Appendix 2. Output from final FPA model Run.

```
#lobound_vonbert_k
0.0001
#hibound_vonbert_k
1
#--
#fyear_jratios
1960
#lyear_jratios
2002
#jratios
 1960 0.0499206
 1961 0.0499206
 1962 0.0499206
 1963 0.0499206
 1964 0.0499206
 1965 0.0499206
 1966 0.0499206
 1967 0.0499206
 1968 0.0483747
 1969 0.0492063
 1970 0.0502046
 1971 0.0504322
 1972 0.0513853
 1973 0.0536338
 1974 0.0572812
 1975 0.0631707
 1976 0.0688843
 1977 0.0742901
 1978 0.0788632
 1979 0.0835613
 1980 0.0875766
 1981 0.0909363
 1982 0.0930431
 1983 0.0943188
 1984 0.0943851
 1985 0.0938452
 1986 0.0933588
 1987 0.093164
 1988 0.0930146
 1989 0.0931039
 1990 0.0933475
 1991 0.0941285
 1992 0.0951191
 1993 0.096404
 1994 0.0978588
 1995 0.099283
 1996 0.100514
 1997 0.101728
 1998 0.103042
 1999 0.104303
 2000 0.105067
 2001 0.105382
 2002 0.105382
#check_after_growth_pars
12345
#--
#emphasis_fpart_igr
1
#cv_igr
0.264
#igr_years_to_constrain
2
#--
#year_lag_recruits
2
#maturity
 0 1
#--
#phase_log_mean_recruit_par
1
#phase_recruit_dev_pars
1
#--
#type_recruit_model
3
#phase_spawner_recruit
1
#emphasis_recruit_model
1
```

```
#fyear_recruit_model_weights
1959
#lyear_recruit_model_weights
2002
#recruit_dev_weights
 1959 1
 1960 1
 1961 1
 1962 1
 1963 1
 1964 1
 1965 1
 1966 1
 1967 1
 1968 1
 1969 1
 1970 1
 1971 1
 1972 1
 1973 1
 1974 1
 1975 1
 1976 1
 1977 1
 1978 1
 1979 1
 1980 1
 1981 1
 1982 1
 1983 1
 1984 1
 1985 1
 1986 1
 1987 1
 1988 1
 1989 1
 1990 1
 1991 1
 1992 1
 1993 1
 1994 1
 1995 1
 1996 1
 1997 1
 1998 1
 1999 1
 2000 1
 2001 1
 2002 1
#--
#emphasis_fpart_firstfew_recr
1
#--
#emphasis_fpart_log_rvar
10
#target_log_rvar
-0.82124
#std_log_rvar
1.01475
#check_after_recruit_stuff
12345
#--
#phase_surplus_production
1
#use_fox
1
#emphasis_fpart_surplus_production
0.0001
#--
#phase_m
-1
#lobound_m
0.0001
#hibound_m
1
#--
#n_natmat_covariates
1
#natmat_covariate_names
Timmy_Turtle
#phase_natmat_covariates
```

```
 -2
#fyear_natmat_covariates
1960
#lyear_natmat_covariates
2002
#natmat_covariates
 1960 -0.85375
 1961 -1.94446
 1962 -1.07196
 1963 -0.442837
 1964 -1.364
 1965 0.0423344
 1966 -0.426332
 1967 1.23901
 1968 -1.94446
 1969 -1.07196
 1970 -0.442837
 1971 -1.364
 1972 0.0423344
 1973 -0.426332
 1974 1.23901
 1975 -0.845328
 1976 0.364838
 1977 1.63832
 1978 -0.85375
 1979 -0.310524
 1980 1.25189
 1981 0.0719867
 1982 -1.08938
 1983 0.536718
 1984 0.0600732
 1985 0.733052
 1986 1.40342
 1987 -0.057267
 1988 -1.52887
 1989 0.628372
 1990 0.516373
 1991 1.85809
 1992 -0.628517
 1993 -1.1758
