Appendix to Gmacs SMBKC Stock Assessment

The base model data file:

```
## Warning in file(con, "r"): cannot open file '../../examples/smbkc2/model_1/
## sm15.dat': No such file or directory

## Error in file(con, "r"): cannot open the connection
## Error in ts[i]: object of type 'closure' is not subsettable
```

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
                                          prior
                1b
                          ub
                                                                       # parameter
                                    phz
                                                    p1
                                                            p2
                                                                       # M
##
    0.18
              0.01
                           1
                                    -4
                                             2
                                                 0.18
                                                         0.02
##
    14.3
              -7.0
                          30
                                    -2
                                             0
                                                  -7
                                                           30
                                                                       # log(R0)
                                                                       # log(Rini)
##
    10.0
              -7.0
                          20
                                    -1
                                             1
                                                -10.0
                                                           20.0
##
    13.7222
              -7.0
                          20
                                     1
                                             0
                                                  -7
                                                           30
                                                                       # log(Rbar)
                                                  72.5
##
    80.0
              30.0
                         310
                                    -2
                                             1
                                                          7.25
                                                                       # Recruitment size distribution
##
    0.25
                           7
                                    -4
               0.1
                                             0
                                                  0.1
                                                          9.0
                                                                       # Recruitment size scale (varia
                                                                       # log(sigma_R)
##
    0.2
             -10.0
                        0.75
                                    -4
                                             0 -10.0
                                                         0.75
##
    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
##
   14.5
              5.00
                       18.00
                                     1
                                             0
                                                  5.00 15.00
                                                                       # logNO vector of initial number
  14.0
              5.00
                       18.00
                                                  5.00 15.00
                                                                       # logNO vector of initial number
##
                                     1
## 13.5
              5.00
                       18.00
                                             0
                                                  5.00 15.00
                                                                       # logNO vector of initial number
                                     1
## ## GROWTH PARAM CONTROLS
                                                                                          ##
## ## Two lines for each parameter if split sex, one line if not
                         ub
## # ival
                lb
                                     phz prior
                                                    p1
                                                            p2
                                                                       # parameter
    14.1
                                     -3
##
              10.0
                        30.0
                                              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
                                     -3
                                              0
                                                                       # molt_cv males or combined
##
     0.060
               0.0
                         1.0
                                                   0.0
                                                         999.0
##
## ## ----- ##
## ## 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
                                                                                                 ##
                                              ADFG pot
                 TBycatch FBycatch NMFS S
                 Gear-2
                          Gear-3
                                     Gear-4
##
   ## Gear-1
                                              Gear-5
##
                                                         # Selectivity periods
##
      \cap
                 0
                          0
                                     0
                                               0
                                                         # sex specific selectivity
##
                 3
                          3
                                     0
                                               0
                                                         # male selectivity type
## ## Gear-1
                 Gear-2
                          Gear-3
                                     Gear-4
                                               Gear-5
##
      1
                 1
                          1
                                     1
                                               1
                                                         # Retention periods
##
      Λ
                 0
                          0
                                     0
                                               0
                                                         # sex specific retention
##
                 2
                          2
                                     2
                                               2
                                                         # male retention type
                          0
##
                                     0
                                               0
                                                         # male retention flag (0 -> no, 1 -> yes)
                                                                                                 ##
##
                                                                      phz
                                                                             start end
  ## gear par
                   sel
   ## index index par sex ival lb
                                                 prior p1
                                                                      mirror period period
                                                                                                 ##
                                         ub
                                                              p2
   # Gear-1
##
      1
                   1
                       0
                            0.432928096608 0.001 2.0
                                                          0
                                                                   0
                                                                          1
                                                                                -2
                                                                                       1978
                                                                                               2008
##
      1
            2
                   2
                       0
                            0.670336057209 0.001 2.0
                                                          0
                                                                   0
                                                                                -2
                                                                                       1978
                                                                                               2008
                                                                          1
                            1.0
##
            3
                   3
                       0
                                      0.001 2.0
                                                            0
                                                                    1
                                                                         -2
                                                                                1978
                                                                                        2008
##
            1
                       0
                            0.392207758620 0.001 2.0
                                                          0
                                                                   0
                                                                                       2009
      1
                   1
                                                                          1
                                                                                -2
                                                                                               2015
##
            2
                   2
                       0
                            0.956150805823 0.001 2.0
                                                          0
                                                                   0
                                                                          1
                                                                                -2
                                                                                       2009
                                                                                               2015
##
      1
            3
                   3
                       0
                            1.0
                                      0.001 2.0
                                                    0
                                                            0
                                                                    1
                                                                         -2
                                                                                 2009
                                                                                        2015
## # Gear-2
            7
                                                                  200
##
      2
                       0
                            40
                                      10.0
                                            200
                                                           10
                                                                         -3
                                                                                 1978
                                                                                        2015
                                                    0
                   1
##
      2
                       0
                            60
                                      10.0
                                            200
                                                                  200
                                                                                 1978
                                                                                        2015
            8
                                                    0
                                                           10
                                                                         -3
## # Gear-3
##
      3
            9
                   1
                       0
                            40
                                      10.0
                                            200
                                                    0
