0.00001  0.00001  0.00001  0.00002  0.00008  0.00037689
      0.00163636  0.00618861  0.0198959  0.0531941  0.118229  0.22283
      0.366512  0.541439  0.736379  0.940456  1.14517  1.34484
      1.5362  1.71769  1.88888  2.04994  2.20134  2.34371  2.47766
      2.60381  2.72269  2.83479  2.94056  3.04039  3.13462
      3.22358  3.30755  3.3868  3.46158  3.53213  3.59867  3.6614
      3.72052  3.77623  3.8287  3.8781  3.9246  3.96835  4.00951  4.04821
      4.08459  4.11879  4.15092  4.18111  4.20945  4.23607
      4.26106  4.28451  4.30651  4.32716  4.34653  4.3647  4.38173
      4.39771  4.41265  4.42667  4.4398  4.45211  4.46365  4.47446
      4.48459  4.49407  4.50296  4.51129
# Age specific information (Females then males) weight selectivity
# wt and selex fleet 1=CA fleets
0.1309  0.1309  0.1309  0.1336  0.1641  0.2291  0.3132  0.4099  0.5169  0.6324  0.7551  0.8832  1.0156
      1.1507  1.2876  1.4250  1.5622  1.6982  1.8324  1.9641  2.0930  2.2186  2.3405  2.4586  2.5726
      2.6824  2.7879  2.8891  2.9860  3.0786  3.1669  3.2511  3.3312  3.4074  3.4796  3.5482  3.6131
      3.6746  3.7328  3.7878  3.8397  3.8887  3.9349  3.9785  4.0196  4.0583  4.0947  4.1290  4.1613
      4.1916  4.2201  4.2469  4.2721  4.2958  4.3180  4.3388  4.3584  4.3767  4.3940  4.4101  4.4253
      4.4395  4.4528  4.4653  4.4769  4.4879  4.4982  4.5078  4.5168  4.5252  4.5332
0.0252  0.0252  0.0252  0.0265  0.0425  0.0885  0.1705  0.2854  0.4174  0.5462  0.6577  0.7467  0.8141
      0.8635  0.8992  0.9249  0.9433  0.9566  0.9664  0.9735  0.9789  0.9829  0.9860  0.9884  0.9903
      0.9917  0.9929  0.9938  0.9946  0.9952  0.9958  0.9962  0.9966  0.9969  0.9972  0.9974  0.9976
    
