

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	lb	ub	phz	prior	p1	p2	# parameter	#
##	0.18	0.01	1	-4	2	0.18	0.02	# M	
##	14.3	-7.0	30	-2	0	-7	30	# log(R0)	
##	10.0	-7.0	20	-1	1	-10.0	20.0	# log(Rini)	
##	13.7222	-7.0	20	1	0	-7	30	# log(Rbar)	
##	80.0	30.0	310	-2	1	72.5	7.25	# Recruitment size distribution	
##	0.25	0.1	7	-4	0	0.1	9.0	# Recruitment size scale (varian	
##	0.2	-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	18.00	1	0	5.00	15.00	# logNO vector of initial number	
##	14.0	5.00	18.00	1	0	5.00	15.00	# logNO vector of initial number	
##	13.5	5.00	18.00	1	0	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	lb	ub	phz	prior	p1	p2	# parameter	#
##	14.1	10.0	30.0	-3	0	0.0	999.0	# alpha males or combined	
##	0.0001	0.0	0.01	-3	0	0.0	999.0	# beta males or combined	
##	0.45	0.01	1.0	-3	0	0.0	999.0	# gscale males or combined	
##	121.5	65.0	145.0	-4	0	0.0	999.0	# molt_mu males or combined	
##	0.060	0.0	1.0	-3	0	0.0	999.0	# molt_cv males or combined	

```
##
```

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

```
## ## SELECTIVITY CONTROLS
```

```
## ## Each gear must have a selectivity and a retention selectivity. If a uniform
## ## prior is selected for a parameter then the lb and ub are used (p1 and p2 are
## ## ignored)
```

```
## ## LEGEND
```

```
## ## sel type: 0 = parametric, 1 = coefficients, 2 = logistic, 3 = logistic95,
## ##           4 = double normal (NIY)
```

```
## ## gear index: use +ve for selectivity, -ve for retention
```

```
## ## sex dep: 0 for sex-independent, 1 for sex-dependent
```

```

## ## ----- ##
## ## ivector for number of year periods or nodes ##
## ## POT      TBycatch FBycatch  NMFS_S  ADFG_pot
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
##      2        1        1        1        1      # Selectivity periods
##      0        0        0        0        0      # sex specific selectivity
##      0        3        3        0        0      # male selectivity type
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
##      1        1        1        1        1      # Retention periods
##      0        0        0        0        0      # sex specific retention
##      3        2        2        2        2      # male retention type
##      1        0        0        0        0      # male retention flag (0 -> no, 1 -> yes)
## ## gear  par  sel
## ## index index par sex  ival  lb    ub    prior p1    p2    phz  start end    ##
## ## # Gear-1
##      1      1    1  0    0.416198 0.001 2.0    0      0      1   -2    1978  2008
##      1      2    2  0    0.657528 0.001 2.0    0      0      1   -2    1978  2008
##      1      3    3  0    1.0        0.001 2.0    0      0      1   -2    1978  2008
##      1      1    1  0    0.326889 0.001 2.0    0      0      1   -2    2009  2015
##      1      2    2  0    0.806548 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
##      2      7    1  0    40        10.0 200    0      10     200   -3    1978  2015
##      2      8    2  0    60        10.0 200    0      10     200   -3    1978  2015
## # Gear-3
##      3      9    1  0    40        10.0 200    0      10     200   -3    1978  2015
##      3     10    2  0    60        10.0 200    0      10     200   -3    1978  2015
## # Gear-4
##      4      8    1  0    0.655565 0.001 2.0    0      0      1   -2    1978  2015
##      4      9    2  0    0.912882 0.001 2.0    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     11    1  0    0.347014 0.001 2.0    0      0      1   -2    1978  2015
##      5     12    2  0    0.720493 0.001 2.0    0      0      1   -2    1978  2015
##      5     13    3  0    1.0        0.001 2.0    0      0      1   -2    1978  2015
## ## Retained
## # Gear-1
##     -1     14    1  0    120     100   200    0      1     900   -1    1978  2015
##     -1     15    2  0    123     110   200    0      1     900   -1    1978  2015
## # Gear-2
##     -2     16    1  0    595      1    700    0      1     900   -3    1978  2015
##     -2     17    2  0     10      1    700    0      1     900   -3    1978  2015
## # Gear-3
##     -3     18    1  0    590      1    700    0      1     900   -3    1978  2015
##     -3     19    2  0     10      1    700    0      1     900   -3    1978  2015
## # Gear-4
##     -4     20    1  0    580      1    700    0      1     900   -3    1978  2015
##     -4     21    2  0     20      1    700    0      1     900   -3    1978  2015
## # Gear-5
##     -5     22    1  0    580      1    700    0      1     900   -3    1978  2015
##     -5     23    2  0     20      1    700    0      1     900   -3    1978  2015
##
## ## ----- ##
## ## PRIORS FOR CATCHABILITY