                                                           10
                                                                  200
                                                                         -3
                                                                                 1978
                                                                                        2015
##
      3
           10
                   2
                       0
                            60
                                      10.0
                                            200
                                                           10
                                                                  200
                                                                         -3
                                                                                 1978
                                                                                        2015
                                                    0
##
   # Gear-4
                            0.79506450558 0.001 2.0
                                                                  0
                                                                                      1978
##
      4
            8
                       0
                                                         0
                                                                         1
                                                                               -2
                                                                                              2015
                   1
                            1.08723867992 0.001 2.0
##
            9
                   2
                       0
                                                         0
                                                                  0
                                                                               -2
                                                                                      1978
                                                                                              2015
                                                                         1
##
      4
            10
                   3
                       0
                            1.0
                                      0.001 2.0
                                                            0
                                                                    1
                                                                         -2
                                                                                 1978
                                                                                        2015
##
  # Gear-5
                            0.405292074017 0.001 2.0
                                                                   0
                                                                                -2
##
      5
            11
                   1
                       0
                                                          0
                                                                          1
                                                                                       1978
                                                                                               2015
##
            12
                       0
                            0.855141058500 0.001 2.0
                                                                                -2
                                                                                       1978
                                                                                               2015
      5
                   2
                                                          0
                                                                   0
                                                                          1
##
      5
            13
                   3
                       0
                            1.0
                                      0.001 2.0
                                                            0
                                                                         -2
                                                                                 1978
                                                                                        2015
## ## Retained
##
  # Gear-1
##
     -1
            14
                       0
                           120
                                  100
                                        200
                                               0
                                                       1
                                                            900
                                                                   -1
                                                                          1978
                                                                                  2015
                   1
##
     -1
            15
                   2
                       0
                           123
                                  110
                                        200
                                                0
                                                       1
                                                            900
                                                                   -1
                                                                          1978
                                                                                  2015
##
  # Gear-2
##
     -2
                           595
                                        700
                                                            900
                                                                   -3
                                                                          1978
                                                                                  2015
            16
                   1
                                   1
                                                       1
##
     -2
                   2
                       0
                            10
                                        700
                                               0
                                                            900
                                                                   -3
                                                                          1978
                                                                                  2015
            17
                                   1
                                                       1
## # Gear-3
##
     -3
                       0
                           590
                                        700
                                                            900
                                                                   -3
                                                                          1978
                                                                                  2015
            18
                                               0
                                                       1
                   1
                                   1
     -3
                                        700
                                                            900
                                                                          1978
##
            19
                   2
                       0
                            10
                                   1
                                                       1
                                                                   -3
                                                                                  2015
## # Gear-4
     -4
                           580
                                        700
                                                            900
                                                                   -3
##
            20
                   1
                       0
                                   1
                                               0
                                                       1
                                                                          1978
                                                                                  2015
     -4
                       0
                            20
                                        700
                                                            900
                                                                          1978
##
            21
                   2
                                   1
                                                0
                                                       1
                                                                   -3
                                                                                  2015
## # Gear-5
            22
                       0
                           580
                                        700
                                                       1
                                                            900
                                                                   -3
##
     -5
                   1
                                   1
                                               0
                                                                          1978
                                                                                  2015
##
     -5
            23
                       0
                            20
                                        700
                                                0
                                                            900
                                                                   -3
                                                                          1978
                                                                                  2015
                   2
                                   1
                                                       1
##
## ## ------ ##
```

PRIORS FOR CATCHABILITY

```
If a uniform prior is selected for a parameter then the 1b 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
         1b
                 пþ
                      phz
                          prior p1
                                       p2
                                            Analytic?
##
    1.0
          0
                 2
                      -1
                          0
                                0
                                       9.0
                                            0
                                                     1
                                                           # NMFS trawl
                                0
## 4.26724288404e-06 0 5
                      1
                          Ω
                                       9.0
                                            0
                                                     1
                                                           # ADF&G pot
##
## ## -----
## ## ADDITIONAL CV FOR SURVEYS/INDICES
       If a uniform prior is selected for a parameter then the 1b 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
                                                                     ##
                                              p2
                                        p1
                ub
                            phz prior
##
    0.00001
             0.000001 10.0
                              -4
                                   4
                                         1.0
                                               100
                                                     # NMFS
              0.000001
                      10.0
                                          1.0
                                                 100
                                                     # ADF&G
## ## ----- ##
## ## ----- ##
  ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR
##
  ## Mean_F STD_PHZ1 STD_PHZ2
                           PHZ
                          1 # Pot
          0.05
                50.0
##
    0.3
##
    0.001
           0.05
                50.0
                          1 # Trawl
           0.05
                 50.0
##
    0.001
                          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 # Type of likelihood
   2
      2
         2 # Type of likelihood
## # 5
       5
          5
            # Type of likelihood
##
         0 # Auto tail compression (pmin)
