Appendix B: BBRKC Stock Assessment Input Files & Size-Frequency Residual Plots

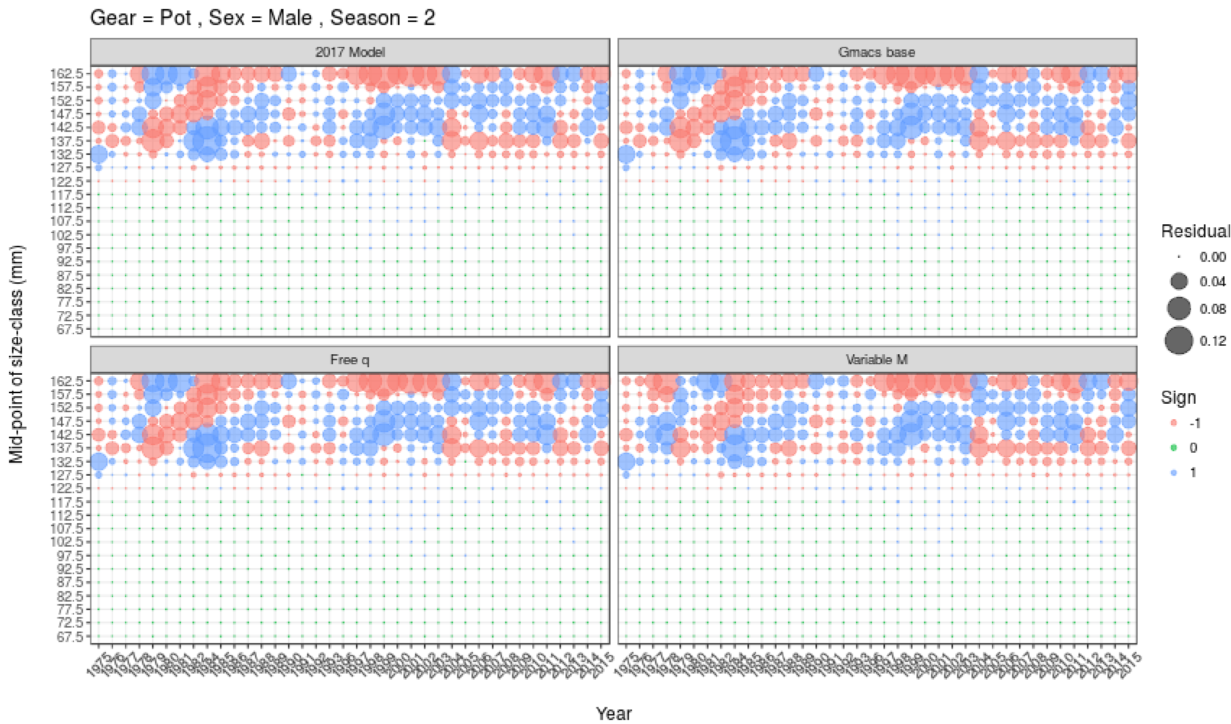

Figure 1: Size-frequency residuals of male BBRKC by year retained in the directed pot fishery for the 2017 model and each of the Gmacs model scenarios.

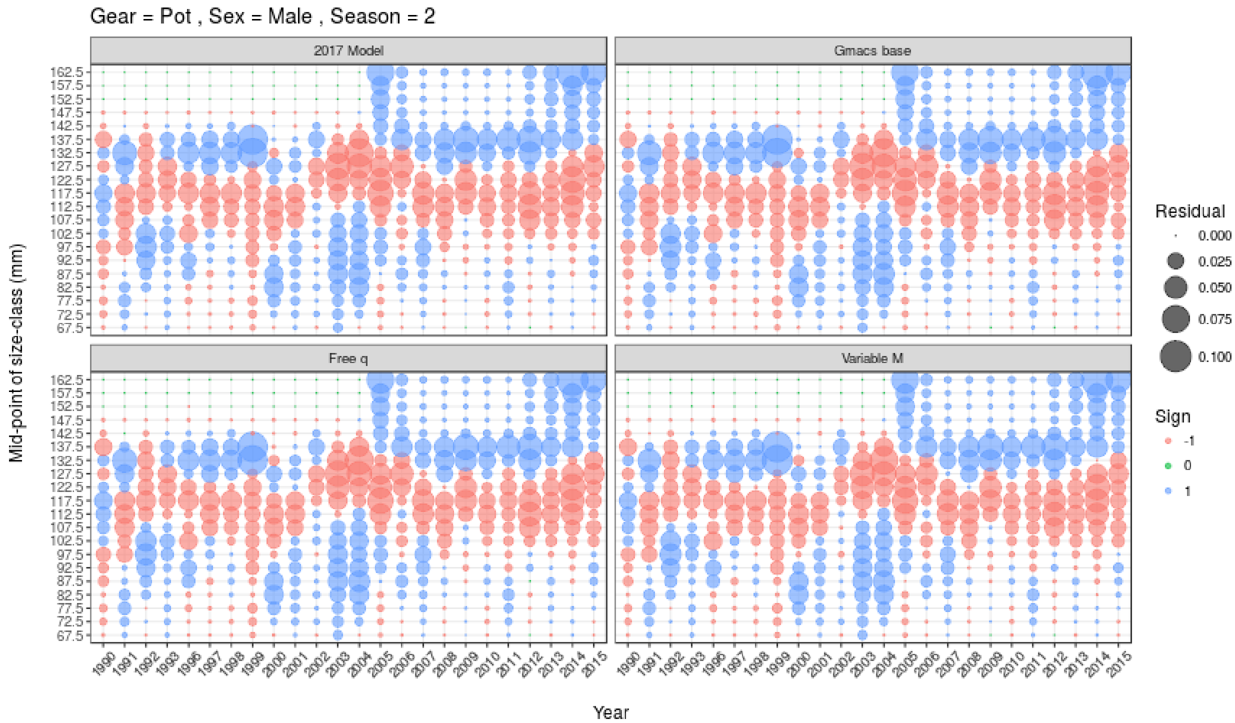

Figure 2: Size-frequency residuals of discarded male BBRKC by year in the directed pot fishery for the 2017 model and each of the Gmacs model scenarios.

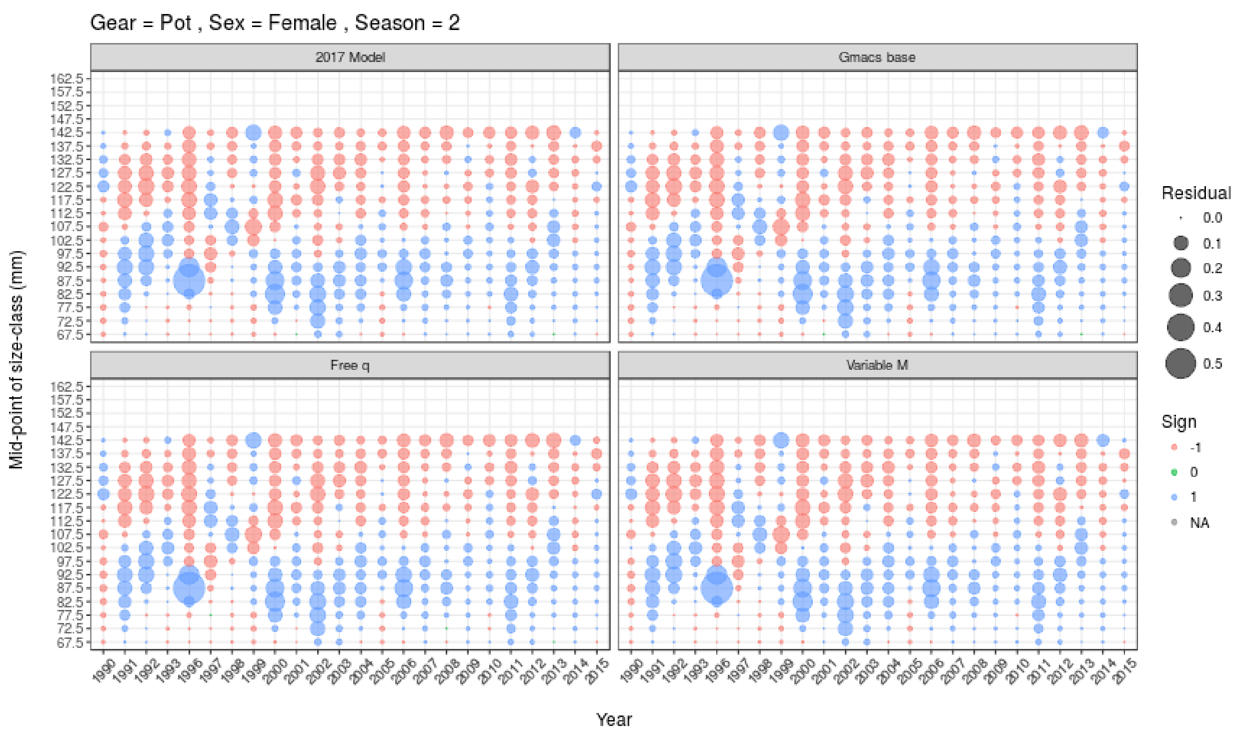

Figure 3: Size-frequency residuals of discarded female BBRKC by year in the directed pot fishery for the 2017 model and each of the Gmacs model scenarios.

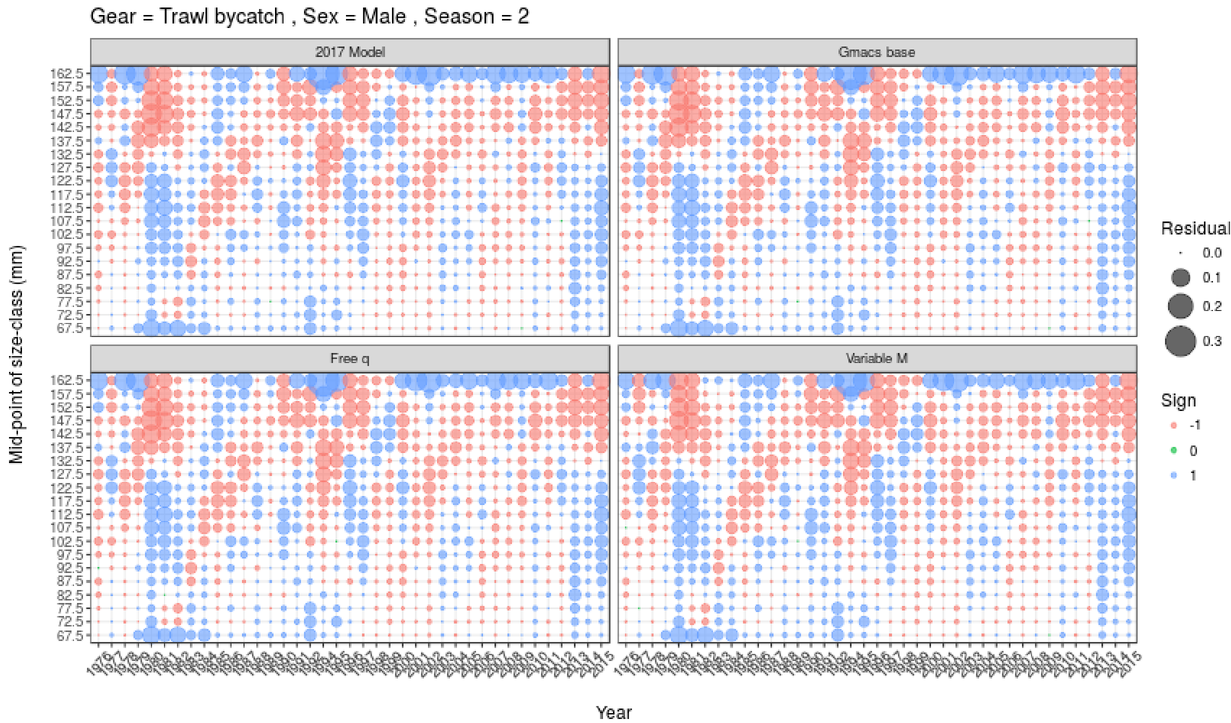

Figure 4: Size-frequency residuals discarded male BBRKC by year in the trawl bycatch fishery for the 2017 model and each of the Gmacs model scenarios.

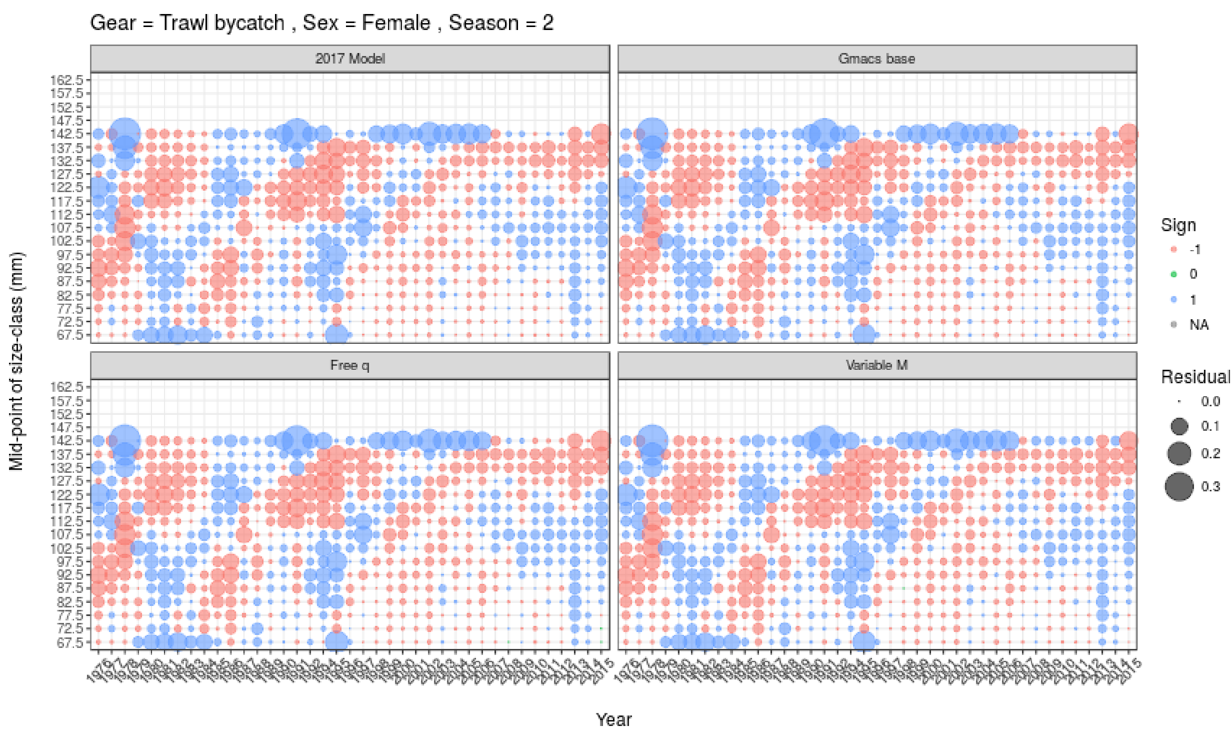

Figure 5: Size-frequency residuals of discarded female BBRKC by year in the trawl bycatch fishery for the 2017 model and each of the Gmacs model scenarios.

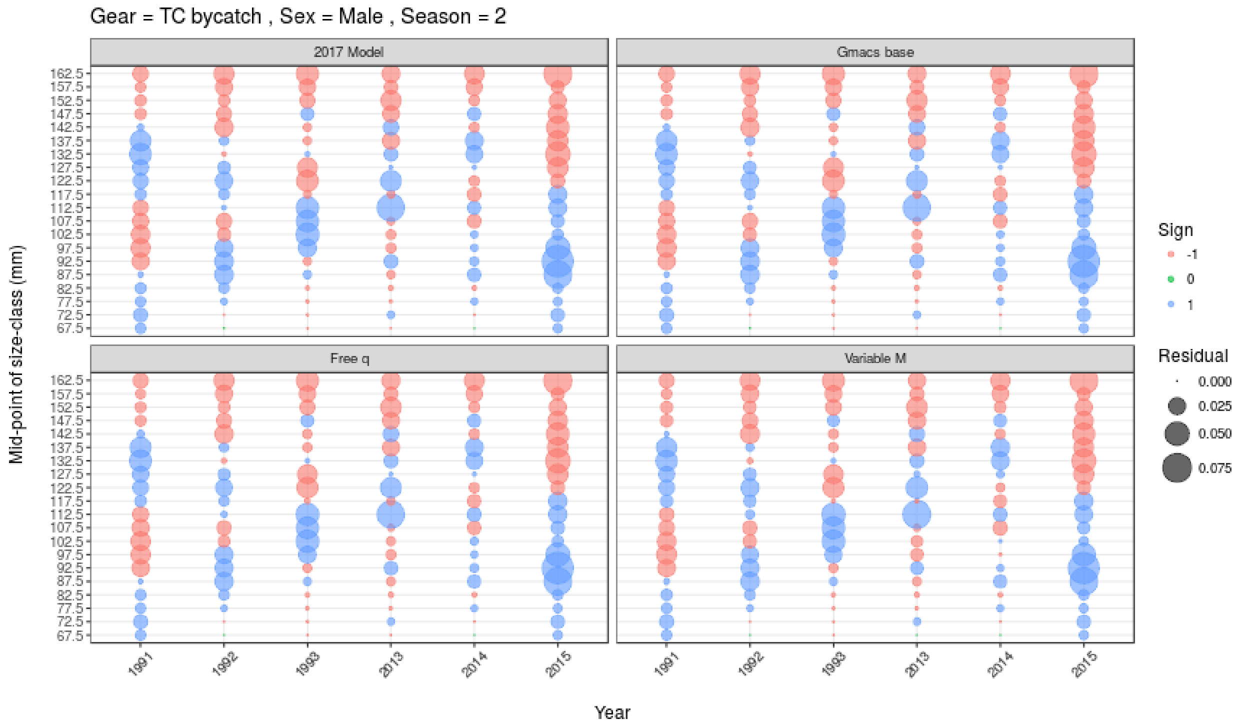

Figure 6: Size-frequency residuals of discarded male BBRKC by year in the tanner crab bycatch fishery for the 2017 model and each of the Gmacs model scenarios.

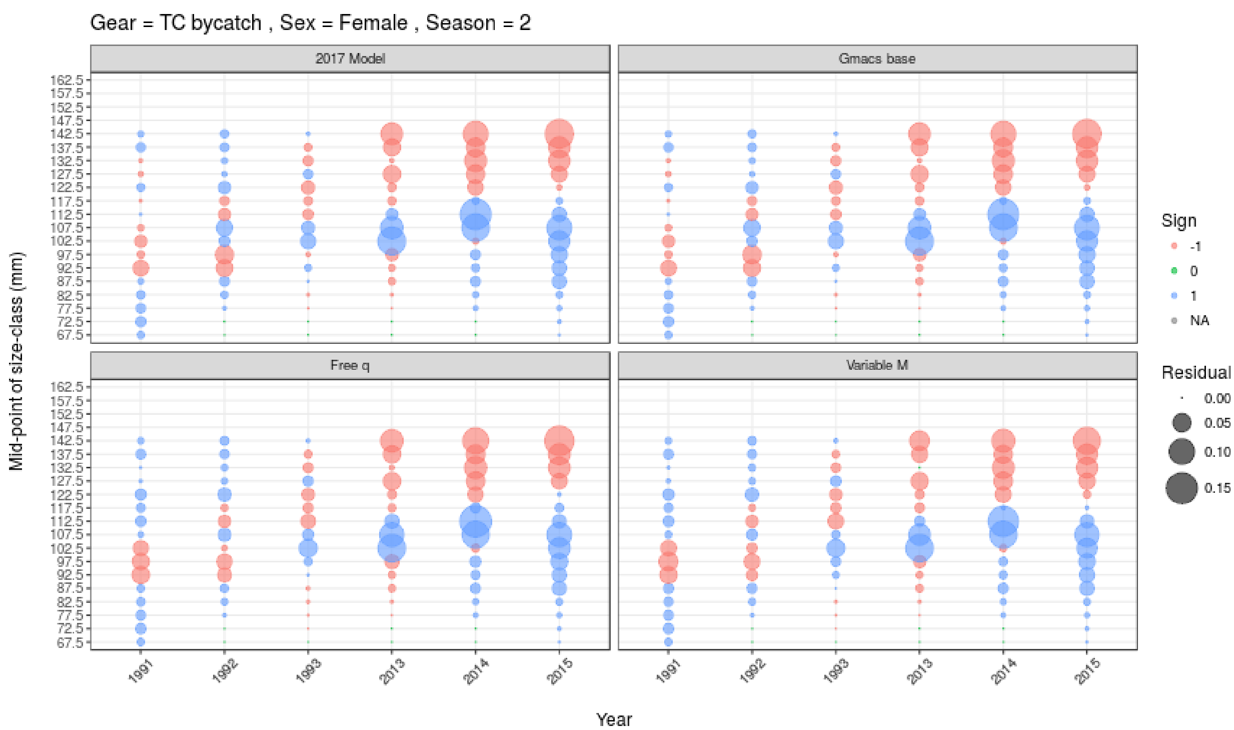

Figure 7: Size-frequency residuals of discarded female BBRKC by year in the tanner crab bycatch fishery for the 2017 model and each of the Gmacs model scenarios.