 1994 -0.230763
 1995 1.23099
 1996 -0.0266012
 1997 -0.306805
 1998 -1.00959
 1999 0.566808
 2000 1.46092
 2001 -0.290394
 2002 -0.40651
#check_after_natmat_covariates
12345
#--
#type_natmat_devs
1
#phase_natmat_devs
-1
#emphasis_fpart_natmat_devs
-1
#cv_natmat_devs
-0.1
#fyear_natmat_dev_weights
1959
#lyear_natmat_dev_weights
2002
#natmat_dev_weights
 1959 1
 1960 1
 1961 1
 1962 1
 1963 1
 1964 1
 1965 1
 1966 1
 1967 1
 1968 1
 1969 1
 1970 1
 1971 1
 1972 1
 1973 1
 1974 1
```

```
 1975 1
 1976 1
 1977 1
 1978 1
 1979 1
 1980 1
 1981 1
 1982 1
 1983 1
 1984 1
 1985 1
 1986 1
 1987 1
 1988 1
 1989 1
 1990 1
 1991 1
 1992 1
 1993 1
 1994 1
 1995 1
 1996 1
 1997 1
 1998 1
 1999 1
 2000 1
 2001 1
 2002 1
#check_after_natmat_dev_stuff
12345
#--
#phase_fdevs
1
#emphasis_fpart_catch
1e+06
#cv_catch
0.2
#--
#fyear_katch
1959
#lyear_katch
2002
# katch year sex area catch discard
 1959 0 0 94.001 0 1
 1960 0 0 93.955 0 1
 1961 0 0 100.556 0 1
 1962 0 0 242.15 0 1
 1963 0 0 194.344 0 1
 1964 0 0 187.445 0 1
 1965 0 0 109.844 0 1
 1966 0 0 210.038 0 1
 1967 0 0 285.245 0 1
 1968 0 0 469.978 0 1
 1969 0 0 392.655 0 1
 1970 0 0 307.131 0 1
 1971 0 0 330.52 0 1
 1972 0 0 271.744 0 1
 1973 0 0 258.551 0 1
 1974 0 0 209.886 0 1
 1975 0 0 216.957 0 1
 1976 0 0 121.925 0 1
 1977 0 0 67.08 0 1
 1978 0 0 88.165 0 1
 1979 0 0 104.178 0 1
 1980 0 0 93.234 0 1
 1981 0 0 84.097 0 1
 1982 0 0 59.852 0 1
 1983 0 0 35.627 0 1
 1984 0 0 42.442 0 1
 1985 0 0 55.155 0 1
 1986 0 0 56.202 0 1
 1987 0 0 66.846 0 1
 1988 0 0 73.95 0 1
 1989 0 0 97.059 0 1
 1990 0 0 93.805 0 1
 1991 0 0 79.943 0 1
 1992 0 0 93.191 0 1
 1993 0 0 88.667 0 1
 1994 0 0 76.821 0 1
 1995 0 0 102.253 0 1
 1996 0 0 126.852 0 1
```

```
 1997 0 0 119.553 0 1
 1998 0 0 125.829 0 1
 1999 0 0 124.101 0 1
 2000 0 0 125.818 0 1
 2001 0 0 133.165 0 1
 2002 0 0 104.43 0 1
#check_after_katch
12345
#--
#c_over_b_threshold
0.95
#emphasis_fpart_c_over_b
10000
#--
#check_after_catch_stuff
12345
#--
#nsurveys
12
#survey_names
Spring_Age_2
Spring_Age_3+
Winter_Age_2
Winter_Age_3+
Fall_Age_2
Fall_Age_3+
Hydroacoustic_3+
Larval_Herring_Index
ICNAF_and_USA_CPUE
Canadian_Larval_Survey
Canadian_Age_2
Canadian_Age_3+
#----done_with_survey_names
#survey selex
 1 0
 0 1
 1 0
 0 1
 1 0
 0 1
 0.5 1
 0.5 1
 1 1
 0.5 1
 1 0
 0 1
#scale_biomass
 0.001 0.001 0.001 0.001 0.001 0.001 1 0.001 0.001 0.001 0.001 0.001
#emphasis_fpart_surveys
 1 1 1 1 1 1 1 1 0 1 1 1
#use_survey_cvs
 -99 -99 -99 -99 -99 -99 1 -99 -99 -99 -99 -99
#phase_nonlinear_indices
 0 0 0 0 0 0 0 0 -1 0 0 0