```

	0.9977	0.9979	0.9980	0.9981	0.9982	0.9983	0.9984	0.9985	0.9985	0.9986	0.9986	0.9987	
	0.9987	0.9988	0.9988	0.9988	0.9989	0.9989	0.9989	0.9989	0.9990	0.9990	0.9990	0.9990	
	0.9990	0.9990	0.9990	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991		
# wt and selex fleet 2=OR fleets													
0.1309	0.1309	0.1309	0.1336	0.1641	0.2291	0.3132	0.4099	0.5169	0.6324	0.7551	0.8832	1.0156	
	1.1507	1.2876	1.4250	1.5622	1.6982	1.8324	1.9641	2.0930	2.2186	2.3405	2.4586	2.5726	
	2.6824	2.7879	2.8891	2.9860	3.0786	3.1669	3.2511	3.3312	3.4074	3.4796	3.5482	3.6131	
	3.6746	3.7328	3.7878	3.8397	3.8887	3.9349	3.9785	4.0196	4.0583	4.0947	4.1290	4.1613	
	4.1916	4.2201	4.2469	4.2721	4.2958	4.3180	4.3388	4.3584	4.3767	4.3940	4.4101	4.4253	
	4.4395	4.4528	4.4653	4.4769	4.4879	4.4982	4.5078	4.5168	4.5252	4.5332			
0.0098	0.0098	0.0098	0.0105	0.0210	0.0575	0.1345	0.2536	0.3963	0.5377	0.6600	0.7563	0.8277	
	0.8787	0.9143	0.9389	0.9559	0.9678	0.9760	0.9819	0.9861	0.9892	0.9915	0.9932	0.9944	
	0.9954	0.9962	0.9968	0.9972	0.9976	0.9979	0.9982	0.9984	0.9986	0.9987	0.9988	0.9989	
	0.9990	0.9991	0.9992	0.9992	0.9993	0.9993	0.9993	0.9994	0.9994	0.9994	0.9995	0.9995	
	0.9995	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	
	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997		
# wt and selex fleet 3=WA fleets													
0.1309	0.1309	0.1309	0.1336	0.1641	0.2291	0.3132	0.4099	0.5169	0.6324	0.7551	0.8832	1.0156	
	1.1507	1.2876	1.4250	1.5622	1.6982	1.8324	1.9641	2.0930	2.2186	2.3405	2.4586	2.5726	
	2.6824	2.7879	2.8891	2.9860	3.0786	3.1669	3.2511	3.3312	3.4074	3.4796	3.5482	3.6131	
	3.6746	3.7328	3.7878	3.8397	3.8887	3.9349	3.9785	4.0196	4.0583	4.0947	4.1290	4.1613	
	4.1916	4.2201	4.2469	4.2721	4.2958	4.3180	4.3388	4.3584	4.3767	4.3940	4.4101	4.4253	
	4.4395	4.4528	4.4653	4.4769	4.4879	4.4982	4.5078	4.5168	4.5252	4.5332			
0.0123	0.0123	0.0123	0.0126	0.0160	0.0241	0.0367	0.0543	0.0776	0.1075	0.1443	0.1876	0.2367	
	0.2900	0.3454	0.4011	0.4551	0.5062	0.5534	0.5964	0.6351	0.6694	0.6998	0.7266	0.7501	
	0.7707	0.7888	0.8047	0.8187	0.8310	0.8418	0.8514	0.8599	0.8675	0.8742	0.8802	0.8856	
	0.8905	0.8948	0.8987	0.9023	0.9055	0.9084	0.9110	0.9134	0.9156	0.9176	0.9194	0.9211	
	0.9226	0.9240	0.9253	0.9265	0.9276	0.9286	0.9296	0.9304	0.9312	0.9320	0.9327	0.9333	
	0.9339	0.9344	0.9350	0.9354	0.9359	0.9363	0.9367	0.9370	0.9374	0.9377			
# M and initial age-structure for 2005													
# for both male and female													
0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
	0.036	0.036	0.036	0.036	0.036								
51.6255	48.5266		45.4700		42.5004		40.5386		38.2789		38.4885		
	37.3432		38.4787		38.7310		39.3492		39.1482		39.8207		
	14.6943		22.8271		44.0905		24.0429		16.0633		13.5908		
	12.3064		129.6330		12.7506		23.1109		12.0458		43.5901		
	6.6227	42.8411		4.5909	4.4241	5.2766	4.4016	29.0624		2.1195	1.8523	1.7643	
	21.6986		1.3380	0.9875	2.4541	2.2532	2.0796	1.9284	1.7969	1.6805	1.5772	1.4854	
	1.4031	1.3289	1.2604	1.1975	1.1387	1.0816	1.0281	0.9778	0.9303	0.8854	0.8432	0.8037	
	0.7670	0.7329	0.7012	0.6717	0.6440	0.6180	0.5933	0.5699	0.5476	0.5264	0.5061	0.4867	
	12.8309												
# Initial age-structure female then male for Ydeclared=2002 (Tmin)													
47.3655	45.1882		42.6739		42.9246		41.6864		43.0243		43.4054		
	44.2166		44.1111		44.9822		16.6355		25.8913		50.0887		
	27.3513		18.2953		15.4953		14.0437		148.0510		14.5722		
	26.4288		13.7825		49.8982		7.5842	49.0784		5.2609	5.0712	6.0499	
	5.0477	33.3347		2.4315	2.1252	2.0246	24.9025		1.5357	1.1335	2.8172	2.5868	
	2.3877	2.2142	2.0634	1.9297	1.8113	1.7060	1.6115	1.5263	1.4477	1.3754	1.3079	1.2424	
	1.1810	1.1232	1.0687	1.0171	0.9687	0.9234	0.8812	0.8420	0.8056	0.7717	0.7399	0.7100	
	0.6817	0.6548	0.6292	0.6048	0.5814	0.5591	0.5378	0.5173	0.4977	13.1895			
# Year for Tmin Age-structure													

2002

Number of simulations

1000

recruitment and biomass

Number of historical assessment years

83

Historical data

year recruitment spawner in B0 in R project in R/S project

1923	127.281	6643.41	1	0	0
1924	127.281	6643.41	1	0	0
1925	127.281	6643.41	0	0	0
1926	127.222	6633.39	0	0	0
1927	127.163	6623.41	0	0	0
1928	127.105	6613.48	0	0	0
1929	127.047	6603.62	0	0	0
1930	126.989	6593.84	0	0	0
1931	126.932	6584.14	0	0	0
1932	126.875	6574.56	0	0	0
1933	126.818	6565.1	0	0	0
1934	126.763	6555.76	0	0	0
1935	126.708	6546.58	0	0	0
1936	126.654	6537.55	0	0	0
1937	126.601	6528.68	0	0	0
1938	126.549	6519.98	0	0	0
1939	126.497	6511.44	0	0	0
1940	126.447	6503.07	0	0	0
1941	126.397	6494.87	0	0	0
1942	126.349	6486.82	0	0	0
1943	126.301	6478.94	0	0	0
1944	126.254	6471.21	0	0	0
1945	126.208	6463.62	0	0	0
1946	126.163	6456.19	0	0	0
1947	126.118	6448.9	0	0	0
1948	126.075	6441.75	0	0	0
1949	126.032	6434.73	0	0	0
1950	125.99	6427.85	0	0	0
1951	125.948	6421.1	0	0	0
1952	125.908	6414.47	0	0	0
1953	125.868	6407.97	0	0	0
1954	125.828	6401.59	0	0	0
1955	125.79	6395.33	0	0	0
1956	125.49	6346.98	0	0	0
1957	125.144	6291.85	0	0	0
1958	124.802	6237.97	0	0	0
1959	124.406	6176.33	0	0	0
1960	124.052	6122.01	0	0	0
1961	123.726	6072.38	0	0	0
1962	123.44	6029.5	0	0	0
1963	123.159	5987.64	0	0	0
1964	122.83	5939.12	0	0	0
1965	122.552	5898.51	0	0	0
1966	122.229	5851.86	0	0	0
1967	121.878	5801.66	0	0	0
1968	44.6223	5751.12	0	1	0
1969	54.626	5700.33	0	1	0
1970	794.277	5620.62	0	1	0

1971	57.4323	5536.46	0	1	0
1972	53.1839	5454.66	0	1	0
1973	53.3088	5338.45	0	1	0
1974	637.256	5196.34	0	1	0
1975	83.934	5058.85	0	1	0
1976	87.4141	4917.57	0	1	0
1977	63.5935	4752.41	0	1	0
1978	57.0958	4579.12	0	1	0
1979	458.69	4411.06	0	1	0
1980	60.6498	4180.21	0	1	0
1981	339.435	3892.78	0	1	0
1982	79.3289	3594.84	0	1	0
1983	128.363	3265.23	0	1	0
1984	59.709	3006.81	0	1	0
1985	513.603	2864.65	0	1	0
1986	41.6036	2699.16	0	1	0
1987	39.6196	2604.61	0	1	0
1988	40.9073	2465.36	0	1	0
1989	54.2458	2316.87	0	1	0
1990	89.5403	2110.33	0	1	0
1991	42.3809	1993.85	0	1	0
1992	25.2998	1792.08	0	1	0
1993	64.3818	1582.76	0	0	0
1994	60.0054	1422.81	0	0	0
1995	57.5386	1337.55	0	0	0
1996	54.2349	1228.48	0	0	0
1997	51.7059	1148.68	0	0	0
1998	48.2626	1044.84	0	0	0
1999	47.8721	1033.4	0	0	0
2000	45.8841	976.155	0	0	0
2001	46.8447	1003.61	0	0	0
2002	47.3655	1018.65	0	0	0
2003	48.8742	1062.9	0	0	0
2004	50.3054	1105.8	0	0	0
2005	51.6255	1146.2	0	0	0

Number of years with pre-specified catches

2

catches for years with pre-specified catches

2005 26

2006 27

Number of future recruitments to override

0

Process for overriding (-1 for average otherwise index in data list)

Which probability to product detailed results for (1=0.5; 2=0.6; 3=0.7; 4=0.8; 5=0.9; 6=Ttarget of T_{min}+0.75(T_{max}-T_{min}); 7="F=0"; 8="40-10" rule; 9=ABC rule)

4

Steepness sigma-R Auto-correlation (Change sigmaR to 0.4 for final runs!!)

0.45 0.5 0

Target SPR rate (FMSY Proxy)

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
0.9
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Definition of recovery (1=now only;2=now or before)
1
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
2
# 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
20
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
1
# User-specific projection (1=Yes); Output replaced (1->6)
0 6 0 0.5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2007 3 0.591
-1 -1 -1
# Split of Fs (first year MUST be Yinit)
2005 0.3 0.3 0.4
2006 0.3 0.3 0.4
-1 1 1 1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
# Use bisection (0) or linear interpolation (1)
0
# Target Depletion
0.4
```