            # Initial value for effective sample size multiplier
##
             # Phz for estimating effective sample size (if appl.)
##
        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
## ## ------ ##
## ## Type
## 3
## ## Phase of estimation
## ## STDEV in m_dev for Random walk
## ## Number of nodes for cubic spline or number of step-changes for option 3
## ## Year position of the knots (vector must be equal to the number of nodes)
## ## ----- ##
## ## ----- ##
## ## OTHER CONTROLS
## ## ----- ##
##
         # Estimated rec_dev phase
         # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
##
##
         # 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
         # Gear index for SPR calculations (i.e. directed fishery)
##
##
         # Lambda (proportion of mature male biomass for SPR reference points)
##
         # Use empirical molt increment data (0 = FALSE, 1 = TRUE)
         # 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
                                     phz
                lb
                                                                        # parameter
                          пþ
                                           prior
                                                   р1
                                                             p2
    0.18
##
               0.01
                           1
                                     -4
                                              2
                                                  0.18
                                                          0.02
                                                                        # M
               -7.0
                                     -2
##
     14.3
                           30
                                              0
                                                   -7
                                                            30
                                                                        # log(R0)
     10.0
               -7.0
                           20
                                     -1
                                                  -10.0
                                                            20.0
                                                                        # log(Rini)
##
                                              1
              -7.0
                                                  -7
##
    13.7222
                          20
                                     1
                                              0
                                                            30
                                                                        # log(Rbar)
                                                           7.25
##
    80.0
              30.0
                         310
                                     -2
                                              1
                                                  72.5
                                                                        # Recruitment size distribution
##
     0.25
               0.1
                           7
                                     -4
                                              0
                                                   0.1
                                                           9.0
                                                                        # Recruitment size scale (varia
##
     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
##
   14.5
               5.00
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
                        18.00
                                     1
                                              0
##
   14.0
               5.00
                        18.00
                                      1
                                              0
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
##
   13.5
               5.00
                        18.00
                                      1
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
## ## GROWTH PARAM CONTROLS
                                                                                           ##
                                                                                           ##
## ## Two lines for each parameter if split sex, one line if not
## # ival
                1b
                          ub
                                      phz prior
                                                             p2
                                                                        # parameter
                                                    р1
##
     14.1
              10.0
                         30.0
                                      -3
                                                    0.0
                                                          999.0
                                                                        # alpha males or combined
##
                         0.01
                                      -3
                                                                        # beta males or combined
     0.0001
               0.0
                                               0
                                                    0.0
                                                          999.0
##
      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
##
                         1.0
                                      -3
                                               0
                                                    0.0
                                                          999.0
                                                                        # molt_cv males or combined
      0.060
               0.0
##
## ## -----
## ## SELECTIVITY CONTROLS
                                                                                           ##
         Each gear must have a selectivity and a retention selectivity. If a uniform
          prior is selected for a parameter then the 1b 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
                                                      # Selectivity periods
                1
                         1
##
                0
                         0
                                            0
                                                      # sex specific selectivity
##
                3
                         3
                                   0
                                            0
                                                      # male selectivity type
## ## Gear-1
                Gear-2
                        Gear-3
                                  Gear-4
                                            Gear-5
##
                                                      # Retention periods
      1
                1
                         1
                                   1
                                            1
##
                         0
                                                      # sex specific retention
```

```
##
                2
                         2
                                    2
                                             2
                                                        # male retention type
##
      1
                0
                          0
                                    0
                                             0
                                                        # male retention flag (0 -> no, 1 -> yes)
  ## gear par
                                                                            start end
                  sel
                                                                    phz
                                                                                               ##
                                                                                               ##
   ## index index par sex ival lb
                                                prior p1
                                                                    mirror period period
                                        ub
                                                             p2
##
   # Gear-1
      1
                       0
                            0.432928096608 0.001 2.0
                                                                  0
                                                                               2
##
            1
                                                         0
                                                                         1
                                                                                     1978
                                                                                             2008
                  1
      1
            2
                            0.670336057209 0.001 1.0
                                                         0
                                                                               2
##
                  2
                       0
                                                                  0
                                                                         1
                                                                                     1978
                                                                                             2008
                                                                              -2
##
      1
            3
                  3
                       0
                                           0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                                     1978
                                                                                             2008
##
      1
            1
                  1
                       0
                            0.392207758620 0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                               2
                                                                                     2009
                                                                                             2015
            2
                            0.956150805823 0.001 1.0
                                                                               2
##
      1
                  2
                       0
                                                         0
                                                                  0
                                                                         1
                                                                                     2009
                                                                                             2015
##
      1
            3
                  3
                       0
                                           0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                              -2
                                                                                     2009
                                                                                             2015
##
   # Gear-2
            7
##
      2
                       0
                            40
                                     10.0
                                           200
                                                   0
                                                          10
                                                                200
                                                                        -3
                                                                               1978
                                                                                      2015