#n_survey_covariates
 2 2 0 0 3 3 1 1 0 0 0 0
#nobs_surveys
 35 35 11 11 37 40 4 24 26 9 17 17
#--
#survey_data survey_id year sex area julian_date datum cv covariates
 1 1968 0 0 86.14 0.0385175 0.385 1 0
 1 1969 0 0 81.19 0.004641 0.683 1 0
 1 1970 0 0 98.72 0.242537 0.282 1 0
 1 1971 0 0 90.47 0.0098343 0.296 1 0
 1 1972 0 0 89.67 0.024021 0.361 1 0
 1 1973 0 0 100.04 0.0036018 0.456 1 0
 1 1974 0 0 99.14 0.0013674 0.295 1 0
 1 1975 0 0 99.02 0.0019482 0.433 1 0
 1 1976 0 0 90.67 0.0018354 0.208 1 0
 1 1977 0 0 109.63 0.0024738 0.659 1 0
 1 1978 0 0 109.12 0.004888 0.526 0 0
 1 1979 0 0 107.6 0.145027 0.406 0 0
 1 1980 0 0 106.5 0.0046453 0.295 0 0
 1 1981 0 0 113.61 0.000864 0.377 0 0
 1 1982 0 0 104.17 0.0198009 0.309 0 0
 1 1983 0 0 97.23 0.0084095 0.416 0 0
 1 1984 0 0 90.05 0.098532 0.319 0 0
 1 1985 0 0 83.2 0.0956823 0.411 0 1
 1 1986 0 0 93.97 0.0896972 0.457 0 1
 1 1987 0 0 104.26 0.0571987 0.246 0 1
 1 1988 0 0 87.21 0.109776 0.335 0 1
```

```
1 1989 0 0 82.1 0.0762634 0.471 0 1
1 1990 0 0 86.76 0.130737 0.292 0 1
1 1991 0 0 86.9 0.242798 0.233 0 1
1 1992 0 0 87.18 0.506074 0.283 0 1
1 1993 0 0 96.39 0.318608 0.295 0 1
1 1994 0 0 91.66 0.213091 0.267 0 1
1 1995 0 0 96.56 0.339567 0.25 0 1
1 1996 0 0 99.38 2.20928 0.27 0 1
1 1997 0 0 88.2 0.978834 0.261 0 1
1 1998 0 0 87.81 0.191786 0.278 0 1
1 1999 0 0 91.59 0.127084 0.206 0 1
1 2000 0 0 100 0.921753 0.272 0 1
1 2001 0 0 93 0.305769 0.185 0 1
1 2002 0 0 93 0.2 0.185 0 1
2 1968 0 0 86.14 4.02381 0.385 1 0
2 1969 0 0 81.19 2.85755 0.683 1 0
2 1970 0 0 98.72 0.781455 0.282 1 0
2 1971 0 0 90.47 0.332553 0.296 1 0
2 1972 0 0 89.67 0.441679 0.361 1 0
2 1973 0 0 100.04 1.48675 0.456 1 0
2 1974 0 0 99.14 0.998222 0.295 1 0
2 1975 0 0 99.02 0.212204 0.433 1 0
2 1976 0 0 90.67 0.196818 0.208 1 0
2 1977 0 0 109.63 0.172891 0.659 1 0
2 1978 0 0 109.12 0.457187 0.526 0 0
2 1979 0 0 107.6 0.626994 0.406 0 0
2 1980 0 0 106.5 1.04988 0.295 0 0
2 1981 0 0 113.61 0.504389 0.377 0 0
2 1982 0 0 104.17 0.042464 0.309 0 0
2 1983 0 0 97.23 0.0685557 0.416 0 0
2 1984 0 0 90.05 0.154971 0.319 0 0
2 1985 0 0 83.2 0.346548 0.411 0 1
2 1986 0 0 93.97 4.2002 0.457 0 1
2 1987 0 0 104.26 0.809923 0.246 0 1
2 1988 0 0 87.21 1.41009 0.335 0 1
2 1989 0 0 82.1 1.19425 0.471 0 1
2 1990 0 0 86.76 0.873336 0.292 0 1
2 1991 0 0 86.9 2.27234 0.233 0 1
2 1992 0 0 87.18 2.72562 0.283 0 1
2 1993 0 0 96.39 7.60452 0.295 0 1
2 1994 0 0 91.66 3.89002 0.267 0 1
2 1995 0 0 96.56 2.9269 0.25 0 1
2 1996 0 0 99.38 3.21558 0.27 0 1
2 1997 0 0 88.2 4.76961 0.261 0 1