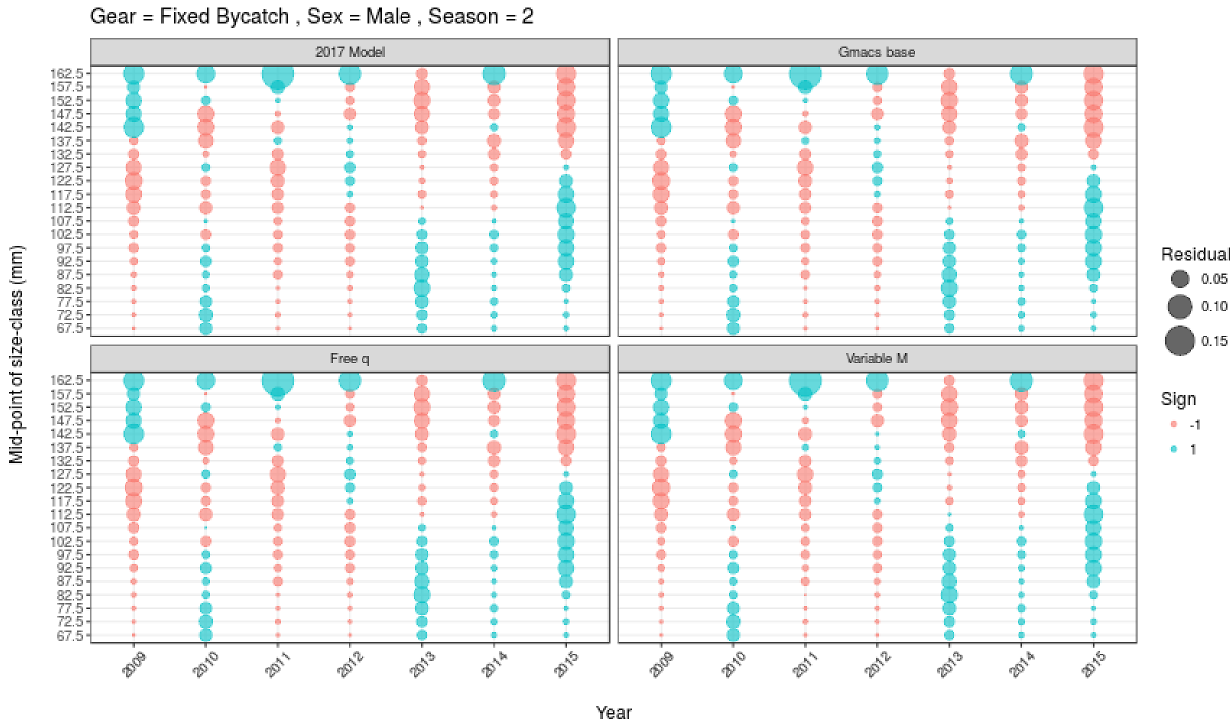

Figure 8: Size-frequency residuals of discarded male BBRKC by year in the fixed bycatch fishery for the 2017 model and each of the Gmacs model scenarios.

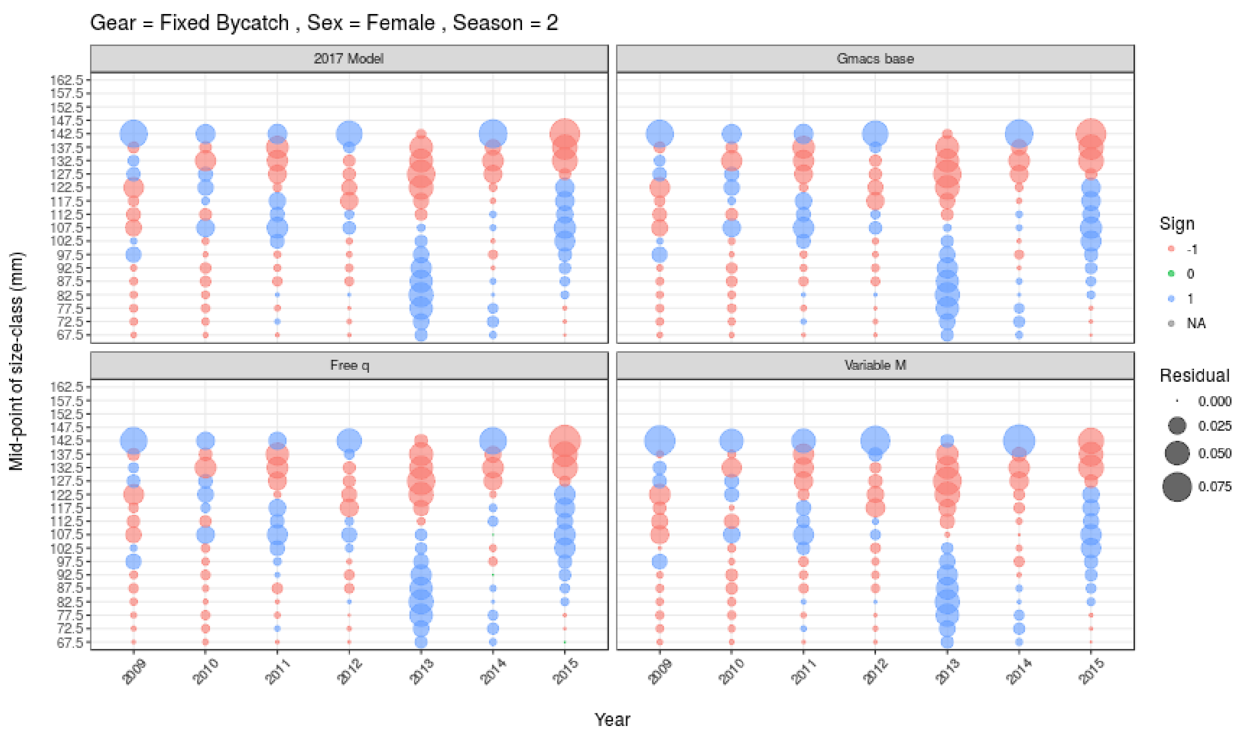

Figure 9: Size-frequency residuals of discarded female BBRKC by year in the fixed bycatch fishery for the 2017 model and each of the Gmacs model scenarios.

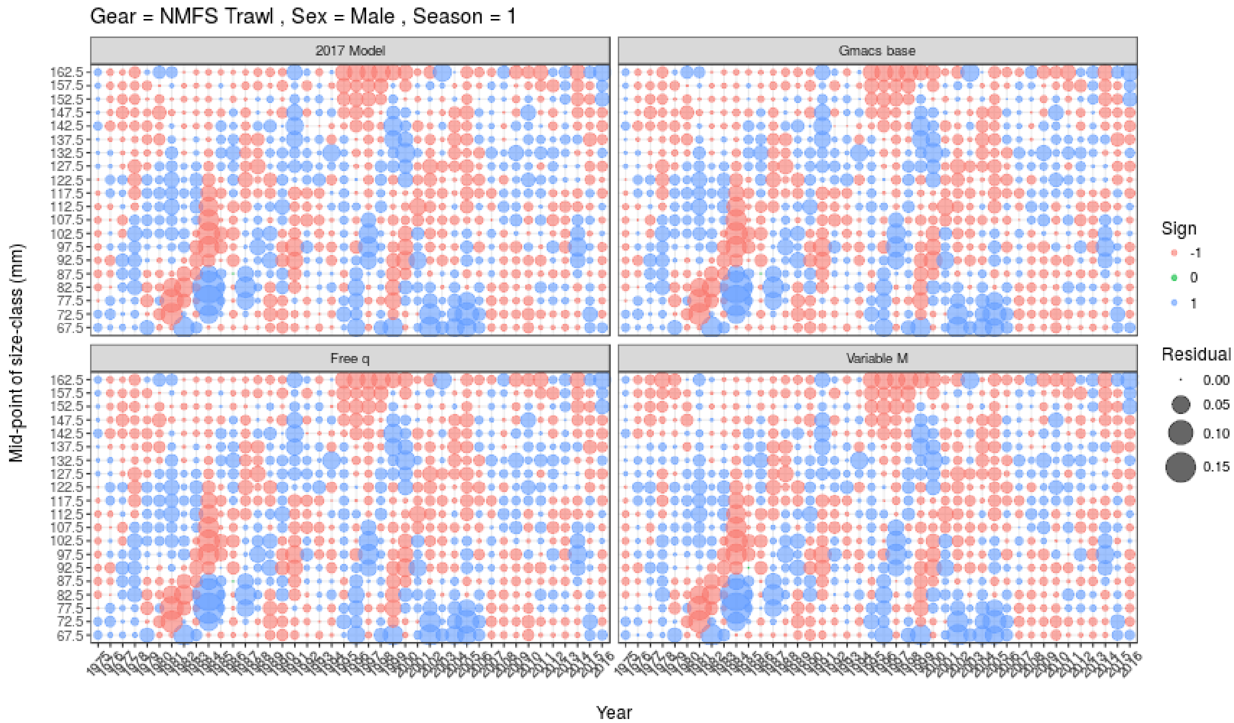

Figure 10: Size-frequency residuals of discarded male BBRKC by year in the NMFS trawl survey for the 2017 model and each of the Gmacs model scenarios.

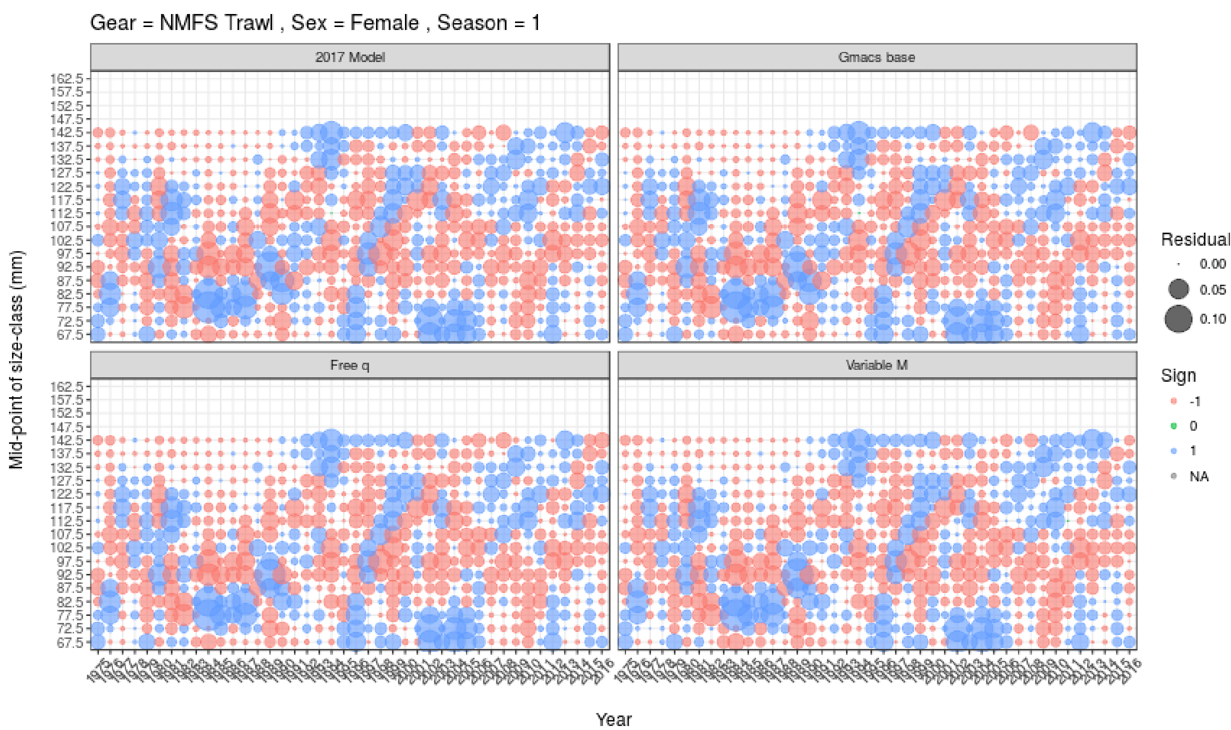

Figure 11: Size-frequency residuals of discarded female BBRKC by year in the NMFS trawl survey for the 2017 model and each of the Gmacs model scenarios.

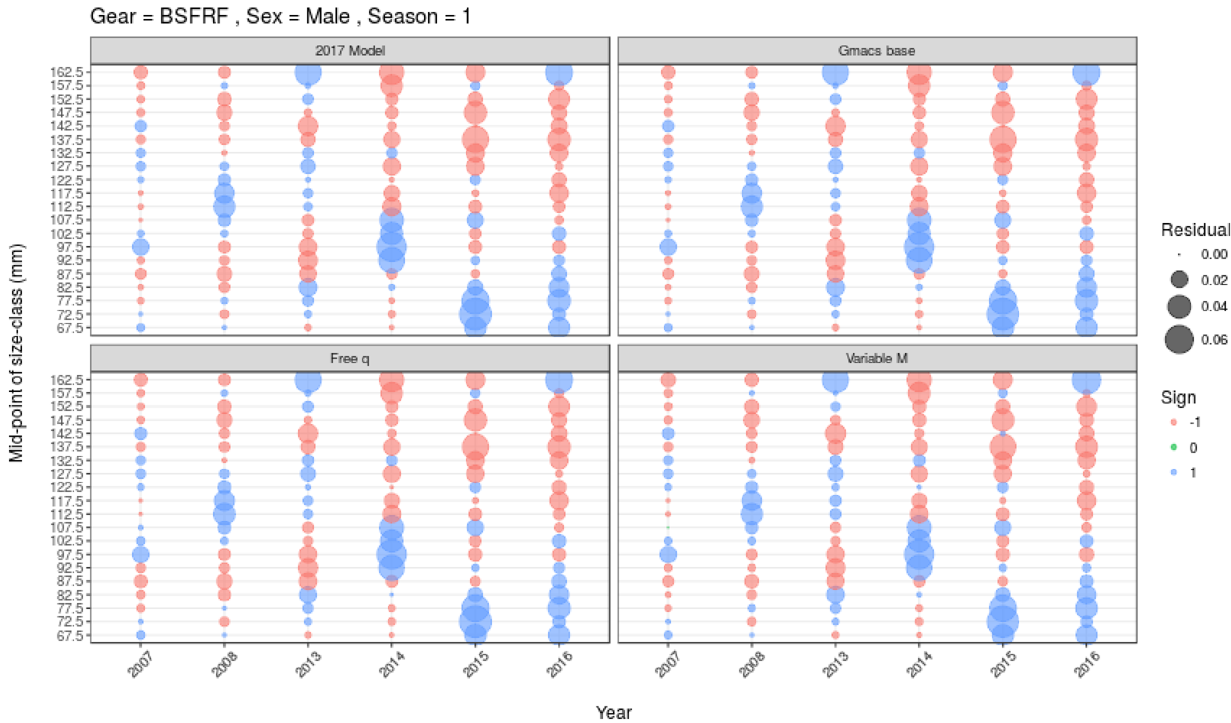

Figure 12: Size-frequency residuals of discarded male BBRKC by year in the BSFRF survey for the 2017 model and each of the Gmacs model scenarios.

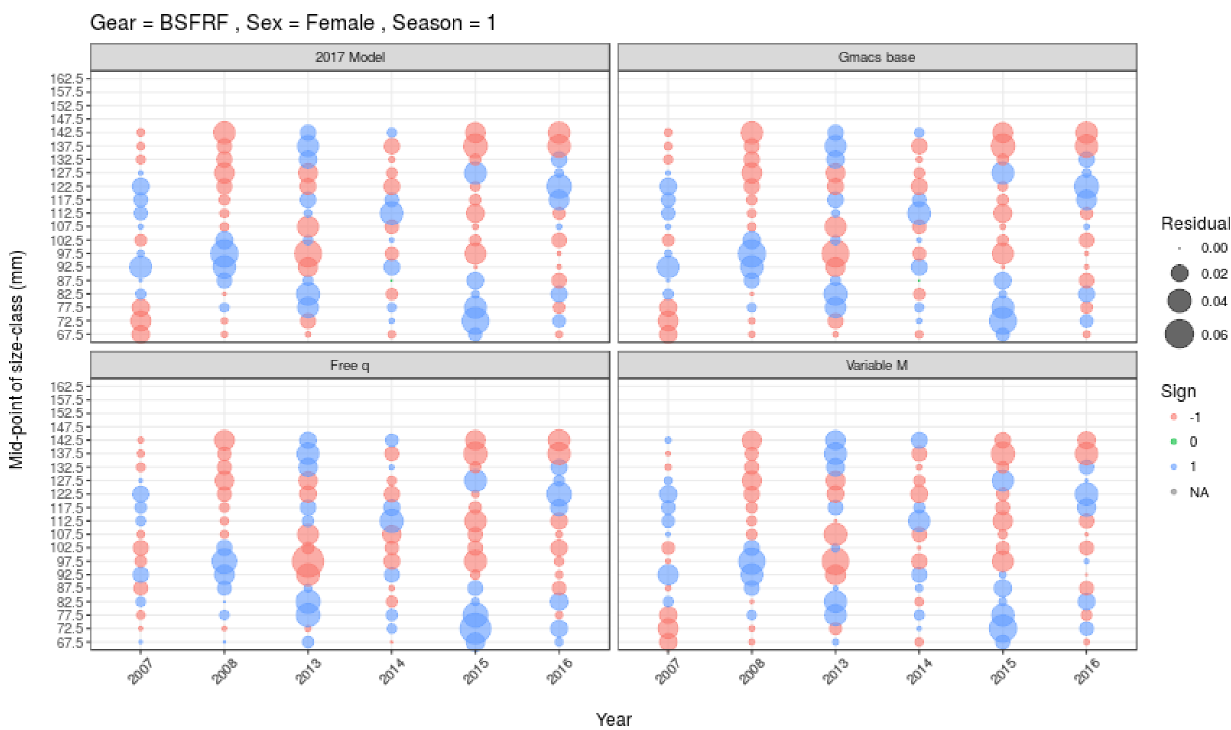

Figure 13: Size-frequency residuals of discarded female BBRKC by year in the BSFRF survey for the 2017 model and each of the Gmacs model scenarios.