```

```

## ##      If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ##      and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ##      prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## LAMBDA: Arbitrary relative weights for each series, 0 = do not fit.
## ## SURVEYS/INDICES ONLY
## ## ival      lb      ub      phz      prior      p1      p2      Analytic?      LAMBDA
## ## 1.0      0      2      -1      0      0      9.0      0      1      # NMFS trawl
## ## 3.98688533089e-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 ##
## ## LEGEND ##
## ##      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
## ## 0.00001      0.000001      10.0      -4      4      1.0      100      # ADF&G
## ## ----- ##
## ##
## ## ----- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR ##
## ## ----- ##
## ## Mean_F      STD_PHZ1      STD_PHZ2      PHZ
## ## 0.3      0.05      50.0      1      # Pot
## ## 0.001      0.05      50.0      1      # Trawl
## ## 0.001      0.05      50.0      1      # Fixed
## ## 0.00      2.00      20.00      -1      # NMFS
## ## 0.00      2.00      20.00      -1      # ADF&G
## ## ----- ##
## ##
## ## ----- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA (COLUMN FOR EACH MATRIX) ##
## ## ----- ##
## ## LIKELIHOOD OPTIONS
## ## -1) Multinomial with estimated/fixed sample size
## ## -2) Robust approximation to multinomial
## ## -3) logistic normal (NIY)
## ## -4) multivariate-t (NIY)
## ## -5) Dirichlet
## ## AUTOTAIL COMPRESSION
## ##      pmin is the cumulative proportion used in tail compression.
## ## ----- ##
## ## 1      1      1      # Type of likelihood
## ## 2      2      2      # Type of likelihood
## ## 5      5      5      # Type of likelihood
## ## 0      0      0      # Auto tail compression (pmin)
## ## 1      1      1      # Initial value for effective sample size multiplier
## ## -4      -4      -4      # Phz for estimating effective sample size (if appl.)
## ## 1      2      3      # Composition aggregator