2 1998 0 0 87.81 5.51109 0.278 0 1
2 1999 0 0 91.59 10.796 0.206 0 1
2 2000 0 0 100 2.65571 0.272 0 1
2 2001 0 0 93 3.73244 0.185 0 1
2 2002 0 0 93 2.5 0.215 0 1
3 1992 0 0 53.59 0.354412 0.26
3 1993 0 0 45.92 0.014014 0.255
3 1994 0 0 41.28 0.003969 0.31
3 1995 0 0 49.8 0.0040992 0.286
3 1996 0 0 46.45 4.02681 0.368
3 1997 0 0 45.23 0.0810106 0.619
3 1998 0 0 47.75 0.0689128 0.261
3 1999 0 0 42.04 0.0129708 0.192
3 2000 0 0 50 2.91682 0.323
3 2001 0 0 41 0.364207 0.471
3 2002 0 0 50 0.4 0.541
4 1992 0 0 53.59 3.25676 0.26
4 1993 0 0 45.92 6.54461 0.255
4 1994 0 0 41.28 0.588561 0.31
4 1995 0 0 49.8 2.66092 0.286
4 1996 0 0 46.45 5.87763 0.368
4 1997 0 0 45.23 8.62009 0.619
4 1998 0 0 47.75 6.66305 0.261
4 1999 0 0 42.04 7.67709 0.192
4 2000 0 0 50 9.15969 0.323
4 2001 0 0 41 8.71385 0.471
4 2002 0 0 50 9.3 0.541
5 1963 0 0 332.97 0.0007125 0.259 -1.672 1 0
5 1964 0 0 313.89 0.0006375 0.308 -0.772 1 0
5 1965 0 0 296.06 7.5e-06 0.29 1.128 1 0
5 1966 0 0 301.15 0.00015 0.192 1.628 1 0
5 1967 0 0 313.08 0.0017125 0.256 -0.872 1 0
5 1968 0 0 302.9 0.0005575 0.222 -1.272 1 0
5 1969 0 0 301.85 0.0009048 0.383 -0.872 1 0
5 1970 0 0 292.59 0.0019404 0.444 -0.672 1 0
5 1971 0 0 293.66 0.0007448 0.72 -0.072 1 0
5 1972 0 0 295.12 0.0064617 0.375 -1.572 1 0
```

```
5 1973 0 0 291.8 3.78e-05 0.578 -1.672 1 0
5 1974 0 0 286.26 1.06e-05 0.581 -0.872 1 0
5 1975 0 0 296.06 0.0003825 0.468 0.228 1 0
5 1977 0 0 301.68 0.0002562 0.316 -1.672 1 0
5 1978 0 0 290.26 0.000428 0.274 0.428 0 0
5 1979 0 0 298.25 0.0003808 0.446 -0.472 0 0
5 1982 0 0 289.17 0.0001715 0.321 0.128 0 0
5 1983 0 0 286.88 0.0020075 0.272 -0.172 0 0
5 1984 0 0 282.9 0.0004692 0.485 0.228 0 0
5 1985 0 0 291.82 0.0016758 0.913 -0.172 0 1
5 1986 0 0 286 0.0011978 0.361 -0.472 0 1
5 1987 0 0 279.81 0.0889812 0.354 0.328 0 1
5 1988 0 0 280.6 0.0345474 0.521 0.228 0 1
5 1989 0 0 281.75 0.0643126 0.406 1.028 0 1
5 1990 0 0 276.94 0.114365 0.583 2.228 0 1
5 1991 0 0 275.26 0.143248 0.635 0.928 0 1
5 1992 0 0 279.54 0.103242 0.301 0.328 0 1
5 1993 0 0 274.45 0.0155892 0.417 0.828 0 1
5 1994 0 0 277.14 0.0311003 0.218 0.428 0 1
5 1995 0 0 273.55 0.0327376 0.368 1.628 0 1
5 1996 0 0 276.73 0.58347 0.313 0.128 0 1
5 1997 0 0 278.32 0.083904 0.316 0.628 0 1
5 1998 0 0 287.7 0.0654524 0.096 0.328 0 1
5 1999 0 0 290.23 0.0120366 0.177 -0.372 0 1
5 2000 0 0 272 0.0671549 0.258 1.728 0 1
5 2001 0 0 272 0.0183549 0.25 1.628 0 1
5 2002 0 0 278 0.149969 0.433 0.908 0 1
6 1963 0 0 332.97 0.639601 0.259 -1.672 1 0
6 1964 0 0 313.89 0.0864806 0.308 -0.772 1 0