The data file:

```
## #====================================================================================================
## #    Gmacs   Main    Data    File    Version 1.1:    BBRKC   Example
## #    GEAR_INDEX  DESCRIPTION
## #    1   :   Pot fishery retained    catch.
## #    1   :   Pot fishery with    discarded   catch.
## #    2   :   Trawl   bycatch
## #    3   :   Trawl   survey
## #    Fisheries:  1   Pot Fishery,    2   Pot Discard,    3   Trawl   by-catch,   4   Tanner bycatch 5 fixed gear
## #    Surveys:    6   NMFS    Trawl   Survey, 7   BSFRF   Survey
## #====================================================================================================
## 1975 #   Start   year
## 2016 #   End year
## 2017 #   Projection  year
## 4    #   Number  of  seasons
## 6    #   Number  of  distinct    data    groups  (among  fishing fleets  and surveys)
## 2    #   Number  of  sexes
## 2    #   Number  of  shell   condition   types
## 1    #   Number  of  maturity    types
## 20   #   Number  of  size-classes    in  the model
## 4    #   Season  recruitment occurs
## 4    #   Season  molting and growth  occurs
## 3    #   Season  to  calculate   SSB
## 1    #   Season  for N   output
## #    size_breaks (a  vector  giving  the break   points  between size    intervals,  dim=nclass+1)
## 65   70  75  80  85  90  95  100 105 110 115 120 125 130 135 140 145 150 155 160 165
## #    weight-at-length    input   method  (1  =   allometry   [w_l    =   a*l^b], 2   =   vector  by  sex)
## 2
## #    weight-at-length    allometry   w_l =   a*l^b
## #a=0.003593,b=2.666076   female  >   89mm
## #a=0.000408,b=3.127956   female  <   90  new shell
## #a=0.000403, b=3.141334  male    new shell
## ##   a   (male,  female)
## 4.03E-07 4.08E-07
## ##   b   (male,  female)
## 3.141334 3.127956
## ##   Males
## 0.000224781  0.000281351 0.000346923 0.000422209 0.000507927 0.000604802 0.000713564 0.00083495  0.0009697   0.00111856  0.00128229  0.00146163  0.00165736  0.00187023  0.00210101  0.00235048  0.002619
## #0.224781    0.281351    0.346923    0.422209    0.507927    0.604802    0.713564    0.83495 0.9697  1.11856 1.28229 1.46163 1.65736 1.87023 2.10101 2.35048 2.61942 2.90861 3.21882 3.9059
## ##   Females
## 0.0002151    0.00026898  0.00033137  0.00040294  0.00048437  0.00062711  0.0007216   0.00082452  0.00093615  0.00105678  0.00118669  0.00132613  0.00147539  0.00163473  0.00180441  0.00218315  0.002183
## #0.21510 0.26898 0.33137 0.40294 0.48437 0.62711 0.7216  0.82452 0.93615 1.05678 1.18669 1.32613 1.47539 1.63473 1.80441 2.18315 2.18315 2.18315 2.18315 2.1831
## #    Male    mature  weight-at-length    (weight *   proportion  mature)
## 0    0   0   0   0   0   0   0   0   0   0   1.46163 1.65736 1.87023 2.10101 2.35048 2.61942 2.90861 3.21882 3.9059
## #    Proportion  mature  by  sex
## 0    0   0   0   0   0   0   0   0   0   0   1   1   1   1   1   1   1   1   1
## 0    0   0   0   0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
## #    Natural mortality   per season  input   type    (1  =   vector  by  season, 2   =   matrix  by  season/year)
## 2
## #    Proportion  of  the total   natural mortality   to  be  applied each    season
## 0.01 0.2329  0.4511  0.306
## 0.01 0.2795  0.4045  0.306
## 0.01 0.3233  0.3607  0.306
## 0.01 0.2548  0.4292  0.306
## 0.01 0.2493  0.4347  0.306
## 0.01 0.2493  0.4347  0.306
## 0.01 0.2493  0.4347  0.306
## 0.01 0.2356  0.4484  0.306
## 0.01 0.24    0.444   0.306
## 0.01 0.2712  0.4128  0.306
## 0.01 0.2438  0.4402  0.306
## 0.01 0.2521  0.4319  0.306
## 0.01 0.2493  0.4347  0.306
## 0.01 0.2438  0.4402  0.306
## 0.01 0.2493  0.4347  0.306
## 0.01 0.3507  0.3333  0.306
## 0.01 0.3425  0.3415  0.306
## 0.01 0.3425  0.3415  0.306
## 0.01 0.3452  0.3388  0.306
## 0.01 0.34    0.344   0.306
## 0.01 0.34    0.344   0.306
## 0.01 0.34    0.344   0.306
## 0.01 0.34    0.344   0.306
## 0.01 0.34    0.344   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## 0.01 0.3 0.384   0.306
## #    Fishing fleet   names   (delimited  with    :   no  spaces  in  names)
## Pot_Fishery:Trawl_Bycatch:Bairdi_Fishery_Bycatch:Fixed_Gear
## #    Survey  names   (delimited  with    :   no  spaces  in  names)
## NMFS_Trawl:BSFRF
## #    Number  of  catch   data    frames
## 7
## #    Number  of  rows    in  each    data    frame
## 40   24  24  40  24  24 7
## ##   ---------------------------------------------------------------------------------   ##
## ##   CATCH   DATA
## ##   Type    of  catch:  1   =   retained,   2   =   discard,    3   =
## ##   Units   of  catch:  1   =   biomass,    2   =   numbers
## ##   for BBRKC   Units   are in  1000    mt  for landed  &   discards.
```

```
## ##   ---------------------------------------------------------------------------------   ##
## ##   Male    retained    pot fishery (tonnes)
## #year    seas    fleet   sex obs cv  type    units   mult    effort  discard_mortality
## 1975 2   1   1   23281.2 0.03    1   1   1   0   0
## 1976 2   1   1   28993.6 0.03    1   1   1   0   0
## 1977 2   1   1   31736.9 0.03    1   1   1   0   0
## 1978 2   1   1   39743   0.03    1   1   1   0   0
## 1979 2   1   1   48910   0.03    1   1   1   0   0
## 1980 2   1   1   58943.6 0.03    1   1   1   0   0
## 1981 2   1   1   15236.8 0.03    1   1   1   0   0
## 1982 2   1   1   1361.3  0.03    1   1   1   0   0
## 1984 2   1   1   1897.1  0.03    1   1   1   0   0
## 1985 2   1   1   1893.7  0.03    1   1   1   0   0
## 1986 2   1   1   5168.2  0.03    1   1   1   0   0
## 1987 2   1   1   5574.2  0.03    1   1   1   0   0
## 1988 2   1   1   3351    0.03    1   1   1   0   0
## 1989 2   1   1   4656    0.03    1   1   1   0   0
## 1990 2   1   1   9272.8  0.03    1   1   1   0   0
## 1991 2   1   1   7885.2  0.03    1   1   1   0   0
## 1992 2   1   1   3681.8  0.03    1   1   1   0   0
## 1993 2   1   1   6659.6  0.03    1   1   1   0   0
## 1994 2   1   1   42.2    0.03    1   1   1   0   0
## 1995 2   1   1   36.3    0.03    1   1   1   0   0
## 1996 2   1   1   3861.9  0.03    1   1   1   0   0
## 1997 2   1   1   4042.1  0.03    1   1   1   0   0
## 1998 2   1   1   6779.4  0.03    1   1   1   0   0
## 1999 2   1   1   5377.8  0.03    1   1   1   0   0
## 2000 2   1   1   3738.1  0.03    1   1   1   0   0
## 2001 2   1   1   3866    0.03    1   1   1   0   0
## 2002 2   1   1   4384.4  0.03    1   1   1   0   0
## 2003 2   1   1   7135.5  0.03    1   1   1   0   0
## 2004 2   1   1   7006.6  0.03    1   1   1   0   0
## 2005 2   1   1   8399.6  0.03    1   1   1   0   0
## 2006 2   1   1   7143.2  0.03    1   1   1   0   0
## 2007 2   1   1   9303.9  0.03    1   1   1   0   0
## 2008 2   1   1   9216.1  0.03    1   1   1   0   0
## 2009 2   1   1   7272.5  0.03    1   1   1   0   0
## 2010 2   1   1   6761.5  0.03    1   1   1   0   0
## 2011 2   1   1   3607.1  0.03    1   1   1   0   0
## 2012 2   1   1   3621.7  0.03    1   1   1   0   0
## 2013 2   1   1   3991    0.03    1   1   1   0   0
## 2014 2   1   1   4538.6  0.03    1   1   1   0   0
## 2015 2   1   1   4613.7  0.03    1   1   1   0   0
## ##   Male    discards    pot fishery (numbers)
## #year    seas    fleet   sex obs cv  type    units   mult    effort  discard_mortality
## 1990 2   1   1   1718800 0.04    2   2   1   0   0.2
## 1991 2   1   1   1453700 0.04    2   2   1   0   0.2
## 1992 2   1   1   2305600 0.04    2   2   1   0   0.2
## 1993 2   1   1   2688000 0.04    2   2   1   0   0.2
## 1996 2   1   1   595000  0.04    2   2   1   0   0.2
## 1997 2   1   1   910000  0.04    2   2   1   0   0.2
## 1998 2   1   1   3173000 0.04    2   2   1   0   0.2
## 1999 2   1   1   922000  0.04    2   2   1   0   0.2
## 2000 2   1   1   1393000 0.04    2   2   1   0   0.2
## 2001 2   1   1   1623500 0.04    2   2   1   0   0.2
## 2002 2   1   1   1527000 0.04    2   2   1   0   0.2
## 2003 2   1   1   3617000 0.04    2   2   1   0   0.2
## 2004 2   1   1   1539000 0.04    2   2   1   0   0.2
## 2005 2   1   1   3792300 0.04    2   2   1   0   0.2
## 2006 2   1   1   1832000 0.04    2   2   1   0   0.2
## 2007 2   1   1   3619800 0.04    2   2   1   0   0.2
## 2008 2   1   1   3786757 0.04    2   2   1   0   0.2
## 2009 2   1   1   2782675 0.04    2   2   1   0   0.2
## 2010 2   1   1   2480059 0.04    2   2   1   0   0.2
## 2011 2   1   1   1279960 0.04    2   2   1   0   0.2
## 2012 2   1   1   640960  0.04    2   2   1   0   0.2
## 2013 2   1   1   967328  0.04    2   2   1   0   0.2
## 2014 2   1   1   1480673 0.04    2   2   1   0   0.2
## 2015 2   1   1   745056  0.04    2   2   1   0   0.2
## ##   Female  discards    Pot fishery
## #year    seas    fleet   sex obs cv  type    units   mult    effort  discard_mortality
## 1990 2   1   2   2670800 0.04    2   2   1   0   0.2
## 1991 2   1   2   484600  0.04    2   2   1   0   0.2
## 1992 2   1   2   2408600 0.04    2   2   1   0   0.2
## 1993 2   1   2   2814500 0.04    2   2   1   0   0.2
## 1996 2   1   2   10000   0.04    2   2   1   0   0.2
## 1997 2   1   2   75000   0.04    2   2   1   0   0.2
## 1998 2   1   2   3896500 0.04    2   2   1   0   0.2
## 1999 2   1   2   30300   0.04    2   2   1   0   0.2
## 2000 2   1   2   304000  0.04    2   2   1   0   0.2
## 2001 2   1   2   786100  0.04    2   2   1   0   0.2
## 2002 2   1   2   47600   0.04    2   2   1   0   0.2
## 2003 2   1   2   2191200 0.04    2   2   1   0   0.2
## 2004 2   1   2   932000  0.04    2   2   1   0   0.2
## 2005 2   1   2   2038700 0.04    2   2   1   0   0.2
## 2006 2   1   2   222200  0.04    2   2   1   0   0.2
## 2007 2   1   2   833890  0.04    2   2   1   0   0.2
## 2008 2   1   2   666098  0.04    2   2   1   0   0.2
## 2009 2   1   2   332340  0.04    2   2   1   0   0.2
## 2010 2   1   2   477993  0.04    2   2   1   0   0.2
## 2011 2   1   2   115860  0.04    2   2   1   0   0.2
## 2012 2   1   2   49933   0.04    2   2   1   0   0.2
## 2013 2   1   2   409135  0.04    2   2   1   0   0.2
## 2014 2   1   2   280805  0.04    2   2   1   0   0.2
## 2015 2   1   2   747306  0.04    2   2   1   0   0.2
## ##   Trawl   fishery discards
## #year    seas    fleet   sex obs cv  type    units   mult    effort  discard_mortality
## 1976 2   2   0   384600  0.04    2   2   1   0   0.8
## 1977 2   2   0   787700  0.04    2   2   1   0   0.8
## 1978 2   2   0   646500  0.04    2   2   1   0   0.8
## 1979 2   2   0   736200  0.04    2   2   1   0   0.8
## 1980 2   2   0   1141300 0.04    2   2   1   0   0.8
## 1981 2   2   0   267100  0.04    2   2   1   0   0.8
## 1982 2   2   0   785400  0.04    2   2   1   0   0.8
## 1983 2   2   0   492800  0.04    2   2   1   0   0.8
## 1984 2   2   0   1168200 0.04    2   2   1   0   0.8
## 1985 2   2   0   274700  0.04    2   2   1   0   0.8
```

```
## 1986 2   2   0   159300  0.04    2   2   1   0   0.8
## 1987 2   2   0   124500  0.04    2   2   1   0   0.8
## 1988 2   2   0   430300  0.04    2   2   1   0   0.8
## 1989 2   2   0   109200  0.04    2   2   1   0   0.8
## 1990 2   2   0   171800  0.04    2   2   1   0   0.8
## 1991 2   2   0   183500  0.04    2   2   1   0   0.8
## 1992 2   2   0   248100  0.04    2   2   1   0   0.8
## 1993 2   2   0   281000  0.04    2   2   1   0   0.8
## 1994 2   2   0   48200   0.04    2   2   1   0   0.8
## 1995 2   2   0   106600  0.04    2   2   1   0   0.8
## 1996 2   2   0   76300   0.04    2   2   1   0   0.8
## 1997 2   2   0   49000   0.04    2   2   1   0   0.8
## 1998 2   2   0   93700   0.04    2   2   1   0   0.8
## 1999 2   2   0   110500  0.04    2   2   1   0   0.8
## 2000 2   2   0   58600   0.04    2   2   1   0   0.8
## 2001 2   2   0   89955   0.04    2   2   1   0   0.8
## 2002 2   2   0   76302   0.04    2   2   1   0   0.8
## 2003 2   2   0   105493  0.04    2   2   1   0   0.8
## 2004 2   2   0   75107   0.04    2   2   1   0   0.8
## 2005 2   2   0   96834   0.04    2   2   1   0   0.8
## 2006 2   2   0   75290   0.04    2   2   1   0   0.8
## 2007 2   2   0   86417   0.04    2   2   1   0   0.8
## 2008 2   2   0   93077   0.04    2   2   1   0   0.8
## 2009 2   2   0   59585   0.04    2   2   1   0   0.8
## 2010 2   2   0   58219   0.04    2   2   1   0   0.8
## 2011 2   2   0   45916   0.04    2   2   1   0   0.8
## 2012 2   2   0   38541   0.04    2   2   1   0   0.8
## 2013 2   2   0   106439  0.04    2   2   1   0   0.8
## 2014 2   2   0   144340  0.04    2   2   1   0   0.8
## 2015 2   2   0   125850  0.04    2   2   1   0   0.8
## ##   Tanner  crab    fishery discards    males
## #y   s   f   s   obs cv  t   u   m   e   d
## #e   e   l   e   obs cv  y   n   u   f   m
## #a   a   e   x   obs cv  p   i   l   f   r
## #r   s   e   obs cv  e   t   t   o   disc
## 1976 2   3   1   59772.50508 0.1 2   2   1   0   0.25
## 1977 2   3   1   358727.6778 0.1 2   2   1   0   0.25
## 1978 2   3   1   264460.4601 0.1 2   2   1   0   0.25
## 1979 2   3   1   331704.5283 0.1 2   2   1   0   0.25
## 1980 2   3   1   798423.191  0.1 2   2   1   0   0.25
## 1981 2   3   1   262852.5797 0.1 2   2   1   0   0.25
## 1982 2   3   1   307789.549  0.1 2   2   1   0   0.25
## 1983 2   3   1   48532.2855  0.1 2   2   1   0   0.25
## 1984 2   3   1   157195.7111 0.1 2   2   1   0   0.25
## 1987 2   3   1   97877.47706 0.1 2   2   1   0   0.25
## 1988 2   3   1   159003.8294 0.1 2   2   1   0   0.25
## 1989 2   3   1   324322.6239 0.1 2   2   1   0   0.25
## 1990 2   3   1   326868.9326 0.1 2   2   1   0   0.25
## 1991 2   3   1   455887.8848 0.1 2   2   1   0   0.25
## 1992 2   3   1   463165.1873 0.1 2   2   1   0   0.25
## 1993 2   3   1   477946.9278 0.1 2   2   1   0   0.25
## 1994 2   3   1   3114.147514 0.1 2   2   1   0   0.25
## 2006 2   3   1   1195.450102 0.1 2   2   1   0   0.25
## 2007 2   3   1   1494.312627 0.1 2   2   1   0   0.25
## 2008 2   3   1   1494.312627 0.1 2   2   1   0   0.25
## 2009 2   3   1   597.725051  0.1 2   2   1   0   0.25
## 2013 2   3   1   5977.250508 0.1 2   2   1   0   0.25
## 2014 2   3   1   5977.250508 0.1 2   2   1   0   0.25
## 2015 2   3   1   415929.9652 0.1 2   2   1   0   0.25
## ##   Tanner  crab    fishery discards    females
## 1976 2   3   2   134691.3715 0.1 2   2   1   0   0.25
## 1977 2   3   2   808357.0006 0.1 2   2   1   0   0.25
## 1978 2   3   2   595935.2386 0.1 2   2   1   0   0.25
## 1979 2   3   2   747463.0315 0.1 2   2   1   0   0.25
## 1980 2   3   2   1799166.933 0.1 2   2   1   0   0.25
## 1981 2   3   2   592312.0407 0.1 2   2   1   0   0.25
## 1982 2   3   2   693573.0138 0.1 2   2   1   0   0.25
## 1983 2   3   2   109362.6591 0.1 2   2   1   0   0.25
## 1984 2   3   2   354224.8379 0.1 2   2   1   0   0.25
## 1987 2   3   2   220557.1208 0.1 2   2   1   0   0.25
## 1988 2   3   2   358299.2519 0.1 2   2   1   0   0.25
## 1989 2   3   2   730828.6472 0.1 2   2   1   0   0.25
## 1990 2   3   2   736566.4996 0.1 2   2   1   0   0.25
## 1991 2   3   2   1027297.825 0.1 2   2   1   0   0.25
## 1992 2   3   2   1043696.499 0.1 2   2   1   0   0.25
## 1993 2   3   2   1077005.676 0.1 2   2   1   0   0.25
## 1994 2   3   2   7017.420455 0.1 2   2   1   0   0.25
## 2006 2   3   2   2693.82743  0.1 2   2   1   0   0.25
## 2007 2   3   2   3367.284287 0.1 2   2   1   0   0.25
## 2008 2   3   2   3367.284287 0.1 2   2   1   0   0.25
## 2009 2   3   2   1346.913715 0.1 2   2   1   0   0.25
## 2013 2   3   2   13469.13715 0.1 2   2   1   0   0.25
## 2014 2   3   2   13469.13715 0.1 2   2   1   0   0.25
## 2015 2   3   2   937256.6431 0.1 2   2   1   0   0.25
## ##   Fixed gear  crab    fishery discards    females 1000000
## 2009 2   4   0   5298    0.1 2   2   1   0   0.2
## 2010 2   4   0   2879    0.1 2   2   1   0   0.2
## 2011 2   4   0   12087   0.1 2   2   1   0   0.2
## 2012 2   4   0   18737   0.1 2   2   1   0   0.2
## 2013 2   4   0   71086   0.1 2   2   1   0   0.2
## 2014 2   4   0   125003  0.1 2   2   1   0   0.2
## 2015 2   4   0   106041  0.1 2   2   1   0   0.2
## ##   ---------------------------------------------------------------------------------   ##
## ##   RELATIVE    ABUNDANCE   DATA
## ##   Units   of  Abundance:  1   =   biomass,    2   =   numbers
## ##   TODO:   add column  for maturity    for terminal    molt    life-histories
## ##   for BBRKC   Units   are in  1000    mt.
## ##   ---------------------------------------------------------------------------------   ##
## ##   Number  of  relative    abundance   indicies
## 2
## ##   Number  of  rows    in  each    index
## 84   6
## #    Survey  data    (abundance  indices,    units   are 1000    mt)
## #Year    Season  Fleet   Sex Abundance   CV  Units
## 1975 1   5   1   135463.32   0.193   1
## 1976 1   5   1   260149.49   0.144   1
## 1977 1   5   1   235411.43   0.152   1
```

```
## 1978 1   5   1   203192.71   0.144   1
## 1979 1   5   1   103715  0.164   1
## 1980 1   5   1   168047.18   0.221   1
## 1981 1   5   1   69161.2 0.19    1
## 1982 1   5   1   73232.86    0.251   1
## 1983 1   5   1   35368.02    0.214   1
## 1984 1   5   1   98281.53    0.606   1
## 1985 1   5   1   27203.7 0.159   1
## 1986 1   5   1   41113.63    0.42    1
## 1987 1   5   1   47410.5 0.209   1
## 1988 1   5   1   35852.58    0.228   1
## 1989 1   5   1   42967.75    0.232   1
## 1990 1   5   1   39271.64    0.242   1
## 1991 1   5   1   67458.39    0.443   1
## 1992 1   5   1   25442.52    0.175   1
## 1993 1   5   1   36217.5 0.198   1
## 1994 1   5   1   23285.54    0.174   1
## 1995 1   5   1   27670.53    0.267   1
## 1996 1   5   1   27277.48    0.203   1
## 1997 1   5   1   60719.57    0.265   1
## 1998 1   5   1   46693.73    0.182   1
## 1999 1   5   1   45126.53    0.204   1
## 2000 1   5   1   38924.68    0.222   1
## 2001 1   5   1   28367.49    0.187   1
## 2002 1   5   1   45596.97    0.202   1
## 2003 1   5   1   74997.93    0.283   1
## 2004 1   5   1   91090.07    0.321   1
## 2005 1   5   1   55471.45    0.172   1
## 2006 1   5   1   51948.59    0.17    1
## 2007 1   5   1   59064.23    0.21    1
## 2008 1   5   1   67945.65    0.225   1
## 2009 1   5   1   43692.76    0.326   1
## 2010 1   5   1   39555.62    0.223   1
## 2011 1   5   1   27529.87    0.211   1
## 2012 1   5   1   30830.44    0.232   1
## 2013 1   5   1   39833.23    0.244   1
## 2014 1   5   1   60859.12    0.191   1
## 2015 1   5   1   36919.28    0.208   1
## 2016 1   5   1   27302.6 0.194   1
##
## 1975 1   5   2   67267.28    0.193   1
## 1976 1   5   2   71718.04    0.144   1
## 1977 1   5   2   140249.63   0.152   1
## 1978 1   5   2   146351.82   0.144   1
## 1979 1   5   2   63911.67    0.164   1
## 1980 1   5   2   81275.03    0.221   1
## 1981 1   5   2   63507.85    0.19    1
## 1982 1   5   2   70506.74    0.251   1
## 1983 1   5   2   13951.7 0.214   1
## 1984 1   5   2   57029.97    0.606   1
## 1985 1   5   2   7330.79 0.159   1
## 1986 1   5   2   7044.78 0.42    1
## 1987 1   5   2   22852.72    0.209   1
## 1988 1   5   2   19519.6 0.228   1
## 1989 1   5   2   12973.56    0.232   1
## 1990 1   5   2   21049.25    0.242   1
## 1991 1   5   2   17596.54    0.443   1
## 1992 1   5   2   12244.8 0.175   1
## 1993 1   5   2   17485.53    0.198   1
## 1994 1   5   2   9049.36 0.174   1
## 1995 1   5   2   10725.74    0.267   1
## 1996 1   5   2   17371.13    0.203   1
## 1997 1   5   2   24557.1 0.265   1
## 1998 1   5   2   38481.97    0.182   1
## 1999 1   5   2   20477.34    0.204   1
## 2000 1   5   2   29417.67    0.222   1
## 2001 1   5   2   24820.57    0.187   1
## 2002 1   5   2   24188.87    0.202   1
## 2003 1   5   2   41796.11    0.283   1
## 2004 1   5   2   40819.81    0.321   1
## 2005 1   5   2   51869.83    0.172   1
## 2006 1   5   2   43727.75    0.17    1
## 2007 1   5   2   45777.06    0.21    1
## 2008 1   5   2   46484.48    0.225   1
## 2009 1   5   2   47979.95    0.326   1
## 2010 1   5   2   42086.47    0.223   1
## 2011 1   5   2   39523.28    0.211   1
## 2012 1   5   2   30417.78    0.232   1
## 2013 1   5   2   22576.58    0.244   1
## 2014 1   5   2   53243.87    0.191   1
## 2015 1   5   2   27320.77    0.208   1
## 2016 1   5   2   33928.4 0.194   1
## # BSFRF
## 2007 1   6   0   130352.8    0.2164  1
## 2008 1   6   0   106040.9    0.1939  1
## 2013 1   6   0   95016.7 0.1939  1
## 2014 1   6   0   111740.4    0.1939  1
## 2015 1   6   0   98952.5 0.1939  1
## 2016 1   6   0   87725.1 0.1939  1
## ##   Number  of  length  frequency   matrices
## 13
## ##   Number  of  rows    in  each    matrix
## 38   24  24  39  39  6   6   7   7   42  42  6   6
## ##   Number  of  bins    in  each    matrix  (columns    of  size    data)
## 20   20  16  20  16  20  16  20  16  20  16  20  16
## ##   SIZE    COMPOSITION DATA    FOR ALL FLEETS
## ##   ------------------------------------------------------------------------------------   ##
## ##   SIZE    COMP    LEGEND
## ##   Sex:    1   =   male,   2   =   female, 0   =   both    sexes   combined
## ##   Type    of  composition:    1   =   retained,   2   =   discard,    0   =   total   composition
## ##   Maturity    state:  1   =   immature,   2   =   mature, 0   =   both    states  combined
## ##   Shell   condition:  1   =   new shell,  2   =   old shell,  0   =   both    shell   types   combined
## ##   ------------------------------------------------------------------------------------   ##
## #Retained    males
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1975 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0071  0.0741  0.1721  0.2239  0.2122  0.1464  0.0858  0.0785
## 1976 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0016  0.029   0.1418  0.2316  0.2199  0.1635  0.1071  0.1055
```

```
## 1977 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0017  0.0192  0.1382  0.2442  0.2226  0.1605  0.104   0.1096
## 1978 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0012  0.0209  0.1441  0.2588  0.2401  0.1673  0.0966  0.0711
## 1979 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0013  0.0119  0.0747  0.1649  0.1998  0.2004  0.1556  0.1914
## 1980 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0008  0.0138  0.0919  0.1771  0.195   0.1792  0.1404  0.2019
## 1981 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0006  0.0225  0.1164  0.1743  0.1711  0.1584  0.1284  0.2283
## 1982 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0   0.0544  0.2576  0.2802  0.1667  0.0837  0.0508  0.1067
## 1984 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0.0003  0.0023  0.0654  0.311   0.3135  0.1763  0.0846  0.0321  0.0145
## 1985 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0.0005  0.0044  0.079   0.2869  0.3098  0.1898  0.086   0.0306  0.0129
## 1986 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0016  0.0531  0.2613  0.3289  0.2084  0.0978  0.0352  0.0137
## 1987 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0013  0.0284  0.1895  0.3045  0.2522  0.1421  0.0565  0.0255
## 1988 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0   0.0202  0.1294  0.2646  0.2471  0.1876  0.1033  0.0477
## 1989 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0005  0.0187  0.1211  0.2209  0.219   0.1908  0.1197  0.1094
## 1990 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0.0003  0   0.0146  0.0887  0.1801  0.1707  0.1728  0.1431  0.2297
## 1991 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0001  0.0005  0.0141  0.0848  0.1651  0.179   0.1739  0.1432  0.2392
## 1992 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0.0003  0.0002  0.0005  0.0095  0.0638  0.1317  0.1673  0.1747  0.1636  0.2886
## 1993 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0   0.0014  0.0138  0.094   0.1789  0.1739  0.1596  0.1331  0.2453
## 1996 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0006  0.0006  0.0129  0.0779  0.1407  0.162   0.1771  0.1671  0.2612
## 1997 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0004  0.0003  0.0138  0.0899  0.1486  0.1603  0.1699  0.1588  0.258
## 1998 2   1   1   1   0   0   100 0   0   0   0   0   0   0.0001  0.0001  0.0001  0.0001  0.0004  0.0002  0.0008  0.0225  0.1187  0.1596  0.149   0.1432  0.1394  0.266
## 1999 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0.0001  0   0.0001  0.0147  0.1313  0.2575  0.2292  0.1624  0.0961  0.1087
## 2000 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0.0001  0.0001  0   0.0001  0.0003  0.0111  0.0931  0.1945  0.2111  0.1822  0.1247  0.1826
## 2001 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0.0001  0.0001  0.0001  0.0002  0.0002  0.0012  0.0181  0.0836  0.1681  0.1986  0.1953  0.1506  0.1838
## 2002 2   1   1   1   0   0   100 0   0   0   0   0   0   0.0001  0   0.0001  0.0001  0.0001  0   0.0002  0.0151  0.108   0.1884  0.1915  0.1683  0.1334  0.1948
## 2003 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0.0001  0.0001  0.0002  0.0009  0.0243  0.1464  0.232   0.1871  0.1497  0.0994  0.1597
## 2004 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0.0002  0.0064  0.0514  0.1302  0.1702  0.1971  0.1632  0.2812
## 2005 2   1   1   1   0   0   100 0   0   0   0   0   0   0.0001  0   0   0.0001  0.0001  0.0008  0.015   0.0859  0.1543  0.1661  0.1783  0.1516  0.2475
## 2006 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0.0001  0.0001  0.0004  0.0102  0.0739  0.1905  0.2203  0.1887  0.137   0.1787
## 2007 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0.0002  0.0003  0.0067  0.0871  0.1833  0.1934  0.1846  0.1472  0.1973
## 2008 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0.0001  0.0002  0.01    0.0746  0.1457  0.1619  0.179   0.1625  0.2659
## 2009 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0002  0.0108  0.1152  0.2215  0.1968  0.1588  0.1084  0.1882
## 2010 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0   0.0003  0.0091  0.0986  0.2244  0.2238  0.1861  0.1144  0.1433
## 2011 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0.0003  0.0001  0.0003  0.0114  0.118   0.2436  0.2292  0.1725  0.1077  0.1169
## 2012 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0.0001  0   0.0001  0   0   0.0044  0.0499  0.1249  0.173   0.1886  0.1654  0.2937
## 2013 2   1   1   1   0   0   100 0   0   0   0   0   0   0.0001  0.0001  0   0   0.0001  0.0001  0.0054  0.0525  0.1271  0.1484  0.1657  0.1632  0.3374
## 2014 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0   0.0004  0.0117  0.0964  0.1831  0.1696  0.1454  0.1246  0.2689
## 2015 2   1   1   1   0   0   100 0   0   0   0   0   0   0   0   0   0   0.0001  0.0003  0.0067  0.0616  0.1473  0.1864  0.1947  0.1634  0.2397
## #Discarded   males
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1990 2   1   1   2   0   0   87.3    0.0011  0   0.0011  0.008   0.0046  0.0126  0.0069  0.0378  0.0504  0.0767  0.1226  0.1523  0.1867  0.244   0.0859  0.0092  0   0   0   0