```

```

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

```

The selex model control file:

```
## # Set up to do Stock Reduction Analysis using Catch data and informative priors.
## # Controls for leading parameter vector theta
## # LEGEND FOR PRIOR:
## #
## #         0 -> uniform
## #         1 -> normal
## #         2 -> lognormal
## #         3 -> beta
## #         4 -> gamma
## # ntheta
## 12
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 0.18      0.01      1      -4      2    0.18    0.02    # M
## 14.3      -7.0      30     -2      0     -7      30     # log(R0)
## 10.0      -7.0      20     -1      1   -10.0    20.0    # log(Rini)
## 13.7222   -7.0      20      1      0     -7      30     # log(Rbar)
## 80.0      30.0     310     -2      1    72.5    7.25    # Recruitment size distribution
## 0.25      0.1       7      -4      0     0.1     9.0     # Recruitment size scale (varian
## 0.2       -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      18.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## 14.0      5.00      18.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## 13.5      5.00      18.00     1      0     5.00    15.00    # logN0 vector of initial numbe
## ## GROWTH PARAM CONTROLS
## ## Two lines for each parameter if split sex, one line if not
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 14.1      10.0     30.0     -3      0     0.0     999.0    # alpha males or combined
## 0.0001     0.0      0.01     -3      0     0.0     999.0    # beta males or combined
## 0.45      0.01      1.0      -3      0     0.0     999.0    # gscale males or combined
## 121.5     65.0     145.0     -4      0     0.0     999.0    # molt_mu males or combined
## 0.060      0.0      1.0      -3      0     0.0     999.0    # molt_cv males or combined
##
## ## -----
## ## SELECTIVITY CONTROLS
## ## Each gear must have a selectivity and a retention selectivity. If a uniform
## ## prior is selected for a parameter then the lb and ub are used (p1 and p2 are
## ## ignored)
## ## LEGEND
## ## sel type: 0 = parametric, 1 = coefficients, 2 = logistic, 3 = logistic95,
## ##            4 = double normal (NIY)
## ## gear index: use +ve for selectivity, -ve for retention
## ## sex dep: 0 for sex-independent, 1 for sex-dependent
## ## -----
## ## ivector for number of year periods or nodes
## ## POT      TBycatch FBycatch  NMFS_S  ADFG_pot
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 2           1         1         1         1      # Selectivity periods
## 0           0         0         0         0      # sex specific selectivity
## 0           3         3         0         0      # male selectivity type
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 1           1         1         1         1      # Retention periods
## 0           0         0         0         0      # sex specific retention
```

```

##      3      2      2      2      2      # male retention type
##      1      0      0      0      0      # male retention flag (0 -> no, 1 -> yes)
## ## gear par sel
## ## index index par sex ival lb ub prior p1 p2 phz start end ##
## ## mirror period period ##
## # Gear-1
## 1 1 1 0 0.416198 0.001 2.0 0 0 1 2 1978 2008
## 1 2 2 0 0.657528 0.001 2.0 0 0 1 2 1978 2008
## 1 3 3 0 1.0 0.001 2.0 0 0 1 -2 1978 2008
## 1 1 1 0 0.326889 0.001 2.0 0 0 1 2 2009 2015
## 1 2 2 0 0.806548 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
## 2 7 1 0 40 10.0 200 0 10 200 -3 1978 2015
## 2 8 2 0 60 10.0 200 0 10 200 -3 1978 2015
## # Gear-3
## 3 9 1 0 40 10.0 200 0 10 200 -3 1978 2015
## 3 10 2 0 60 10.0 200 0 10 200 -3 1978 2015
## # Gear-4
## 4 8 1 0 0.655565 0.001 2.0 0 0 1 2 1978 2015
## 4 9 2 0 0.912882 0.001 2.0 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 11 1 0 0.347014 0.001 2.0 0 0 1 2 1978 2015
## 5 12 2 0 0.720493 0.001 2.0 0 0 1 2 1978 2015
## 5 13 3 0 1.0 0.001 2.0 0 0 1 -2 1978 2015
## ## Retained
## # Gear-1
## -1 14 1 0 120 100 200 0 1 900 -1 1978 2015
## -1 15 2 0 123 110 200 0 1 900 -1 1978 2015
## # Gear-2
## -2 16 1 0 595 1 700 0 1 900 -3 1978 2015
## -2 17 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-3
## -3 18 1 0 590 1 700 0 1 900 -3 1978 2015
## -3 19 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-4
## -4 20 1 0 580 1 700 0 1 900 -3 1978 2015
## -4 21 2 0 20 1 700 0 1 900 -3 1978 2015
## # Gear-5
## -5 22 1 0 580 1 700 0 1 900 -3 1978 2015
## -5 23 2 0 20 1 700 0 1 900 -3 1978 2015
##
## ## ----- ##
## ## PRIORS FOR CATCHABILITY
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## LAMBDA: Arbitrary relative weights for each series, 0 = do not fit.
## ## SURVEYS/INDICES ONLY
## ## ival lb ub phz prior p1 p2 Analytic? LAMBDA
## 1.0 0 2 -1 0 0 9.0 0 1 # NMFS trawl
## 3.98688533089e-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 ##
## ## LEGEND ##
## ## 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
## 0.00001 0.000001 10.0 -4 4 1.0 100 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR ##
## ## ----- ##
## ## Mean_F STD_PHZ1 STD_PHZ2 PHZ ##
## 0.3 0.05 50.0 1 # Pot
## 0.001 0.05 50.0 1 # Trawl
## 0.001 0.05 50.0 1 # Fixed
## 0.00 2.00 20.00 -1 # NMFS
## 0.00 2.00 20.00 -1 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA (COLUMN FOR EACH MATRIX) ##
## ## ----- ##
## ## LIKELIHOOD OPTIONS
## ## -1) Multinomial with estimated/fixed sample size
## ## -2) Robust approximation to multinomial
## ## -3) logistic normal (NIY)
## ## -4) multivariate-t (NIY)
## ## -5) Dirichlet
## ## AUTOTAIL COMPRESSION
## ## pmin is the cumulative proportion used in tail compression.
## ## ----- ##
## # 1 1 1 # Type of likelihood
## # 2 2 2 # Type of likelihood
## # 5 5 5 # Type of likelihood
## # 0 0 0 # Auto tail compression (pmin)
## # 1 1 1 # Initial value for effective sample size multiplier
## -4 -4 -4 # Phz for estimating effective sample size (if appl.)
## # 1 2 3 # Composition aggregator
## ## ----- ##
##
## ## ----- ##
## ## TIME VARYING NATURAL MORTALIITY RATES ##
## ## ----- ##
## ## TYPE:
## ## 0 = constant natural mortality
## ## 1 = Random walk (deviates constrained by variance in M)
## ## 2 = Cubic Spline (deviates constrained by nodes & node-placement)
## ## 3 = Blocked changes (deviates constrained by variance at specific knots)