Appendix B. Input data for California model

```

#Title
Yelloweye_CA_06
# Number of sexes
1
# Age range to consider (minimum age; maximum age)
0 70
# Number of fleets
2
# First year of projection (Yinit, last year of assessment)
2005
# Year declared overfished (Ydecl, the first year of zero OY)
2002
# 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     41     42     43     44     45     46     47     48     49     50     51     52
      53     54     55     56     57     58     59     60     61     62     63     64     65
      66     67     68     69     70
0.00    0.00    0.00    0.00006    0.0003  0.0014  0.0051  0.0176  0.0509  0.1207  0.2374  0.3984
      0.5909  0.7993  1.0102  1.2152  1.4096  1.5914  1.7604  1.9171  2.0624  2.1972  2.3224  2.4388
      2.5471  2.6481  2.7422  2.8300  2.9118  2.9881  3.0593  3.1257  3.1876  3.2453  3.2990  3.3491
      3.3957  3.4391  3.4794  3.5170  3.5520  3.5844  3.6146  3.6427  3.6688  3.6930  3.7155  3.7363
      3.7557  3.7737  3.7904  3.8059  3.8202  3.8335  3.8459  3.8573  3.8680  3.8778  3.8869  3.8954
      3.9032  3.9104  3.9171  3.9232  3.9289  3.9342  3.9391  3.9437  3.9479  3.9518  3.9554
# Age specific information (Females then males) weight selectivity
# wt and selex fleet 1=CA recreation
0.1309  0.1320  0.1764  0.2644  0.3650  0.4736  0.5877  0.7100  0.8362  0.9658  1.0979  1.2314  1.3653
      1.4986  1.6302  1.7594  1.8855  2.0079  2.1261  2.2400  2.3492  2.4536  2.5531  2.6477  2.7374
      2.8224  2.9027  2.9784  3.0497  3.1168  3.1798  3.2390  3.2944  3.3462  3.3948  3.4401  3.4825
      3.5221  3.5589  3.5933  3.6254  3.6552  3.6830  3.7088  3.7329  3.7552  3.7760  3.7953  3.8132
      3.8299  3.8453  3.8597  3.8730  3.8854  3.8968  3.9075  3.9173  3.9265  3.9350  3.9428  3.9501
      3.9568  3.9629  3.9686  3.9739  3.9788  3.9833  3.9875  3.9914  3.9950  3.9983
0.0000  0.0357  0.0540  0.1143  0.2169  0.3533  0.5001  0.6321  0.7363  0.8125  0.8660  0.9031  0.9286
      0.9464  0.9589  0.9679  0.9744  0.9792  0.9829  0.9856  0.9878  0.9895  0.9908  0.9919  0.9927
      0.9935  0.9941  0.9946  0.9950  0.9954  0.9957  0.9959  0.9962  0.9964  0.9965  0.9967  0.9968
      0.9969  0.9970  0.9971  0.9972  0.9973  0.9974  0.9974  0.9974  0.9975  0.9975  0.9976  0.9976  0.9977
      0.9977  0.9977  0.9977  0.9978  0.9978  0.9978  0.9978  0.9978  0.9979  0.9979  0.9979  0.9979  0.9979
      0.9979  0.9979  0.9980  0.9980  0.9980  0.9980  0.9980  0.9980  0.9980  0.9980  0.9980
# wt and selex fleet 2=CA commercial

```

0.1309 0.1323 0.1838 0.2783 0.3843 0.4952 0.6076 0.7265 0.8483 0.9736 1.1021 1.2330 1.3650
 1.4970 1.6278 1.7565 1.8822 2.0045 2.1227 2.2365 2.3457 2.4502 2.5498 2.6445 2.7343
 2.8193 2.8997 2.9755 3.0469 3.1141 3.1771 3.2363 3.2918 3.3437 3.3923 3.4377 3.4801
 3.5197 3.5566 3.5910 3.6231 3.6529 3.6807 3.7066 3.7306 3.7530 3.7738 3.7931 3.8111
 3.8277 3.8432 3.8576 3.8709 3.8833 3.8947 3.9054 3.9153 3.9244 3.9329 3.9408 3.9481
 3.9547 3.9609 3.9666 3.9718 3.9767 3.9813 3.9855 3.9894 3.9930 3.9963
 0.0000 0.0087 0.0161 0.0475 0.1220 0.2524 0.4206 0.5865 0.7190 0.8130 0.8755 0.9160 0.9421
 0.9591 0.9704 0.9780 0.9832 0.9869 0.9896 0.9916 0.9930 0.9941 0.9950 0.9957 0.9962
 0.9966 0.9970 0.9973 0.9975 0.9977 0.9979 0.9980 0.9981 0.9982 0.9983 0.9984 0.9985
 0.9986 0.9986 0.9987 0.9987 0.9987 0.9988 0.9988 0.9988 0.9989 0.9989 0.9989 0.9989
 0.9989 0.9989 0.9990 0.9990 0.9990 0.9990 0.9990 0.9990 0.9990 0.9990 0.9990 0.9990
 0.9991 0.9991 0.9991 0.9991 0.9991 0.9991 0.9991 0.9991 0.9991 0.9991 0.9991 0.9991