                  1
      2
                                                                200
##
            8
                  2
                       0
                            60
                                     10.0
                                           200
                                                   0
                                                          10
                                                                        -3
                                                                               1978
                                                                                      2015
##
  # Gear-3
##
      3
            9
                  1
                       0
                            40
                                     10.0
                                           200
                                                   0
                                                          10
                                                                200
                                                                        -3
                                                                               1978
                                                                                      2015
##
      3
                                           200
                                                          10
                                                                200
                                                                               1978
           10
                  2
                       0
                            60
                                     10.0
                                                   0
                                                                        -3
                                                                                      2015
##
   # Gear-4
                       0
                            0.79506450558 0.001 2.0
                                                                0
                                                                                    1978
##
      4
            8
                                                        0
                                                                        1
                                                                              2
                                                                                            2015
                  1
##
      4
            9
                  2
                       0
                            1.08723867992 0.001 1.0
                                                        0
                                                                0
                                                                        1
                                                                              2
                                                                                    1978
                                                                                            2015
##
      4
            10
                  3
                       0
                            1.0
                                          0.001 2.0
                                                        0
                                                                0
                                                                        1
                                                                             -2
                                                                                    1978
                                                                                            2015
   # Gear-5
##
##
      5
                       0
                            0.405292074017 0.001 2.0
                                                         0
                                                                 0
                                                                               2
                                                                         1
                                                                                     1978
                                                                                             2015
            11
                  1
      5
                  2
                       0
                            0.855141058500 0.001 1.0
                                                         0
                                                                               2
                                                                                     1978
##
            12
                                                                  0
                                                                         1
                                                                                             2015
                                           0.001 2.0
      5
                            1.0
                                                                              -2
##
            13
                  3
                       0
                                                         0
                                                                  0
                                                                         1
                                                                                     1978
                                                                                             2015
##
  ## Retained
##
   # Gear-1
                           120
                                 100
                                       200
                                                           900
                                                                         1978
                                                                                2015
##
     -1
            14
                       0
                                               0
                                                      1
                                                                 -1
                  1
##
     -1
                  2
                       0
                           123
                                 110
                                       200
                                               0
                                                           900
                                                                         1978
                                                                                2015
            15
                                                      1
                                                                 -1
##
   # 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
                       0
                           590
                                       700
                                                           900
                                                                  -3
                                              0
                                                      1
                                                                         1978
                                                                                2015
                  1
                                  1
##
     -3
            19
                  2
                       0
                            10
                                       700
                                               0
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
                                  1
                                                      1
##
  # Gear-4
##
     -4
            20
                       0
                           580
                                       700
                                               0
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
##
     -4
            21
                       0
                            20
                                       700
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
                  2
                                  1
                                               0
                                                      1
  # Gear-5
##
##
     -5
                           580
                                                           900
                                                                  -3
            22
                       0
                                       700
                                              0
                                                                         1978
                                                                                2015
                  1
                                  1
                                                      1
                                       700
                                                           900
##
     -5
            23
                  2
                      0
                            20
                                  1
                                               0
                                                      1
                                                                  -3
                                                                         1978
                                                                                2015
##
   ## ----- ##
##
   ## PRIORS FOR CATCHABILITY
##
          If a uniform prior is selected for a parameter then the 1b 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
                                    prior
   ## ival
              1b
                        ub
                              phz
                                            р1
                                                      p2
                                                            Analytic?
                                                                         LAMBDA
##
      1.0
              0
                        2
                              -1
                                    0
                                            0
                                                      9.0
                                                            0
                                                                         1
                                                                                 # NMFS trawl
## 4.26724288404e-06 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
       prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma
                                                                         ##
## ## -----
## ## ival lb ub
                              phz prior p1 p2
                              -4 4
    0.00001
             0.000001 10.0
                                           1.0
                                                   100
                                                        # NMFS
           0.000001 10.0
                               -4
                                            1.0
                                     4
                                                   100 # ADF&G
    0.00001
##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR
  ## Mean_F STD_PHZ1 STD_PHZ2
                             PHZ
                           1 # Pot
           0.05 50.0
##
    0.3
                 50.0
                            1 # Trawl
##
    0.001
           0.05
##
    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 # Type of likelihood
          2 # Type of likelihood
      5 5 # Type of likelihood
      0 0 # Auto tail compression (pmin)
       1 1
             # Initial value for effective sample size multiplier
      -4 -4 # Phz for estimating effective sample size (if appl.)