```



```

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

```

The add CV model control file:

```
## # Set up to do Stock Reduction Analysis using Catch data and informative priors.
## # Controls for leading parameter vector theta
## # LEGEND FOR PRIOR:
## #
## #         0 -> uniform
## #         1 -> normal
## #         2 -> lognormal
## #         3 -> beta
## #         4 -> gamma
## # ntheta
## 12
## # ival      lb      ub      phz      prior      p1      p2      # parameter      #
## 0.18      0.01      1      -4      2      0.18      0.02      # M
## 14.3      -7.0      30      -2      0      -7      30      # log(R0)
## 10.0      -7.0      20      -1      1      -10.0      20.0      # log(Rini)
## 13.7222    -7.0      20      1      0      -7      30      # log(Rbar)
## 80.0      30.0      310     -2      1      72.5      7.25      # Recruitment size distribution
## 0.25      0.1      7      -4      0      0.1      9.0      # Recruitment size scale (varian
## 0.2      -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      18.00      1      0      5.00      15.00      # logN0 vector of initial numbe
## 14.0      5.00      18.00      1      0      5.00      15.00      # logN0 vector of initial numbe
## 13.5      5.00      18.00      1      0      5.00      15.00      # logN0 vector of initial numbe
## ## GROWTH PARAM CONTROLS
## ## Two lines for each parameter if split sex, one line if not
## # ival      lb      ub      phz      prior      p1      p2      # parameter      #
## 14.1      10.0      30.0      -3      0      0.0      999.0      # alpha males or combined
## 0.0001     0.0      0.01     -3      0      0.0      999.0      # beta males or combined
## 0.45      0.01      1.0      -3      0      0.0      999.0      # gscale males or combined
## 121.5      65.0      145.0     -4      0      0.0      999.0      # molt_mu males or combined
## 0.060      0.0      1.0      -3      0      0.0      999.0      # molt_cv males or combined
##
## ## -----
## ## SELECTIVITY CONTROLS
## ## Each gear must have a selectivity and a retention selectivity. If a uniform
## ## prior is selected for a parameter then the lb and ub are used (p1 and p2 are
## ## ignored)
## ## LEGEND
## ## sel type: 0 = parametric, 1 = coefficients, 2 = logistic, 3 = logistic95,
## ##            4 = double normal (NIY)
## ## gear index: use +ve for selectivity, -ve for retention
## ## sex dep: 0 for sex-independent, 1 for sex-dependent
## ## -----
## ## ivector for number of year periods or nodes
## ## POT      TBycatch FBycatch NMFS_S ADFG_pot
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 2           1         1         1         1      # Selectivity periods
## 0           0         0         0         0      # sex specific selectivity
## 0           3         3         0         0      # male selectivity type
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 1           1         1         1         1      # Retention periods
## 0           0         0         0         0      # sex specific retention
```

```