## 1991 2   1   1   2   0   0   100 0.0033  0.0101  0.0197  0.0214  0.0242  0.0394  0.0326  0.063   0.0624  0.0692  0.0641  0.1125  0.1586  0.2154  0.0939  0.0101  0   0   0   0
## 1992 2   1   1   2   0   0   100 0   0.0009  0.0012  0.0111  0.0222  0.0549  0.0869  0.1143  0.1183  0.123   0.118   0.1251  0.1112  0.0807  0.0293  0.0028  0   0   0   0
## 1993 2   1   1   2   0   0   100 0.0019  0.0045  0.0057  0.005   0.0062  0.0122  0.0312  0.0571  0.0778  0.108   0.1334  0.1544  0.1518  0.1705  0.0747  0.0055  0   0   0   0
## 1996 2   1   1   2   0   0   23  0   0   0   0.0131  0.0524  0.083   0.0742  0.0306  0.048   0.0699  0.0611  0.1004  0.1485  0.2009  0.1048  0.0131  0   0   0   0
## 1997 2   1   1   2   0   0   100 0   0.0002  0.0005  0.0007  0.0015  0.0197  0.0553  0.109   0.1268  0.1304  0.1031  0.1002  0.1275  0.1424  0.0751  0.0076  0   0   0   0
## 1998 2   1   1   2   0   0   100 0.0002  0.0005  0.0008  0.0044  0.007   0.01    0.0104  0.0175  0.0391  0.097   0.1402  0.2062  0.2047  0.1811  0.0714  0.0097  0   0   0   0
## 1999 2   1   1   2   0   0   100 0   0   0   0.0086  0.0086  0.0029  0.0076  0.0086  0.0143  0.0286  0.063   0.126   0.2118  0.3244  0.188   0.0076  0   0   0   0
## 2000 2   1   1   2   0   0   100 0.0003  0.0051  0.0192  0.0483  0.0613  0.0576  0.0595  0.0581  0.0532  0.0558  0.0712  0.1059  0.1497  0.1554  0.0895  0.0097  0   0   0   0
## 2001 2   1   1   2   0   0   100 0.0016  0.0057  0.0093  0.0115  0.0155  0.0302  0.0568  0.0866  0.1009  0.1196  0.1239  0.1411  0.1319  0.1128  0.0481  0.0045  0   0   0   0
## 2002 2   1   1   2   0   0   100 0.0012  0.0061  0.006   0.0091  0.0065  0.0104  0.0133  0.0335  0.063   0.1142  0.1543  0.1705  0.1642  0.1582  0.0803  0.0093  0   0   0   0
## 2003 2   1   1   2   0   0   100 0.0081  0.0119  0.0146  0.0317  0.0552  0.0666  0.072   0.067   0.0642  0.0599  0.0655  0.0958  0.1322  0.1708  0.0781  0.0064  0   0   0   0
## 2004 2   1   1   2   0   0   100 0.0004  0.0074  0.0177  0.0403  0.051   0.0483  0.0615  0.1087  0.1384  0.1452  0.1102  0.0849  0.07    0.0688  0.0404  0.0059  0.0008  0   0   0
## 2005 2   1   1   2   0   0   100 0.0002  0.0008  0.0015  0.0029  0.0076  0.022   0.0343  0.0418  0.0454  0.0658  0.0956  0.1376  0.1381  0.1385  0.0729  0.0262  0.0246  0.0349  0.0345  0.075
## 2006 2   1   1   2   0   0   100 0.0003  0.0013  0.0044  0.015   0.0312  0.0377  0.0368  0.0346  0.0452  0.0766  0.0929  0.1144  0.1377  0.1764  0.1275  0.0284  0.0105  0.0085  0.0075  0.0132
## 2007 2   1   1   2   0   0   100 0.0012  0.0042  0.0068  0.0098  0.0171  0.0366  0.0658  0.085   0.0928  0.0857  0.0819  0.0987  0.1291  0.1651  0.0956  0.0126  0.0032  0.0028  0.0022  0.0037
## 2008 2   1   1   2   0   0   100 0.0001  0.0003  0.0012  0.0046  0.0108  0.0141  0.0159  0.0214  0.0441  0.0808  0.1269  0.1793  0.1988  0.1838  0.0983  0.0099  0.0014  0.0018  0.0018  0.0045
## 2009 2   1   1   2   0   0   100 0.0004  0.001   0.0018  0.0032  0.0041  0.0073  0.0178  0.0402  0.0631  0.0705  0.0798  0.118   0.1809  0.2413  0.1455  0.0149  0.0021  0.0016  0.0022  0.0043
## 2010 2   1   1   2   0   0   100 0.0007  0.0011  0.0025  0.0055  0.0085  0.0119  0.0148  0.0218  0.0341  0.0541  0.0962  0.1517  0.2017  0.2373  0.135   0.0137  0.0017  0.0018  0.0016  0.0042
## 2011 2   1   1   2   0   0   100 0.0017  0.0066  0.0112  0.0199  0.0204  0.0188  0.0272  0.0309  0.0409  0.056   0.0756  0.1176  0.1698  0.221   0.1565  0.018   0.0026  0.0017  0.0009  0.0025
## 2012 2   1   1   2   0   0   100 0.0006  0.0008  0.0024  0.0042  0.0111  0.0262  0.0416  0.0563  0.0534  0.057   0.0704  0.106   0.1521  0.2072  0.1468  0.0248  0.0054  0.0085  0.0069  0.0182
## 2013 2   1   1   2   0   0   100 0.0001  0.0016  0.004   0.0052  0.011   0.0137  0.0227  0.0353  0.06    0.0871  0.1253  0.1381  0.1523  0.1563  0.1001  0.0207  0.0088  0.0177  0.0158  0.0242
## 2014 2   1   1   2   0   0   100 0.0006  0.0014  0.0017  0.0025  0.0038  0.0082  0.0139  0.0249  0.0347  0.0449  0.0767  0.1027  0.1525  0.1845  0.1225  0.0278  0.0231  0.0319  0.0371  0.1047
## 2015 2   1   1   2   0   0   100 0.0002  0.0006  0.0021  0.004   0.0082  0.0156  0.0169  0.019   0.0332  0.0769  0.0966  0.1365  0.1533  0.1834  0.1101  0.0238  0.0143  0.0185  0.0203  0.0664
## #Discarded   females
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1990 2   1   2   2   0   0   50  0   0.0014  0.0029  0.0029  0.0057  0.0072  0.0143  0.0672  0.1016  0.1731  0.1688  0.2132  0.1359  0.0715  0.0243  0.01
## 1991 2   1   2   2   0   0   37.5    0.0054  0.0239  0.0612  0.0957  0.133   0.1596  0.1223  0.0718  0.0691  0.0559  0.0691  0.0798  0.0346  0.0106  0.0053  0.0027
## 1992 2   1   2   2   0   0   50  0.0008  0.0013  0.0029  0.0176  0.0799  0.1757  0.1941  0.1694  0.0958  0.0816  0.0577  0.0406  0.0406  0.0259  0.0117  0.0046
## 1993 2   1   2   2   0   0   50  0.0015  0.0024  0.0044  0.0059  0.013   0.0326  0.1011  0.1597  0.1444  0.1137  0.0905  0.0853  0.0835  0.074   0.0434  0.0446
## 1996 2   1   2   2   0   0   1.1 0   0   0   0.0909  0.6364  0.2727  0   0   0   0   0   0   0   0   0   0
## 1997 2   1   2   2   0   0   50  0   0   0.0011  0.0011  0.0099  0.0265  0.0364  0.0464  0.0695  0.1391  0.1667  0.1435  0.117   0.1082  0.0607  0.074
## 1998 2   1   2   2   0   0   50  0.0002  0.0004  0.001   0.0026  0.0064  0.018   0.057   0.1813  0.2307  0.1527  0.0828  0.0855  0.0578  0.0514  0.0337  0.0386
## 1999 2   1   2   2   0   0   3.6 0   0   0   0.0278  0.0278  0.0278  0.0556  0   0   0.1111  0.1389  0.0833  0.1111  0.1111  0.0833  0.2222
## 2000 2   1   2   2   0   0   50  0   0.0175  0.1036  0.2234  0.2093  0.1319  0.0774  0.0323  0.0209  0.0316  0.0451  0.0518  0.0229  0.0141  0.0047  0.0135
## 2001 2   1   2   2   0   0   50  0.0027  0.005   0.0151  0.033   0.0588  0.0866  0.097   0.0866  0.0575  0.0525  0.0874  0.1392  0.1421  0.0649  0.0291  0.0426
## 2002 2   1   2   2   0   0   30.2    0.0258  0.1194  0.1452  0.1548  0.1161  0.0645  0.0258  0.0226  0.0548  0.0419  0.0355  0.0258  0.0323  0.0355  0.0323  0.0678
## 2003 2   1   2   2   0   0   50  0.0141  0.0187  0.0255  0.0719  0.1116  0.1157  0.0743  0.0476  0.0661  0.0902  0.1012  0.0628  0.0497  0.0504  0.046   0.054
## 2004 2   1   2   2   0   0   50  0.0005  0.0075  0.0306  0.0596  0.0754  0.09    0.1425  0.1333  0.0883  0.0484  0.0574  0.0584  0.0511  0.0394  0.0389  0.0788
## 2005 2   1   2   2   0   0   50  0.0004  0.0013  0.0022  0.005   0.0146  0.0499  0.0788  0.0931  0.1233  0.1211  0.0871  0.1021  0.0958  0.0885  0.0519  0.0848
## 2006 2   1   2   2   0   0   50  0.0003  0.0044  0.0248  0.1218  0.1937  0.1603  0.072   0.0558  0.0722  0.0778  0.0614  0.0401  0.034   0.0282  0.0199  0.0333
## 2007 2   1   2   2   0   0   50  0.003   0.0126  0.0214  0.0223  0.0436  0.0854  0.1105  0.0828  0.0558  0.0744  0.102   0.1165  0.0954  0.0684  0.0444  0.0614
## 2008 2   1   2   2   0   0   50  0.0004  0.0018  0.0097  0.0364  0.0768  0.0661  0.0469  0.0773  0.107   0.0868  0.0954  0.1265  0.1257  0.0672  0.0392  0.0369
## 2009 2   1   2   2   0   0   50  0.0037  0.008   0.01    0.0144  0.0164  0.0277  0.0647  0.0863  0.0803  0.0913  0.0858  0.09    0.1144  0.1308  0.088   0.0881
## 2010 2   1   2   2   0   0   50  0.0037  0.0051  0.0051  0.0199  0.0276  0.029   0.0271  0.0443  0.0882  0.1138  0.1322  0.1427  0.1007  0.0915  0.0879  0.0813
## 2011 2   1   2   2   0   0   50  0.0132  0.0373  0.0653  0.1089  0.0814  0.0734  0.0619  0.0436  0.0281  0.0373  0.0717  0.0896  0.0748  0.0587  0.061   0.0938
## 2012 2   1   2   2   0   0   50  0.0089  0.0107  0.0125  0.0339  0.0606  0.1159  0.0945  0.0392  0.0178  0.0125  0.041   0.0392  0.1658  0.1515  0.1105  0.0856
## 2013 2   1   2   2   0   0   50  0.0005  0.0017  0.0083  0.0109  0.0187  0.0369  0.0714  0.1329  0.1424  0.0972  0.0718  0.0635  0.0855  0.0904  0.0732  0.0947
## 2014 2   1   2   2   0   0   50  0.0015  0.0062  0.0082  0.0108  0.0113  0.0236  0.0318  0.0297  0.0528  0.0672  0.0754  0.0764  0.0928  0.1123  0.1241  0.2759
## 2015 2   1   2   2   0   0   50  0   0.0014  0.002   0.0059  0.0138  0.0182  0.0204  0.0367  0.0567  0.0885  0.0881  0.1428  0.1078  0.1019  0.0817  0.2342
## #Trawl   bycatch male
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1976 2   2   1   0   0   0   50  0   0   0   0   0   0.013   0.0087  0.0043  0.0216  0.0087  0.026   0.039   0.0433  0.0649  0.0996  0.0866  0.0736  0.0909  0.0649  0.1299
## 1977 2   2   1   0   0   0   50  0.0036  0.0009  0.0009  0.0009  0.0026  0.0035  0.0079  0.0097  0.0317  0.0485  0.0599  0.0996  0.1084  0.1251  0.104   0.1057  0.1004  0.0634  0.0326  0.0441
## 1978 2   2   1   0   0   0   50  0   0   0   0   0   0   0   0.0025  0.0012  0.0025  0.0149  0.0274  0.0511  0.0872  0.1245  0.1158  0.0797  0.0984  0.0672  0.188
## 1979 2   2   1   0   0   0   50  0.0178  0.0013  0.0025  0.0013  0.0025  0.0076  0.0038  0.0025  0.0013  0.0063  0.0051  0.0114  0.0228  0.0556  0.0582  0.0708  0.0898  0.086   0.0809  0.1858
## 1980 2   2   1   0   0   0   50  0.0531  0.0207  0.0096  0.0135  0.0142  0.0163  0.0274  0.0263  0.038   0.0375  0.0422  0.0394  0.0368  0.0377  0.0313  0.0231  0.0207  0.0142  0.0131  0.0265
## 1981 2   2   1   0   0   0   50  0.0262  0.0028  0.0045  0.0066  0.0112  0.0175  0.0279  0.0349  0.0386  0.0504  0.0434  0.048   0.0287  0.0334  0.0241  0.0212  0.0112  0.0064  0.0051  0.0087
## 1982 2   2   1   0   0   0   50  0.0701  0.0268  0.0247  0.0326  0.0356  0.0443  0.0409  0.0403  0.0401  0.0475  0.0426  0.0479  0.0405  0.0326  0.0218  0.0153  0.0084  0.0052  0.0038  0.0099
## 1983 2   2   1   0   0   0   50  0.0231  0.0214  0.0336  0.0344  0.0311  0.0319  0.0377  0.0445  0.0473  0.0471  0.0457  0.0437  0.0409  0.0414  0.0371  0.0283  0.0204  0.0129  0.0096  0.018
## 1984 2   2   1   0   0   0   50  0.0366  0.0156  0.0147  0.0199  0.027   0.0342  0.0399  0.0407  0.0431  0.0476  0.0511  0.0596  0.0594  0.0563  0.0473  0.0355  0.0264  0.017   0.0109  0.0146
## 1985 2   2   1   0   0   0   50  0.0051  0.0014  0.0034  0.0059  0.01    0.0164  0.0256  0.0396  0.0357  0.0446  0.0538  0.0636  0.0843  0.0862  0.0883  0.0843  0.0638  0.0455  0.0299  0.0578
## 1986 2   2   1   0   0   0   50  0.0038  0.0019  0.0085  0.0019  0.0056  0.0136  0.0193  0.0357  0.016   0.0249  0.0221  0.032   0.071   0.0555  0.0527  0.0635  0.0456  0.0362  0.0259  0.0282
## 1987 2   2   1   0   0   0   50  0.002   0   0.001   0.002   0.005   0.008   0.019   0.0271  0.017   0.022   0.0441  0.0491  0.0401  0.0581  0.0852  0.0812  0.0671  0.0611  0.0511  0.0842
## 1988 2   2   1   0   0   0   43.7    0.0048  0.0048  0.0063  0.0016  0.0032  0   0.0095  0.0174  0.0127  0.0396  0.0523  0.0539  0.0571  0.0634  0.065   0.0887  0.0792  0.0586  0.0349  0.0396
## 1989 2   2   1   0   0   0   50  0.0049  0.0025  0.0019  0.0008  0.0021  0.0021  0.0049  0.0047  0.0098  0.0144  0.0233  0.0373  0.0435  0.0526  0.07    0.0797  0.0787  0.0774  0.0672  0.0895
## 1990 2   2   1   0   0   0   50  0.0052  0.0052  0.0078  0.0017  0.0069  0.0069  0.0225  0.0207  0.038   0.038   0.0225  0.0242  0.0328  0.0484  0.0778  0.0709  0.0691  0.0588  0.0328  0.0674
## 1991 2   2   1   0   0   0   20.8    0.0032  0.0063  0.0032  0.0063  0.0159  0.0127  0.0127  0.0159  0.0317  0.0222  0.0317  0.0286  0.0349  0.019   0.0254  0.0603  0.0444  0.0571  0.0571  0.1714
## 1992 2   2   1   0   0   0   21.4    0.0203  0.0203  0.0203  0.0023  0.0068  0.009   0.0135  0.0023  0.0113  0.0158  0.0203  0.0158  0.0293  0.0293  0.0293  0.045   0.0248  0.036   0.0158  0.1149
```

```
## 1994 2   2   1   0   0   0   33  0.0035  0.0017  0.0035  0.0069  0.0017  0   0   0   0   0   0.0017  0.0017  0.0087  0.0156  0.0208  0.0468  0.0433  0.0572  0.0832  0.2756
## 1995 2   2   1   0   0   0   10.3    0.0072  0.029   0.0145  0.0072  0   0.0072  0   0.0072  0.0072  0.0145  0   0.0145  0.0145  0.0145  0.029   0.0652  0.1232  0.0942  0.0507  0.2464
## 1996 2   2   1   0   0   0   50  0.001   0.0015  0.0025  0.003   0.004   0.009   0.014   0.0156  0.0206  0.0276  0.0346  0.0437  0.0341  0.0482  0.0286  0.0447  0.0301  0.0376  0.0286  0.0853
## 1997 2   2   1   0   0   0   50  0   0   0.0018  0.0018  0.0107  0.022   0.0386  0.054   0.0516  0.051   0.0427  0.0291  0.0315  0.035   0.035   0.0309  0.035   0.0427  0.0475  0.1525
## 1998 2   2   1   0   0   0   50  0.0004  0.0004  0.0004  0   0   0.0008  0.0028  0.0035  0.0067  0.013   0.0268  0.0342  0.0547  0.0625  0.0677  0.0673  0.059   0.059   0.0504  0.1306
## 1999 2   2   1   0   0   0   50  0.002   0.0007  0.001   0.0003  0.0007  0   0.0033  0.0017  0.0023  0.0056  0.0083  0.0212  0.0422  0.0707  0.0953  0.1042  0.0979  0.0803  0.0588  0.1185
## 2000 2   2   1   0   0   0   50  0   0   0.0012  0.0006  0.0006  0.003   0.0042  0.0162  0.0222  0.0258  0.0252  0.0426  0.0372  0.0426  0.036   0.0468  0.0414  0.045   0.048   0.158
## 2001 2   2   1   0   0   0   50  0   0.0001  0.001   0.0006  0.0023  0.0071  0.008   0.0111  0.0192  0.0208  0.0224  0.0211  0.0234  0.0265  0.0312  0.0432  0.0593  0.0607  0.0612  0.2159
## 2002 2   2   1   0   0   0   50  0.0004  0.0004  0.0002  0.0019  0.0012  0.0023  0.0017  0.0025  0.005   0.0105  0.0161  0.0203  0.0287  0.0354  0.0486  0.0536  0.0651  0.0703  0.0753  0.2579
## 2003 2   2   1   0   0   0   50  0.0011  0.0008  0.0034  0.0099  0.0145  0.0149  0.0202  0.0122  0.0103  0.0122  0.0118  0.0251  0.0282  0.037   0.0514  0.0564  0.0556  0.051   0.051   0.1303
## 2004 2   2   1   0   0   0   50  0   0.0003  0.0016  0.0047  0.0028  0.0072  0.0094  0.0225  0.026   0.0232  0.0282  0.0238  0.0244  0.0235  0.0291  0.0429  0.0495  0.0469  0.0429  0.1199
## 2005 2   2   1   0   0   0   50  0.0016  0.0016  0.0016  0.0027  0.003   0.0065  0.0084  0.0155  0.0098  0.013   0.0212  0.0298  0.032   0.0336  0.0331  0.0331  0.0372  0.0388  0.0388  0.131
## 2006 2   2   1   0   0   0   50  0.0006  0   0   0   0.0006  0.0014  0.0023  0.0055  0.0075  0.0179  0.0182  0.0234  0.0254  0.03    0.0413  0.0436  0.043   0.0424  0.0367  0.0878
## 2007 2   2   1   0   0   0   50  0   0.0005  0   0.0009  0.0028  0.0019  0.0028  0.0081  0.009   0.0104  0.0171  0.018   0.0194  0.0356  0.0403  0.0403  0.037   0.0403  0.0565  0.1385
## 2008 2   2   1   0   0   0   50  0.0007  0   0.0003  0.001   0.0024  0.0014  0.0021  0.0041  0.0145  0.0237  0.0299  0.0478  0.0533  0.0478  0.0571  0.0399  0.0506  0.0489  0.0499  0.1669
## 2009 2   2   1   0   0   0   50  0.0004  0.0004  0.0004  0.0017  0.0017  0.0021  0.0021  0.0072  0.0102  0.0111  0.0115  0.0247  0.0353  0.0506  0.0591  0.0778  0.074   0.0604  0.0523  0.1471
## 2010 2   2   1   0   0   0   50  0.0027  0.0034  0.004   0.0027  0.0027  0.006   0.004   0.0074  0.0141  0.0121  0.0161  0.0248  0.0396  0.0389  0.0402  0.0342  0.0288  0.0315  0.0302  0.0892
## 2011 2   2   1   0   0   0   50  0   0   0.0012  0.0031  0.0018  0.0025  0.0018  0.0037  0.0061  0.0043  0.0055  0.0067  0.0116  0.0208  0.0356  0.0349  0.0386  0.0374  0.0337  0.095
## 2012 2   2   1   0   0   0   50  0   0.0003  0.0003  0.0006  0.0012  0.0012  0.0049  0.0074  0.0107  0.0132  0.0218  0.0255  0.0313  0.0328  0.0393  0.0433  0.0387  0.0427  0.0359  0.1114
## 2013 2   2   1   0   0   0   50  0.0069  0.0093  0.0145  0.0241  0.02    0.0176  0.02    0.0205  0.0222  0.0255  0.0266  0.0323  0.0347  0.0308  0.0313  0.0278  0.0281  0.027   0.0258  0.0881
## 2014 2   2   1   0   0   0   50  0.0018  0.0026  0.0037  0.0026  0.0037  0.0053  0.0084  0.0132  0.011   0.0143  0.0192  0.0234  0.0284  0.0269  0.026   0.0419  0.0295  0.0278  0.0262  0.1155
## 2015 2   2   1   0   0   0   50  0.0006  0.001   0.0012  0.0027  0.0062  0.0091  0.011   0.0133  0.0124  0.019   0.0182  0.018   0.0161  0.0166  0.0128  0.0099  0.013   0.0101  0.0097  0.0319
## #Trawl   bycatch female
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1976 2   2   2   0   0   0   50  0   0   0   0   0   0   0.013   0.0087  0.0216  0.026   0.0303  0.0563  0.013   0.026   0.0043  0.026
## 1977 2   2   2   0   0   0   50  0   0.0009  0.0009  0   0   0.0009  0.0026  0.0053  0.007   0.0088  0.0062  0.0053  0.0044  0.0026  0.0009  0.0009
## 1978 2   2   2   0   0   0   50  0   0   0   0   0   0   0   0   0   0   0.0075  0.005   0.0075  0.0262  0.0324  0.061
## 1979 2   2   2   0   0   0   50  0.013   0.0013  0   0   0.0063  0.0038  0.0152  0.0468  0.0354  0.0392  0.0544  0.0215  0.0164  0.0177  0.0013  0.0139
## 1980 2   2   2   0   0   0   50  0.0433  0.016   0.0096  0.0189  0.0281  0.0409  0.0497  0.0472  0.0489  0.0525  0.0362  0.0265  0.0134  0.0081  0.0039  0.004
## 1981 2   2   2   0   0   0   50  0.0612  0.0245  0.0245  0.0437  0.054   0.0608  0.0525  0.0425  0.0315  0.0383  0.0312  0.0267  0.024   0.0158  0.0093  0.0086
## 1982 2   2   2   0   0   0   50  0.0631  0.0235  0.0237  0.0285  0.0379  0.0413  0.0332  0.0246  0.019   0.0177  0.0156  0.0144  0.0104  0.008   0.0034  0.0049
## 1983 2   2   2   0   0   0   50  0.0281  0.0233  0.0351  0.0363  0.0358  0.0407  0.0392  0.0316  0.0222  0.0154  0.01    0.0087  0.0065  0.0042  0.003   0.0041
## 1984 2   2   2   0   0   0   50  0.04    0.0156  0.0155  0.0211  0.0298  0.0344  0.0399  0.0359  0.0287  0.0151  0.0085  0.006   0.0042  0.0031  0.0019  0.0029
## 1985 2   2   2   0   0   0   50  0.0034  0.0013  0.0024  0.0046  0.0096  0.0171  0.0195  0.0193  0.0163  0.0128  0.0119  0.0111  0.0108  0.0057  0.0025  0.0066
## 1986 2   2   2   0   0   0   28.4    0.0038  0.0014  0.0038  0   0.0038  0.0099  0.0329  0.0762  0.063   0.047   0.0494  0.0466  0.0428  0.0202  0.0085  0.0268
## 1987 2   2   2   0   0   0   50  0.002   0.002   0.003   0.01    0.018   0.0311  0.0331  0.0401  0.022   0.0311  0.016   0.0391  0.008   0.008   0.003   0.009
## 1988 2   2   2   0   0   0   27.5    0.0079  0.0143  0.0032  0.0079  0.0063  0.0127  0.0222  0.0349  0.0475  0.0523  0.0396  0.0222  0.0174  0.0079  0.0048  0.0063
## 1989 2   2   2   0   0   0   19.4    0.0028  0.0023  0.0025  0.0047  0.0081  0.0123  0.0212  0.0428  0.0498  0.0477  0.0432  0.0297  0.0252  0.017   0.0064  0.0172
## 1990 2   2   2   0   0   0   50  0.0017  0.0035  0.0078  0.0069  0.0112  0.0112  0.019   0.0268  0.0424  0.038   0.0372  0.0346  0.0251  0.0173  0.0147  0.0449
## 1991 2   2   2   0   0   0   39.6    0   0.0032  0.0063  0.0032  0   0.0063  0.0032  0.0063  0.0254  0.0159  0.0159  0.0349  0.0222  0.054   0.0222  0.1206
## 1992 2   2   2   0   0   0   10.7    0.0045  0   0   0.0023  0.0315  0.0473  0.036   0.036   0.036   0.036   0.0473  0.0608  0.0495  0.0405  0.036   0.0541
## 1994 2   2   2   0   0   0   24.7    0   0.0035  0.0087  0.0295  0.0329  0.0433  0.0295  0.0659  0.0451  0.0173  0.0139  0.0121  0.0139  0.0225  0.0208  0.0693
## 1995 2   2   2   0   0   0   3.5 0.0507  0   0   0.0217  0.0072  0.0217  0.0435  0.0145  0.0217  0   0.0217  0.0072  0.0072  0.0145  0   0.0217
## 1996 2   2   2   0   0   0   50  0.003   0.0005  0.0025  0.007   0.0186  0.0236  0.0181  0.0261  0.0326  0.0482  0.0637  0.0602  0.0487  0.0416  0.0306  0.0607
## 1997 2   2   2   0   0   0   48.3    0   0   0.0006  0.0006  0.0042  0.0101  0.0285  0.0297  0.0469  0.0439  0.0243  0.0184  0.0178  0.0136  0.0101  0.038
## 1998 2   2   2   0   0   0   50  0   0   0.0004  0.0008  0.0012  0.0028  0.0134  0.0389  0.0441  0.033   0.0307  0.024   0.0295  0.0256  0.0319  0.0838
## 1999 2   2   2   0   0   0   50  0   0   0.0007  0.0003  0.0003  0.0007  0.0013  0.0066  0.0166  0.0322  0.0408  0.0365  0.0295  0.0259  0.0206  0.0727
## 2000 2   2   2   0   0   0   50  0   0   0   0.0018  0.0018  0.0042  0.0078  0.0138  0.0114  0.0228  0.0402  0.0547  0.0462  0.0432  0.039   0.1159
## 2001 2   2   2   0   0   0   50  0.0003  0.0001  0.0003  0.0014  0.0036  0.0062  0.0126  0.0169  0.0159  0.0189  0.0362  0.0615  0.0554  0.0343  0.027   0.0739
## 2002 2   2   2   0   0   0   50  0.0006  0.0008  0.0008  0.0006  0.0008  0.0025  0.0035  0.0087  0.0167  0.0165  0.013   0.0242  0.0349  0.036   0.0378  0.105
## 2003 2   2   2   0   0   0   50  0.0008  0.0019  0.0019  0.0118  0.0194  0.0156  0.0107  0.0088  0.0156  0.0225  0.0297  0.0335  0.0339  0.0453  0.0434  0.1078
## 2004 2   2   2   0   0   0   50  0.0003  0.0003  0.0016  0.0025  0.0041  0.0106  0.0182  0.0307  0.0285  0.026   0.0444  0.0413  0.0435  0.041   0.0426  0.1358
## 2005 2   2   2   0   0   0   50  0.0003  0.0024  0.003   0.0016  0.0033  0.0087  0.0138  0.0269  0.0393  0.0485  0.038   0.0393  0.0499  0.0407  0.0374  0.1546
## 2006 2   2   2   0   0   0   50  0.0003  0   0.0003  0.0003  0.002   0.004   0.0092  0.024   0.0456  0.0722  0.0707  0.0661  0.0494  0.0372  0.03    0.1611
## 2007 2   2   2   0   0   0   50  0   0.0005  0.0019  0.0019  0.0028  0.0109  0.0194  0.0337  0.038   0.0541  0.0731  0.0764  0.0593  0.046   0.0289  0.0735
## 2008 2   2   2   0   0   0   50  0.0003  0.0007  0.0007  0.001   0.0038  0.0045  0.0096  0.0182  0.0365  0.0296  0.0399  0.0427  0.0502  0.031   0.0224  0.0664
## 2009 2   2   2   0   0   0   50  0.0004  0.0004  0.0013  0.0009  0.0021  0.0089  0.02    0.0327  0.0327  0.0272  0.0293  0.0315  0.0442  0.0378  0.0289  0.0714
## 2010 2   2   2   0   0   0   50  0.0007  0.0007  0.0007  0.002   0.004   0.0087  0.0188  0.0268  0.0436  0.0503  0.0698  0.0698  0.0691  0.049   0.0456  0.108
## 2011 2   2   2   0   0   0   50  0   0.0018  0.0018  0.0086  0.008   0.0147  0.0239  0.027   0.0478  0.0546  0.0846  0.0785  0.0687  0.0558  0.0423  0.1373
## 2012 2   2   2   0   0   0   50  0   0   0.0009  0.0025  0.0021  0.0123  0.0215  0.0279  0.0322  0.0347  0.0338  0.0546  0.066   0.0632  0.0629  0.123
## 2013 2   2   2   0   0   0   50  0.0054  0.0102  0.0214  0.0252  0.0235  0.0236  0.0249  0.0321  0.0354  0.0279  0.0251  0.0238  0.0293  0.0409  0.0327  0.0854
## 2014 2   2   2   0   0   0   50  0.0022  0.0057  0.0048  0.0015  0.0042  0.0057  0.0095  0.0225  0.0425  0.0524  0.0485  0.0483  0.0487  0.0535  0.0582  0.1602
## 2015 2   2   2   0   0   0   50  0.0002  0.0004  0.0004  0.0046  0.0095  0.0145  0.0251  0.0516  0.071   0.0849  0.1029  0.1004  0.0729  0.0528  0.0557  0.1201
## #Tanner  crab    bycatch Male
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1991 2   3   1   0   0   0   50  0.009   0.0169  0.0102  0.0147  0.0181  0.0147  0.0361  0.0497  0.0508  0.0384  0.0553  0.0587  0.0632  0.0937  0.1016  0.0801  0.0734  0.07    0.0587  0.0869
## 1992 2   3   1   0   0   0   50  0   0   0.0036  0.0107  0.0393  0.0571  0.0893  0.0821  0.0893  0.1036  0.0929  0.0929  0.0643  0.0429  0.05    0.0179  0.0357  0.0464  0.025   0.0571
## 1993 2   3   1   0   0   0   50  0   0   0   0   0.0086  0.0043  0.056   0.1034  0.125   0.1422  0.0991  0.0603  0.056   0.0776  0.056   0.0474  0.0647  0.0302  0.0216  0.0474
## 2013 2   3   1   0   0   0   50  0   0.0046  0   0   0   0.0321  0.0275  0.0505  0.0688  0.1468  0.0734  0.1101  0.0642  0.0734  0.0321  0.0826  0.0459  0.0367  0.0505  0.1009
## 2014 2   3   1   0   0   0   50  0   0   0.0039  0   0.0195  0.0195  0.0313  0.0469  0.0391  0.0781  0.0547  0.0664  0.0781  0.1016  0.1016  0.0625  0.0859  0.0625  0.043   0.1055
## 2015 2   3   1   0   0   0   50  0.0069  0.0152  0.0069  0.0096  0.0716  0.0978  0.0702  0.0455  0.0606  0.0799  0.0854  0.0468  0.0344  0.0262  0.0482  0.0413  0.0537  0.0565  0.0592  0.084
## #Tanner  crab    bycatch female
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1991 2   3   2   0   0   0   50  0.0073  0.015   0.0136  0.0145  0.0341  0.0464  0.0795  0.065   0.1177  0.1627  0.1591  0.1341  0.0768  0.0377  0.0264  0.01
## 1992 2   3   2   0   0   0   50  0   0   0.0015  0.0088  0.0321  0.0642  0.1153  0.1314  0.1226  0.0759  0.1095  0.1401  0.092   0.0569  0.0321  0.0175
## 1993 2   3   2   0   0   0   50  0   0   0   0   0.0075  0.0642  0.1547  0.2113  0.1509  0.0679  0.0755  0.0755  0.1057  0.0491  0.0226  0.0151
## 2013 2   3   2   0   0   0   50  0   0   0   0   0   0.0302  0.0688  0.2466  0.1963  0.1057  0.0638  0.0755  0.0503  0.0889  0.0319  0.0419
## 2014 2   3   2   0   0   0   50  0   0   0.0026  0.0052  0.0184  0.0367  0.0787  0.0919  0.2388  0.2651  0.0971  0.0446  0.0367  0.0184  0.0289  0.0367
## 2015 2   3   2   0   0   0   50  0.0005  0.0018  0.0037  0.0069  0.0319  0.0462  0.0851  0.1378  0.1923  0.1489  0.123   0.092   0.0499  0.0268  0.0227  0.0305
## # Fixed gear crab    bycatch Male
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 2009 2   4   1   0   0   0   50  0   0   0   0   0.0009  0.0009  0.0009  0.0101  0.0129  0.0129  0.0129  0.0202  0.0395  0.0606  0.0634  0.1093  0.0817  0.0735  0.0542  0.1166