6 1965 0 0 296.06 0.349221 0.29 1.128 1 0
6 1966 0 0 301.15 1.00297 0.192 1.628 1 0
6 1967 0 0 313.08 0.323385 0.256 -0.872 1 0
6 1968 0 0 302.9 0.130374 0.222 -1.272 1 0
6 1969 0 0 301.85 0.0647873 0.383 -0.872 1 0
6 1970 0 0 292.59 0.0583215 0.444 -0.672 1 0
6 1971 0 0 293.66 0.332917 0.72 -0.072 1 0
6 1972 0 0 295.12 0.0733762 0.375 -1.572 1 0
6 1973 0 0 291.8 0.0071231 0.578 -1.672 1 0
6 1974 0 0 286.26 0.0179494 0.581 -0.872 1 0
6 1975 0 0 296.06 0.062106 0.468 0.228 1 0
6 1976 0 0 298.01 0.0228836 0.606 -2.372 1 0
6 1977 0 0 301.68 0.0045698 0.316 -1.672 1 0
6 1978 0 0 290.26 0.0940207 0.274 0.428 0 0
6 1979 0 0 298.25 0.0023015 0.446 -0.472 0 0
6 1980 0 0 293.22 0.0006386 0.527 -0.972 0 0
6 1981 0 0 290.98 0.0011165 0.385 -0.072 0 0
6 1982 0 0 289.17 0.0198178 0.321 0.128 0 0
6 1983 0 0 286.88 0.0230087 0.272 -0.172 0 0
6 1984 0 0 282.9 0.224414 0.485 0.228 0 0
6 1985 0 0 291.82 0.382118 0.913 -0.172 0 1
6 1986 0 0 286 0.14279 0.361 -0.472 0 1
6 1987 0 0 279.81 0.907407 0.354 0.328 0 1
6 1988 0 0 280.6 1.24556 0.521 0.228 0 1
6 1989 0 0 281.75 1.81458 0.406 1.028 0 1
6 1990 0 0 276.94 1.26961 0.583 2.228 0 1
6 1991 0 0 275.26 1.90785 0.635 0.928 0 1
6 1992 0 0 279.54 6.34181 0.301 0.328 0 1
6 1993 0 0 274.45 2.36244 0.417 0.828 0 1
6 1994 0 0 277.14 1.78319 0.218 0.428 0 1
6 1995 0 0 273.55 9.7751 0.368 1.628 0 1
6 1996 0 0 276.73 3.77061 0.313 0.128 0 1
6 1997 0 0 278.32 4.32641 0.316 0.628 0 1
6 1998 0 0 287.7 2.54039 0.096 0.328 0 1
6 1999 0 0 290.23 1.68844 0.177 -0.372 0 1
6 2000 0 0 272 3.1045 0.258 1.728 0 1
6 2001 0 0 272 3.77602 0.25 1.628 0 1
6 2002 0 0 278 10.8981 0.433 0.908 0 1
7 1999 0 0 273 1193 0.1071 -0.1353
7 2000 0 0 265 1427 0.0722 -0.0734
7 2001 0 0 265 1819 0.066 0.0332
7 2002 0 0 265 763 0.1365 0.1755
8 1971 0 0 90 89.7 0.2 0
8 1972 0 0 90 81.4 0.2 0
8 1973 0 0 90 355.2 0.2 0
8 1974 0 0 90 304.5 0.2 0
8 1975 0 0 90 55.9 0.2 0
8 1976 0 0 90 2.2 0.2 0
8 1977 0 0 90 19.2 0.2 0
8 1978 0 0 90 2.4 0.2 0
8 1979 0 0 90 6 0.2 0
8 1980 0 0 90 1.9 0.2 0
```

```
8 1981 0 0 90 29.7 0.2 0
8 1982 0 0 90 18.2 0.2 0
8 1983 0 0 90 3.7 0.2 0
8 1984 0 0 90 2.3 0.2 0
8 1985 0 0 90 95.4 0.2 0
8 1986 0 0 90 60.4 0.2 0
8 1987 0 0 90 31.4 0.2 0
8 1988 0 0 90 184.9 0.2 0
8 1989 0 0 90 454.3 0.2 1
8 1990 0 0 90 394.1 0.2 1
8 1991 0 0 90 354.2 0.2 1
8 1992 0 0 90 577.1 0.2 1
8 1993 0 0 90 397.6 0.2 1
8 1994 0 0 90 610 0.2 1
9 1960 0 0 180 0.154094 1
9 1961 0 0 180 0.145542 1
9 1963 0 0 180 0.16747 1
9 1964 0 0 180 0.119432 1
9 1965 0 0 180 0.0503471 1
9 1966 0 0 180 0.0936122 1