M and initial age-structure for 2005

for both male and female

0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036
 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036
 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036
 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036
 0.036 0.036 0.036 0.036 0.036

14.8329 13.8524 12.9318 12.0221 11.3712 10.8050 10.8923
 10.6878 11.6463 12.3016 12.3010 12.1624 11.5713
 10.4492 6.0055 4.9790 5.9539 14.0654 8.5047 5.0151 4.2398 5.8357 2.9907
 2.0763 11.5461 1.9081 1.6592 6.4867 2.0495 1.6458 1.2881 0.9644 0.7431 0.6702
 3.5202 0.5999 0.4803 0.3651 0.6875 0.6381 0.5954 0.5581 0.5260 0.4975 0.4722 0.4496
 0.4292 0.4105 0.3926 0.3758 0.3594 0.3427 0.3267 0.3114 0.2970 0.2834 0.2709 0.2594
 0.2488 0.2389 0.2296 0.2208 0.2124 0.2044 0.1967 0.1894 0.1823 0.1755 0.1690 0.1627
 4.3220

Initial age-structure female then male for Ydeclared=2002 (Tmin)

13.4058 12.6932 12.0832 12.2164 12.0314 13.1620 13.9523
 13.9919 13.8641 13.2104 11.9420 6.8685 5.6973 6.8153 16.1045
 9.7395 5.7440 4.8565 6.6851 3.4261 2.3787 13.2285 2.1862 1.9011 7.4324 2.3484
 1.8858 1.4759 1.1051 0.8514 0.7679 4.0338 0.6874 0.5504 0.4184 0.7878 0.7312 0.6823
 0.6395 0.6028 0.5702 0.5411 0.5152 0.4918 0.4704 0.4499 0.4306 0.4118 0.3927 0.3744
 0.3569 0.3403 0.3248 0.3105 0.2973 0.2851 0.2737 0.2631 0.2530 0.2434 0.2342 0.2254
 0.2170 0.2089 0.2011 0.1937 0.1865 0.1796 0.1729 0.1665 4.4338

Year for Tmin Age-structure

2002

Number of simulations

1000

recruitment and biomass

Number of historical assessment years

83

Historical data

year recruitment spawner in B0 in R project in R/S project

1923 65.704 3429.02 1 0 0
 1924 65.4049 3413.41 1 0 0
 1925 65.6123 3413.41 0 0 0
 1926 65.5696 3406.18 0 0 0
 1927 65.5269 3398.97 0 0 0
 1928 65.4843 3391.78 0 0 0
 1929 65.4417 3384.63 0 0 0
 1930 65.3993 3377.52 0 0 0
 1931 65.3571 3370.47 0 0 0
 1932 65.3152 3363.5 0 0 0
 1933 65.2737 3356.61 0 0 0

1934	65.2328	3349.83	0	0	0
1935	65.1924	3343.17	0	0	0
1936	65.1528	3336.64	0	0	0
1937	65.1139	3330.25	0	0	0
1938	65.0757	3323.99	0	0	0
1939	65.0383	3317.88	0	0	0
1940	65.0015	3311.89	0	0	0
1941	64.9656	3306.04	0	0	0
1942	64.9302	3300.31	0	0	0
1943	64.8956	3294.71	0	0	0
1944	64.8616	3289.22	0	0	0
1945	64.8283	3283.85	0	0	0
1946	64.7955	3278.58	0	0	0
1947	64.7633	3273.42	0	0	0
1948	64.7317	3268.37	0	0	0
1949	64.7007	3263.41	0	0	0
1950	64.6703	3258.56	0	0	0
1951	64.6403	3253.8	0	0	0
1952	64.6109	3249.13	0	0	0
1953	64.582	3244.55	0	0	0
1954	64.5536	3240.06	0	0	0
1955	64.5257	3235.66	0	0	0
1956	64.3242	3204.1	0	0	0
1957	64.0789	3166.23	0	0	0
1958	63.8396	3129.87	0	0	0
1959	63.5532	3087.11	0	0	0
1960	63.3128	3051.81	0	0	0
1961	63.103	3021.45	0	0	0
1962	62.9388	2997.96	0	0	0
1963	62.7821	2975.77	0	0	0
1964	62.5966	2949.79	0	0	0
1965	62.467	2931.82	0	0	0
1966	62.2935	2907.98	0	0	0
1967	62.0932	2880.78	0	0	0
1968	30.3249	2853.27	0	1	0
1969	36.4519	2825.59	0	1	0
1970	41.3152	2781.87	0	1	0
1971	218.362	2728.16	0	1	0
1972	37.0963	2678.42	0	1	0
1973	36.3038	2602.33	0	1	0
1974	41.1095	2502.85	0	1	0
1975	47.435	2407.19	0	1	0
1976	52.0892	2305.22	0	1	0
1977	55.7812	2194.07	0	1	0
1978	152.371	2089.3	0	1	0
1979	33.7009	1990.26	0	1	0
1980	33.3917	1859.12	0	1	0
1981	172.841	1661.94	0	1	0
1982	26.2746	1456.13	0	1	0
1983	31.6742	1230.91	0	1	0
1984	51.1318	1154.82	0	1	0
1985	30.4267	1065.9	0	1	0
1986	29.4327	972.492	0	1	0
1987	40.9978	913.922	0	1	0
1988	56.2407	833.007	0	1	0
1989	19.9289	760.843	0	1	0