##      3      2      2      2      2      # male retention type
##      1      0      0      0      0      # male retention flag (0 -> no, 1 -> yes)
## ## gear par sel
## ## index index par sex ival lb ub prior p1 p2 phz start end ##
## ## mirror period period ##
## # Gear-1
## 1 1 1 0 0.416198 0.001 2.0 0 0 1 2 1978 2008
## 1 2 2 0 0.657528 0.001 1.0 0 0 1 2 1978 2008
## 1 3 3 0 1.0 0.001 2.0 0 0 1 -2 1978 2008
## 1 1 1 0 0.326889 0.001 2.0 0 0 1 2 2009 2015
## 1 2 2 0 0.806548 0.001 1.0 0 0 1 2 2009 2015
## 1 3 3 0 1.0 0.001 2.0 0 0 1 -2 2009 2015
## # Gear-2
## 2 7 1 0 40 10.0 200 0 10 200 -3 1978 2015
## 2 8 2 0 60 10.0 200 0 10 200 -3 1978 2015
## # Gear-3
## 3 9 1 0 40 10.0 200 0 10 200 -3 1978 2015
## 3 10 2 0 60 10.0 200 0 10 200 -3 1978 2015
## # Gear-4
## 4 8 1 0 0.655565 0.001 2.0 0 0 1 2 1978 2015
## 4 9 2 0 0.912882 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 11 1 0 0.347014 0.001 2.0 0 0 1 2 1978 2015
## 5 12 2 0 0.720493 0.001 2.0 0 0 1 2 1978 2015
## 5 13 3 0 1.0 0.001 2.0 0 0 1 -2 1978 2015
## ## Retained
## # Gear-1
## -1 14 1 0 120 100 200 0 1 900 -1 1978 2015
## -1 15 2 0 123 110 200 0 1 900 -1 1978 2015
## # Gear-2
## -2 16 1 0 595 1 700 0 1 900 -3 1978 2015
## -2 17 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-3
## -3 18 1 0 590 1 700 0 1 900 -3 1978 2015
## -3 19 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-4
## -4 20 1 0 580 1 700 0 1 900 -3 1978 2015
## -4 21 2 0 20 1 700 0 1 900 -3 1978 2015
## # Gear-5
## -5 22 1 0 580 1 700 0 1 900 -3 1978 2015
## -5 23 2 0 20 1 700 0 1 900 -3 1978 2015
##
## ## ----- ##
## ## PRIORS FOR CATCHABILITY
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## LAMBDA: Arbitrary relative weights for each series, 0 = do not fit.
## ## SURVEYS/INDICES ONLY
## ## ival lb ub phz prior p1 p2 Analytic? LAMBDA
## 1.0 0 2 -1 0 0 9.0 0 1 # NMFS trawl
## 3.98688533089e-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 ##
## ## LEGEND ##
## ## 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
## 0.00001 0.000001 10.0 -4 4 1.0 100 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR ##
## ## ----- ##
## ## Mean_F STD_PHZ1 STD_PHZ2 PHZ ##
## 0.3 0.05 50.0 1 # Pot
## 0.001 0.05 50.0 1 # Trawl
## 0.001 0.05 50.0 1 # Fixed
## 0.00 2.00 20.00 -1 # NMFS
## 0.00 2.00 20.00 -1 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA (COLUMN FOR EACH MATRIX) ##
## ## ----- ##
## ## LIKELIHOOD OPTIONS
## ## -1) Multinomial with estimated/fixed sample size
## ## -2) Robust approximation to multinomial
## ## -3) logistic normal (NIY)
## ## -4) multivariate-t (NIY)
## ## -5) Dirichlet
## ## AUTOTAIL COMPRESSION
## ## pmin is the cumulative proportion used in tail compression.
## ## ----- ##
## # 1 1 1 # Type of likelihood
## 2 2 2 # Type of likelihood
## # 5 5 5 # Type of likelihood
## 0 0 0 # Auto tail compression (pmin)
## 1 1 1 # Initial value for effective sample size multiplier
## -4 -4 -4 # Phz for estimating effective sample size (if appl.)
## 1 2 3 # Composition aggregator
## ## ----- ##
##
## ## ----- ##
## ## TIME VARYING NATURAL MORTALIITY RATES ##
## ## ----- ##
## ## TYPE:
## ## 0 = constant natural mortality
## ## 1 = Random walk (deviates constrained by variance in M)
## ## 2 = Cubic Spline (deviates constrained by nodes & node-placement)
## ## 3 = Blocked changes (deviates constrained by variance at specific knots)