9 1967 0 0 180 0.165301 1
9 1968 0 0 180 0.225098 1
9 1969 0 0 180 0.164017 1
9 1970 0 0 180 0.193137 1
9 1971 0 0 180 0.150286 1
9 1972 0 0 180 0.0931927 1
9 1973 0 0 180 0.103168 1
9 1974 0 0 180 0.0981641 1
9 1975 0 0 180 0.071347 1
9 1976 0 0 180 0.0731125 1
9 1977 0 0 180 0.103725 1
9 1978 0 0 180 0.12956 1
9 1979 0 0 180 0.177007 1
9 1980 0 0 180 0.128225 1
9 1982 0 0 180 0.0710141 1
9 1983 0 0 180 0.0437593 1
9 1984 0 0 180 0.0492521 1
9 1985 0 0 180 0.058507 1
9 1986 0 0 180 0.0724594 1
9 1987 0 0 180 0.0764225 1
10 1987 0 0 311 12.5893 0.428706
10 1988 0 0 309 6.05366 0.192931
10 1989 0 0 304 7.3743 0.356369
10 1990 0 0 308 10.214 0.186788
10 1991 0 0 311 3.28665 0.258948
10 1992 0 0 333 12.172 0.148202
10 1993 0 0 324 30.3514 0.134717
10 1994 0 0 326 52.2595 0.165629
10 1995 0 0 325 41.294 0.202032
11 1986 0 0 60 0.0962586 0.53915
11 1987 0 0 60 0.0354864 0.625298
11 1988 0 0 60 0.0137315 0.286945
11 1989 0 0 60 3.12522 0.50749
11 1990 0 0 60 1.58928 0.42794
11 1991 0 0 60 2.08539 0.568197
11 1992 0 0 60 0.404232 0.548984
11 1993 0 0 60 0.0192857 -0.69347
11 1994 0 0 60 0.0178963 -0.617265
11 1995 0 0 60 0.0975029 0.695333
11 1996 0 0 60 1.72861 0.458356
11 1997 0 0 60 0.988147 0.704324
11 1998 0 0 60 0.0601231 0.754251
11 1999 0 0 60 0.0322447 0.418691
11 2000 0 0 60 28.4954 0.391581
11 2001 0 0 60 0.124303 0.380895
11 2002 0 0 60 0.5 0.685102
12 1986 0 0 60 1.27675 0.536046
12 1987 0 0 60 0.0135768 0.326106
12 1988 0 0 60 0.556319 0.321023
12 1989 0 0 60 0.479208 0.486534
12 1990 0 0 60 0.220152 0.418123
12 1991 0 0 60 8.19958 0.492509
12 1992 0 0 60 4.99388 0.309343
12 1993 0 0 60 30.0806 -0.430868
12 1994 0 0 60 0.298118 -0.344542
12 1995 0 0 60 4.83328 0.442822
12 1996 0 0 60 2.41639 0.249246
12 1997 0 0 60 31.0152 0.396522
12 1998 0 0 60 3.16382 0.284036
12 1999 0 0 60 41.2759 0.259872
12 2000 0 0 60 7.04226 0.312992
```

```
 12 2001 0 0 60 47.8367 0.229625
 12 2002 0 0 60 15 0.324383
#check_after_survey_data
12345
#--
#phase_survey_covariate_pars
 -9 1 -9 -1 -1 -9 1 1 -9 1 -9 1
#survey_covariate_names
Spring_Age2_Effort_Dummy
Spring_Age2_Door_Dummy
Spring_Age3_Effort_Dummy
Spring_Age3_Door_Dummy
Fall_Age2_Temp_Anomaly
Fall_Age2_Effort_Anomaly
Fall_Age2_Door_Dummy
Fall_Age3_Temp_Anomaly
Fall_Age3_Effort_Anomaly
Fall_Age3_Door_Dummy
Percent_spent_and_resting
Break_US_Larval_1988_89
#----done_with_survey_covariate_names
#phase_survey_q_devs
-1
#emphasis_survey_q_devs
 0 0 0 0 0 0 0 0 0 0 0 0
#cv_survey_q_devs
 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1
#--
