

Appendix to Gmacs SMBKC Stock Assessment

The base model data file:

```
## #=====
## # Gmacs Main Data File Version 1.1: SM15 example
## # GEAR_INDEX DESCRIPTION
## # 1 : Pot fishery retained catch.
## # 1 : Pot fishery with discarded catch.
## # 2 : Trawl bycatch
## # 3 : Fixed bycatch
## # 4 : Trawl survey
## # 5 : Pot survey
##
## # Fisheries: 1 Pot Fishery, 2 Pot Discard, 3 Trawl by-catch, 3 Fixed by-catch
## # Surveys: 4 NMFS Trawl Survey, 5 Pot Survey
## #=====
##
## 1978 # Start year
## 2015 # End year
## 4 # Number of seasons
## 5 # Number of distinct data groups (among fishing fleets and surveys)
## 1 # Number of sexes
## 1 # Number of shell condition types
## 1 # Number of maturity types
## 3 # Number of size-classes in the model
## 4 # Season recruitment occurs
## 4 # Season molting and growth occurs
## 3 # Season to calculate SSB
## # size_breaks (a vector giving the break points between size intervals with dimension nclass+1)
## 90 105 120 135
## # weight-at-length input method (1 = allometry i.e.  $w_l = a \cdot l^b$ , 2 = vector by sex)
## 2
## # weight-at-length allometry  $w_l = a \cdot l^b$ 
## 4.03E-07
## # b (male, female)
## 3.141334
## # Male weight-at-length
## # 1.65 2.57 4.26 (lbs)
## # 0.7484274 1.165732 1.932303 (kgs)
## 0.000748 0.001165732 0.001932303 # (tonnes)
## # Male mature weight-at-length (weight * proportion mature)
## #0 1.166 1.932
## 0 0.001165732 0.001932303
## # Proportion mature by sex
## 0 1 1
## # Proportion of the total natural mortality to be applied each season (must add to 1)
## 0 0.440 0.185 0.375
## # Fishing fleet names (delimited with : no spaces in names)
## Pot_Fishery:Trawl_Bycatch:Fixed_bycatch
## # Survey names (delimited with : no spaces in names)
## NMFS_Trawl:ADFG_Pot
## # Number of catch data frames
## 4
## # Number of rows in each data frame
## 26 14 24 24
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## ## CATCH DATA
## ## Type of catch: 1 = retained, 2 = discard
## ## Units of catch: 1 = biomass, 2 = numbers
## ## for SMBKC Units are in number of crab for landed & 1000 kg for discards.
## ## Male Retained
## ## year seas fleet sex obs cv type units mult effort discard_mortality
## 1978 2 1 1 436126 0.03 1 2 1 0 0
## 1979 2 1 1 52966 0.03 1 2 1 0 0
## 1980 2 1 1 33162 0.03 1 2 1 0 0
## 1981 2 1 1 1045619 0.03 1 2 1 0 0
## 1982 2 1 1 1935886 0.03 1 2 1 0 0
## 1983 2 1 1 193199 0.03 1 2 1 0 0
## 1984 2 1 1 841017 0.03 1 2 1 0 0
## 1985 2 1 1 436021 0.03 1 2 1 0 0
## 1986 2 1 1 219548 0.03 1 2 1 0 0
## 1987 2 1 1 227447 0.03 1 2 1 0 0
## 1988 2 1 1 280401 0.03 1 2 1 0 0
## 1989 2 1 1 247641 0.03 1 2 1 0 0
## 1990 2 1 1 391405 0.03 1 2 1 0 0
## 1991 2 1 1 726519 0.03 1 2 1 0 0
## 1992 2 1 1 545222 0.03 1 2 1 0 0
## 1993 2 1 1 630353 0.03 1 2 1 0 0
## 1994 2 1 1 827015 0.03 1 2 1 0 0
## 1995 2 1 1 666905 0.03 1 2 1 0 0
## 1996 2 1 1 660665 0.03 1 2 1 0 0
## 1997 2 1 1 939822 0.03 1 2 1 0 0
## 1998 2 1 1 635370 0.03 1 2 1 0 0
## 2009 2 1 1 103376 0.03 1 2 1 0 0
## 2010 2 1 1 298669 0.03 1 2 1 0 0
## 2011 2 1 1 437862 0.03 1 2 1 0 0
## 2012 2 1 1 379386 0.03 1 2 1 0 0
## 2014 2 1 1 69109 0.03 1 2 1 0 0
## ## Male discards Pot fishery
## 1990 2 1 1 254.979 0.60 2 1 1 0 0.2
## 1991 2 1 1 531.448 0.60 2 1 1 0 0.2
## 1992 2 1 1 1050.387 0.60 2 1 1 0 0.2
## 1993 2 1 1 951.463 0.60 2 1 1 0 0.2
## 1994 2 1 1 1210.765 0.60 2 1 1 0 0.2
## 1995 2 1 1 363.112 0.60 2 1 1 0 0.2
## 1996 2 1 1 528.524 0.60 2 1 1 0 0.2
## 1997 2 1 1 1382.825 0.60 2 1 1 0 0.2
## 1998 2 1 1 781.103 0.60 2 1 1 0 0.2
## 2009 2 1 1 123.371 0.20 2 1 1 0 0.2
## 2010 2 1 1 304.656 0.20 2 1 1 0 0.2
## 2011 2 1 1 481.357 0.20 2 1 1 0 0.2
## 2012 2 1 1 437.336 0.20 2 1 1 0 0.2
## 2014 2 1 1 45.484 0.20 2 1 1 0 0.2
## ## Trawl fishery discards
## 1991 2 2 1 3.538 0.310 2 1 1 0 0.8
## 1992 2 2 1 1.996 0.310 2 1 1 0 0.8
## 1993 2 2 1 1.542 0.310 2 1 1 0 0.8
## 1994 2 2 1 0.318 0.310 2 1 1 0 0.8
## 1995 2 2 1 0.635 0.310 2 1 1 0 0.8
## 1996 2 2 1 0.0001 0.310 2 1 1 0 0.8

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## 1997 2 2 1 0.0001 0.310 2 1 1 0 0.8
## 1998 2 2 1 0.0001 0.310 2 1 1 0 0.8
## 1999 2 2 1 0.0001 0.310 2 1 1 0 0.8
## 2000 2 2 1 0.0001 0.310 2 1 1 0 0.8
## 2001 2 2 1 0.0001 0.310 2 1 1 0 0.8
## 2002 2 2 1 0.726 0.310 2 1 1 0 0.8
## 2003 2 2 1 0.998 0.310 2 1 1 0 0.8
## 2004 2 2 1 0.091 0.310 2 1 1 0 0.8
## 2005 2 2 1 0.0001 0.310 2 1 1 0 0.8
## 2006 2 2 1 2.812 0.310 2 1 1 0 0.8
## 2007 2 2 1 0.045 0.310 2 1 1 0 0.8
## 2008 2 2 1 0.272 0.310 2 1 1 0 0.8
## 2009 2 2 1 0.635 0.310 2 1 1 0 0.8
## 2010 2 2 1 0.363 0.310 2 1 1 0 0.8
## 2011 2 2 1 0.181 0.310 2 1 1 0 0.8
## 2012 2 2 1 0.590 0.310 2 1 1 0 0.8
## 2013 2 2 1 0.181 0.310 2 1 1 0 0.8
## 2014 2 2 1 0.0001 0.310 2 1 1 0 0.8
## ## Fixed fishery discards
## 1991 2 3 1 0.045 0.310 2 1 1 0 0.5
## 1992 2 3 1 2.268 0.310 2 1 1 0 0.5
## 1993 2 3 1 0.0001 0.310 2 1 1 0 0.5
## 1994 2 3 1 0.091 0.310 2 1 1 0 0.5
## 1995 2 3 1 0.136 0.310 2 1 1 0 0.5
## 1996 2 3 1 0.045 0.310 2 1 1 0 0.5
## 1997 2 3 1 0.181 0.310 2 1 1 0 0.5
## 1998 2 3 1 0.907 0.310 2 1 1 0 0.5
## 1999 2 3 1 1.361 0.310 2 1 1 0 0.5
## 2000 2 3 1 0.0001 0.310 2 1 1 0 0.5
## 2001 2 3 1 0.862 0.310 2 1 1 0 0.5
## 2002 2 3 1 0.408 0.310 2 1 1 0 0.5
## 2003 2 3 1 1.134 0.310 2 1 1 0 0.5
## 2004 2 3 1 0.635 0.310 2 1 1 0 0.5
## 2005 2 3 1 0.590 0.310 2 1 1 0 0.5
## 2006 2 3 1 1.451 0.310 2 1 1 0 0.5
## 2007 2 3 1 69.717 0.310 2 1 1 0 0.5
## 2008 2 3 1 6.622 0.310 2 1 1 0 0.5
## 2009 2 3 1 7.530 0.310 2 1 1 0 0.5
## 2010 2 3 1 9.571 0.310 2 1 1 0 0.5
## 2011 2 3 1 0.590 0.310 2 1 1 0 0.5
## 2012 2 3 1 0.0001 0.310 2 1 1 0 0.5
## 2013 2 3 1 0.272 0.310 2 1 1 0 0.5
## 2014 2 3 1 0.136 0.310 2 1 1 0 0.5
## ## RELATIVE ABUNDANCE DATA
## ## Units of abundance: 1 = biomass, 2 = numbers
## ## for SMBKC Units are in crabs for Abundance.
## ## Number of relative abundance indicies
## 2
## ## Number of rows in each index
## 38 8
## # Survey data (abundance indices, units are mt for trawl survey and crab/potlift for pot survey)
## # Year, Seas, Fleet, Sex, Abundance, CV units
## 1978 1 4 1 6832.824 0.394 1
## 1979 1 4 1 7989.887 0.463 1