```

```

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

```

The no M_{1998} model control file:

```
## # Set up to do Stock Reduction Analysis using Catch data and informative priors.
## # Controls for leading parameter vector theta
## # LEGEND FOR PRIOR:
## #
## #         0 -> uniform
## #         1 -> normal
## #         2 -> lognormal
## #         3 -> beta
## #         4 -> gamma
## # ntheta
## 12
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 0.18      0.01      1      -4      2    0.18    0.02      # M
## 14.3      -7.0     30     -2      0     -7      30      # log(R0)
## 10.0      -7.0     20     -1      1   -10.0    20.0      # log(Rini)
## 13.7222   -7.0     20      1      0     -7      30      # log(Rbar)
## 80.0      30.0     310     -2      1    72.5    7.25      # Recruitment size distribution
## 0.25      0.1       7     -4      0     0.1     9.0      # Recruitment size scale (varian
## 0.2      -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     18.00    1      0     5.00    15.00      # logN0 vector of initial numbe
## 14.0      5.00     18.00    1      0     5.00    15.00      # logN0 vector of initial numbe
## 13.5      5.00     18.00    1      0     5.00    15.00      # logN0 vector of initial numbe
## ## GROWTH PARAM CONTROLS
## ## Two lines for each parameter if split sex, one line if not
## # ival      lb      ub      phz  prior    p1    p2      # parameter      #
## 14.1      10.0     30.0    -3      0     0.0    999.0      # alpha males or combined
## 0.0001     0.0      0.01   -3      0     0.0    999.0      # beta males or combined
## 0.45      0.01     1.0     -3      0     0.0    999.0      # gscale males or combined
## 121.5      65.0    145.0   -4      0     0.0    999.0      # molt_mu males or combined
## 0.060      0.0      1.0     -3      0     0.0    999.0      # molt_cv males or combined
##
## ## -----
## ## SELECTIVITY CONTROLS
## ## Each gear must have a selectivity and a retention selectivity. If a uniform
## ## prior is selected for a parameter then the lb and ub are used (p1 and p2 are
## ## ignored)
## ## LEGEND
## ## sel type: 0 = parametric, 1 = coefficients, 2 = logistic, 3 = logistic95,
## ##            4 = double normal (NIY)
## ## gear index: use +ve for selectivity, -ve for retention
## ## sex dep: 0 for sex-independent, 1 for sex-dependent
## ## -----
## ## ivector for number of year periods or nodes
## ## POT      TBycatch FBycatch  NMFS_S  ADFG_pot
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 2           1         1         1         1      # Selectivity periods
## 0           0         0         0         0      # sex specific selectivity
## 0           3         3         0         0      # male selectivity type
## ## Gear-1    Gear-2    Gear-3    Gear-4    Gear-5
## 1           1         1         1         1      # Retention periods
## 0           0         0         0         0      # sex specific retention
```

```