       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
## ## ----- ##
## ## Type
## 3
## ## Phase of estimation
## ## STDEV in m dev for Random walk
## ## Number of nodes for cubic spline or number of step-changes for option 3
## ## Year position of the knots (vector must be equal to the number of nodes)
## 1998 1999
##
## ## ----- ##
## ## OTHER CONTROLS
##
          # Estimated rec dev phase
##
           # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
           # 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
##
          # Target SPR ratio for Bmsy proxy
    0.35
##
           # Gear index for SPR calculations (i.e. directed fishery)
    1
          # Lambda (proportion of mature male biomass for SPR reference points)
##
           # Use empirical molt increment data (0 = FALSE, 1 = TRUE)
           # 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
                                     phz
                lb
                                                                        # parameter
                           пþ
                                           prior
                                                   р1
                                                             p2
    0.18
##
               0.01
                           1
                                     -4
                                              2
                                                  0.18
                                                          0.02
                                                                        # M
               -7.0
                                     -2
##
     14.3
                           30
                                              0
                                                   -7
                                                            30
                                                                        # log(R0)
     10.0
               -7.0
                           20
                                     -1
                                                  -10.0
                                                            20.0
                                                                        # log(Rini)
##
                                              1
              -7.0
                                                   -7
                                                            30
##
     13.7222
                           20
                                      1
                                              0
                                                                        # log(Rbar)
                                                           7.25
##
    80.0
              30.0
                          310
                                     -2
                                              1
                                                   72.5
                                                                        # Recruitment size distribution
##
     0.25
               0.1
                           7
                                     -4
                                              0
                                                   0.1
                                                           9.0
                                                                        # Recruitment size scale (varia
##
     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
##
   14.5
               5.00
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
                        18.00
                                      1
                                              0
##
   14.0
               5.00
                        18.00
                                      1
                                              0
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
##
   13.5
               5.00
                        18.00
                                      1
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
## ## GROWTH PARAM CONTROLS
                                                                                           ##
                                                                                           ##
## ## Two lines for each parameter if split sex, one line if not
## # ival
                1b
                           ub
                                      phz prior
                                                             p2
                                                                        # parameter
                                                     р1
##
     14.1
              10.0
                         30.0
                                      -3
                                               0
                                                    0.0
                                                          999.0
                                                                        # alpha males or combined
##
                          0.01
                                      -3
                                                                        # beta males or combined
     0.0001
               0.0
                                               0
                                                    0.0
                                                          999.0
##
      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
##
                          1.0
                                      -3
                                                    0.0
                                                          999.0
                                                                        # molt_cv males or combined
      0.060
               0.0
##
## ## -----
## ## SELECTIVITY CONTROLS
                                                                                           ##
         Each gear must have a selectivity and a retention selectivity. If a uniform
          prior is selected for a parameter then the 1b 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
                                                      # Selectivity periods
                1
                         1
##
                0
                         0
                                            0
                                                      # sex specific selectivity
##
                3
                         3
                                   0
                                            0
                                                      # male selectivity type
## ## Gear-1
                Gear-2
                        Gear-3
                                  Gear-4
                                            Gear-5
##
                                                      # Retention periods
      1
                1
                         1
                                   1
                                            1
##
                         0
                                                      # sex specific retention
```

```
##
                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
                                                prior p1
                                                                    mirror period period
                                        ub
                                                             p2
##
   # Gear-1
      1
                       0
                            0.432928096608 0.001 2.0
                                                                  0
                                                                               2
##
            1
                                                         0
                                                                         1
                                                                                     1978
                                                                                             2008
                  1
      1
            2
                       0
                            0.670336057209 0.001 1.0
                                                         0
                                                                               2
##
                  2
                                                                  0
                                                                         1
                                                                                     1978
                                                                                             2008
                                                                              -2
##
      1
            3
                  3
                       0
                                           0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                                     1978
                                                                                             2008
##
      1
            1
                  1
                       0
                            0.392207758620 0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                               2
                                                                                     2009
                                                                                             2015
            2
                       0
                            0.956150805823 0.001 1.0
                                                                               2
##
      1
                  2
                                                         0
                                                                  0
                                                                         1
                                                                                     2009
                                                                                             2015
##
      1
            3
                  3
                       0
                                           0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                              -2
                                                                                      2009
                                                                                             2015
##
   # Gear-2
            7
                                                                200
##
      2
                       0
                            40
                                     10.0
                                           200
                                                   0
                                                          10
                                                                        -3
                                                                               1978
                                                                                      2015
                  1
      2
                                                                200
##
            8
                  2
                       0
                            60
                                     10.0
                                           200
                                                   0
                                                          10