1990	14.0639	702.201	0	1	0
1991	14.4547	631.309	0	1	0
1992	21.7774	520.784	0	1	0
1993	21.3551	439.811	0	0	0
1994	20.3219	412.711	0	0	0
1995	18.9849	378.741	0	0	0
1996	17.801	349.652	0	0	0
1997	15.9558	306.054	0	0	0
1998	13.9752	261.479	0	0	0
1999	13.6365	254.076	0	0	0
2000	12.9935	240.189	0	0	0
2001	13.1585	243.731	0	0	0
2002	13.4058	249.068	0	0	0
2003	13.9023	259.881	0	0	0
2004	14.3602	269.972	0	0	0
2005	14.8329	280.512	0	0	0

Number of years with pre-specified catches

2

catches for years with pre-specified catches

2005 8

2006 8

Number of future recruitments to override

0

Process for overriding (-1 for average otherwise index in data list)

Which probability to product detailed results for (1=0.5; 2=0.6; 3=0.7; 4=0.8; 5=0.9; 6=Ttarget of Tmin+0.75(Tmax-Tmin); 7="F=0"; 8="40-10" rule; 9=ABC rule)

4

Steepness sigma-R Auto-correlation (Change sigmaR to 0.4 for final runs!!)

0.45 0.5 0

Target SPR rate (FMSY Proxy)

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

0.9

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)

1

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

```
20
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
1
# User-specific projection (1=Yes); Output replaced (1->6)
0      6      0      0.5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2007 3 0.717
-1      -1      -1
# Split of Fs (first year MUST be Yinit)
2005 0.8 0.2
2006 0.8 0.2
-1      1      1      1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
# Use bisection (0) or linear interpolation (1)
0
# Target Depletion
0.4
```

Appendix C. Input data for Oregon model

```

#Title
Yelloweye_OR_06
# Number of sexes
1
# Age range to consider (minimum age; maximum age)
0 70
# Number of fleets
2
# First year of projection (Yinit, last year of assessment)
2005
# Year declared overfished (Ydecl, the first year of zero OY)
2002
# 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     41     42     43     44     45     46     47     48     49     50     51     52
      53     54     55     56     57     58     59     60     61     62     63     64     65
0.00000  0.00000  0.00001  0.00001  0.00001  0.00001  0.00001  0.00001  0.00001  0.00001  0.00006
      0.00038  0.00201  0.00900  0.03218  0.08970  0.19769
      0.35888  0.56178  0.78864  1.02318  1.25403  1.47468
      1.68223  1.87588  2.05599  2.22337  2.37902  2.52390
      2.65887  2.78472  2.90214  3.01173  3.11402  3.20950
      3.29861  3.38175  3.45929  3.53158  3.59895  3.66171
      3.72015  3.77454  3.82514  3.87219  3.91593  3.95658
      3.99433  4.02939  4.06193  4.09213  4.12015  4.14614
      4.17024  4.19257  4.21328  4.23247  4.25024  4.26671
      4.28196  4.29609  4.30916  4.32127  4.33248  4.34286
      4.35241  4.36125  4.36943  4.37700  4.38401  4.39049
      4.39648  4.40202  4.40715  4.41189
# Age specific information (Females then males) weight selectivity
# wt and selex fleet 1=CA recreation
0.1309 0.1309 0.1309 0.1309 0.1318 0.1854 0.2929 0.4043 0.5156 0.6313 0.7551 0.8882 1.0296
      1.1770 1.3284 1.4815 1.6345 1.7859 1.9346 2.0796 2.2202 2.3558 2.4862 2.6110 2.7301
      2.8434 2.9509 3.0527 3.1488 3.2395 3.3249 3.4051 3.4804 3.5511 3.6172 3.6790 3.7368
      3.7908 3.8411 3.8880 3.9317 3.9724 4.0103 4.0455 4.0783 4.1087 4.1369 4.1632 4.1875
      4.2101 4.2311 4.2505 4.2685 4.2852 4.3007 4.3150 4.3283 4.3406 4.3520 4.3625 4.3723
      4.3812 4.3895 4.3972 4.4043 4.4109 4.4170 4.4227 4.4279 4.4327 4.4371
0.0000 0.0118 0.0118 0.0118 0.0119 0.0231 0.0864 0.2411 0.4570 0.6560 0.7969 0.8832 0.9327
      0.9604 0.9760 0.9850 0.9903 0.9935 0.9955 0.9968 0.9976 0.9982 0.9986 0.9989 0.9991
      0.9993 0.9994 0.9995 0.9996 0.9996 0.9997 0.9997 0.9997 0.9998 0.9998 0.9998 0.9998
      0.9998 0.9998 0.9998 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999

```

0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999
0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999 0.9999

wt and selex fleet 2=CA commercial
0.1309 0.1309 0.1309 0.1309 0.1316 0.1784 0.2884 0.4204 0.5612 0.7012 0.8386 0.9753 1.1134
1.2539 1.3967 1.5411 1.6860 1.8303 1.9729 2.1128 2.2491 2.3812 2.5085 2.6309 2.7479
2.8594 2.9655 3.0660 3.1611 3.2509 3.3354 3.4150 3.4897 3.5598 3.6255 3.6870 3.7444
3.7981 3.8481 3.8948 3.9383 3.9788 4.0165 4.0516 4.0842 4.1145 4.1426 4.1687 4.1930
4.2155 4.2363 4.2557 4.2736 4.2903 4.3057 4.3200 4.3332 4.3455 4.3568 4.3673 4.3770
4.3860 4.3943 4.4019 4.4090 4.4156 4.4216 4.4272 4.4324 4.4372 4.4417

0.0000 0.0036 0.0036 0.0036 0.0037 0.0060 0.0184 0.0539 0.1299 0.2511 0.3977 0.5413 0.6628
0.7563 0.8246 0.8731 0.9071 0.9309 0.9478 0.9598 0.9685 0.9749 0.9797 0.9832 0.9860
0.9881 0.9898 0.9912 0.9922 0.9931 0.9938 0.9944 0.9949 0.9953 0.9957 0.9960 0.9963
0.9965 0.9967 0.9969 0.9970 0.9971 0.9972 0.9974 0.9974 0.9975 0.9976 0.9977 0.9977
0.9978 0.9978 0.9979 0.9979 0.9979 0.9980 0.9980 0.9980 0.9981 0.9981 0.9981 0.9981
0.9981 0.9982 0.9982 0.9982 0.9982 0.9982 0.9982 0.9982 0.9982 0.9982 0.9982