```

##	1980	1	4	1	9986.838	0.507	1				
##	1981	1	4	1	6551.137	0.402	1				
##	1982	1	4	1	16221.946	0.344	1				
##	1983	1	4	1	9634.257	0.298	1				
##	1984	1	4	1	4071.221	0.179	1				
##	1985	1	4	1	3110.544	0.210	1				
##	1986	1	4	1	1416.851	0.388	1				
##	1987	1	4	1	2278.918	0.291	1				
##	1988	1	4	1	3158.172	0.252	1				
##	1989	1	4	1	6338.627	0.271	1				
##	1990	1	4	1	6730.136	0.274	1				
##	1991	1	4	1	6948.190	0.248	1				
##	1992	1	4	1	7093.277	0.201	1				
##	1993	1	4	1	9548.466	0.169	1				
##	1994	1	4	1	6539.139	0.176	1				
##	1995	1	4	1	5703.596	0.178	1				
##	1996	1	4	1	9410.411	0.241	1				
##	1997	1	4	1	10924.116	0.337	1				
##	1998	1	4	1	7976.846	0.355	1				
##	1999	1	4	1	1594.548	0.182	1				
##	2000	1	4	1	2096.797	0.310	1				
##	2001	1	4	1	2831.442	0.245	1				
##	2002	1	4	1	1732.601	0.320	1				
##	2003	1	4	1	1566.677	0.336	1				
##	2004	1	4	1	1523.870	0.305	1				
##	2005	1	4	1	1642.018	0.371	1				
##	2006	1	4	1	3893.879	0.334	1				
##	2007	1	4	1	6470.779	0.385	1				
##	2008	1	4	1	4654.477	0.284	1				
##	2009	1	4	1	6301.475	0.256	1				
##	2010	1	4	1	11130.907	0.466	1				
##	2011	1	4	1	10931.241	0.558	1				
##	2012	1	4	1	6200.224	0.339	1				
##	2013	1	4	1	2287.559	0.217	1				
##	2014	1	4	1	6029.225	0.449	1				
##	2015	1	4	1	5877.438	0.770	1				
##	1995	1	5	1	12.042	0.13	2				
##	1998	1	5	1	12.531	0.06	2				
##	2001	1	5	1	8.477	0.08	2				
##	2004	1	5	1	1.667	0.15	2				
##	2007	1	5	1	8.643	0.09	2				
##	2010	1	5	1	10.209	0.13	2				
##	2013	1	5	1	5.643	0.19	2				
##	2015	1	5	1	2.805	0.18	2				
##	##	Number of length frequency matrices									
##	3										
##	##	Number of rows in each matrix									
##	14	38	8								
##	##	Number of bins in each matrix (columns of size data)									
##	3	3	3								
##	##	SIZE COMPOSITION DATA FOR ALL FLEETS									
##	##	SIZE COMP LEGEND									
##	##	Sex: 1 = male, 2 = female, 0 = both sexes combined									
##	##	Type of composition: 1 = retained, 2 = discard, 0 = total composition									