                                                                        -3
                                                                               1978
                                                                                      2015
##
  # Gear-3
##
      3
            9
                  1
                       0
                            40
                                     10.0
                                           200
                                                   0
                                                          10
                                                                200
                                                                        -3
                                                                               1978
                                                                                      2015
##
      3
                                           200
                                                          10
                                                                200
                                                                               1978
           10
                  2
                       0
                            60
                                     10.0
                                                   0
                                                                        -3
                                                                                      2015
##
   # Gear-4
                                                                                            2015
                       0
                            0.79506450558 0.001 2.0
                                                                0
                                                                                    1978
##
      4
            8
                                                        0
                                                                        1
                                                                              2
                  1
##
      4
            9
                  2
                       0
                            1.08723867992 0.001 1.0
                                                        0
                                                                0
                                                                        1
                                                                              2
                                                                                    1978
                                                                                            2015
##
      4
            10
                  3
                       0
                            1.0
                                          0.001 2.0
                                                        0
                                                                0
                                                                        1
                                                                             -2
                                                                                    1978
                                                                                            2015
   # Gear-5
##
##
      5
                       0
                            0.405292074017 0.001 2.0
                                                         0
                                                                 0
                                                                               2
                                                                         1
                                                                                     1978
                                                                                             2015
            11
                  1
      5
                  2
                       0
                            0.855141058500 0.001 1.0
                                                         0
                                                                               2
                                                                                     1978
##
            12
                                                                  0
                                                                         1
                                                                                             2015
                                           0.001 2.0
      5
                            1.0
                                                                              -2
##
            13
                  3
                       0
                                                         0
                                                                  0
                                                                         1
                                                                                      1978
                                                                                             2015
##
  ## Retained
##
   # Gear-1
                           120
                                 100
                                       200
                                                           900
                                                                         1978
                                                                                2015
##
     -1
            14
                       0
                                               0
                                                      1
                                                                 -1
                  1
                           123
##
     -1
            15
                  2
                       0
                                 110
                                       200
                                               0
                                                           900
                                                                         1978
                                                                                2015
                                                      1
                                                                 -1
##
   # 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
                                       700
##
     -3
            18
                       0
                           590
                                                           900
                                                                  -3
                                              0
                                                      1
                                                                         1978
                                                                                2015
                  1
                                  1
##
     -3
            19
                  2
                       0
                            10
                                       700
                                               0
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
                                  1
                                                      1
##
  # Gear-4
##
     -4
            20
                       0
                           580
                                       700
                                               0
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
##
     -4
            21
                       0
                            20
                                       700
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
                  2
                                  1
                                               0
                                                      1
  # Gear-5
##
##
     -5
                           580
                                       700
                                                           900
                                                                  -3
            22
                       0
                                              0
                                                                         1978
                                                                                2015
                  1
                                  1
                                                      1
                                       700
                                                           900
##
     -5
            23
                  2
                      0
                            20
                                  1
                                               0
                                                      1
                                                                  -3
                                                                         1978
                                                                                2015
##
   ## ----- ##
##
   ## PRIORS FOR CATCHABILITY
##
          If a uniform prior is selected for a parameter then the 1b 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
                                    prior
   ## ival
              1b
                        ub
                              phz
                                            р1
                                                      p2
                                                            Analytic?
                                                                         LAMBDA
##
      1.0
              0
                        2
                              -1
                                    0
                                            0
                                                      9.0
                                                            0
                                                                         1
                                                                                 # NMFS trawl
## 4.26724288404e-06 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
       prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma
                                                                         ##
## ## -----
## ## ival lb ub
                              phz prior p1 p2
    0.00001
             0.000001 10.0
                              4 4
                                           1.0
                                                   100
                                                        # NMFS
           0.000001 10.0
                               4 4
                                            1.0
                                                   100 # ADF&G
    0.00001
##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR
  ## Mean_F STD_PHZ1 STD_PHZ2
                             PHZ
                           1 # Pot
           0.05 50.0
##
    0.3
                 50.0
                            1 # Trawl
##
    0.001
           0.05
##
    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 # Type of likelihood
      5 5 # Type of likelihood
      0 0 # Auto tail compression (pmin)
       1 1
             # Initial value for effective sample size multiplier
      -4 -4 # Phz for estimating effective sample size (if appl.)