##      3      2      2      2      2      # male retention type
##      1      0      0      0      0      # male retention flag (0 -> no, 1 -> yes)
## ## gear par sel
## ## index index par sex ival lb ub prior p1 p2 phz start end ##
## ## mirror period period ##
## # Gear-1
## 1 1 1 0 0.416198 0.001 2.0 0 0 1 2 1978 2008
## 1 2 2 0 0.657528 0.001 1.0 0 0 1 2 1978 2008
## 1 3 3 0 1.0 0.001 2.0 0 0 1 -2 1978 2008
## 1 1 1 0 0.326889 0.001 2.0 0 0 1 2 2009 2015
## 1 2 2 0 0.806548 0.001 1.0 0 0 1 2 2009 2015
## 1 3 3 0 1.0 0.001 2.0 0 0 1 -2 2009 2015
## # Gear-2
## 2 7 1 0 40 10.0 200 0 10 200 -3 1978 2015
## 2 8 2 0 60 10.0 200 0 10 200 -3 1978 2015
## # Gear-3
## 3 9 1 0 40 10.0 200 0 10 200 -3 1978 2015
## 3 10 2 0 60 10.0 200 0 10 200 -3 1978 2015
## # Gear-4
## 4 8 1 0 0.655565 0.001 2.0 0 0 1 2 1978 2015
## 4 9 2 0 0.912882 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 11 1 0 0.347014 0.001 2.0 0 0 1 2 1978 2015
## 5 12 2 0 0.720493 0.001 1.0 0 0 1 2 1978 2015
## 5 13 3 0 1.0 0.001 2.0 0 0 1 -2 1978 2015
## ## Retained
## # Gear-1
## -1 14 1 0 120 100 200 0 1 900 -1 1978 2015
## -1 15 2 0 123 110 200 0 1 900 -1 1978 2015
## # Gear-2
## -2 16 1 0 595 1 700 0 1 900 -3 1978 2015
## -2 17 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-3
## -3 18 1 0 590 1 700 0 1 900 -3 1978 2015
## -3 19 2 0 10 1 700 0 1 900 -3 1978 2015
## # Gear-4
## -4 20 1 0 580 1 700 0 1 900 -3 1978 2015
## -4 21 2 0 20 1 700 0 1 900 -3 1978 2015
## # Gear-5
## -5 22 1 0 580 1 700 0 1 900 -3 1978 2015
## -5 23 2 0 20 1 700 0 1 900 -3 1978 2015
##
## ## ----- ##
## ## PRIORS FOR CATCHABILITY
## ## If a uniform prior is selected for a parameter then the lb and ub are used (p1 ##
## ## and p2 are ignored). ival must be > 0 ##
## ## LEGEND ##
## ## prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma ##
## ## ----- ##
## ## LAMBDA: Arbitrary relative weights for each series, 0 = do not fit.
## ## SURVEYS/INDICES ONLY
## ## ival lb ub phz prior p1 p2 Analytic? LAMBDA
## 1.0 0 2 -1 0 0 9.0 0 1 # NMFS trawl
## 3.98688533089e-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 ##
## ## LEGEND ##
## ## 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
## 0.00001 0.000001 10.0 4 4 1.0 100 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR ##
## ## ----- ##
## ## Mean_F STD_PHZ1 STD_PHZ2 PHZ ##
## 0.3 0.05 50.0 1 # Pot
## 0.001 0.05 50.0 1 # Trawl
## 0.001 0.05 50.0 1 # Fixed
## 0.00 2.00 20.00 -1 # NMFS
## 0.00 2.00 20.00 -1 # ADF&G
## ## ----- ##
##
## ## ----- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA (COLUMN FOR EACH MATRIX) ##
## ## ----- ##
## ## LIKELIHOOD OPTIONS
## ## -1) Multinomial with estimated/fixed sample size
## ## -2) Robust approximation to multinomial
## ## -3) logistic normal (NIY)
## ## -4) multivariate-t (NIY)
## ## -5) Dirichlet
## ## AUTOTAIL COMPRESSION
## ## pmin is the cumulative proportion used in tail compression.
## ## ----- ##
## # 1 1 1 # Type of likelihood
## 2 2 2 # Type of likelihood
## # 5 5 5 # Type of likelihood
## 0 0 0 # Auto tail compression (pmin)
## 1 1 1 # Initial value for effective sample size multiplier
## -4 -4 -4 # Phz for estimating effective sample size (if appl.)
## 1 2 3 # Composition aggregator
## ## ----- ##
##
## ## ----- ##
## ## TIME VARYING NATURAL MORTALIITY RATES ##
## ## ----- ##
## ## TYPE:
## ## 0 = constant natural mortality
## ## 1 = Random walk (deviates constrained by variance in M)
## ## 2 = Cubic Spline (deviates constrained by nodes & node-placement)
## ## 3 = Blocked changes (deviates constrained by variance at specific knots)

```



```

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

```