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## ## Maturity state: 1 = immature, 2 = mature, 0 = both states combined
## ## Shell condition: 1 = new shell, 2 = old shell, 0 = both shell types combined
## ##length proportions of pot discarded males
## ##Year, Seas, Fleet, Sex, Type, Shell, Maturity, Nsamp, DataVec
## 1990 2 1 1 0 0 0 15 0.1133 0.3933 0.4933
## 1991 2 1 1 0 0 0 25 0.1329 0.1768 0.6902
## 1992 2 1 1 0 0 0 25 0.1905 0.2677 0.5417
## 1993 2 1 1 0 0 0 25 0.2807 0.2097 0.5096
## 1994 2 1 1 0 0 0 25 0.2942 0.2714 0.4344
## 1995 2 1 1 0 0 0 25 0.1478 0.2127 0.6395
## 1996 2 1 1 0 0 0 25 0.1595 0.2229 0.6176
## 1997 2 1 1 0 0 0 25 0.1818 0.2053 0.6128
## 1998 2 1 1 0 0 0 25 0.1927 0.2162 0.5911
## 2009 2 1 1 0 0 0 50 0.1413 0.3235 0.5352
## 2010 2 1 1 0 0 0 50 0.1314 0.3152 0.5534
## 2011 2 1 1 0 0 0 50 0.1314 0.3051 0.5636
## 2012 2 1 1 0 0 0 50 0.1417 0.3178 0.5406
## 2014 2 1 1 0 0 0 50 0.0939 0.2275 0.6786
## ##length proportions of trawl survey males
## ##Year, Seas, Fleet, Sex, Type, Shell, Maturity, Nsamp, DataVec
## 1978 1 4 1 0 0 0 50 0.3865 0.3478 0.2657
## 1979 1 4 1 0 0 0 50 0.4281 0.3190 0.2529
## 1980 1 4 1 0 0 0 50 0.3588 0.3220 0.3192
## 1981 1 4 1 0 0 0 50 0.1219 0.3065 0.5716
## 1982 1 4 1 0 0 0 50 0.1671 0.2435 0.5893
## 1983 1 4 1 0 0 0 50 0.1752 0.2726 0.5522
## 1984 1 4 1 0 0 0 50 0.1823 0.2085 0.6092
## 1985 1 4 1 0 0 0 46.5 0.2023 0.2010 0.5967
## 1986 1 4 1 0 0 0 23 0.1984 0.4364 0.3652
## 1987 1 4 1 0 0 0 35.5 0.1944 0.3779 0.4277
## 1988 1 4 1 0 0 0 40.5 0.1879 0.3737 0.4384
## 1989 1 4 1 0 0 0 50 0.4246 0.2259 0.3496
## 1990 1 4 1 0 0 0 50 0.2380 0.2332 0.5288
## 1991 1 4 1 0 0 0 50 0.2274 0.3300 0.4426
## 1992 1 4 1 0 0 0 50 0.2263 0.2911 0.4826
## 1993 1 4 1 0 0 0 50 0.2296 0.2759 0.4945
## 1994 1 4 1 0 0 0 50 0.1989 0.2926 0.5085
## 1995 1 4 1 0 0 0 50 0.2593 0.3005 0.4403
## 1996 1 4 1 0 0 0 50 0.1998 0.3054 0.4948
## 1997 1 4 1 0 0 0 50 0.1622 0.3102 0.5275
## 1998 1 4 1 0 0 0 50 0.1276 0.3212 0.5511
## 1999 1 4 1 0 0 0 26 0.2224 0.2214 0.5562
## 2000 1 4 1 0 0 0 30.5 0.2154 0.2180 0.5665
## 2001 1 4 1 0 0 0 45.5 0.2253 0.2699 0.5048
## 2002 1 4 1 0 0 0 19 0.1127 0.2346 0.6527
## 2003 1 4 1 0 0 0 32.5 0.3762 0.2345 0.3893
## 2004 1 4 1 0 0 0 24 0.2488 0.1848 0.5663
## 2005 1 4 1 0 0 0 21 0.2825 0.2744 0.4431
## 2006 1 4 1 0 0 0 50 0.3276 0.2293 0.4431
## 2007 1 4 1 0 0 0 50 0.4394 0.3525 0.2081
## 2008 1 4 1 0 0 0 50 0.3745 0.2219 0.4036
## 2009 1 4 1 0 0 0 50 0.3057 0.4202 0.2741
## 2010 1 4 1 0 0 0 50 0.4081 0.3371 0.2548
## 2011 1 4 1 0 0 0 50 0.2179 0.3940 0.3881

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## 2012 1 4 1 0 0 0 50 0.1573 0.4393 0.4034
## 2013 1 4 1 0 0 0 37 0.2100 0.2834 0.5065
## 2014 1 4 1 0 0 0 50 0.1738 0.3912 0.4350
## 2015 1 4 1 0 0 0 50 0.2340 0.2994 0.4666
## ##length proportions of pot survey
## ##Year, Seas, Fleet, Sex, Type, Shell, Maturity, Nsamp, DataVec
## 1995 1 5 1 0 0 0 100 0.1594 0.2656 0.5751
## 1998 1 5 1 0 0 0 100 0.0769 0.2205 0.7026
## 2001 1 5 1 0 0 0 100 0.1493 0.2049 0.6457
## 2004 1 5 1 0 0 0 100 0.0672 0.2484 0.6845
## 2007 1 5 1 0 0 0 100 0.1257 0.3148 0.5595
## 2010 1 5 1 0 0 0 100 0.1299 0.3209 0.5492
## 2013 1 5 1 0 0 0 100 0.1556 0.2477 0.5967
## 2015 1 5 1 0 0 0 100 0.0706 0.2431 0.6859
## ## Growth data (increment)
## # nobs_growth
## 3
## # MidPoint Sex Increment CV
## 97.5 1 14.1 0.2197
## 112.5 1 14.1 0.2197
## 127.5 1 14.1 0.2197
## # 97.5 1 13.8 0.2197
## # 112.5 1 14.1 0.2197
## # 127.5 1 14.4 0.2197
## ## eof
## 9999

```

The base model control file:

```

## # Set up to do Stock Reduction Analysis using Catch data and informative priors.
## # Controls for leading parameter vector theta
## # LEGEND FOR PRIOR:
## # 0 -> uniform
## # 1 -> normal
## # 2 -> lognormal
## # 3 -> beta
## # 4 -> gamma
## # ntheta
## 12
## # ival lb ub phz prior p1 p2 # parameter #
## 0.18 0.01 1 -4 2 0.18 0.02 # M
## 14.3 -7.0 30 2 0 -7 30 # logR0
## 10.0 -7.0 20 -1 1 -10.0 20.0 # logRini
## 10.0 -7.0 20 1 0 -7 30 # logRbar
## 80.0 30.0 310 -2 1 72.5 7.25 # Recruitment size distribution
## 0.25 0.1 7 -4 0 0.1 9.0 # Recruitment size scale (variance)
## -0.40 -10.0 0.75 -4 0 -10.0 0.75 # ln(sigma_R)
## 0.75 0.20 1.00 -2 3 3.0 2.00 # steepness
## 0.01 0.00 1.00 -3 3 1.01 1.01 # recruitment autocorrelation
## 14.0 5.00 15.00 1 0 5.00 15.00 # logN0 vector of initial number
## 14.0 5.00 15.00 1 0 5.00 15.00 # logN0 vector of initial number
## 14.0 5.00 15.00 1 0 5.00 15.00 # logN0 vector of initial number
## ## GROWTH PARAM CONTROLS ##