       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
## ## ----- ##
## ## Type
## 3
## ## Phase of estimation
## ## STDEV in m dev for Random walk
## ## Number of nodes for cubic spline or number of step-changes for option 3
## ## Year position of the knots (vector must be equal to the number of nodes)
## 1998 1999
##
## ## ----- ##
## ## OTHER CONTROLS
##
          # Estimated rec dev phase
##
           # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
           # 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
##
          # Target SPR ratio for Bmsy proxy
    0.35
           # Gear index for SPR calculations (i.e. directed fishery)
##
    1
          # Lambda (proportion of mature male biomass for SPR reference points)
##
           # Use empirical molt increment data (0 = FALSE, 1 = TRUE)
           # 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
                                     phz
                lb
                                                                        # parameter
                          пþ
                                           prior
                                                   р1
                                                             p2
##
    0.18
               0.01
                           1
                                     -4
                                              2
                                                  0.18
                                                          0.02
                                                                        # M
               -7.0
                                     -2
##
     14.3
                           30
                                              0
                                                   -7
                                                            30
                                                                        # log(R0)
     10.0
               -7.0
                           20
                                     -1
                                                  -10.0
                                                            20.0
                                                                        # log(Rini)
##
                                              1
##
                                                  -7
                                                            30
    13.7222
              -7.0
                          20
                                     1
                                              0
                                                                        # log(Rbar)
                                                           7.25
##
    80.0
              30.0
                         310
                                     -2
                                              1
                                                  72.5
                                                                        # Recruitment size distribution
##
     0.25
               0.1
                           7
                                     -4
                                              0
                                                   0.1
                                                           9.0
                                                                        # Recruitment size scale (varia
##
     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
                                     -3
##
    0.01
              0.00
                        1.00
                                              3
                                                  1.01
                                                          1.01
                                                                        # recruitment autocorrelation
##
   14.5
               5.00
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
                        18.00
                                     1
                                              0
##
   14.0
               5.00
                        18.00
                                      1
                                              0
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
##
   13.5
               5.00
                        18.00
                                      1
                                                   5.00
                                                         15.00
                                                                        # logNO vector of initial number
## ## GROWTH PARAM CONTROLS
                                                                                           ##
                                                                                           ##
## ## Two lines for each parameter if split sex, one line if not
## # ival
                1b
                          ub
                                      phz prior
                                                             p2
                                                                        # parameter
                                                    р1
##
     14.1
               10.0
                         30.0
                                      -3
                                                    0.0
                                                          999.0
                                                                        # alpha males or combined
                         0.01
                                      -3
##
     0.0001
               0.0
                                               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
##
                         1.0
                                      -3
                                                    0.0
                                                          999.0
                                                                        # molt_cv males or combined
      0.060
               0.0
##
## ## -----
## ## SELECTIVITY CONTROLS
                                                                                           ##
         Each gear must have a selectivity and a retention selectivity. If a uniform
          prior is selected for a parameter then the 1b 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
                                                      # Selectivity periods
                1
                         1
##
                0
                         0
                                            0
                                                      # sex specific selectivity
##
                3
                         3
                                   0
                                           0
                                                      # male selectivity type
## ## Gear-1
                Gear-2
                        Gear-3
                                  Gear-4
                                            Gear-5
##
                                                      # Retention periods
      1
                1
                         1
                                   1
                                            1
##
                         0
                                                      # sex specific retention
```

```
##
                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
                                                prior p1
                                                                    mirror period period
                                        ub
                                                             p2
##
   # Gear-1
      1
                       0
                            0.432928096608 0.001 2.0
                                                                  0
                                                                               2
##
            1
                                                         0
                                                                         1
                                                                                     1978
                                                                                             2008
                  1
      1
            2
                  2
                       0
                            0.670336057209 0.001 1.0
                                                         0
                                                                               2
##
                                                                  0
                                                                         1
                                                                                     1978
                                                                                             2008
                                                                              -2
##
      1
            3
                  3
                       0
                                           0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                                     1978
                                                                                             2008
##
      1
            1
                  1
                       0
                            0.392207758620 0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                               2
                                                                                     2009
                                                                                             2015
            2
                       0
                            0.956150805823 0.001 1.0
                                                                               2
##
      1
                  2
                                                         0
                                                                  0
                                                                         1
                                                                                     2009
                                                                                             2015
##
      1
            3
                  3
                       0
                                           0.001 2.0
                                                         0
                                                                  0
                                                                         1
                                                                              -2
                                                                                      2009
                                                                                             2015
##
   # Gear-2
            7
                                                                 200
##
      2
                       0
                            40
                                     10.0
                                           200
                                                   0
                                                          10
                                                                        -3
                                                                               1978
                                                                                      2015
                  1
      2
                                                                 200
##
            8
                  2
                       0
                            60
                                     10.0
                                           200
                                                   0
                                                          10
                                                                        -3
                                                                               1978
                                                                                      2015
##
  # Gear-3
##
      3
            9
                  1
                       0
                            40