## 2010 2   4   1   0   0   0   50  0.0073  0.0091  0.0073  0.0036  0.0036  0.0073  0.0055  0   0.0073  0.0036  0.0109  0.0146  0.0255  0.0255  0.0201  0.0182  0.0164  0.0274  0.0182  0.0456
## 2011 2   4   1   0   0   0   50  0   0   0.0008  0.0017  0   0.0025  0.0017  0.0025  0.0042  0.0025  0.005   0.0067  0.0076  0.0185  0.0302  0.0235  0.0302  0.0285  0.0302  0.0865
## 2012 2   4   1   0   0   0   50  0   0   0.0003  0.0007  0.0013  0.001   0.0047  0.0074  0.0114  0.0138  0.0225  0.0269  0.0316  0.0323  0.0377  0.0444  0.0377  0.0417  0.034   0.1056
## 2013 2   4   1   0   0   0   50  0.0073  0.0097  0.0153  0.0253  0.021   0.0185  0.0211  0.0215  0.0232  0.0264  0.0275  0.0327  0.034   0.0303  0.03    0.0265  0.0272  0.0256  0.025   0.0798
## 2014 2   4   1   0   0   0   50  0.0019  0.0026  0.004   0.0026  0.0033  0.0054  0.0089  0.0128  0.0121  0.0145  0.0191  0.0238  0.0285  0.0261  0.0233  0.039   0.0287  0.0273  0.025   0.1102
## 2015 2   4   1   0   0   0   50  0.0007  0.0011  0.0007  0.0022  0.0063  0.0098  0.0107  0.013   0.0125  0.0192  0.0177  0.017   0.015   0.0143  0.011   0.0076  0.0103  0.0083  0.0074  0.0262
## # Fixed gear crab    bycatch female
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 2009 2   4   2   0   0   0   50  0   0   0   0   0   0.0028  0.0147  0.0184  0.022   0.0294  0.034   0.0312  0.0487  0.0395  0.0239  0.0652
## 2010 2   4   2   0   0   0   50  0   0   0   0.0036  0.0036  0.0036  0.0109  0.0201  0.0657  0.0657  0.0912  0.1058  0.1077  0.062   0.0584  0.1241
## 2011 2   4   2   0   0   0   50  0   0.0025  0.0008  0.0067  0.0076  0.0176  0.0202  0.0336  0.0579  0.0663  0.0999  0.0907  0.0739  0.0638  0.0428  0.1327
## 2012 2   4   2   0   0   0   50  0   0   0.001   0.0027  0.002   0.0104  0.0215  0.0262  0.034   0.0346  0.034   0.0572  0.0669  0.0649  0.0659  0.1237
## 2013 2   4   2   0   0   0   50  0.0056  0.0108  0.0224  0.0266  0.0243  0.0245  0.0249  0.0316  0.0354  0.0272  0.0251  0.0241  0.0296  0.0412  0.0334  0.0853
## 2014 2   4   2   0   0   0   50  0.0023  0.0061  0.0049  0.0014  0.0042  0.0056  0.0084  0.0229  0.0423  0.0537  0.0497  0.0502  0.0511  0.056   0.0598  0.1623
## 2015 2   4   2   0   0   0   50  0.0002  0.0002  0.0002  0.0045  0.0072  0.0132  0.0228  0.0512  0.0745  0.0879  0.1082  0.1064  0.0767  0.0557  0.0586  0.1216
## #NMFS    males   combined
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1975 1   5   1   0   0   0   200 0.0222  0.0411  0.02989 0.03787 0.0342  0.02994 0.03088 0.02457 0.02643 0.03137 0.02677 0.0292  0.02836 0.02734 0.02444 0.02701 0.01831 0.0134  0.00972 0.01126
## 1976 1   5   1   0   0   0   200 0.00254 0.01272 0.02684 0.05025 0.06225 0.05223 0.05591 0.04486 0.03916 0.0329  0.04085 0.04379 0.03693 0.03915 0.03351 0.02212 0.02358 0.01543 0.00699 0.0077
## 1977 1   5   1   0   0   0   200 0.00401 0.00427 0.00653 0.01018 0.01985 0.03762 0.04525 0.04405 0.04137 0.04496 0.04091 0.04094 0.03108 0.03237 0.03221 0.02589 0.01664 0.01399 0.00839 0.01207
## 1978 1   5   1   0   0   0   200 0.00429 0.01195 0.01361 0.02401 0.01724 0.01906 0.01783 0.0279  0.02956 0.02974 0.03003 0.03035 0.02906 0.03665 0.03463 0.02826 0.02601 0.01728 0.01084 0.0091
## 1979 1   5   1   0   0   0   200 0.02058 0.01543 0.01033 0.01232 0.0144  0.01627 0.01369 0.01548 0.01636 0.01566 0.02351 0.03377 0.03325 0.04324 0.04149 0.03777 0.03592 0.02977 0.0136  0.02353
## 1980 1   5   1   0   0   0   200 0.00673 0.01333 0.03758 0.02873 0.02951 0.02964 0.02645 0.02622 0.02244 0.01916 0.02082 0.01647 0.02307 0.0251  0.02637 0.03781 0.02664 0.02678 0.02163 0.03565
## 1981 1   5   1   0   0   0   200 0.01595 0.01131 0.01823 0.02395 0.0366  0.03616 0.03305 0.03673 0.02909 0.03556 0.02605 0.02846 0.0194  0.02207 0.01557 0.01448 0.01123 0.01057 0.0085  0.0176
## 1982 1   5   1   0   0   0   200 0.07924 0.08112 0.06821 0.02867 0.02399 0.031   0.03527 0.02872 0.01973 0.0171  0.01983 0.01411 0.01306 0.00791 0.00658 0.00433 0.00394 0.00053 0.00041 0.00176
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## 1983 1   5   1   0   0   0   200 0.03252 0.03556 0.0497  0.06649 0.08005 0.07825 0.05982 0.04681 0.04016 0.03975 0.03202 0.03089 0.01901 0.01192 0.01067 0.00368 0.0025  0.00123 0   0
## 1984 1   5   1   0   0   0   200 0.01605 0.0626  0.12287 0.13271 0.06822 0.03886 0.02064 0.02018 0.02078 0.01535 0.01185 0.00719 0.00632 0.00501 0.00652 0.00209 0.00087 0.00089 0.0001  0.0003
## 1985 1   5   1   0   0   0   200 0.00261 0.01279 0.02442 0.03954 0.0589  0.05817 0.04235 0.04026 0.06015 0.06139 0.05132 0.05231 0.0497  0.04183 0.02794 0.02374 0.00176 0.0051  0.00415 0
## 1986 1   5   1   0   0   0   200 0.01118 0.01788 0.0248  0.0201  0.02318 0.01563 0.04079 0.04    0.05588 0.04852 0.06746 0.07339 0.07    0.07875 0.05634 0.03848 0.02745 0.00733 0.00293 0.00232
## 1987 1   5   1   0   0   0   200 0.00124 0.00707 0.03402 0.05458 0.04693 0.03171 0.02904 0.0291  0.03095 0.02534 0.0332  0.02702 0.03627 0.03448 0.02896 0.0284  0.01826 0.01539 0.0038  0.00394
## 1988 1   5   1   0   0   0   200 0.00132 0.00131 0.00661 0.01098 0.01329 0.02154 0.04687 0.04304 0.04045 0.03737 0.02619 0.03082 0.02097 0.03712 0.03305 0.04953 0.03683 0.02677 0.00944 0.00926
## 1989 1   5   1   0   0   0   200 0.00165 0    0.00089 0.0024  0.01493 0.03477 0.01836 0.03764 0.02324 0.04118 0.02877 0.02534 0.04499 0.05229 0.0535  0.06652 0.04826 0.04662 0.02825 0.0278
## 1990 1   5   1   0   0   0   200 0.00127 0.01061 0.01509 0.03475 0.03294 0.00938 0.00797 0.0084  0.0182  0.02957 0.02192 0.02978 0.03407 0.04012 0.03692 0.03824 0.02986 0.03439 0.01955 0.03424
## 1991 1   5   1   0   0   0   200 0.00105 0.00895 0.02235 0.01675 0.02654 0.02168 0.01373 0.02739 0.02213 0.01724 0.00529 0.01977 0.03468 0.03637 0.05878 0.06743 0.06583 0.04824 0.03692 0.07566
## 1992 1   5   1   0   0   0   200 0.001   0    0.00202 0.01271 0.0252  0.0355  0.0552  0.05277 0.03818 0.03993 0.02909 0.03781 0.03483 0.02803 0.02336 0.02333 0.02188 0.03065 0.01685 0.04963
## 1993 1   5   1   0   0   0   200 0.00209 0.01099 0.01366 0.01049 0.00954 0.01568 0.01418 0.02352 0.03089 0.04425 0.04172 0.06268 0.04792 0.03903 0.03712 0.02688 0.02882 0.02978 0.02424 0.04112
## 1994 1   5   1   0   0   0   200 0.00162 0    0.00309 0.0237  0.02348 0.01516 0.01236 0.01733 0.02131 0.03537 0.04122 0.0403  0.06273 0.09071 0.0474  0.04612 0.0468  0.03273 0.02294 0.0504
## 1995 1   5   1   0   0   0   200 0.02826 0.06829 0.05574 0.02203 0.01101 0.01691 0.02219 0.02553 0.02748 0.03046 0.02626 0.02679 0.03434 0.04021 0.04902 0.04328 0.0323  0.02377 0.01076 0.02615
## 1996 1   5   1   0   0   0   200 0.02781 0.01354 0.0298  0.05291 0.06316 0.05938 0.02756 0.02249 0.0117  0.01786 0.01403 0.01501 0.01394 0.01298 0.02177 0.01647 0.01903 0.01714 0.01827 0.02521
## 1997 1   5   1   0   0   0   200 0    0.00357 0.00221 0.00519 0.0127  0.05636 0.09427 0.10698 0.09097 0.05154 0.03012 0.01617 0.01488 0.01321 0.0142  0.01683 0.02337 0.01681 0.01731 0.04015
## 1998 1   5   1   0   0   0   200 0.02085 0.01739 0.01031 0.01272 0.012   0.01014 0.01345 0.01689 0.02263 0.04666 0.04852 0.05232 0.04513 0.02907 0.01832 0.01525 0.01955 0.01348 0.00795 0.0245
## 1999 1   5   1   0   0   0   200 0.05828 0.02442 0.01336 0.01038 0.01196 0.011   0.01214 0.01479 0.00468 0.01322 0.01815 0.0233  0.05204 0.05362 0.07004 0.06879 0.0435  0.03029 0.02206 0.02521
## 2000 1   5   1   0   0   0   200 0.00176 0.00474 0.01949 0.03958 0.03102 0.01998 0.02277 0.0163  0.02006 0.01468 0.01341 0.02961 0.02941 0.04894 0.04161 0.03597 0.03427 0.02291 0.00849 0.01964
## 2001 1   5   1   0   0   0   200 0.00689 0.00496 0.01061 0.0149  0.0156  0.04209 0.03715 0.05234 0.03461 0.01999 0.02533 0.01664 0.01396 0.02016 0.01317 0.01116 0.02189 0.01912 0.01921 0.03269
## 2002 1   5   1   0   0   0   200 0.05335 0.06381 0.0436  0.02723 0.01193 0.00907 0.0076  0.01062 0.02292 0.02661 0.03474 0.02903 0.02025 0.02516 0.017   0.01934 0.01948 0.02216 0.02415 0.0274
## 2003 1   5   1   0   0   0   200 0.01486 0.00685 0.01419 0.02363 0.0392  0.03203 0.03006 0.01646 0.01123 0.0143  0.01328 0.02506 0.02357 0.03856 0.03481 0.03639 0.02539 0.02164 0.0212  0.06663
## 2004 1   5   1   0   0   0   200 0.03708 0.0289  0.02678 0.01954 0.01866 0.01866 0.03499 0.05351 0.0436  0.04447 0.0293  0.02382 0.01419 0.01504 0.01787 0.02321 0.02404 0.03267 0.02318 0.04471
## 2005 1   5   1   0   0   0   200 0.03525 0.05861 0.04185 0.01599 0.00976 0.02277 0.02344 0.02146 0.01842 0.01713 0.02186 0.02326 0.01588 0.01891 0.01249 0.01583 0.01033 0.01545 0.01437 0.02521
## 2006 1   5   1   0   0   0   200 0.01329 0.01974 0.01728 0.02762 0.02908 0.03689 0.02097 0.02077 0.01289 0.01877 0.01161 0.01284 0.02359 0.0205  0.03294 0.02798 0.02711 0.01995 0.01444 0.02461
## 2007 1   5   1   0   0   0   200 0.00173 0.00247 0.00532 0.00836 0.01964 0.02711 0.03454 0.04364 0.03857 0.02876 0.01874 0.0233  0.02355 0.03147 0.02728 0.02875 0.02769 0.0262  0.0229  0.02895
## 2008 1   5   1   0   0   0   200 0    0.0008  0.00379 0.00678 0.01489 0.01878 0.01944 0.02393 0.03722 0.04701 0.04531 0.03278 0.03824 0.03168 0.02488 0.02263 0.02421 0.02358 0.02219 0.04671
## 2009 1   5   1   0   0   0   200 0.00095 0.00048 0.00369 0.00525 0.00531 0.01037 0.00964 0.02253 0.03295 0.03007 0.03151 0.03278 0.03626 0.04786 0.03122 0.03289 0.01979 0.0163  0.01483 0.01688
## 2010 1   5   1   0   0   0   200 0    0.00334 0.00802 0.00943 0.00774 0.00538 0.01608 0.01344 0.01296 0.01527 0.02697 0.0363  0.0302  0.03253 0.03672 0.03475 0.0423  0.02624 0.01454 0.01999
## 2011 1   5   1   0   0   0   200 0.00364 0.00437 0.01248 0.02043 0.01686 0.0138  0.01677 0.01505 0.01821 0.0132  0.01805 0.02026 0.01612 0.02952 0.02745 0.02573 0.02416 0.02042 0.01154 0.01646
## 2012 1   5   1   0   0   0   200 0.00247 0.00398 0.01202 0.01593 0.01281 0.0227  0.03362 0.02474 0.01742 0.01742 0.01532 0.01955 0.02169 0.02644 0.02341 0.02094 0.02315 0.02811 0.01318 0.04342
## 2013 1   5   1   0   0   0   200 0.00082 0.00253 0.01232 0.01451 0.01006 0.01741 0.01341 0.02352 0.02798 0.02607 0.03226 0.03482 0.03028 0.03192 0.03436 0.03244 0.03397 0.04308 0.03945 0.07491
## 2014 1   5   1   0   0   0   200 0    0.00046 0.00259 0.003   0.01598 0.03132 0.04368 0.03479 0.03127 0.0192  0.02307 0.03258 0.03357 0.03086 0.03724 0.0258  0.02237 0.01888 0.01799 0.04393
## 2015 1   5   1   0   0   0   200 0.01049 0.02068 0.01027 0.00933 0.00465 0.01101 0.01577 0.01488 0.02441 0.01865 0.02854 0.02032 0.0235  0.03182 0.02404 0.03383 0.03129 0.02818 0.02777 0.07956
## 2016 1   5   1   0   0   0   200 0.00664 0.00092 0.00263 0.00322 0.00414 0.00426 0.00337 0.00833 0.00688 0.01293 0.00853 0.01452 0.01273 0.02535 0.01953 0.02134 0.02405 0.0389  0.03242 0.07093
## #NMFS    female
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 1975 1   5   2   0   0   0   200 0.0331  0.04013 0.04814 0.04942 0.05635 0.04386 0.04444 0.04537 0.03261 0.02886 0.01624 0.01581 0.01159 0.00351 0.0029  0.00337
## 1976 1   5   2   0   0   0   200 0.00292 0.00922 0.03134 0.05633 0.0688  0.06279 0.04944 0.02692 0.01213 0.01368 0.00663 0.0049  0.00231 0.00151 0.00028 0.00109
## 1977 1   5   2   0   0   0   200 0.00256 0.00677 0.00793 0.01932 0.03367 0.07011 0.08076 0.07146 0.04525 0.04354 0.0415  0.03157 0.0151  0.01004 0.00328 0.00458
## 1978 1   5   2   0   0   0   200 0.00604 0.0111  0.01868 0.02009 0.0233  0.04183 0.09199 0.12124 0.07912 0.04404 0.0301  0.02673 0.01757 0.00889 0.00446 0.00745
## 1979 1   5   2   0   0   0   200 0.02855 0.01536 0.01209 0.01473 0.01478 0.02297 0.03813 0.0734  0.09219 0.08763 0.0565  0.03363 0.02145 0.01228 0.00425 0.00571
## 1980 1   5   2   0   0   0   200 0.00479 0.02191 0.03221 0.02922 0.05972 0.08196 0.04872 0.05811 0.054   0.04236 0.03153 0.01303 0.01096 0.00587 0.00348 0.00201
## 1981 1   5   2   0   0   0   200 0.01521 0.01126 0.01507 0.01897 0.03662 0.04562 0.04427 0.04722 0.05995 0.07744 0.08035 0.05095 0.02524 0.01431 0.0028  0.00415
## 1982 1   5   2   0   0   0   200 0.05357 0.09537 0.06029 0.03784 0.04226 0.04818 0.03978 0.02321 0.01896 0.02571 0.02813 0.02027 0.01141 0.00625 0.00238 0.00086
## 1983 1   5   2   0   0   0   200 0.01741 0.0383  0.04749 0.06292 0.06466 0.03981 0.03406 0.01518 0.01068 0.00422 0.00904 0.00563 0.00605 0.00222 0.00129 0
## 1984 1   5   2   0   0   0   200 0.01741 0.05854 0.12291 0.11051 0.06465 0.03249 0.01589 0.01191 0.00379 0.00166 0    0.00041 0.0001  0.0002  0.00009 0
## 1985 1   5   2   0   0   0   200 0.00086 0.01548 0.03765 0.05212 0.0643  0.05553 0.05156 0.03973 0.01606 0.00681 0   0   0.00149 0   0   0
## 1986 1   5   2   0   0   0   183.5   0.01237 0.02244 0.03547 0.02742 0.02628 0.03133 0.03617 0.03878 0.0274  0.01125 0.00715 0.00079 0   0   0.00076 0
## 1987 1   5   2   0   0   0   200 0.00132 0.01236 0.0525  0.09184 0.0761  0.04624 0.04448 0.05692 0.04138 0.02915 0.01788 0.00791 0.00183 0.00041 0   0
## 1988 1   5   2   0   0   0   200 0.00059 0.00764 0.00644 0.00617 0.01394 0.06945 0.09103 0.09785 0.06971 0.06    0.04068 0.01837 0.0077  0.00766 0   0
## 1989 1   5   2   0   0   0   200 0.00165 0    0.00171 0.00818 0.03103 0.07404 0.06458 0.06919 0.05312 0.03764 0.03146 0.01943 0.00643 0.00413 0   0
## 1990 1   5   2   0   0   0   200 0.00405 0.00521 0.02352 0.0513  0.05251 0.00709 0.0256  0.06012 0.0732  0.0708  0.06333 0.04095 0.02151 0.00616 0.00369 0.0037
## 1991 1   5   2   0   0   0   200 0.00415 0.0115  0.01956 0.03195 0.0218  0.03443 0.03426 0.03095 0.03663 0.03294 0.02808 0.0431  0.02323 0.01104 0.00689 0.00269
## 1992 1   5   2   0   0   0   180 0    0.00534 0.00737 0.01974 0.03642 0.04139 0.06251 0.04481 0.03529 0.02733 0.04503 0.04068 0.02651 0.02118 0.01619 0.01224
## 1993 1   5   2   0   0   0   200 0.00655 0.008   0.01751 0.00849 0.01309 0.02482 0.04371 0.06474 0.06388 0.02686 0.02996 0.02676 0.02709 0.04448 0.01754 0.02194
## 1994 1   5   2   0   0   0   133 0    0.0016  0.00443 0.00296 0.01685 0.00917 0.0124  0.02131 0.04312 0.0416  0.03619 0.02802 0.03953 0.04689 0.02916 0.03206
## 1995 1   5   2   0   0   0   200 0.02942 0.04821 0.03155 0.01453 0.01391 0.01824 0.01628 0.02535 0.02343 0.03343 0.02724 0.02335 0.02398 0.0145  0.02031 0.01547
## 1996 1   5   2   0   0   0   200 0.02595 0.02186 0.04362 0.0794  0.07958 0.04357 0.02255 0.02176 0.02451 0.02017 0.01611 0.02847 0.02443 0.01563 0.00871 0.02361
## 1997 1   5   2   0   0   0   200 0.00043 0.00367 0.00162 0.00201 0.0146  0.07907 0.09694 0.06164 0.02119 0.01367 0.00948 0.01455 0.01427 0.01092 0.00836 0.02077
## 1998 1   5   2   0   0   0   200 0.0145  0.0196  0.01006 0.00876 0.01105 0.01161 0.03029 0.10399 0.1153  0.05939 0.03029 0.02522 0.0225  0.02353 0.02319 0.03361
## 1999 1   5   2   0   0   0   200 0.02426 0.01691 0.0125  0.01148 0.00435 0.00547 0.00925 0.0164  0.05117 0.07996 0.05828 0.03579 0.03397 0.01988 0.01227 0.02683
## 2000 1   5   2   0   0   0   200 0.00175 0.00672 0.02685 0.04027 0.03573 0.02718 0.02545 0.02263 0.03583 0.05235 0.06757 0.06028 0.04188 0.02084 0.0167  0.04334
## 2001 1   5   2   0   0   0   200 0.0056  0.01683 0.01951 0.01361 0.02585 0.05984 0.07787 0.05792 0.03945 0.03981 0.02909 0.06914 0.056   0.02621 0.01028 0.02048
## 2002 1   5   2   0   0   0   200 0.05063 0.07685 0.04852 0.02466 0.02215 0.01761 0.02247 0.05199 0.0399  0.02964 0.0163  0.02059 0.02046 0.02206 0.00712 0.0136
## 2003 1   5   2   0   0   0   200 0.01634 0.00586 0.01433 0.03142 0.04137 0.04644 0.02385 0.02915 0.03511 0.05333 0.05263 0.0356  0.02189 0.02647 0.02196 0.03492
## 2004 1   5   2   0   0   0   200 0.02787 0.0327  0.01935 0.01322 0.01994 0.03692 0.05771 0.05139 0.03339 0.02035 0.01956 0.0232  0.01836 0.01662 0.01266 0.02251
## 2005 1   5   2   0   0   0   200 0.04054 0.0561  0.04573 0.01155 0.00988 0.0336  0.03861 0.05206 0.05668 0.04675 0.03355 0.03825 0.03468 0.02272 0.01648 0.02455
## 2006 1   5   2   0   0   0   200 0.01429 0.01386 0.01981 0.04248 0.06153 0.04621 0.02542 0.02591 0.04811 0.06555 0.06186 0.04148 0.03012 0.0352  0.01666 0.01864
## 2007 1   5   2   0   0   0   200 0.00152 0.00227 0.00641 0.00782 0.01546 0.03563 0.05737 0.05603 0.0325  0.05699 0.06137 0.06413 0.04591 0.03429 0.02104 0.0323
## 2008 1   5   2   0   0   0   200 0    0.00267 0.00538 0.01359 0.01158 0.01666 0.03027 0.05696 0.07237 0.05603 0.05546 0.05617 0.05754 0.03547 0.02343 0.02157
## 2009 1   5   2   0   0   0   200 0.00046 0.00189 0.00503 0.00549 0.00814 0.01218 0.02057 0.04661 0.06559 0.08662 0.06446 0.06028 0.05226 0.0705  0.05137 0.04697
## 2010 1   5   2   0   0   0   200 0.00184 0.00058 0.00373 0.0048  0.00685 0.01163 0.02131 0.03645 0.05649 0.0927  0.09548 0.07004 0.05089 0.0497  0.05075 0.05452
## 2011 1   5   2   0   0   0   200 0.00577 0.00845 0.0092  0.01412 0.02842 0.03104 0.03835 0.04841 0.02992 0.053   0.06374 0.09051 0.06345 0.05714 0.04303 0.07095
## 2012 1   5   2   0   0   0   200 0.02925 0.01803 0.0191  0.02495 0.02805 0.04611 0.03514 0.02198 0.03313 0.03551 0.03653 0.04609 0.06625 0.05206 0.04621 0.06328
## 2013 1   5   2   0   0   0   200 0.00081 0.00269 0.00929 0.01117 0.00669 0.01248 0.02018 0.03841 0.04287 0.04496 0.03041 0.03016 0.04553 0.04914 0.04049 0.07861
## 2014 1   5   2   0   0   0   200 0   0   0.00122 0.00395 0.00909 0.02582 0.02188 0.03196 0.04992 0.07704 0.05691 0.04559 0.0307  0.03987 0.0516  0.0859
## 2015 1   5   2   0   0   0   200 0.00736 0.01285 0.01098 0.00549 0.01195 0.01136 0.01067 0.02344 0.04079 0.04609 0.06164 0.06684 0.05313 0.05034 0.03618 0.08192
## 2016 1   5   2   0   0   0   200 0.01201 0.00186 0.00358 0.00425 0.00258 0.00511 0.01429 0.01409 0.03897 0.07143 0.07817 0.10231 0.07368 0.0823  0.06165 0.11576
## #BSFRF   males
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 2007 1   6   1   0   0   0   628 0.0045  0.0074  0.0103  0.0155  0.0198  0.0321  0.0532  0.0491  0.0443  0.0354  0.0268  0.0231  0.0236  0.0256  0.0223  0.032   0.0246  0.0218  0.017   0.0278
## 2008 1   6   1   0   0   0   907 0.0017  0.001   0.0093  0.0119  0.0175  0.0279  0.0267  0.0348  0.0428  0.0596  0.0581  0.0455  0.0371  0.0284  0.0218  0.0211  0.0156  0.0157  0.0202  0.0294
## 2013 1   6   1   0   0   0   190 0    0.0073  0.0145  0.0291  0.0102  0.0136  0.0205  0.0341  0.0357  0.0458  0.0448  0.0383  0.042   0.0348  0.0206  0.0149  0.0337  0.0426  0.0358  0.0986
## 2014 1   6   1   0   0   0   218 0   0   0.003   0.0101  0.0118  0.0448  0.0546  0.0423  0.047   0.0164  0.0221  0.0321  0.0226  0.0369  0.022   0.0282  0.0257  0.026   0.0116  0.039
## 2015 1   6   1   0   0   0   212 0.0208  0.0463  0.037   0.0162  0.0069  0.0162  0.0119  0.0174  0.0355  0.0206  0.0274  0.0357  0.0228  0.0262  0.0131  0.0428  0.0215  0.0327  0.0396  0.0627
## 2016 1   6   1   0   0   0   112 0.0121  0.0065  0.0175  0.0169  0.015   0.0135  0.0056  0.0138  0.0085  0.0091  0.006   0.0118  0.0179  0.0144  0.0127  0.0222  0.0247  0.0188  0.0248  0.0769
## #BSFRF   females
## #Year    Season  Fleet   Sex Type    Shell   Maturity    Nsamp   DataVec
## 2007 1   6   2   0   0   0   623 0.0007  0.0016  0.0044  0.0198  0.0302  0.0705  0.0563  0.0345  0.0364  0.0493  0.0501  0.0448  0.0272  0.0183  0.0152  0.0243  #0  0   0   0
## 2008 1   6   2   0   0   0   796 0.0004  0.0013  0.0088  0.0142  0.0286  0.0483  0.0754  0.0687  0.0463  0.0386  0.0411  0.0357  0.021   0.0179  0.0126  0.015   #0  0   0   0
## 2013 1   6   2   0   0   0   113 0.0035  0   0.0191  0.0258  0.0176  0.0105  0.0094  0.0407  0.024   0.0291  0.0308  0.0216  0.0232  0.0403  0.0392  0.0483  #0  0   0   0
## 2014 1   6   2   0   0   0   205 0    0.0037  0.0071  0.0037  0.014   0.031   0.0238  0.0415  0.0457  0.0708  0.0481  0.0279  0.0385  0.0448  0.0324  0.0707  #0  0   0   0
## 2015 1   6   2   0   0   0   183 0.0116  0.0324  0.0231  0.0069  0.0153  0.0112  0.0042  0.0231  0.0361  0.0358  0.0427  0.0364  0.0528  0.0366  0.0208  0.0575  #0  0   0   0
## 2016 1   6   2   0   0   0   232 0.0034  0.0156  0.0034  0.026   0.0057  0.0137  0.017   0.0177  0.043   0.0509  0.0904  0.1004  0.066   0.0725  0.0376  0.1008  #0  0   0   0
## ##    Growth  data    (increment)
## #     nobs_growth
## 40
## ##    Note    SM  used    loewss  regression  for males   BBRKC   data
## ##    and cubic   spine   to  interpolate 3   sets    of  female  BBRKC   data
## #     MidPoint    Sex Increment   CV
## 67.5 2   14.766667   0.2
## 72.5 2   13.333333   0.2
## 77.5 2   11.866667   0.2
## 82.5 2   10.233333   0.2
## 87.5 2   9   0.2
## 92.5 2   7.866667    0.2
## 97.5 2   7.066667    0.2
```

```
## 102.5    2   6.433333    0.2
## 107.5    2   5.933333    0.2
## 112.5    2   5.433333    0.2
## 117.5    2   4.933333    0.2
## 122.5    2   4.433333    0.2
## 127.5    2   3.933333    0.2
## 132.5    2   3.466667    0.2
## 137.5    2   3.033333    0.2
## 142.5    2   2.533333    0.2
## 147.5    2   2.033333    0.2
## 152.5    2   1.533333    0.2
## 157.5    2   1.033333    0.2
## 162.5    2   0.6 0.2
## 67.5 1   16.510674   0.2
## 72.5 1   16.454438   0.2
## 77.5 1   16.398615   0.2
## 82.5 1   16.343118   0.2
## 87.5 1   16.287715   0.2
## 92.5 1   16.23213    0.2
## 97.5 1   16.176368   0.2
## 102.5    1   16.123732   0.2
## 107.5    1   16.069744   0.2
## 112.5    1   16.013906   0.2
## 117.5    1   15.957058   0.2
## 122.5    1   15.900084   0.2
## 127.5    1   15.843143   0.2
## 132.5    1   15.786395   0.2
## 137.5    1   15.732966   0.2
## 142.5    1   15.68064    0.2
## 147.5    1   15.628775   0.2
## 152.5    1   15.577259   0.2
## 157.5    1   15.526092   0.2
## 162.5    1   15.475241   0.2
## #    Use custom  growth  transition  matrix  (0=no,  1=yes,  by  sex and size)
## 1
## #    The growth  matrix  (if not using   just    fill    with    zeros)
## #    Males
##  0   0.0374249   0.257557    0.369321    0.236624    0.0941279   0.00494521  0   0   0   0   0   0   0   0   0   0   0   0   0
##  0   0   0.0374249   0.257557    0.369321    0.236624    0.0941279   0.00494521  0   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0.0390317   0.262221    0.369126    0.233146    0.0916878   0.00478779  0   0   0   0   0   0   0   0   0   0
##  0   0   0   0   0.0406974   0.266902    0.368829    0.229653    0.0892849   0.00463398  0   0   0   0   0   0   0   0   0
##  0   0   0   0   0   0.0406974   0.266902    0.368829    0.229653    0.0892849   0.00463398  0   0   0   0   0   0   0   0
##  0   0   0   0   0   0   0.0424237   0.271597    0.36843 0.226146    0.0869192   0.00448375  0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0.0424237   0.271597    0.36843 0.226146    0.0869192   0.00448375  0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0.0442121   0.276304    0.367927    0.222629    0.084591    0.00433705  0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0.0442121   0.276304    0.367927    0.222629    0.084591    0.00433705  0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0.0460642   0.28102 0.367321    0.219101    0.0823004   0.00419385  0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0.0460642   0.28102 0.367321    0.219101    0.0823004   0.00419385  0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0.0479817   0.285742    0.36661 0.215565    0.0800475   0.00405411  0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0.0499661   0.290466    0.365796    0.212022    0.0778325   0.0039178   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0.0499661   0.290466    0.365796    0.212022    0.0778325   0.0039178
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0.0520191   0.295189    0.364877    0.208474    0.0794404
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0.0520191   0.295189    0.364877    0.287915
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0.0541422   0.29991 0.645948
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0.0541422   0.945858
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1
##  #   Females
##  0   0.0315365   0.29835 0.415939    0.203388    0.0507866   0   0   0   0   0   0   0   0   0   0   0   0   0
##  0   0   0.0715876   0.40062 0.374586    0.133701    0.0195053   0   0   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0.1459  0.478366    0.296233    0.076745    0.0027561   0   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0.00293279  0.2747  0.495812    0.195133    0.0314218   0   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0   0.0106724   0.435786    0.435296    0.110078    0.00816757  0   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0   0   0.0342176   0.540301    0.364189    0.0612922   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0   0   0   0.0569465   0.602618    0.304312    0.0361236   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0.0853184   0.644334    0.2515  0.0188471   0   0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0.12638 0.660964    0.206567    0.00608825  0   0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0.172781    0.666124    0.161095    0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0.231245    0.653752    0.115003    0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0.302451    0.622588    0.0749609   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0.385785    0.573046    0.041169    0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0.478849    0.507767    0.0133836   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0.560249    0.439751    0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
##  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## #    Use custom  natural mortality   (0=no,  1=yes,  by  sex and year)
## 0
## #    Custom  natural mortality   rates   (by sex)
##  0.18    0.270878    0.270878    0.270878    0.270878    0.986707    0.986707    0.986707    0.986707    0.986707    0.270878    0.270878    0.270878    0.270878    0.270878    0.270878    0.270878
##  0.18    0.18    0.18    0.18    0.18    0.64029 0.64029 0.64029 0.64029 0.64029 0.18    0.18    0.18    0.18    0.18    0.18    0.18    0.18    0.18    0.18    0.18    0.18    0.18    0.18    0.18
## ##   eof
## 9999
```

