Appendix B: SMBKC Stock Assessment Input Files

The data file used for the reference model (16.0) control file:

```
#=================================================================================================================
# Gmacs Main  Data  File  Version 1.1:  SM17 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
2017  # End year
2018  # Projection year
5     # 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
5     # Season recruitment occurs
5     # Season molting and growth occurs
4     # Season to calculate SSB
1     # Season for N output
# 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*l^b, 2 = vector by sex, 3 = matrix by sex)
3
# weight-at-length allometry w_l = a*l^b
4.03E-07
# b (male, female)
3.141334
# Male weight-at-length
0.000748427     0.001165731     0.001930510
0.000748427     0.001165731     0.001688886
0.000748427     0.001165731     0.001922246
0.000748427     0.001165731     0.001877957
0.000748427     0.001165731     0.001938634
0.000748427     0.001165731     0.002076413
0.000748427     0.001165731     0.001899330
0.000748427     0.001165731     0.002116687
0.000748427     0.001165731     0.001938784
0.000748427     0.001165731     0.001939764
0.000748427     0.001165731     0.001871067
0.000748427     0.001165731     0.001998295
0.000748427     0.001165731     0.001870418
0.000748427     0.001165731     0.001969415
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0.000748427     0.001165731     0.001926859
0.000748427     0.001165731     0.002021492
0.000748427     0.001165731     0.001931318
0.000748427     0.001165731     0.002014407
0.000748427     0.001165731     0.001977471
0.000748427     0.001165731     0.002099246
0.000748427     0.001165731     0.001982478
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001891628
0.000748427     0.001165731     0.001795721
0.000748427     0.001165731     0.001823113
0.000748427     0.001165731     0.001807433
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001894627
0.000748427     0.001165731     0.001850611
0.000748427     0.001165731     0.001930932
0.000748427     0.001165731     0.001930932
# Male mature weight-at-length (weight * proportion  mature)
0 0.001165732 0.001945911
# Proportion mature by sex
0 1 1
# Natural mortality per season input type (1 = vector by season, 2 = matrix by season/year)
2
# Proportion of the total natural mortality to be applied each season (each row must add to 1)
#0  0.0025  0  0.6245  0.373
   0.0000   0.0700   0.0000   0.5600   0.3700
   0.0000   0.0600   0.0000   0.5700   0.3700
   0.0000   0.0700   0.0000   0.5600   0.3700
   0.0000   0.0500   0.0000   0.5800   0.3700
   0.0000   0.0700   0.0000   0.5600   0.3700
   0.0000   0.1200   0.0000   0.5100   0.3700
   0.0000   0.1000   0.0000   0.5300   0.3700
   0.0000   0.1400   0.0000   0.4900   0.3700
   0.0000   0.1400   0.0000   0.4900   0.3700
   0.0000   0.1400   0.0000   0.4900   0.3700
   0.0000   0.1400   0.0000   0.4900   0.3700
   0.0000   0.1400   0.0000   0.4900   0.3700
   0.0000   0.1400   0.0000   0.4900   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1400   0.0000   0.4900   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
   0.0000   0.1800   0.0000   0.4500   0.3700
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   0.0000   0.4400   0.0000   0.1900   0.3700
   0.0000   0.4400   0.0000   0.1900   0.3700
   0.0000   0.4400   0.0000   0.1900   0.3700
   0.0000   0.4400   0.0000   0.1900   0.3700
   0.0000   0.4400   0.0000   0.1900   0.3700
   0.0000   0.4400   0.0000   0.1900   0.3700
   0.0000   0.4400   0.0000   0.1900   0.3700
   0.0000   0.4400   0.0000   0.1900   0.3700
   0.0000   0.4400   0.0000   0.1900   0.3700
# 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
28  16  26  26
##  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       1931990 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
2015    2       1       1       24407   0.03    1       2       1       0       0
2016    2       1       1       24.407   0.03    1       2       1       0       0
# Male  discards  Pot fishery
1990    2       1       1     254.9787861     0.6     2       1       1       0       0.2
1991    2       1       1     531.4483252     0.6     2       1       1       0       0.2
1992    2       1       1     1050.387026     0.6     2       1       1       0       0.2
1993    2       1       1     951.4626128     0.6     2       1       1       0       0.2
1994    2       1       1     1210.764588     0.6     2       1       1       0       0.2