M and initial age-structure for 2005
for both male and female
0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036
0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036
0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036
0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036 0.036
0.036 0.036 0.036 0.036 0.036

21.9894 20.5636 19.1752 17.7679 16.4652 15.2328 15.2911
14.8226 15.3906 15.3280 15.9415 15.9114 16.8150
6.7280 8.4961 8.3043 8.5727 39.7469 7.9843 7.2014 5.9153 3.9757 84.1920
2.6733 2.3903 2.4198 16.7143 1.2385 1.0151 0.9076 0.8684 10.8216 0.7696
0.6936 0.6232 7.0388 0.3788 0.8131 0.7517 0.7001 0.6559 0.6175 0.5834 0.5529 0.5250
0.4993 0.4755 0.4535 0.4329 0.4137 0.3956 0.3779 0.3613 0.3455 0.3305 0.3164 0.3029
0.2902 0.2782 0.2669 0.2564 0.2465 0.2372 0.2284 0.2200 0.2120 0.2043 0.1969 0.1898
0.1830 4.9528

Initial age-structure female then male for Ydeclared=2002 (Tmin)
19.7969 18.3469 16.9736 17.0394 16.5228 17.1753 17.1459
17.8930 17.9239 18.9994 7.6187 9.6349 9.4263 9.7368 45.1619
9.0744 8.1859 6.7248 4.5201 95.7253 3.0396 2.7179 2.7515 19.0059 1.4083
1.1543 1.0320 0.9875 12.3058 0.8751 0.7888 0.7086 8.0042 0.4307 0.9247 0.8548
0.7961 0.7459 0.7022 0.6635 0.6287 0.5970 0.5678 0.5408 0.5157 0.4923 0.4704 0.4499
0.4298 0.4108 0.3929 0.3759 0.3598 0.3445 0.3300 0.3163 0.3035 0.2916 0.2803 0.2698
0.2597 0.2502 0.2411 0.2323 0.2239 0.2159 0.2081 0.2006 0.1935 0.1865 5.0515

Year for Tmin Age-structure
2002
Number of simulations
1000
recruitment and biomass
Number of historical assessment years
83
Historical data
year recruitment spawner in B0 in R project in R/S project
1923 47.1445 2515.11 1 0 0
1924 46.9689 2505.74 1 0 0
1925 47.0907 2505.74 0 0 0
1926 47.0854 2504.82 0 0 0
1927 47.0801 2503.89 0 0 0
1928 47.0748 2502.98 0 0 0
1929 47.0695 2502.07 0 0 0
1930 47.0644 2501.17 0 0 0

1931	47.0592	2500.28	0	0	0
1932	47.0541	2499.4	0	0	0
1933	47.0492	2498.53	0	0	0
1934	47.0442	2497.69	0	0	0
1935	47.0394	2496.86	0	0	0
1936	47.0348	2496.05	0	0	0
1937	47.0302	2495.26	0	0	0
1938	47.0258	2494.51	0	0	0
1939	47.0216	2493.78	0	0	0
1940	47.0176	2493.09	0	0	0
1941	47.0138	2492.43	0	0	0
1942	47.0101	2491.79	0	0	0
1943	47.0066	2491.19	0	0	0
1944	47.0032	2490.6	0	0	0
1945	46.9999	2490.04	0	0	0
1946	46.9968	2489.5	0	0	0
1947	46.9938	2488.98	0	0	0
1948	46.9908	2488.48	0	0	0
1949	46.988	2487.99	0	0	0
1950	46.9852	2487.51	0	0	0
1951	46.9826	2487.05	0	0	0
1952	46.9799	2486.6	0	0	0
1953	46.9774	2486.16	0	0	0
1954	46.9749	2485.74	0	0	0
1955	46.9725	2485.32	0	0	0
1956	46.8889	2471.03	0	0	0
1957	46.802	2456.28	0	0	0
1958	46.7123	2441.19	0	0	0
1959	46.6194	2425.68	0	0	0
1960	46.5238	2409.88	0	0	0
1961	46.4252	2393.73	0	0	0
1962	46.3242	2377.33	0	0	0
1963	46.2203	2360.62	0	0	0
1964	46.1142	2343.73	0	0	0
1965	46.0055	2326.59	0	0	0
1966	45.8948	2309.31	0	0	0
1967	45.7815	2291.8	0	0	0
1968	45.6663	2274.19	0	1	0
1969	19.4462	2256.38	0	1	0
1970	327.158	2225.66	0	1	0
1971	25.9613	2202.43	0	1	0
1972	25.6524	2176.91	0	1	0
1973	25.05	2144.21	0	1	0
1974	307.775	2110.63	0	1	0
1975	21.4547	2078.32	0	1	0
1976	19.3827	2046.63	0	1	0
1977	18.6466	2002.29	0	1	0
1978	19.4331	1952.81	0	1	0
1979	221.978	1902.86	0	1	0
1980	26.9285	1822.99	0	1	0
1981	22.0788	1753.85	0	1	0
1982	20.3212	1657.00	0	1	0
1983	523.067	1544.93	0	1	0
1984	20.1546	1358.73	0	1	0
1985	24.5851	1302.58	0	1	0
1986	24.8154	1235.07	0	1	0

1987	23.193	1196.04	0	1	0
1988	99.3495	1146.26	0	1	0
1989	18.8451	1077.39	0	1	0
1990	16.4023	950.896	0	1	0
1991	15.3674	913.641	0	1	0
1992	11.3309	829.403	0	1	0
1993	26.7272	718.584	0	0	0
1994	24.0959	608.913	0	0	0
1995	23.1138	571.285	0	0	0
1996	21.337	507.238	0	0	0
1997	20.5976	482.005	0	0	0
1998	19.1026	433.322	0	0	0
1999	18.9889	429.743	0	0	0
2000	18.2427	406.65	0	0	0
2001	19.0194	430.701	0	0	0
2002	19.7969	455.554	0	0	0
2003	20.6078	482.348	0	0	0
2004	21.3174	506.561	0	0	0
2005	21.9894	530.179	0	0	0

Number of years with pre-specified catches

2

catches for years with pre-specified catches (use W-O-C: 5.1:4:3.7 ratio to split the OY)

2005 8

2006 8

Number of future recruitments to override

0

Process for overriding (-1 for average otherwise index in data list)

Which probability to product detailed results for (1=0.5; 2=0.6; 3=0.7; 4=0.8; 5=0.9; 6=Ttarget of $T_{min}+0.75(T_{max}-T_{min})$; 7="F=0"; 8="40-10" rule; 9=ABC rule)

4

Steepness sigma-R Auto-correlation (Change sigmaR to 0.4 for final runs!!)