The Gmacs base model control file:

```
## ## ---------------------------------------------------------------------------------- ##
## ## LEADING PARAMETER CONTROLS                                                          ##
## ##     Controls for leading parameter vector (theta)                                   ##
## ## LEGEND                                                                              ##
## ##     prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma              ##
## ## ---------------------------------------------------------------------------------- ##
## ## ntheta
##    9
## ## ---------------------------------------------------------------------------------- ##
## ## ival        lb        ub        phz   prior     p1      p2         # parameter      ##
## ## ---------------------------------------------------------------------------------- ##
##     0.18        0.15    0.2         -4       2    0.18    0.04        # M
##    16.5        -10       18         -2       0  -10.0    20.0        # logR0
##    14.0        -10       20         -2       0   10.0    20.0        # logR1, to estimate if NOT initialized at unfished
##    14.0        -10       20          1       0   10.0    20.0        # logRbar, to estimate if NOT initialized at unfished
##    72.5         55      100         -4       1   72.5    7.25        # recruitment expected value
```

```
##     0.544      0.1      5        -3      0    0.1     5.0        # recruitment scale (variance component) - THIS IS ESTIMATED BY SEX IN JIES MODEL CALLED betar (I FIXED AT MEAN HERE)
##    -0.9      -10        0.75     -4      0  -10.0     0.75       # ln(sigma_R)
##     0.75       0.20     1.00     -2      3    3.0     2.00       # steepness
##     0.01       0.00     1.00     -3      3    1.01    1.01       # recruitment autocorrelation
## ## ------------------------------------------------------------------------------------ ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## GROWTH PARAMETER CONTROLS                                                            ##
## ##     Two lines for each parameter if split sex, one line if not                       ##
## ## ------------------------------------------------------------------------------------ ##
## ## number of molt periods
## 2
## ## ------------------------------------------------------------------------------------ ##
## ## ival       lb       ub       phz   prior     p1      p2         # parameter       ##
## ## ------------------------------------------------------------------------------------ ##
##    99.9       1.0      90.0      -3      0    0.0    999.0        # alpha males or combined
##    99.9       1.0      90.0      -3      0    0.0    999.0        # alpha
##     0.00      0.0       0.9      -3      0    0.0    999.0        # beta males or combined
##     0.00      0.0       0.9      -3      0    0.0    999.0        # beta
##     1.365758  0.1       3.0      -4      0    0.0    999.0        # gscale males or combined
##     1.885541  0.1       3.0      -4      0    0.0    999.0        # gscale
## ## ----------------------------------------------------------------------------------- ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## MOLTING PROBABILITY CONTROLS                                                         ##
## ##     Two lines for each parameter if split sex, one line if not                       ##
## ## ------------------------------------------------------------------------------------ ##
## ## ival       lb       ub       phz   prior     p1      p2         # parameter       ##
## ## ------------------------------------------------------------------------------------ ##
## ## Period 1
##   144.170986  1.0     180.0       3      0    0.0    999.0        # molt_mu males
##   400.0       1.0     999.0      -4      0    0.0    999.0        # molt_mu females (molt every year)
##     0.05      0.0001    1.0       4      0    0.0    999.0        # molt_cv males
##     0.1       0.0001    9.0      -4      0    0.0    999.0        # molt_cv females (molt every year)
## ## Period 2
##   140.5       1.0     195.0       3      0    0.0    999.0        # molt_mu males
##   400.0       1.0     999.0      -4      0    0.0    999.0        # molt_mu females (molt every year)
##     0.071     0.0001    9.0       4      0    0.0    999.0        # molt_cv males
##     0.1       0.0001    9.0      -4      0    0.0    999.0        # molt_cv females (molt every year)
## ## ----------------------------------------------------------------------------------- ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## SELECTIVITY CONTROLS                                                                 ##
## ##     Selectivity P(capture of all sizes). 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 (NIY), 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                              ##
## ## ------------------------------------------------------------------------------------ ##
## ## Gear-1   Gear-2   Gear-3   Gear-4   Gear-5   Gear-6
##    1        1        1        1        2        1         # selectivity periods
##    1        0        1        0        1        1         # sex specific selectivity
##    3        3        3        3        3        3         # male selectivity type
##    3        3        3        3        3        3         # female selectivity type
## ## Gear-1   Gear-2   Gear-3   Gear-4   Gear-5   Gear-6
##    1        1        1        1        1        1         # retention periods
##    1        0        0        0        0        0         # sex specific retention
##    3        2        2        2        2        2         # male   retention type
##    2        2        2        2        2        2         # female retention type
##    1        0        0        0        0        0         # male   retention flag (0 = no, 1 = yes)
##    0        0        0        0        0        0         # female retention flag (0 = no, 1 = yes)
## ## ------------------------------------------------------------------------------------ ##
## ## gear  par   sel                                                 start  end          ##
## ## index index par sex  ival  lb    ub     prior   p1   p2     phz  period period       ##
## ## ------------------------------------------------------------------------------------ ##
## # Gear-1
##    1      1    1   1    100    5    136    0       1    999    3    1975   2016
##    1      2    2   1    120    5    137    0       1    999    3    1975   2016
##    1      3    1   2     84   60    150    0       1    999    3    1975   2016
##    1      4    2   2     95   60    150    0       1    999    3    1975   2016
## # Gear-2
##    2      5    1   0    110    5    185    0       1    999    3    1975   2016
##    2      6    2   0    150    5    185    0       1    999    3    1975   2016
## # Gear-3
##    3      7    1   1    110    5    185    0       1    999    3    1975   2016
##    3      8    2   1    150    5    185    0       1    999    3    1975   2016
##    3      9    1   2    110    5    185    0       1    999    3    1975   2016
##    3     10    2   2    150    5    185    0       1    999    3    1975   2016
## # Gear-3
##    4     11    1   0    110    5    185    0       1    999    3    1975   2016
##    4     12    2   0    150    5    185    0       1    999    3    1975   2016
## # Gear-5
##    5     13    1   1     74   60     90    0       1    999    3    1975   1981
##    5     14    2   1     95   70    150    0       1    999    3    1975   1981
##    5     15    1   1     90   60     90    0       1    999    3    1982   2016
##    5     16    2   1    160   70    150    0       1    999    3    1982   2016
##    5     17    1   2     74   60    180    0       1    999    3    1975   1981
##    5     18    2   2     95   70    180    0       1    999    3    1975   1981
##    5     19    1   2     90   60    180    0       1    999    3    1982   2016
##    5     20    2   2    160   70    180    0       1    999    3    1982   2016
## # Gear-6
##    6     21    1   1     70    1    180    0       1    999    4    1975   2016
##    6     22    2   1     90    1    180    0       1    999    4    1975   2016
##    6     23    1   2    110    1    180    0       1    999    4    1975   2016
##    6     24    2   2    190    1    180    0       1    999    4    1975   2016
## ## ------------------------------------------------------------------------------------ ##
## ## Retained                                                                             ##
## ## gear  par   sel                                                 start  end          ##
## ## index index par sex  ival  lb    ub     prior   p1   p2     phz  period period       ##
## ## ------------------------------------------------------------------------------------ ##
## # Gear-1
##   -1     25    1   1    136    1    999    0       1    999    4    1975   2016
##   -1     26    2   1    137    1    999    0       1    999    5    1975   2016
##   -1     27    1   2    591    1    999    0       1    999   -3    1975   2016
```

```
##   -1     28    2   2     11    1    999    0       1    999   -3     1975   2016
## # Gear-2
##   -2     29    1   0    595    1    999    0       1    999   -3     1975   2016
##   -2     30    2   0     10    1    999    0       1    999   -3     1975   2016
## # Gear-3
##   -3     31    1   0    595    1    999    0       1    999   -3     1975   2016
##   -3     32    2   0     10    1    999    0       1    999   -3     1975   2016
## # Gear-4
##   -4     33    1   0    595    1    999    0       1    999   -3     1975   2016
##   -4     34    2   0     10    1    999    0       1    999   -3     1975   2016
## # Gear-5
##   -5     35    1   0    590    1    999    0       1    999   -3     1975   2016
##   -5     36    2   0     10    1    999    0       1    999   -3     1975   2016
## # Gear-6
##   -6     37    1   0    580    1    999    0       1    999   -3     1975   2016
##   -6     38    2   0     20    1    999    0       1    999   -3     1975   2016
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## 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               ##
## ## ---------------------------------------------------------------------------------- ##
## ## ival     lb       ub    phz   prior  p1        p2     Analytic?   LAMBDA
##    0.84      0        1     4    1      0.843136  0.03   0           1     # NMFS, 0.896 is the magic number * 0.941 (Jies max selex)
##    1.0       0        5    -4    0      0.001     5.00   0           1     # BSFRF
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## 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 type: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma          ##
## ## ---------------------------------------------------------------------------------- ##
## ## ival        lb        ub        phz   prior     p1      p2
##    0.0001      0.00001   10.0      -4    4         1.0     100   # NMFS
##    0.0001      0.00001   10.0      -4    4         1.0     100   # BSFRF
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR
## ## ---------------------------------------------------------------------------------- ##
## ## Mean_F   STD_PHZ1   STD_PHZ2   PHZ
##    0.1      0.5        45.50      1   # Pot
##    0.005    0.5        45.50      1   # Trawl
##    0.005    0.5        45.50      1   # Tanner
##    0.005    0.5        45.50      1   # Fixed
##    0.00     2.00       20.00     -1   # NMFS trawl survey (0 catch)
##    0.00     2.00       20.00     -1   # BSFRF (0)
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA                                                     ##
## ##     One column for each data matrix                                                  ##
## ## LEGEND                                                                               ##
## ##     Likelihood: 1 = Multinomial with estimated/fixed sample size                     ##
## ##                 2 = Robust approximation to multinomial                              ##
## ##                 3 = logistic normal (NIY)                                            ##
## ##                 4 = multivariate-t (NIY)                                             ##
## ##                 5 = Dirichlet                                                        ##
## ## AUTO TAIL COMPRESSION                                                                ##
## ##     pmin is the cumulative proportion used in tail compression                       ##
## ## ---------------------------------------------------------------------------------- ##
## #  Pot         Trawl   Tanner  NMFS    BSFRF
##    2   2   2   2   2   2   2  2  2   2  2  2  2 # Type of likelihood
##    0   0   0   0   0   0   0  0  0   0  0  0  0 # Auto tail compression (pmin)
##    1   1   1   1   1   1   1  1  1   1  1  1  1 # Initial value for effective sample size multiplier
##   -4  -4  -4  -4  -4  -4  -4 -4 -4  -4 -4 -4 -4 # Phz for estimating effective sample size (if appl.)
##    1   2   2   3   3   4   4  5  5   6  6  7  7 # Composition aggregator
##    1   1   1   1   1   1   1  1  1   1  1  1  1 # LAMBDA
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## TIME VARYING NATURAL MORTALIIY RATES                                                 ##
## ## LEGEND                                                                               ##
## ## Type: 0 = constant natural mortality                                                 ##
## ##       1 = Random walk (deviates constrained by variance in M)                        ##
## ##       2 = Cubic Spline (deviates constrained by nodes & node-placement)              ##
## ##       3 = Blocked changes (deviates constrained by variance at specific knots)       ##
## ##       4 = Time blocks                                                                ##
## ## ---------------------------------------------------------------------------------- ##
## ## Sex-specific? (0=no, 1=yes)
## 1
## ## Type
## 3
## ## Phase of estimation
## 3
## ## STDEV in m_dev for Random walk
## 0.25
## ## Number of nodes for cubic spline or number of step-changes for option 3
## 2
## 4
## ## Year position of the knots (vector must be equal to the number of nodes)
## 1980 1985
## 1976 1980 1985 1994
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## OTHER CONTROLS
## ## ---------------------------------------------------------------------------------- ##
##    3       # Estimated rec_dev phase
##   -3       # Estimated rec_ini phase
##    0       # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
##    0       # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters)
```

```
##    1984    # First year for average recruitment for Bspr calculation.
##    2016    # Last year for average recruitment for Bspr calculation.
##    0.35    # Target SPR ratio for Bmsy proxy.
##    1       # Gear index for SPR calculations (i.e., directed fishery).
##    1       # Lambda (proportion of mature male biomass for SPR reference points).
##    1       # Use empirical molt increment data (0=FALSE, 1=TRUE)
##    0       # Stock-Recruit-Relationship (0 = none, 1 = Beverton-Holt)
## ## EOF
## 9999
```