1995    2       1       1     363.112032      0.6     2       1       1       0       0.2
1996    2       1       1     528.5244687     0.6     2       1       1       0       0.2
1997    2       1       1     1382.825328     0.6     2       1       1       0       0.2
1998    2       1       1     781.1032977     0.6     2       1       1       0       0.2
2009    2       1       1     123.3712279     0.2     2       1       1       0       0.2
2010    2       1       1     304.6562225     0.2     2       1       1       0       0.2
2011    2       1       1     481.3572126     0.2     2       1       1       0       0.2
2012    2       1       1     437.3360731     0.2     2       1       1       0       0.2
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2014    2       1       1     45.4839749      0.2     2       1       1       0       0.2
2015    2       1       1     21.19378597     0.2     2       1       1       0       0.2
2016    2       1       1     0.021193786     0.2     2       1       1       0       0.2
# Trawl fishery discards
1991    2       2       1       3.538   0.31    2       1       1       0       0.8
1992    2       2       1       1.996   0.31    2       1       1       0       0.8
1993    2       2       1       1.542   0.31    2       1       1       0       0.8
1994    2       2       1       0.318   0.31    2       1       1       0       0.8
1995    2       2       1       0.635   0.31    2       1       1       0       0.8
1996    2       2       1       0.500   0.31    2       1       1       0       0.8
1997    2       2       1       0.500   0.31    2       1       1       0       0.8
1998    2       2       1       0.500   0.31    2       1       1       0       0.8
1999    2       2       1       0.500   0.31    2       1       1       0       0.8
2000    2       2       1       0.500   0.31    2       1       1       0       0.8
2001    2       2       1       0.500   0.31    2       1       1       0       0.8
2002    2       2       1       0.726   0.31    2       1       1       0       0.8
2003    2       2       1       0.998   0.31    2       1       1       0       0.8
2004    2       2       1       0.091   0.31    2       1       1       0       0.8
2005    2       2       1       0.500   0.31    2       1       1       0       0.8
2006    2       2       1       2.812   0.31    2       1       1       0       0.8
2007    2       2       1       0.045   0.31    2       1       1       0       0.8
2008    2       2       1       0.272   0.31    2       1       1       0       0.8
2009    2       2       1       0.635   0.31    2       1       1       0       0.8
2010    2       2       1       0.363   0.31    2       1       1       0       0.8
2011    2       2       1       0.181   0.31    2       1       1       0       0.8
2012    2       2       1       0.100   0.31    2       1       1       0       0.8
2013    2       2       1       0.400   0.31    2       1       1       0       0.8
2014    2       2       1       0.100   0.31    2       1       1       0       0.8
2015    2       2       1       0.100   0.31    2       1       1       0       0.8
2016    2       2       1       0.500   0.31    2       1       1       0       0.8
# Fixed fishery discards
1991    2       3       1       0.045   0.31    2       1       1       0       0.5
1992    2       3       1       2.268   0.31    2       1       1       0       0.5
1993    2       3       1       0.500   0.31    2       1       1       0       0.5
1994    2       3       1       0.091   0.31    2       1       1       0       0.5
1995    2       3       1       0.136   0.31    2       1       1       0       0.5
1996    2       3       1       0.045   0.31    2       1       1       0       0.5
1997    2       3       1       0.181   0.31    2       1       1       0       0.5
1998    2       3       1       0.907   0.31    2       1       1       0       0.5
1999    2       3       1       1.361   0.31    2       1       1       0       0.5
2000    2       3       1       0.500   0.31    2       1       1       0       0.5
2001    2       3       1       0.862   0.31    2       1       1       0       0.5
2002    2       3       1       0.408   0.31    2       1       1       0       0.5
2003    2       3       1       1.134   0.31    2       1       1       0       0.5
2004    2       3       1       0.635   0.31    2       1       1       0       0.5
2005    2       3       1       0.590   0.31    2       1       1       0       0.5
2006    2       3       1       1.451   0.31    2       1       1       0       0.5