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```

## ## Two lines for each parameter if split sex, one line if not ##
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 14.1      10.0    30.0     -3     0    0.0   999.0    # alpha males or combined
## 0.0001     0.0     0.01    -3     0    0.0   999.0    # beta males or combined
## 0.45       0.01     1.0     -3     0    0.0   999.0    # gscale males or combined
## 121.5      65.0    145.0    -4     0    0.0   999.0    # molt_mu males or combined
## 0.060      0.0     1.0     -3     0    0.0   999.0    # molt_cv males or combined
##
## ## ----- ##
## ## SELECTIVITY CONTROLS ##
## ## Each gear must have a selectivity and a retention selectivity. If a uniform ##
## ## prior is selected for a parameter then the lb and ub are used (p1 and p2 are ##
## ## ignored) ##
## ## LEGEND ##
## ## sel type: 0 = parametric, 1 = coefficients, 2 = logistic, 3 = logistic95, ##
## ## 4 = double normal (NIY) ##
## ## gear index: use +ve for selectivity, -ve for retention ##
## ## sex dep: 0 for sex-independent, 1 for sex-dependent ##
## ## ----- ##
## ## ivector for number of year periods or nodes ##
## ## POT      TBycatch FBycatch NMFS_S  ADFG_pot
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 2           1         1         1         1      # Selectivity periods
## 0           0         0         0         0      # sex specific selectivity
## 0           3         3         0         0      # male selectivity type
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 1           1         1         1         1      # Retention periods
## 0           0         0         0         0      # sex specific retention
## 3           2         2         2         2      # male retention type
## 1           0         0         0         0      # male retention flag (0 -> no, 1 -> yes)
## ## gear  par  sel
## ## index index par sex  ival  lb    ub    prior p1    p2    phz  start end      ##
## ## # Gear-1
## 1      1      1  0    0.416198 0.001 2.0    0      0      1    -4    1978 2008
## 1      2      2  0    0.657528 0.001 2.0    0      0      1    -4    1978 2008
## 1      3      3  0    1.0         0.001 1.0    0      0      1    -4    1978 2008
## 1      1      1  0    0.326889 0.001 2.0    0      0      1    -4    2009 2015
## 1      2      2  0    0.806548 0.001 2.0    0      0      1    -4    2009 2015
## 1      3      3  0    1.0         0.001 1.0    0      0      1    -4    2009 2015
## # Gear-2
## 2      7      1  0    40         10.0 200    0      10     200   -2    1978 2015
## 2      8      2  0    60         10.0 200    0      10     200   -2    1978 2015
## # Gear-3
## 3      9      1  0    40         10.0 200    0      10     200   -3    1978 2015
## 3     10      2  0    60         10.0 200    0      10     200   -3    1978 2015
## # Gear-4
## 4      8      1  0    0.655565 0.001 2.0    0      0      1    -4    1978 2015
## 4      9      2  0    0.912882 0.001 2.0    0      0      1    -4    1978 2015
## 4     10      3  0    1.0         0.001 1.0    0      0      1    -4    1978 2015
## # Gear-5
## 5     11      1  0    0.347014 0.001 2.0    0      0      1    -4    1978 2015
## 5     12      2  0    0.720493 0.001 2.0    0      0      1    -4    1978 2015
## 5     13      3  0    1.0         0.001 1.0    0      0      1    -4    1978 2015
## ## Retained

```



```

## # Gear-1
## -1 14 1 0 120 100 200 0 1 900 -1 1978 2015
## -1 15 2 0 123 110 200 0 1 900 -1 1978 2015
## # Gear-2
## -2 16 1 0 595 1 700 0 1 900 -3 1978 2015
## -2 17 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-3
## -3 18 1 0 590 1 700 0 1 900 -3 1978 2015
## -3 19 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-4
## -4 20 1 0 580 1 700 0 1 900 -3 1978 2015
## -4 21 2 0 20 1 700 0 1 900 -3 1978 2015
## # Gear-5
## -5 22 1 0 580 1 700 0 1 900 -3 1978 2015
## -5 23 2 0 20 1 700 0 1 900 -3 1978 2015
##
## ## ----- ##
## ## PRIORS FOR CATCHABILITY
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## LAMBDA: Arbitrary relative weights for each series, 0 = do not fit.
## ## SURVEYS/INDICES ONLY
## ## ival lb ub phz prior p1 p2 Analytic? LAMBDA
## ## 1.0 0 2 -4 0 0 9.0 0 1 # NMFS trawl
## ## 3.98689 0 5 4 0 0 9.0 0 1 # ADF&G pot
## ## ----- ##
## ##
## ## ----- ##
## ## ADDITIONAL CV FOR SURVEYS/INDICES
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## ival lb ub phz prior p1 p2
## ## 0.0001 0.00001 10.0 -4 4 1.0 100 # NMFS
## ## 0.0001 0.00001 10.0 -4 4 1.0 100 # ADF&G
## ## ----- ##
## ##
## ## ----- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR
## ## ----- ##
## ## Mean_F STD_PHZ1 STD_PHZ2 PHZ
## ## 0.3 0.05 45.50 1 # Pot
## ## 0.001 0.05 4.050 1 # Trawl
## ## 0.001 0.05 4.020 1 # Fixed
## ## 0.00 2.00 20.00 -1 # NMFS
## ## 0.00 2.00 20.00 -1 # ADF&G
## ## ----- ##
## ##
## ## ----- ##

```

```

## ## OPTIONS FOR SIZE COMPOSTION DATA (COLUMN FOR EACH MATRIX)
## ## ----- ##
## ## LIKELIHOOD OPTIONS
## ## -1) Multinomial with estimated/fixed sample size
## ## -2) Robust approximation to multinomial
## ## -3) logistic normal (NIY)
## ## -4) multivariate-t (NIY)
## ## -5) Dirichlet
## ## AUTOTAIL COMPRESSION
## ## pmin is the cumulative proportion used in tail compression.
## ## ----- ##
## # 0 0 0 # Type of likelihood
## # 1 1 1 # Type of likelihood
## # 2 2 2 # Type of likelihood
## # 5 5 5 # Type of likelihood
## # 0 0 0 # Auto tail compression (pmin)
## # 1 1 1 # Initial value for effective sample size multiplier
## -4 -4 -4 # Phz for estimating effective sample size (if appl.)
## # 1 2 3 # Composition aggregator
## ## ----- ##
## ## ----- ##
## ## TIME VARYING NATURAL MORTALIIY RATES ##
## ## ----- ##
## ## TYPE:
## ## 0 = constant natural mortality
## ## 1 = Random walk (deviates constrained by variance in M)
## ## 2 = Cubic Spline (deviates constrained by nodes & node-placement)
## ## 3 = Blocked changes (deviates constrained by variance at specific knots)
## ## 4 = Time blocks
## ## ----- ##
## 3
## ## Phase of estimation
## 2
## ## STDEV in m_dev for Random walk
## # 0.55
## 10.0
## ## Number of nodes for cubic spline or number of step-changes for option 3
## 2
## ## Year position of the knots (vector must be equal to the number of nodes)
## 1998 1999
## ## ----- ##
## ##
## ## OTHER CONTROLS
## 2 # Estimated rec_dev phase
## 0 # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
## 2 # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters)
## 1978 # First year for average recruitment for Bspr calculation
## 2015 # Last year for average recruitment for Bspr calculation
## 0.35 # Target SPR ratio for Bmsy proxy
## 1 # Gear index for SPR calculations (i.e. directed fishery)
## 1 # Lambda (proportion of mature male biomass for SPR reference points)
## 1 # Use empirical molt increment data (0 = FALSE, 1 = TRUE)
## 0 # Stock-Recruit-Relationship (0 = None, 1 = Beverton-Holt)

```

EOF
9999

The selex model control file:

```
## # Set up to do Stock Reduction Analysis using Catch data and informative priors.
## # Controls for leading parameter vector theta
## # LEGEND FOR PRIOR:
## #
## #         0 -> uniform
## #         1 -> normal
## #         2 -> lognormal
## #         3 -> beta
## #         4 -> gamma
## # ntheta
## 12
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 0.18      0.01      1      -4      2    0.18    0.02    # M
## 14.3      -7.0     30      2      0     -7      30    # logR0
## 10.0      -7.0     20     -1      1   -10.0    20.0    # logRini
## 10.0      -7.0     20      1      0     -7      30    # logRbar
## 80.0      30.0     310     -2      1    72.5    7.25    # Recruitment size distribution
## 0.25      0.1       7     -4      0     0.1     9.0     # Recruitment size scale (varian
## -0.40     -10.0     0.75    -4      0   -10.0    0.75    # ln(sigma_R)
## 0.75      0.20     1.00    -2      3     3.0     2.00    # steepness
## 0.01      0.00     1.00    -3      3     1.01    1.01    # recruitment autocorrelation
## 14.0      5.00     15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## 14.0      5.00     15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## 14.0      5.00     15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## ## GROWTH PARAM CONTROLS
## ## Two lines for each parameter if split sex, one line if not
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 14.1      10.0     30.0     -3      0     0.0     999.0    # alpha males or combined
## 0.0001     0.0      0.01     -3      0     0.0     999.0    # beta males or combined
## 0.45      0.01     1.0      -3      0     0.0     999.0    # gscale males or combined
## 121.5      65.0    145.0     -4      0     0.0     999.0    # molt_mu males or combined
## 0.060      0.0      1.0      -3      0     0.0     999.0    # molt_cv males or combined
##
## ## -----
## ## SELECTIVITY CONTROLS
## ## Each gear must have a selectivity and a retention selectivity. If a uniform
## ## prior is selected for a parameter then the lb and ub are used (p1 and p2 are
## ## ignored)
## ## LEGEND
## ## sel type: 0 = parametric, 1 = coefficients, 2 = logistic, 3 = logistic95,
## ##            4 = double normal (NIY)
## ## gear index: use +ve for selectivity, -ve for retention
## ## sex dep: 0 for sex-independent, 1 for sex-dependent
## ## -----
## ## ivector for number of year periods or nodes
## ## POT      TBycatch FBycatch  NMFS_S  ADFG_pot
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 2           1         1         1         1      # Selectivity periods
## 0           0         0         0         0      # sex specific selectivity
## 0           3         3         0         0      # male selectivity type
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 1           1         1         1         1      # Retention periods
## 0           0         0         0         0      # sex specific retention
```

```

##      3      2      2      2      2      # male retention type
##      1      0      0      0      0      # male retention flag (0 -> no, 1 -> yes)
## ## gear par sel
## ## index index par sex ival lb ub prior p1 p2 phz start end ##
## ## mirror period period ##
## # Gear-1
## 1 1 1 0 0.416198 0.001 2.0 0 0 1 4 1978 2008
## 1 2 2 0 0.657528 0.001 2.0 0 0 1 4 1978 2008
## 1 3 3 0 1.0 0.001 1.0 0 0 1 -4 1978 2008
## 1 1 1 0 0.326889 0.001 2.0 0 0 1 4 2009 2015
## 1 2 2 0 0.806548 0.001 2.0 0 0 1 4 2009 2015
## 1 3 3 0 1.0 0.001 1.0 0 0 1 -4 2009 2015
## # Gear-2
## 2 7 1 0 40 10.0 200 0 10 200 -2 1978 2015
## 2 8 2 0 60 10.0 200 0 10 200 -2 1978 2015
## # Gear-3
## 3 9 1 0 40 10.0 200 0 10 200 -3 1978 2015
## 3 10 2 0 60 10.0 200 0 10 200 -3 1978 2015
## # Gear-4
## 4 8 1 0 0.655565 0.001 2.0 0 0 1 4 1978 2015
## 4 9 2 0 0.912882 0.001 2.0 0 0 1 4 1978 2015
## 4 10 3 0 1.0 0.001 1.0 0 0 1 -4 1978 2015
## # Gear-5
## 5 11 1 0 0.347014 0.001 2.0 0 0 1 4 1978 2015
## 5 12 2 0 0.720493 0.001 2.0 0 0 1 4 1978 2015
## 5 13 3 0 1.0 0.001 1.0 0 0 1 -4 1978 2015
## ## Retained
## # Gear-1
## -1 14 1 0 120 100 200 0 1 900 -1 1978 2015
## -1 15 2 0 123 110 200 0 1 900 -1 1978 2015
## # Gear-2
## -2 16 1 0 595 1 700 0 1 900 -3 1978 2015
## -2 17 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-3
## -3 18 1 0 590 1 700 0 1 900 -3 1978 2015
## -3 19 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-4
## -4 20 1 0 580 1 700 0 1 900 -3 1978 2015
## -4 21 2 0 20 1 700 0 1 900 -3 1978 2015
## # Gear-5
## -5 22 1 0 580 1 700 0 1 900 -3 1978 2015
## -5 23 2 0 20 1 700 0 1 900 -3 1978 2015
##
## ## ----- ##
## ## PRIORS FOR CATCHABILITY
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## LAMBDA: Arbitrary relative weights for each series, 0 = do not fit.
## ## SURVEYS/INDICES ONLY
## ## ival lb ub phz prior p1 p2 Analytic? LAMBDA
## 1.0 0 2 -4 0 0 9.0 0 1 # NMFS trawl
## 3.98689 0 5 4 0 0 9.0 0 1 # ADF&G pot

```