The Free q model control file:

```
## ## ------------------------------------------------------------------------------------ ##
## ## LEADING PARAMETER CONTROLS                                                           ##
## ##     Controls for leading parameter vector (theta)                                    ##
## ## LEGEND                                                                               ##
## ##     prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma              ##
## ## ------------------------------------------------------------------------------------ ##
## ## ntheta
##    9
## ## ------------------------------------------------------------------------------------ ##
## ## ival        lb        ub        phz   prior     p1      p2        # parameter       ##
## ## ------------------------------------------------------------------------------------ ##
##     0.18        0.15    0.2         -4       2    0.18    0.04        # M
##    16.5       -10        18         -2       0  -10.0    20.0        # logR0
##    14.0       -10        20         -2       0   10.0    20.0        # logR1, to estimate if NOT initialized at unfished
##    14.0       -10        20          1       0   10.0    20.0        # logRbar, to estimate if NOT initialized at unfished
##    72.5        55       100         -4       1   72.5     7.25       # recruitment expected value
##     0.544       0.1       5         -3       0    0.1     5.0        # recruitment scale (variance component) - THIS IS ESTIMATED BY SEX IN JIES MODEL CALLED betar (I FIXED AT MEAN HERE)
##    -0.9       -10         0.75      -4       0  -10.0     0.75       # ln(sigma_R)
##     0.75        0.20      1.00      -2       3    3.0     2.00       # steepness
##     0.01        0.00      1.00      -3       3    1.01    1.01       # recruitment autocorrelation
## ## ------------------------------------------------------------------------------------ ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## GROWTH PARAMETER CONTROLS                                                            ##
## ##     Two lines for each parameter if split sex, one line if not                      ##
## ## ------------------------------------------------------------------------------------ ##
## ## number of molt periods
## 2
## ## ------------------------------------------------------------------------------------ ##
## ## ival       lb        ub        phz   prior     p1      p2         # parameter       ##
## ## ------------------------------------------------------------------------------------ ##
##    99.9      1.0      90.0        -3       0    0.0    999.0        # alpha males or combined
##    99.9      1.0      90.0        -3       0    0.0    999.0        # alpha
##     0.00     0.0       0.9        -3       0    0.0    999.0        # beta males or combined
##     0.00     0.0       0.9        -3       0    0.0    999.0        # beta
##     1.365758  0.1      3.0        -4       0    0.0    999.0        # gscale males or combined
##     1.885541  0.1      3.0        -4       0    0.0    999.0        # gscale
## ## ----------------------------------------------------------------------------------- ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## MOLTING PROBABILITY CONTROLS                                                         ##
## ##     Two lines for each parameter if split sex, one line if not                      ##
## ## ------------------------------------------------------------------------------------ ##
## ## ival       lb        ub        phz   prior     p1      p2         # parameter       ##
## ## ------------------------------------------------------------------------------------ ##
## ## Period 1
##   144.170986  1.0     180.0         3       0    0.0    999.0        # molt_mu males
##   400.0       1.0     999.0        -4       0    0.0    999.0        # molt_mu females (molt every year)
##     0.05      0.0001    1.0         4       0    0.0    999.0        # molt_cv males
##     0.1       0.0001    9.0        -4       0    0.0    999.0        # molt_cv females (molt every year)
## ## Period 2
##   140.5       1.0     195.0         3       0    0.0    999.0        # molt_mu males
##   400.0       1.0     999.0        -4       0    0.0    999.0        # molt_mu females (molt every year)
##     0.071     0.0001    9.0         4       0    0.0    999.0        # molt_cv males
##     0.1       0.0001    9.0        -4       0    0.0    999.0        # molt_cv females (molt every year)
## ## ----------------------------------------------------------------------------------- ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## SELECTIVITY CONTROLS                                                                 ##
## ##     Selectivity P(capture of all sizes). 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 (NIY), 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                              ##
## ## ------------------------------------------------------------------------------------ ##
## ## Gear-1   Gear-2   Gear-3   Gear-4   Gear-5   Gear-6
##    1        1        1        1        2        1         # selectivity periods
##    1        0        1        0        1        1         # sex specific selectivity
##    3        3        3        3        3        3         # male selectivity type
##    3        3        3        3        3        3         # female selectivity type
## ## Gear-1   Gear-2   Gear-3   Gear-4   Gear-5   Gear-6
##    1        1        1        1        1        1         # retention periods
##    1        0        0        0        0        0         # sex specific retention
##    3        2        2        2        2        2         # male   retention type
##    2        2        2        2        2        2         # female retention type
##    1        0        0        0        0        0         # male   retention flag (0 = no, 1 = yes)
##    0        0        0        0        0        0         # female retention flag (0 = no, 1 = yes)
## ## ------------------------------------------------------------------------------------ ##
## ## gear  par   sel                                                  start  end          ##
## ## index index par sex  ival  lb    ub     prior   p1   p2     phz   period period       ##
## ## ------------------------------------------------------------------------------------ ##
## # Gear-1
##    1      1    1  1    100    5    136    0       1    999    3     1975   2016
##    1      2    2  1    120    5    137    0       1    999    3     1975   2016
##    1      3    1  2     84   60    150    0       1    999    3     1975   2016
##    1      4    2  2     95   60    150    0       1    999    3     1975   2016
## # Gear-2
##    2      5    1  0    110    5    185    0       1    999    3     1975   2016
##    2      6    2  0    150    5    185    0       1    999    3     1975   2016
## # Gear-3
##    3      7    1  1    110    5    185    0       1    999    3     1975   2016
##    3      8    2  1    150    5    185    0       1    999    3     1975   2016
##    3      9    1  2    110    5    185    0       1    999    3     1975   2016
##    3     10    2  2    150    5    185    0       1    999    3     1975   2016
## # Gear-3
##    4     11    1  0    110    5    185    0       1    999    3     1975   2016
##    4     12    2  0    150    5    185    0       1    999    3     1975   2016
## # Gear-5
##    5     13    1  1     74   60     90    0       1    999    3     1975   1981
##    5     14    2  1     95   70    150    0       1    999    3     1975   1981
##    5     15    1  1     90   60     90    0       1    999    3     1982   2016
##    5     16    2  1    160   70    150    0       1    999    3     1982   2016
```

```
##    5     17    1   2     74   60    180    0       1    999    3     1975   1981
##    5     18    2   2     95   70    180    0       1    999    3     1975   1981
##    5     19    1   2     90   60    180    0       1    999    3     1982   2016
##    5     20    2   2    160   70    180    0       1    999    3     1982   2016
## # Gear-6
##    6     21    1   1     70    1    180    0       1    999    4     1975   2016
##    6     22    2   1     90    1    180    0       1    999    4     1975   2016
##    6     23    1   2    110    1    180    0       1    999    4     1975   2016
##    6     24    2   2    190    1    180    0       1    999    4     1975   2016
## ## ------------------------------------------------------------------------------------ ##
## ## Retained                                                                             ##
## ## gear  par   sel                                                  start  end          ##
## ## index index par sex  ival  lb    ub     prior  p1   p2     phz   period period       ##
## ## ------------------------------------------------------------------------------------ ##
## # Gear-1
##   -1     25    1   1    136    1    999    0       1    999    4     1975   2016
##   -1     26    2   1    137    1    999    0       1    999    5     1975   2016
##   -1     27    1   2    591    1    999    0       1    999   -3     1975   2016
##   -1     28    2   2     11    1    999    0       1    999   -3     1975   2016
## # Gear-2
##   -2     29    1   0    595    1    999    0       1    999   -3     1975   2016
##   -2     30    2   0     10    1    999    0       1    999   -3     1975   2016
## # Gear-3
##   -3     31    1   0    595    1    999    0       1    999   -3     1975   2016
##   -3     32    2   0     10    1    999    0       1    999   -3     1975   2016
## # Gear-4
##   -4     33    1   0    595    1    999    0       1    999   -3     1975   2016
##   -4     34    2   0     10    1    999    0       1    999   -3     1975   2016
## # Gear-5
##   -5     35    1   0    590    1    999    0       1    999   -3     1975   2016
##   -5     36    2   0     10    1    999    0       1    999   -3     1975   2016
## # Gear-6
##   -6     37    1   0    580    1    999    0       1    999   -3     1975   2016
##   -6     38    2   0     20    1    999    0       1    999   -3     1975   2016
## ## ------------------------------------------------------------------------------------ ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## 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               ##
## ## ------------------------------------------------------------------------------------ ##
## ## ival     lb       ub    phz   prior  p1        p2     Analytic?   LAMBDA
##    0.84      0        1     4    1      0.843136  0.03   0           1     # NMFS, 0.896 is the magic number * 0.941 (Jies max selex)
##    1.0       0        5     4    0      0.001     5.00   0           1     # BSFRF
## ## ------------------------------------------------------------------------------------ ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## 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 type: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma          ##
## ## ------------------------------------------------------------------------------------ ##
## ## ival        lb         ub         phz   prior     p1      p2
##    0.0001      0.00001    10.0       -4    4         1.0     100   # NMFS
##    0.0001      0.00001    10.0       -4    4         1.0     100   # BSFRF
## ## ------------------------------------------------------------------------------------ ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR
## ## ------------------------------------------------------------------------------------ ##
## ## Mean_F   STD_PHZ1   STD_PHZ2   PHZ
##    0.1      0.5        45.50      1   # Pot
##    0.005    0.5        45.50      1   # Trawl
##    0.005    0.5        45.50      1   # Tanner
##    0.005    0.5        45.50      1   # Fixed
##    0.00     2.00       20.00     -1   # NMFS trawl survey (0 catch)
##    0.00     2.00       20.00     -1   # BSFRF (0)
## ## ------------------------------------------------------------------------------------ ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## OPTIONS FOR SIZE COMPOSTION DATA                                                     ##
## ##     One column for each data matrix                                                  ##
## ## LEGEND                                                                               ##
## ##     Likelihood: 1 = Multinomial with estimated/fixed sample size                     ##
## ##                 2 = Robust approximation to multinomial                              ##
## ##                 3 = logistic normal (NIY)                                            ##
## ##                 4 = multivariate-t (NIY)                                             ##
## ##                 5 = Dirichlet                                                        ##
## ## AUTO TAIL COMPRESSION                                                                ##
## ##     pmin is the cumulative proportion used in tail compression                       ##
## ## ------------------------------------------------------------------------------------ ##
## #  Pot         Trawl   Tanner  NMFS    BSFRF
##    2   2   2   2   2   2   2  2  2   2  2  2  2 # Type of likelihood
##    0   0   0   0   0   0   0  0  0   0  0  0  0 # Auto tail compression (pmin)
##    1   1   1   1   1   1   1  1  1   1  1  1  1 # Initial value for effective sample size multiplier
##   -4  -4  -4  -4  -4  -4  -4  -4 -4 -4 -4 -4 -4 # Phz for estimating effective sample size (if appl.)
##    1   2   2   3   3   4   4   5  5  6  6  7  7 # Composition aggregator
##    1   1   1   1   1   1   1   1  1  1  1  1  1 # LAMBDA
## ## ------------------------------------------------------------------------------------ ##
##
## ## ------------------------------------------------------------------------------------ ##
## ## TIME VARYING NATURAL MORTALIIY RATES                                                 ##
## ## LEGEND                                                                               ##
## ## Type: 0 = constant natural mortality                                                 ##
## ##       1 = Random walk (deviates constrained by variance in M)                        ##
## ##       2 = Cubic Spline (deviates constrained by nodes & node-placement)              ##
## ##       3 = Blocked changes (deviates constrained by variance at specific knots)       ##
## ##       4 = Time blocks                                                                ##
## ## ------------------------------------------------------------------------------------ ##
## ## Sex-specific? (0=no, 1=yes)
## 1
## ## Type
## 3
## ## Phase of estimation
```

```
## 3
## ## STDEV in m_dev for Random walk
## 0.25
## ## Number of nodes for cubic spline or number of step-changes for option 3
## 2
## 4
## ## Year position of the knots (vector must be equal to the number of nodes)
## 1980 1985
## 1976 1980 1985 1994
## ## ---------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------- ##
## ## OTHER CONTROLS
## ## ---------------------------------------------------------------------------- ##
##    3       # Estimated rec_dev phase
##   -3       # Estimated rec_ini phase
##    0       # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
##    0       # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters)
##    1984    # First year for average recruitment for Bspr calculation.
##    2016    # Last year for average recruitment for Bspr calculation.
##    0.35    # Target SPR ratio for Bmsy proxy.
##    1       # Gear index for SPR calculations (i.e., directed fishery).
##    1       # Lambda (proportion of mature male biomass for SPR reference points).
##    1       # Use empirical molt increment data (0=FALSE, 1=TRUE)
##    0       # Stock-Recruit-Relationship (0 = none, 1 = Beverton-Holt)
## ## EOF
## 9999
```