2007    2       3       1       69.717  0.31    2       1       1       0       0.5
2008    2       3       1       6.622   0.31    2       1       1       0       0.5
2009    2       3       1       7.530   0.31    2       1       1       0       0.5
2010    2       3       1       9.571   0.31    2       1       1       0       0.5
2011    2       3       1       1.800   0.31    2       1       1       0       0.5
2012    2       3       1       1.600   0.31    2       1       1       0       0.5
2013    2       3       1       0.8     0.31    2       1       1       0       0.5
2014    2       3       1       1.1     0.31    2       1       1       0       0.5
2015    2       3       1       1.600   0.31    2       1       1       0       0.5
2016    2       3       1       3.600   0.31    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
40  9
# 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 6832.819  0.394 1
1979  1 4 1 7989.881  0.463 1
1980  1 4 1 9986.830  0.507 1
1981  1 4 1 6551.132  0.402 1
1982  1 4 1 16221.933 0.344 1
1983  1 4 1 9634.250  0.298 1
1984  1 4 1 4071.218  0.179 1
1985  1 4 1 3110.541  0.210 1
1986  1 4 1 1416.849  0.388 1
1987  1 4 1 2278.917  0.291 1
1988  1 4 1 3158.169  0.252 1
1989  1 4 1 6338.622  0.271 1
1990  1 4 1 6730.130  0.274 1
1991  1 4 1 6948.184  0.248 1
1992  1 4 1 7093.272  0.201 1
1993  1 4 1 9548.459  0.169 1
1994  1 4 1 6539.133  0.176 1
1995  1 4 1 5703.591  0.178 1
1996  1 4 1 9410.403  0.241 1
1997  1 4 1 10924.107 0.337 1
1998  1 4 1 7976.839  0.355 1
1999  1 4 1 1594.546  0.182 1
2000  1 4 1 2096.795  0.310 1
2001  1 4 1 2831.440  0.245 1
2002  1 4 1 1732.599  0.320 1
2003  1 4 1 1566.675  0.336 1
2004  1 4 1 1523.869  0.305 1
2005  1 4 1 1642.017  0.371 1
2006  1 4 1 3893.875  0.334 1
2007  1 4 1 6470.773  0.385 1
2008  1 4 1 4654.473  0.284 1
2009  1 4 1 6301.470  0.256 1
2010  1 4 1 11130.898 0.466 1
2011  1 4 1 10931.232 0.558 1
2012  1 4 1 6200.219  0.339 1
2013  1 4 1 2287.557  0.217 1
2014  1 4 1 6029.220  0.449 1
2015  1 4 1 5877.433  0.770 1
2016  1 4 1 3485.909  0.393 1
2017  1 4 1 1793.760  0.599 1
1995  1 5 1 12042.000 0.130 2
1998  1 5 1 12531.000 0.060 2
2001  1 5 1 8477.000  0.080 2
2004  1 5 1 1667.000  0.150 2
2007  1 5 1 8643.000  0.090 2
2010  1 5 1 10209.000 0.130 2
2013  1 5 1 5643.000  0.190 2
2015  1 5 1 2805.000  0.180 2
2016  1 5 1 2378.000  0.186 2
##  Number  of  length  frequency matrices
3
##  Number  of  rows  in  each  matrix
15  40  9
##  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
##  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
  2015  2 1 1 0 0 0 50  0.1148  0.2518  0.6333
##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
  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
  2016  1 4 1 0 0 0 50   0.2255  0.2780  0.4965
  2017  1 4 1 0 0 0 50   0.0849  0.2994  0.6157
  ##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
  2016  1 5 1 0 0 0 100  0.0832  0.1917  0.7251
##  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
# Use custom transition matrix (0=no, 1=growth matrix, 2=transition matrix, i.e. growth and molting)
0
# The custom growth matrix (if not using just fill with zeros)
# Alternative TM (loosely) based on Otto and Cummiskey (1990)
0.2  0.7  0.1
0.0  0.4  0.6
0.0  0.0  1.0
#   Use custom  natural mortality   (0=no,  1=yes,  by  sex and year)
0
0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.1
## eof
9999
```

The reference model (16.0) control file:

```
## ------------------------------------------------------------------------------------- ##
## LEADING PARAMETER CONTROLS                                                            ##
# 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         # log(R0)
  10.0      -7.0        20        -1       1   -10.0     20         # log(Rini)
  14.13979   7.0        16         1       0     7.0     16.        # log(Rbar)
  80.0      30.0       310        -2       1    72.5    7.25        # Recruitment size distribution expected value
  0.25       0.1         7        -4       0    0.1     9.0         # Recruitment size scale (variance component)
  0.2      -10.0      0.75        -4       0  -10.0    0.75         # log(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
 14.9      10.00     15.00         3       0    5.00  20.00         # logN0 vector of initial numbers at length
 14.5      10.00     15.00         3       0    5.00  20.00         # logN0 vector of initial numbers at length
 14.3      10.00     15.00         3       0    5.00  20.00         # logN0 vector of initial numbers at length