```

## ## ----- ##
##
## ## ----- ##
## ## ADDITIONAL CV FOR SURVEYS/INDICES ##
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## ival lb ub phz prior p1 p2 ##
## 0.0001 0.00001 10.0 -4 4 1.0 100 # NMFS
## 0.0001 0.00001 10.0 -4 4 1.0 100 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR ##
## ## ----- ##
## ## Mean_F STD_PHZ1 STD_PHZ2 PHZ ##
## 0.3 0.05 45.50 1 # Pot
## 0.001 0.05 4.050 1 # Trawl
## 0.001 0.05 4.020 1 # Fixed
## 0.00 2.00 20.00 -1 # NMFS
## 0.00 2.00 20.00 -1 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA (COLUMN FOR EACH MATRIX) ##
## ## ----- ##
## ## LIKELIHOOD OPTIONS
## ## -1) Multinomial with estimated/fixed sample size
## ## -2) Robust approximation to multinomial
## ## -3) logistic normal (NIY)
## ## -4) multivariate-t (NIY)
## ## -5) Dirichlet
## ## AUTOTAIL COMPRESSION
## ## pmin is the cumulative proportion used in tail compression.
## ## ----- ##
## # 0 0 0 # Type of likelihood
## # 1 1 1 # Type of likelihood
## # 2 2 2 # Type of likelihood
## # 5 5 5 # Type of likelihood
## # 0 0 0 # Auto tail compression (pmin)
## # 1 1 1 # Initial value for effective sample size multiplier
## -4 -4 -4 # Phz for estimating effective sample size (if appl.)
## # 1 2 3 # Composition aggregator
## ## ----- ##
##
## ## ----- ##
## ## TIME VARYING NATURAL MORTALIITY RATES ##
## ## ----- ##
## ## TYPE:
## ## 0 = constant natural mortality
## ## 1 = Random walk (deviates constrained by variance in M)
## ## 2 = Cubic Spline (deviates constrained by nodes & node-placement)

```

```

## ##      3 = Blocked changes (deviates constrained by variance at specific knots)
## ##      4 = Time blocks
## ## ----- ##
##      3
## ## Phase of estimation
##      2
## ## STDEV in m_dev for Random walk
## # 0.55
##      10.0
## ## Number of nodes for cubic spline or number of step-changes for option 3
##      2
## ## Year position of the knots (vector must be equal to the number of nodes)
##      1998 1999
## ## ----- ##
##
## ## OTHER CONTROLS
##      2      # Estimated rec_dev phase
##      0      # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
##      2      # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters)
##      1978    # First year for average recruitment for Bspr calculation
##      2015    # Last year for average recruitment for Bspr calculation
##      0.35    # Target SPR ratio for Bmsy proxy
##      1      # Gear index for SPR calculations (i.e. directed fishery)
##      1      # Lambda (proportion of mature male biomass for SPR reference points)
##      1      # Use empirical molt increment data (0 = FALSE, 1 = TRUE)
##      0      # Stock-Recruit-Relationship (0 = None, 1 = Beverton-Holt)
## ## EOF
## 9999

```

The add CV model control file:

```
## # Set up to do Stock Reduction Analysis using Catch data and informative priors.
## # Controls for leading parameter vector theta
## # LEGEND FOR PRIOR:
## #
## #         0 -> uniform
## #         1 -> normal
## #         2 -> lognormal
## #         3 -> beta
## #         4 -> gamma
## # ntheta
## 12
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 0.18      0.01      1      -4      2    0.18    0.02    # M
## 14.3      -7.0      30      2      0     -7      30      # logR0
## 10.0      -7.0      20     -1      1   -10.0    20.0     # logRini
## 10.0      -7.0      20      1      0     -7      30      # logRbar
## 80.0      30.0     310     -2      1    72.5    7.25     # Recruitment size distribution
## 0.25      0.1       7     -4      0     0.1     9.0      # Recruitment size scale (varian
## -0.40     -10.0     0.75    -4      0   -10.0    0.75     # ln(sigma_R)
## 0.75      0.20      1.00    -2      3     3.0     2.00     # steepness
## 0.01      0.00      1.00    -3      3     1.01    1.01     # recruitment autocorrelation
## 14.0      5.00      15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## 14.0      5.00      15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## 14.0      5.00      15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## ## GROWTH PARAM CONTROLS
## ## Two lines for each parameter if split sex, one line if not
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 14.1      10.0     30.0     -3      0     0.0     999.0     # alpha males or combined
## 0.0001     0.0      0.01     -3      0     0.0     999.0     # beta males or combined
## 0.45      0.01      1.0      -3      0     0.0     999.0     # gscale males or combined
## 121.5      65.0     145.0     -4      0     0.0     999.0     # molt_mu males or combined
## 0.060      0.0      1.0      -3      0     0.0     999.0     # molt_cv males or combined
##
## ## -----
## ## SELECTIVITY CONTROLS
## ## Each gear must have a selectivity and a retention selectivity. If a uniform
## ## prior is selected for a parameter then the lb and ub are used (p1 and p2 are
## ## ignored)
## ## LEGEND
## ## sel type: 0 = parametric, 1 = coefficients, 2 = logistic, 3 = logistic95,
## ##            4 = double normal (NIY)
## ## gear index: use +ve for selectivity, -ve for retention
## ## sex dep: 0 for sex-independent, 1 for sex-dependent
## ## -----
## ## ivector for number of year periods or nodes
## ## POT      TBycatch FBycatch  NMFS_S  ADFG_pot
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 2           1         1         1         1      # Selectivity periods
## 0           0         0         0         0      # sex specific selectivity
## 0           3         3         0         0      # male selectivity type
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 1           1         1         1         1      # Retention periods
## 0           0         0         0         0      # sex specific retention
```