The Variable M model control file:

```
## ## ---------------------------------------------------------------------------- ##
## ## LEADING PARAMETER CONTROLS                                                   ##
## ##     Controls for leading parameter vector (theta)                            ##
## ## LEGEND                                                                       ##
## ##     prior: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma       ##
## ## ---------------------------------------------------------------------------- ##
## ## ntheta
##    9
## ## ---------------------------------------------------------------------------- ##
## ## ival        lb        ub        phz   prior     p1      p2         # parameter       ##
## ## ---------------------------------------------------------------------------- ##
##     0.18        0.15    0.2        -4       2    0.18    0.04        # M
##    16.5       -10        18        -2       0  -10.0    20.0         # logR0
##    14.0       -10        20        -2       0   10.0    20.0         # logR1, to estimate if NOT initialized at unfished
##    14.0       -10        20         1       0   10.0    20.0         # logRbar, to estimate if NOT initialized at unfished
##    72.5        55       100        -4       1   72.5     7.25        # recruitment expected value
##     0.544      0.1        5        -3       0    0.1     5.0         # recruitment scale (variance component) - THIS IS ESTIMATED BY SEX IN JIES MODEL CALLED betar (I FIXED AT MEAN HERE)
##    -0.9       -10         0.75     -4       0  -10.0    0.75         # ln(sigma_R)
##     0.75        0.20      1.00     -2       3    3.0    2.00         # steepness
##     0.01        0.00      1.00     -3       3    1.01   1.01         # recruitment autocorrelation
## ## ---------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------- ##
## ## GROWTH PARAMETER CONTROLS                                                    ##
## ##     Two lines for each parameter if split sex, one line if not               ##
## ## ---------------------------------------------------------------------------- ##
## ## number of molt periods
## 2
## ## ---------------------------------------------------------------------------- ##
## ## ival       lb       ub       phz   prior     p1      p2         # parameter       ##
## ## ---------------------------------------------------------------------------- ##
##    99.9       1.0      90.0       -3      0    0.0    999.0        # alpha males or combined
##    99.9       1.0      90.0       -3      0    0.0    999.0        # alpha
##     0.00      0.0       0.9       -3      0    0.0    999.0        # beta males or combined
##     0.00      0.0       0.9       -3      0    0.0    999.0        # beta
##     1.365758  0.1       3.0       -4      0    0.0    999.0        # gscale males or combined
##     1.885541  0.1       3.0       -4      0    0.0    999.0        # gscale
## ## ---------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------- ##
## ## MOLTING PROBABILITY CONTROLS                                                 ##
## ##     Two lines for each parameter if split sex, one line if not               ##
## ## ---------------------------------------------------------------------------- ##
## ## ival       lb       ub       phz   prior     p1      p2         # parameter       ##
## ## ---------------------------------------------------------------------------- ##
## ## Period 1
##   144.170986  1.0     180.0        3      0    0.0    999.0        # molt_mu males
##   400.0       1.0     999.0       -4      0    0.0    999.0        # molt_mu females (molt every year)
##     0.05      0.0001    1.0        4      0    0.0    999.0        # molt_cv males
##     0.1       0.0001    9.0       -4      0    0.0    999.0        # molt_cv females (molt every year)
## ## Period 2
##   140.5       1.0     195.0        3      0    0.0    999.0        # molt_mu males
##   400.0       1.0     999.0       -4      0    0.0    999.0        # molt_mu females (molt every year)
##     0.071     0.0001    9.0        4      0    0.0    999.0        # molt_cv males
##     0.1       0.0001    9.0       -4      0    0.0    999.0        # molt_cv females (molt every year)
## ## ---------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------- ##
## ## SELECTIVITY CONTROLS                                                         ##
## ##     Selectivity P(capture of all sizes). 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 (NIY), 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                      ##
## ## ---------------------------------------------------------------------------- ##
## ## Gear-1   Gear-2   Gear-3   Gear-4   Gear-5   Gear-6
##    1        1        1        1        2        1         # selectivity periods
##    1        0        1        0        1        1         # sex specific selectivity
##    3        3        3        3        3        3         # male selectivity type
##    3        3        3        3        3        3         # female selectivity type
## ## Gear-1   Gear-2   Gear-3   Gear-4   Gear-5   Gear-6
```

```
##    1       1       1       1       1       1       # retention periods
##    1       0       0       0       0       0       # sex specific retention
##    3       2       2       2       2       2       # male   retention type
##    2       2       2       2       2       2       # female retention type
##    1       0       0       0       0       0       # male   retention flag (0 = no, 1 = yes)
##    0       0       0       0       0       0       # female retention flag (0 = no, 1 = yes)
## ## ---------------------------------------------------------------------------------- ##
## ## gear  par   sel                                                  start  end         ##
## ## index index par sex  ival  lb    ub     prior   p1   p2     phz   period period      ##
## ## ---------------------------------------------------------------------------------- ##
## # Gear-1
##    1      1    1  1    100    5    136    0       1    999    3     1975   2016
##    1      2    2  1    120    5    137    0       1    999    3     1975   2016
##    1      3    1  2     84   60    150    0       1    999    3     1975   2016
##    1      4    2  2     95   60    150    0       1    999    3     1975   2016
## # Gear-2
##    2      5    1  0    110    5    185    0       1    999    3     1975   2016
##    2      6    2  0    150    5    185    0       1    999    3     1975   2016
## # Gear-3
##    3      7    1  1    110    5    185    0       1    999    3     1975   2016
##    3      8    2  1    150    5    185    0       1    999    3     1975   2016
##    3      9    1  2    110    5    185    0       1    999    3     1975   2016
##    3     10    2  2    150    5    185    0       1    999    3     1975   2016
## # Gear-3
##    4     11    1  0    110    5    185    0       1    999    3     1975   2016
##    4     12    2  0    150    5    185    0       1    999    3     1975   2016
## # Gear-5
##    5     13    1  1     74   60     90    0       1    999    3     1975   1981
##    5     14    2  1     95   70    150    0       1    999    3     1975   1981
##    5     15    1  1     90   60     90    0       1    999    3     1982   2016
##    5     16    2  1    160   70    150    0       1    999    3     1982   2016
##    5     17    1  2     74   60    180    0       1    999    3     1975   1981
##    5     18    2  2     95   70    180    0       1    999    3     1975   1981
##    5     19    1  2     90   60    180    0       1    999    3     1982   2016
##    5     20    2  2    160   70    180    0       1    999    3     1982   2016
## # Gear-6
##    6     21    1  1     70    1    180    0       1    999    4     1975   2016
##    6     22    2  1     90    1    180    0       1    999    4     1975   2016
##    6     23    1  2    110    1    180    0       1    999    4     1975   2016
##    6     24    2  2    190    1    180    0       1    999    4     1975   2016
## ## ---------------------------------------------------------------------------------- ##
## ## Retained                                                                          ##
## ## gear  par   sel                                                  start  end         ##
## ## index index par sex  ival  lb    ub     prior   p1   p2     phz   period period      ##
## ## ---------------------------------------------------------------------------------- ##
## # Gear-1
##   -1     25    1  1    136    1    999    0       1    999    4     1975   2016
##   -1     26    2  1    137    1    999    0       1    999    5     1975   2016
##   -1     27    1  2    591    1    999    0       1    999   -3     1975   2016
##   -1     28    2  2     11    1    999    0       1    999   -3     1975   2016
## # Gear-2
##   -2     29    1  0    595    1    999    0       1    999   -3     1975   2016
##   -2     30    2  0     10    1    999    0       1    999   -3     1975   2016
## # Gear-3
##   -3     31    1  0    595    1    999    0       1    999   -3     1975   2016
##   -3     32    2  0     10    1    999    0       1    999   -3     1975   2016
## # Gear-4
##   -4     33    1  0    595    1    999    0       1    999   -3     1975   2016
##   -4     34    2  0     10    1    999    0       1    999   -3     1975   2016
## # Gear-5
##   -5     35    1  0    590    1    999    0       1    999   -3     1975   2016
##   -5     36    2  0     10    1    999    0       1    999   -3     1975   2016
## # Gear-6
##   -6     37    1  0    580    1    999    0       1    999   -3     1975   2016
##   -6     38    2  0     20    1    999    0       1    999   -3     1975   2016
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## 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             ##
## ## ---------------------------------------------------------------------------------- ##
## ## ival     lb       ub    phz   prior  p1        p2     Analytic?   LAMBDA
##    0.84     0        1     4    1      0.843136  0.03   0           1     # NMFS, 0.896 is the magic number * 0.941 (Jies max selex)
##    1.0      0        5    -4    0      0.001     5.00   0           1     # BSFRF
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## 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 type: 0 = uniform, 1 = normal, 2 = lognormal, 3 = beta, 4 = gamma        ##
## ## ---------------------------------------------------------------------------------- ##
## ## ival        lb        ub        phz   prior     p1      p2
##    0.0001      0.00001   10.0      -4    4         1.0     100   # NMFS
##    0.0001      0.00001   10.0      -4    4         1.0     100   # BSFRF
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## PENALTIES FOR AVERAGE FISHING MORTALITY RATE FOR EACH GEAR
## ## ---------------------------------------------------------------------------------- ##
## ## Mean_F   STD_PHZ1   STD_PHZ2   PHZ
##    0.1      0.5        45.50      1   # Pot
##    0.005    0.5        45.50      1   # Trawl
##    0.005    0.5        45.50      1   # Tanner
##    0.005    0.5        45.50      1   # Fixed
##    0.00     2.00       20.00     -1   # NMFS trawl survey (0 catch)
##    0.00     2.00       20.00     -1   # BSFRF (0)
## ## ---------------------------------------------------------------------------------- ##
##
## ## ---------------------------------------------------------------------------------- ##
## ## OPTIONS FOR SIZE COMPOSTION DATA                                                  ##
## ##     One column for each data matrix                                               ##
## ## LEGEND                                                                            ##
```

```
## ##     Likelihood: 1 = Multinomial with estimated/fixed sample size                    ##
## ##                 2 = Robust approximation to multinomial                             ##
## ##                 3 = logistic normal (NIY)                                           ##
## ##                 4 = multivariate-t (NIY)                                            ##
## ##                 5 = Dirichlet                                                       ##
## ## AUTO TAIL COMPRESSION                                                               ##
## ##     pmin is the cumulative proportion used in tail compression                      ##
## ## ----------------------------------------------------------------------------------- ##
## #  Pot         Trawl   Tanner  NMFS    BSFRF
##    2   2   2   2   2   2   2  2  2   2  2  2  2 # Type of likelihood
##    0   0   0   0   0   0   0  0  0   0  0  0  0 # Auto tail compression (pmin)
##    1   1   1   1   1   1   1  1  1   1  1  1  1 # Initial value for effective sample size multiplier
##   -4  -4  -4  -4  -4  -4  -4  -4 -4 -4 -4 -4 -4 # Phz for estimating effective sample size (if appl.)
##    1   2   2   3   3   4   4   5  5  6  6  7  7 # Composition aggregator
##    1   1   1   1   1   1   1   1  1  1  1  1  1 # LAMBDA
## ## ----------------------------------------------------------------------------------- ##
##
## ## ----------------------------------------------------------------------------------- ##
## ## TIME VARYING NATURAL MORTALIIY RATES                                                ##
## ## LEGEND                                                                              ##
## ## Type: 0 = constant natural mortality                                                ##
## ##       1 = Random walk (deviates constrained by variance in M)                       ##
## ##       2 = Cubic Spline (deviates constrained by nodes & node-placement)             ##
## ##       3 = Blocked changes (deviates constrained by variance at specific knots)      ##
## ##       4 = Time blocks                                                               ##
## ## ----------------------------------------------------------------------------------- ##
## ## Sex-specific? (0=no, 1=yes)
## 1
## ## Type
## 1
## ## Phase of estimation
## 3
## ## STDEV in m_dev for Random walk
## 0.25
## ## Number of nodes for cubic spline or number of step-changes for option 3
## 4
## 4
## ## Year position of the knots (vector must be equal to the number of nodes)
## 1980 1985 1990 2000
## 1980 1985 1990 2000
## ## ----------------------------------------------------------------------------------- ##
##
## ## ----------------------------------------------------------------------------------- ##
## ## OTHER CONTROLS
## ## ----------------------------------------------------------------------------------- ##
##    3       # Estimated rec_dev phase
##   -3       # Estimated rec_ini phase
##    0       # VERBOSE FLAG (0 = off, 1 = on, 2 = objective func)
##    0       # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters)
##    1984    # First year for average recruitment for Bspr calculation.
##    2016    # Last year for average recruitment for Bspr calculation.
##    0.35    # Target SPR ratio for Bmsy proxy.
##    1       # Gear index for SPR calculations (i.e., directed fishery).
##    1       # Lambda (proportion of mature male biomass for SPR reference points).
##    1       # Use empirical molt increment data (0=FALSE, 1=TRUE)
##    0       # Stock-Recruit-Relationship (0 = none, 1 = Beverton-Holt)
## ## EOF
## 9999
```