## GROWTH PARAM CONTROLS                                                                ##
## Two lines for each parameter if split sex, one line if not                           ##
## number of molt periods
1
## Year(s) molt period changes (blank if no changes)

## ------------------------------------------------------------------------------------- ##
# 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    0.4    0.001 1.0    0       0      1     3     1978   2008
   1     2     2   0    0.7    0.001 1.0    0       0      1     3     1978   2008
   1     3     3   0    1.0    0.001 2.0    0       0      1    -2     1978   2008
   1     1     1   0    0.4    0.001 1.0    0       0      1     3     2009   2017
   1     2     2   0    0.4    0.001 1.0    0       0      1     3     2009   2017
   1     3     3   0    1.0    0.001 2.0    0       0      1    -2     2009   2017
# Gear-2
   2     7     1   0    40      10.0  200    0      10    200   -3     1978   2017
   2     8     2   0    60      10.0  200    0      10    200   -3     1978   2017
# Gear-3
   3     9     1   0    40      10.0  200    0      10    200   -3     1978   2017
   3    10     2   0    60      10.0  200    0      10    200   -3     1978   2017
# Gear-4
   4     8     1   0    0.7     0.001 1.0    0       0      1    4     1978   2017
   4     9     2   0    0.7     0.001 1.0    0       0      1    4     1978   2017
   4     10    3   0    0.9     0.001 1.0    0       0      1   -2     1978   2017
# Gear-5
   5     11    1   0    0.4     0.001 1.0    0       0      1    4     1978   2017
   5     12    2   0    0.7     0.001 1.0    0       0      1    4     1978   2017
   5     13    3   0    1.0     0.001 2.0    0       0      1   -2     1978   2017
## Retained
# Gear-1
  -1     14    1   0   120   100   200    0      1    900   -1     1978   2017
  -1     15    2   0   123   110   200    0      1    900   -1     1978   2017
# Gear-2
  -2     16    1   0   595    1    700    0      1    900   -3     1978   2017
  -2     17    2   0    10    1    700    0      1    900   -3     1978   2017
# Gear-3
  -3     18    1   0   590    1    700    0      1    900   -3     1978   2017
  -3     19    2   0    10    1    700    0      1    900   -3     1978   2017
# Gear-4
  -4     20    1   0   580    1    700    0      1    900   -3     1978   2017
  -4     21    2   0    20    1    700    0      1    900   -3     1978   2017
# Gear-5
  -5     22    1   0   580    1    700    0      1    900   -3     1978   2017
  -5     23    2   0    20    1    700    0      1    900   -3     1978   2017

## ------------------------------------------------------------------------------------- ##
```

```
## 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     -1    0       0        9.0   0           1       # NMFS trawl
0.00411135867487 0 5       1    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
   0.0000001      0.00000001   10.0      -4    4         1.0     100   # NMFS
   0.0000001      0.00000001   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
   0.2       0.05     50.0       1   # Pot
   0.001     0.05     50.0       1   # Trawl
   0.001     0.05     50.0       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.
## ------------------------------------------------------------------------------------ ##
#  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
  1   1   1   # LAMBDA
## ------------------------------------------------------------------------------------ ##

## ------------------------------------------------------------------------------------ ##
## 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
## ------------------------------------------------------------------------------------- ##
## Sex-specific? (0=no, 1=yes)
0
## Type
3
## Phase of estimation
4
## STDEV in m_dev for Random walk
10.0
## Number of nodes for cubic spline or number of step-changes for option 3
2
0 # Females (ignored if single sex...)
## Year position of the knots (vector must be equal to the number of nodes)
1998 1999
# 1976 1980 1985 1994 # Females (ignored if single sex...)
## ------------------------------------------------------------------------------------- ##

## ------------------------------------------------------------------------------------- ##
## OTHER CONTROLS
## ------------------------------------------------------------------------------------- ##
  3       # Estimated rec_dev phase
  3       # Estimated rec_ini 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
  2016    # 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
```