```

##      3      2      2      2      2      # male retention type
##      1      0      0      0      0      # male retention flag (0 -> no, 1 -> yes)
## ## gear par sel                                phz start end      ##
## ## index index par sex ival lb ub prior p1 p2 mirror period period ##
## # Gear-1
##      1      1      1      0      0.416198 0.001 2.0      0      0      1      4      1978      2008
##      1      2      2      0      0.657528 0.001 2.0      0      0      1      4      1978      2008
##      1      3      3      0      1.0      0.001 1.0      0      0      1     -4      1978      2008
##      1      1      1      0      0.326889 0.001 2.0      0      0      1      4      2009      2015
##      1      2      2      0      0.806548 0.001 2.0      0      0      1      4      2009      2015
##      1      3      3      0      1.0      0.001 1.0      0      0      1     -4      2009      2015
## # Gear-2
##      2      7      1      0      40      10.0 200      0      10     200     -2      1978      2015
##      2      8      2      0      60      10.0 200      0      10     200     -2      1978      2015
## # Gear-3
##      3      9      1      0      40      10.0 200      0      10     200     -3      1978      2015
##      3     10      2      0      60      10.0 200      0      10     200     -3      1978      2015
## # Gear-4
##      4      8      1      0      0.655565 0.001 2.0      0      0      1      4      1978      2015
##      4      9      2      0      0.912882 0.001 2.0      0      0      1      4      1978      2015
##      4     10      3      0      1.0      0.001 1.0      0      0      1     -4      1978      2015
## # Gear-5
##      5     11      1      0      0.347014 0.001 2.0      0      0      1      4      1978      2015
##      5     12      2      0      0.720493 0.001 2.0      0      0      1      4      1978      2015
##      5     13      3      0      1.0      0.001 1.0      0      0      1     -4      1978      2015
## ## Retained
## # Gear-1
##     -1     14      1      0     120     100     200      0      1     900     -1      1978      2015
##     -1     15      2      0     123     110     200      0      1     900     -1      1978      2015
## # Gear-2
##     -2     16      1      0     595      1     700      0      1     900     -3      1978      2015
##     -2     17      2      0      10      1     700      0      1     900     -3      1978      2015
## # Gear-3
##     -3     18      1      0     590      1     700      0      1     900     -3      1978      2015
##     -3     19      2      0      10      1     700      0      1     900     -3      1978      2015
## # Gear-4
##     -4     20      1      0     580      1     700      0      1     900     -3      1978      2015
##     -4     21      2      0      20      1     700      0      1     900     -3      1978      2015
## # Gear-5
##     -5     22      1      0     580      1     700      0      1     900     -3      1978      2015
##     -5     23      2      0      20      1     700      0      1     900     -3      1978      2015
##
## ## ----- ##
## ## PRIORS FOR CATCHABILITY
## ##      If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ##      and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ##      prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## LAMBDA: Arbitrary relative weights for each series, 0 = do not fit.
## ## SURVEYS/INDICES ONLY
## ##      ival lb ub phz prior p1 p2 Analytic? LAMBDA
##      1.0 0 2 -4 0 0 9.0 0 1 # NMFS trawl
##      3.98689 0 5 4 0 0 9.0 0 1 # ADF&G pot

```

```

## ## ----- ##
##
## ## ----- ##
## ## ADDITIONAL CV FOR SURVEYS/INDICES ##
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## ival lb ub phz prior p1 p2 ##
## 0.0001 0.00001 10.0 -4 4 1.0 100 # NMFS
## 0.0001 0.00001 10.0 4 4 1.0 100 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR ##
## ## ----- ##
## ## Mean_F STD_PHZ1 STD_PHZ2 PHZ ##
## 0.3 0.05 45.50 1 # Pot
## 0.001 0.05 4.050 1 # Trawl
## 0.001 0.05 4.020 1 # Fixed
## 0.00 2.00 20.00 -1 # NMFS
## 0.00 2.00 20.00 -1 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA (COLUMN FOR EACH MATRIX) ##
## ## ----- ##
## ## LIKELIHOOD OPTIONS
## ## -1) Multinomial with estimated/fixed sample size
## ## -2) Robust approximation to multinomial
## ## -3) logistic normal (NIY)
## ## -4) multivariate-t (NIY)
## ## -5) Dirichlet
## ## AUTOTAIL COMPRESSION
## ## pmin is the cumulative proportion used in tail compression.
## ## ----- ##
## # 0 0 0 # Type of likelihood
## # 1 1 1 # Type of likelihood
## # 2 2 2 # Type of likelihood
## # 5 5 5 # Type of likelihood
## # 0 0 0 # Auto tail compression (pmin)
## # 1 1 1 # Initial value for effective sample size multiplier
## -4 -4 -4 # Phz for estimating effective sample size (if appl.)
## # 1 2 3 # Composition aggregator
## ## ----- ##
##
## ## ----- ##
## ## TIME VARYING NATURAL MORTALIITY RATES ##
## ## ----- ##
## ## TYPE:
## ## 0 = constant natural mortality
## ## 1 = Random walk (deviates constrained by variance in M)
## ## 2 = Cubic Spline (deviates constrained by nodes & node-placement)

```

```

## ##      3 = Blocked changes (deviates constrained by variance at specific knots)
## ##      4 = Time blocks
## ## ----- ##
##      3
## ## Phase of estimation
##      2
## ## STDEV in m_dev for Random walk
## # 0.55
##      10.0
## ## Number of nodes for cubic spline or number of step-changes for option 3
##      2
## ## Year position of the knots (vector must be equal to the number of nodes)
##      1998 1999
## ## ----- ##
##
## ## OTHER CONTROLS
##      2      # Estimated rec_dev phase
##      0      # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
##      2      # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters)
##      1978   # First year for average recruitment for Bspr calculation
##      2015   # Last year for average recruitment for Bspr calculation
##      0.35   # Target SPR ratio for Bmsy proxy
##      1      # Gear index for SPR calculations (i.e. directed fishery)
##      1      # Lambda (proportion of mature male biomass for SPR reference points)
##      1      # Use empirical molt increment data (0 = FALSE, 1 = TRUE)
##      0      # Stock-Recruit-Relationship (0 = None, 1 = Beverton-Holt)
## ## EOF
## 9999

```

The no M_{1998} model control file:

```
## # Set up to do Stock Reduction Analysis using Catch data and informative priors.
## # Controls for leading parameter vector theta
## # LEGEND FOR PRIOR:
## #
## #         0 -> uniform
## #         1 -> normal
## #         2 -> lognormal
## #         3 -> beta
## #         4 -> gamma
## # ntheta
## 12
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 0.18      0.01      1      -4      2    0.18    0.02    # M
## 14.3      -7.0     30      2      0     -7      30    # logR0
## 10.0      -7.0     20     -1      1   -10.0    20.0    # logRini
## 10.0      -7.0     20      1      0     -7      30    # logRbar
## 80.0      30.0     310     -2      1    72.5    7.25    # Recruitment size distribution
## 0.25      0.1       7     -4      0     0.1     9.0     # Recruitment size scale (varian
## -0.40     -10.0     0.75    -4      0   -10.0    0.75    # ln(sigma_R)
## 0.75      0.20     1.00    -2      3     3.0     2.00    # steepness
## 0.01      0.00     1.00    -3      3     1.01    1.01    # recruitment autocorrelation
## 14.0      5.00     15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## 14.0      5.00     15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## 14.0      5.00     15.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## ## GROWTH PARAM CONTROLS
## ## Two lines for each parameter if split sex, one line if not
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 14.1      10.0     30.0     -3      0     0.0     999.0    # alpha males or combined
## 0.0001     0.0      0.01    -3      0     0.0     999.0    # beta males or combined
## 0.45      0.01     1.0      -3      0     0.0     999.0    # gscale males or combined
## 121.5      65.0    145.0     -4      0     0.0     999.0    # molt_mu males or combined
## 0.060      0.0      1.0      -3      0     0.0     999.0    # molt_cv males or combined
##
## ## -----
## ## SELECTIVITY CONTROLS
## ## Each gear must have a selectivity and a retention selectivity. If a uniform
## ## prior is selected for a parameter then the lb and ub are used (p1 and p2 are
## ## ignored)
## ## LEGEND
## ## sel type: 0 = parametric, 1 = coefficients, 2 = logistic, 3 = logistic95,
## ##            4 = double normal (NIY)
## ## gear index: use +ve for selectivity, -ve for retention
## ## sex dep: 0 for sex-independent, 1 for sex-dependent
## ## -----
## ## ivector for number of year periods or nodes
## ## POT      TBycatch FBycatch  NMFS_S  ADFG_pot
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 2           1         1         1         1      # Selectivity periods
## 0           0         0         0         0      # sex specific selectivity
## 0           3         3         0         0      # male selectivity type
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 1           1         1         1         1      # Retention periods
## 0           0         0         0         0      # sex specific retention
```