                                     10.0
                                           200
                                                   0
                                                          10
                                                                 200
                                                                        -3
                                                                               1978
                                                                                      2015
##
      3
                                           200
                                                          10
                                                                 200
                                                                               1978
           10
                  2
                       0
                            60
                                     10.0
                                                   0
                                                                        -3
                                                                                      2015
##
   # Gear-4
                                                                                            2015
                       0
                            0.79506450558 0.001 2.0
                                                                 0
                                                                                    1978
##
      4
            8
                                                        0
                                                                        1
                                                                              2
                  1
                                                                              2
##
      4
            9
                  2
                       0
                            1.08723867992 0.001 1.0
                                                        0
                                                                 0
                                                                        1
                                                                                    1978
                                                                                            2015
##
      4
            10
                  3
                       0
                            1.0
                                          0.001 2.0
                                                        0
                                                                 0
                                                                        1
                                                                             -2
                                                                                    1978
                                                                                            2015
   # Gear-5
##
##
      5
                       0
                            0.405292074017 0.001 2.0
                                                         0
                                                                 0
                                                                               2
                                                                         1
                                                                                     1978
                                                                                             2015
            11
                  1
      5
                  2
                       0
                            0.855141058500 0.001 1.0
                                                         0
                                                                               2
                                                                                     1978
##
            12
                                                                  0
                                                                         1
                                                                                             2015
                                           0.001 2.0
      5
                            1.0
                                                                              -2
##
            13
                  3
                       0
                                                         0
                                                                  0
                                                                         1
                                                                                      1978
                                                                                             2015
##
  ## Retained
##
   # Gear-1
                           120
                                 100
                                       200
                                                           900
                                                                         1978
                                                                                2015
##
     -1
            14
                       0
                                               0
                                                      1
                                                                 -1
                  1
                           123
##
     -1
            15
                  2
                       0
                                 110
                                       200
                                               0
                                                           900
                                                                         1978
                                                                                2015
                                                      1
                                                                 -1
##
   # 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
                                       700
##
     -3
            18
                       0
                           590
                                                           900
                                                                  -3
                                              0
                                                      1
                                                                         1978
                                                                                2015
                  1
                                  1
##
     -3
            19
                  2
                       0
                            10
                                       700
                                               0
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
                                  1
                                                      1
##
  # Gear-4
##
     -4
            20
                       0
                           580
                                       700
                                               0
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
##
     -4
            21
                       0
                            20
                                       700
                                                           900
                                                                  -3
                                                                         1978
                                                                                2015
                  2
                                  1
                                               0
                                                      1
  # Gear-5
##
##
     -5
                           580
                                       700
                                                           900
                                                                  -3
            22
                       0
                                              0
                                                                         1978
                                                                                2015
                  1
                                  1
                                                      1
                                       700
                                                           900
##
     -5
            23
                  2
                      0
                            20
                                  1
                                               0
                                                      1
                                                                  -3
                                                                         1978
                                                                                2015
##
   ## ----- ##
##
   ## PRIORS FOR CATCHABILITY
##
          If a uniform prior is selected for a parameter then the 1b 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
                                    prior
   ## ival
              1b
                        ub
                              phz
                                            р1
                                                      p2
                                                            Analytic?
                                                                         LAMBDA
##
      1.0
              0
                        2
                              -1
                                    0
                                            0
                                                      9.0
                                                            0
                                                                         1
                                                                                 # NMFS trawl
## 4.26724288404e-06 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
       prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma
                                                                         ##
## ## -----
## ## ival lb ub
                              phz prior p1 p2
    0.00001
             0.000001 10.0
                              4 4
                                           1.0
                                                   100
                                                        # NMFS
           0.000001 10.0
                               4 4
                                            1.0
                                                   100 # ADF&G
    0.00001
##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR
  ## Mean_F STD_PHZ1 STD_PHZ2
                             PHZ
                           1 # Pot
           0.05 50.0
##
    0.3
                 50.0
                            1 # Trawl
##
    0.001
           0.05
##
    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 # Type of likelihood
      5 5 # Type of likelihood
      0 0 # Auto tail compression (pmin)
       1 1
             # Initial value for effective sample size multiplier
      -4 -4 # Phz for estimating effective sample size (if appl.)
       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
## ## ----- ##
## ## Type
## 0
## ## Phase of estimation
## ## STDEV in m dev for Random walk
## ## Number of nodes for cubic spline or number of step-changes for option 3
## ## Year position of the knots (vector must be equal to the number of nodes)
## 1998 1999
## ## ----- ##
##
## ## ----- ##
## ## OTHER CONTROLS
##
          # Estimated rec dev phase
##
          # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
          # 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
##
         # Target SPR ratio for Bmsy proxy
   0.35
##
          # Gear index for SPR calculations (i.e. directed fishery)
   1
          # Lambda (proportion of mature male biomass for SPR reference points)
##
          # Use empirical molt increment data (0 = FALSE, 1 = TRUE)
          # Stock-Recruit-Relationship (0 = None, 1 = Beverton-Holt)
## ## EOF
## 9999
```