0.45 0.5 0

Target SPR rate (FMSY Proxy)

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

0.9

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)

1

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
20
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
1
# User-specific projection (1=Yes); Output replaced (1->6)
0      6      0      0.5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2007 3 0.717
-1      -1      -1
# Split of Fs (first year MUST be Yinit)
2005 0.8 0.2
2006 0.8 0.2
-1      1      1      1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
# Use bisection (0) or linear interpolation (1)
0
# Target Depletion
0.4
```

Appendix D. Input data for Washington model

```

#Title
Yelloweye_WA_06
# Number of sexes
1
# Age range to consider (minimum age; maximum age)
0 70
# Number of fleets
2
# First year of projection (Yinit, last year of assessment)
2005
# Year declared overfished (Ydecl, the first year of zero OY)
2002
# 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     41     42     43     44     45     46     47     48     49     50     51     52
      53     54     55     56     57     58     59     60     61     62     63     64     65
0.00001  0.00001  0.00001  0.00001  0.00001  0.00001  0.00001  0.00001  0.00001  0.00001  0.00005
      0.00031  0.00172  0.00806  0.03102  0.09285  0.21444
      0.39745  0.62398  0.87036  1.11793  1.35575  1.57896
      1.78627  1.97815  2.15571  2.32025  2.47295  2.61486
      2.74690  2.86983  2.98432  3.09096  3.19027  3.28272
      3.36876  3.44879  3.52319  3.59233  3.65653  3.71612
      3.77140  3.82266  3.87017  3.91417  3.95492  3.99264
      4.02753  4.05980  4.08964  4.11722  4.14270  4.16624
      4.18799  4.20806  4.22659  4.24369  4.25948  4.27404
      4.28747  4.29986  4.31129  4.32182  4.33154  4.34050
      4.34861  4.35609  4.36299  4.36934  4.37519  4.38059
      4.38556  4.39014  4.39435  4.39824
# Age specific information (Females then males) weight selectivity
# wt and selex fleet 1=WA recreation
0.1309  0.1309  0.1309  0.1309  0.1309  0.1731  0.2821  0.4184  0.5576  0.6893  0.8197  0.9549  1.0973
      1.2461  1.3995  1.5551  1.7109  1.8650  2.0162  2.1633  2.3057  2.4426  2.5738  2.6989  2.8178
      2.9305  3.0371  3.1376  3.2321  3.3209  3.4041  3.4820  3.5549  3.6228  3.6862  3.7453  3.8002
      3.8513  3.8987  3.9428  3.9836  4.0215  4.0566  4.0891  4.1192  4.1470  4.1728  4.1966  4.2186
      4.2389  4.2577  4.2751  4.2911  4.3058  4.3195  4.3321  4.3437  4.3544  4.3643  4.3734  4.3818
      4.3893  4.3963  4.4027  4.4086  4.4141  4.4191  4.4237  4.4280  4.4319  4.4356
0.0000  0.0009  0.0009  0.0009  0.0009  0.0017  0.0098  0.0502  0.1743  0.3836  0.5974  0.7561  0.8555
      0.9135  0.9466  0.9657  0.9771  0.9841  0.9885  0.9914  0.9933  0.9947  0.9957  0.9964  0.9969
      0.9974  0.9977  0.9979  0.9981  0.9983  0.9984  0.9985  0.9986  0.9987  0.9988  0.9988  0.9989
      0.9989  0.9990  0.9990  0.9990  0.9991  0.9991  0.9991  0.9991  0.9991  0.9992  0.9992  0.9992

```

0.9992 0.9992 0.9992 0.9992 0.9992 0.9992 0.9992 0.9992 0.9993 0.9993 0.9993 0.9993
0.9993 0.9993 0.9993 0.9993 0.9993 0.9993 0.9993 0.9993 0.9993 0.9993

wt and selex fleet 2=WA commercial (with line gear)

0.1309 0.1309 0.1309 0.1309 0.1309 0.1638 0.2636 0.3933 0.5459 0.7134 0.8864 1.0574 1.2232
1.3839 1.5405 1.6938 1.8442 1.9915 2.1352 2.2751 2.4105 2.5411 2.6665 2.7864 2.9008
3.0094 3.1123 3.2096 3.3013 3.3875 3.4685 3.5444 3.6155 3.6818 3.7438 3.8016 3.8554
3.9054 3.9519 3.9951 4.0352 4.0724 4.1069 4.1388 4.1684 4.1958 4.2211 4.2445 4.2662
4.2862 4.3047 4.3217 4.3375 4.3521 4.3655 4.3779 4.3893 4.3999 4.4096 4.4186 4.4269
4.4342 4.4410 4.4473 4.4531 4.4584 4.4633 4.4678 4.4720 4.4758 4.4794

0.0004 0.0004 0.0004 0.0004 0.0004 0.0006 0.0019 0.0056 0.0149 0.0355 0.0750 0.1391 0.2264
0.3273 0.4295 0.5237 0.6051 0.6728 0.7276 0.7716 0.8066 0.8345 0.8569 0.8749 0.8895
0.9015 0.9113 0.9195 0.9263 0.9320 0.9369 0.9410 0.9446 0.9476 0.9503 0.9526 0.9546
0.9564 0.9580 0.9594 0.9606 0.9617 0.9627 0.9636 0.9643 0.9650 0.9657 0.9663 0.9668
0.9672 0.9677 0.9681 0.9684 0.9687 0.9690 0.9693 0.9695 0.9697 0.9699 0.9701 0.9703