```

##      3      2      2      2      2      # male retention type
##      1      0      0      0      0      # male retention flag (0 -> no, 1 -> yes)
## ## gear par sel
## ## index index par sex ival lb ub prior p1 p2 phz start end ##
## ## mirror period period ##
## # Gear-1
## 1 1 1 0 0.416198 0.001 2.0 0 0 1 4 1978 2008
## 1 2 2 0 0.657528 0.001 2.0 0 0 1 4 1978 2008
## 1 3 3 0 1.0 0.001 1.0 0 0 1 -4 1978 2008
## 1 1 1 0 0.326889 0.001 2.0 0 0 1 4 2009 2015
## 1 2 2 0 0.806548 0.001 2.0 0 0 1 4 2009 2015
## 1 3 3 0 1.0 0.001 1.0 0 0 1 -4 2009 2015
## # Gear-2
## 2 7 1 0 40 10.0 200 0 10 200 -2 1978 2015
## 2 8 2 0 60 10.0 200 0 10 200 -2 1978 2015
## # Gear-3
## 3 9 1 0 40 10.0 200 0 10 200 -3 1978 2015
## 3 10 2 0 60 10.0 200 0 10 200 -3 1978 2015
## # Gear-4
## 4 8 1 0 0.655565 0.001 2.0 0 0 1 4 1978 2015
## 4 9 2 0 0.912882 0.001 2.0 0 0 1 4 1978 2015
## 4 10 3 0 1.0 0.001 1.0 0 0 1 -4 1978 2015
## # Gear-5
## 5 11 1 0 0.347014 0.001 2.0 0 0 1 4 1978 2015
## 5 12 2 0 0.720493 0.001 2.0 0 0 1 4 1978 2015
## 5 13 3 0 1.0 0.001 1.0 0 0 1 -4 1978 2015
## ## Retained
## # Gear-1
## -1 14 1 0 120 100 200 0 1 900 -1 1978 2015
## -1 15 2 0 123 110 200 0 1 900 -1 1978 2015
## # Gear-2
## -2 16 1 0 595 1 700 0 1 900 -3 1978 2015
## -2 17 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-3
## -3 18 1 0 590 1 700 0 1 900 -3 1978 2015
## -3 19 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-4
## -4 20 1 0 580 1 700 0 1 900 -3 1978 2015
## -4 21 2 0 20 1 700 0 1 900 -3 1978 2015
## # Gear-5
## -5 22 1 0 580 1 700 0 1 900 -3 1978 2015
## -5 23 2 0 20 1 700 0 1 900 -3 1978 2015
##
## ## ----- ##
## ## PRIORS FOR CATCHABILITY
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## LAMBDA: Arbitrary relative weights for each series, 0 = do not fit.
## ## SURVEYS/INDICES ONLY
## ## ival lb ub phz prior p1 p2 Analytic? LAMBDA
## 1.0 0 2 -4 0 0 9.0 0 1 # NMFS trawl
## 3.98689 0 5 4 0 0 9.0 0 1 # ADF&G pot

```

```

## ## ----- ##
##
## ## ----- ##
## ## ADDITIONAL CV FOR SURVEYS/INDICES ##
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## ival lb ub phz prior p1 p2 ##
## 0.0001 0.00001 10.0 -4 4 1.0 100 # NMFS
## 0.0001 0.00001 10.0 -4 4 1.0 100 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR ##
## ## ----- ##
## ## Mean_F STD_PHZ1 STD_PHZ2 PHZ ##
## 0.3 0.05 45.50 1 # Pot
## 0.001 0.05 4.050 1 # Trawl
## 0.001 0.05 4.020 1 # Fixed
## 0.00 2.00 20.00 -1 # NMFS
## 0.00 2.00 20.00 -1 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA (COLUMN FOR EACH MATRIX) ##
## ## ----- ##
## ## LIKELIHOOD OPTIONS
## ## -1) Multinomial with estimated/fixed sample size
## ## -2) Robust approximation to multinomial
## ## -3) logistic normal (NIY)
## ## -4) multivariate-t (NIY)
## ## -5) Dirichlet
## ## AUTOTAIL COMPRESSION
## ## pmin is the cumulative proportion used in tail compression.
## ## ----- ##
## # 0 0 0 # Type of likelihood
## # 1 1 1 # Type of likelihood
## # 2 2 2 # Type of likelihood
## # 5 5 5 # Type of likelihood
## # 0 0 0 # Auto tail compression (pmin)
## # 1 1 1 # Initial value for effective sample size multiplier
## -4 -4 -4 # Phz for estimating effective sample size (if appl.)
## # 1 2 3 # Composition aggregator
## ## ----- ##
##
## ## ----- ##
## ## TIME VARYING NATURAL MORTALIITY RATES ##
## ## ----- ##
## ## TYPE:
## ## 0 = constant natural mortality
## ## 1 = Random walk (deviates constrained by variance in M)
## ## 2 = Cubic Spline (deviates constrained by nodes & node-placement)

```

```

## ##      3 = Blocked changes (deviates constrained by variance at specific knots)
## ##      4 = Time blocks
## ## ----- ##
## 0
## ## Phase of estimation
## 2
## ## STDEV in m_dev for Random walk
## # 0.55
## 10.0
## ## Number of nodes for cubic spline or number of step-changes for option 3
## 2
## ## Year position of the knots (vector must be equal to the number of nodes)
## 1998 1999
## ## ----- ##
##
## ## OTHER CONTROLS
## 2      # Estimated rec_dev phase
## 0      # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
## 2      # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters)
## 1978   # First year for average recruitment for Bspr calculation
## 2015   # Last year for average recruitment for Bspr calculation
## 0.35   # Target SPR ratio for Bmsy proxy
## 1      # Gear index for SPR calculations (i.e. directed fishery)
## 1      # Lambda (proportion of mature male biomass for SPR reference points)
## 1      # Use empirical molt increment data (0 = FALSE, 1 = TRUE)
## 0      # Stock-Recruit-Relationship (0 = None, 1 = Beverton-Holt)
## ## EOF
## 9999

```