0.9705 0.9707 0.9708 0.9710 0.9711 0.9712 0.9713 0.9714 0.9715 0.9716

M and initial age-structure for 2005

for both male and female

0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04
0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04
0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04
0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04
0.04 0.04 0.04 0.04 0.04

9.3089 8.8362 8.3557 7.9966 8.3428 8.2372 8.6273 8.4875 8.5030 8.4335 8.3180 22.7786
10.6208 6.1877 4.4632 3.7844 3.6566 4.1672 5.6961 4.6955 4.1456 3.6217 3.1537
2.7398 2.3882 2.1216 1.8910 1.6944 1.5278 1.3801 1.2532 1.1465 1.0550 0.9747 0.9023
0.8361 0.7743 0.7181 0.6679 0.6236 0.5845 0.5498 0.5187 0.4899 0.4637 0.4397 0.4175
0.3969 0.3775 0.3592 0.3421 0.3333 0.3177 0.3031 0.2893 0.2763 0.2640 0.2524 0.2414
0.2310 0.2212 0.2119 0.2030 0.1945 0.1864 0.1786 0.1712 0.1641 0.1572 0.1507 3.4918

Initial age-structure female then male for Ydeclared=2002 (Tmin)

9.0165 9.4071 9.2880 9.7281 9.5721 9.5986 9.5503 9.4814 26.2087 12.3455 7.2570
5.2706 4.4921 4.3576 4.9813 6.8255 5.6373 4.9845 4.3596 3.7997 3.3034 2.8811 2.5606
2.2831 2.0463 1.8456 1.6675 1.5144 1.3856 1.2752 1.1783 1.0909 1.0109 0.9363 0.8683
0.8076 0.7541 0.7069 0.6649 0.6273 0.5925 0.5608 0.5318 0.5050 0.4800 0.4565 0.4345
0.4137 0.4032 0.3843 0.3666 0.3499 0.3342 0.3194 0.3053 0.2921 0.2795 0.2676 0.2563
0.2455 0.2352 0.2254 0.2160 0.2071 0.1985 0.1902 0.1823 0.1748 0.1675 0.1606 3.7211

Year for Tmin Age-structure
2002

Number of simulations
1000

recruitment and biomass

Number of historical assessment years
53

Historical data

year recruitment spawner in B0 in R project in R/S project

1953	20.1555	906.199	1	0	0
1954	20.1555	842.582	1	0	0
1955	19.701	842.582	0	0	0
1956	19.6942	841.668	0	0	0
1957	19.6873	840.756	0	0	0
1958	19.6804	839.846	0	0	0
1959	19.6667	838.028	0	0	0
1960	19.653	836.217	0	0	0
1961	19.6393	834.418	0	0	0
1962	19.6257	832.634	0	0	0
1963	19.6122	830.87	0	0	0

1964	19.5778	826.383	0	0	0
1965	19.5433	821.925	0	0	0
1966	19.5087	817.494	0	0	0
1967	19.4741	813.081	0	0	0
1968	19.4393	808.681	0	0	0
1969	19.4043	804.294	0	0	0
1970	19.3693	799.925	0	0	0
1971	19.3186	793.665	0	0	0
1972	19.2715	787.905	0	0	0
1973	19.2175	781.377	0	0	0
1974	19.1489	773.179	0	0	0
1975	19.0715	764.063	0	0	0
1976	19.0049	756.332	0	0	0
1977	18.9102	745.513	0	0	0
1978	18.7153	723.881	0	0	0
1979	18.4986	700.77	0	0	0
1980	18.242	674.603	0	0	0
1981	17.9234	643.801	0	0	0
1982	17.8338	635.453	0	0	0
1983	17.7171	624.778	0	0	0
1984	17.5265	607.814	0	0	0
1985	17.3089	589.117	0	0	0
1986	16.9786	562.024	0	0	0
1987	17.9171	545.66	0	1	0
1988	11.4743	518.901	0	1	0
1989	8.89669	493.991	0	1	0
1990	8.23966	451.587	0	1	0
1991	8.81922	425.257	0	1	0
1992	11.2441	397.383	0	1	0
1993	17.9672	359.504	0	1	0
1994	36.2702	323.943	0	1	0
1995	12.5664	304.453	0	0	0
1996	12.1511	287.145	0	0	0
1997	11.7294	270.423	0	0	0
1998	11.2369	251.894	0	0	0
1999	10.9699	242.271	0	0	0
2000	10.0625	211.597	0	0	0
2001	9.79097	202.981	0	0	0
2002	9.01646	179.688	0	0	0
2003	9.05178	180.711	0	0	0
2004	9.19683	184.95	0	0	0
2005	9.3089	188.268	0	0	0

Number of years with pre-specified catches

2

catches for years with pre-specified catches

2005 10

2006 11

Number of future recruitments to override

0

Process for overriding (-1 for average otherwise index in data list)

Which probability to product detailed results for (1=0.5; 2=0.6; 3=0.7; 4=0.8; 5=0.9; 6=Ttarget of Tmin+0.75(Tmax-Tmin); 7="F=0"; 8="40-10" rule; 9=ABC rule)

4

Steepness sigma-R Auto-correlation (Change sigmaR to 0.4 for final runs!!)

0.45 0.5 0

Target SPR rate (FMSY Proxy)

```
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
0.9
# 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)
1
# 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
20
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
1
# User-specific projection (1=Yes); Output replaced (1->6)
0      6      0      0.5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2007 3 0.717
-1     -1     -1
# Split of Fs (first year MUST be Yinit)
2005 0.5 0.5
2006 0.5 0.5
-1     1     1     1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
# Use bisection (0) or linear interpolation (1)
0
# Target Depletion
0.4
```