#emphasis_fpart_bayes_q
 0 0 0 0 0 0 1 0 0 0 0 0
#distn_prior_q_(1=log_normal;2=beta;other=NONE)
  0 0 0 0 0 0 1 0 0 0 0 0
#min_prior_q
 1e-06 1e-06 1e-06 1e-06 1e-06 1e-06 1e-06 1e-06 1e-06 1e-06 1e-06 1e-06
#max_prior_q
 99 99 99 99 99 99 99 99 99 99 99 99
#mean_qprior
 9 9 9 9 9 9 0.85 9 9 9 9 9
#cv_qprior
 9 9 9 9 9 9 0.429 9 9 9 9 9
#--
#emphasis_fpart_profile_q
0
#profile_q
-99
#profile_q_target
-99
#--
#fyear_fstatus
2000
#lyear_fstatus
2002
#--
#fyear_bstatus
2000
#lyear_bstatus
2002
#check_eof
12345
#---------------------------------------
#OUTPUT_CALCULATIONS:
#---------------------------------------
total_number_of_objective_function_calls 250
objective_function_calls_last_phase 249
final_obj_func 398.974
#---------------------------------------
Miscellaneous_Biology:
VonBert_K 0.173515
#---------------------------------------
#---------------------------------------
Goodness_of_fit_summary:
#---------------------------------------
Objective_function_components:
ComponentName Component_Value Emphasis Product
Survey_trends  see_below see_below 413.441
Prior_survey_Q  see_below see_below 0.0642656
survey_q_devs_(survey_Q_process_errors)  see_below  see_below 0 (not_used)
BEVERTON-HOLT_MODEL -18.1769 1 -18.1769
Constrain_first_few_recruitments -1.88142 1 -1.88142 (see_below)
Fox_surplus_production -37.0455 0.0001 -0.00370455
Natural_mortality_process_errors 0 0 0 (not_used)
```

```
Profile_Survey_Q 0 0 0 (not_used)
Prior_Log_Rec_Residual_Var 0.551205 10 5.51205 (see_below)
Catch 5.17475e-13 1e+06 5.17475e-07
C/B_constraint 0 10000 0
B_too_small 0 1000 0
B_too_big 0 1000 0
Constrain_Bzero 6.18217e-12 1000 6.18217e-09
Constrain_inital_IGR 0.0186878 1 0.0186878
Center_fdevs 1.79123e-18 1000 1.79123e-15
Center_recruit_devs 9.35824e-20 1000 9.35824e-17
Center_survey_q_devs 0 0 0 (not_used)
Center_natmat_devs 0 0 0 (not_used)
Total_LogLikelihood NA NA 398.974
#--------------------------------------
Constrain_first_few_recruitments
#--------------------------------------
Constrain_first_few_recruitments
Years_constrained 2
sd_recruit_devs 0.389325
Predicted_recruitment_(year_1962) 152.869
Year  1960 1961
Recruit_dev_weights  1 1
Recruits  158.148 149.687
#--------------------------------------
Goodness_of_fit_survey_trends
#--------------------------------------
SurveyNo ComponentName  Component_Value  Emphasis  Product
1 Trend_Spring_Age_2 64.2804 1 64.2804
2 Trend_Spring_Age_3+ 49.7078 1 49.7078
3 Trend_Winter_Age_2 20.8307 1 20.8307
4 Trend_Winter_Age_3+ 8.43102 1 8.43102
5 Trend_Fall_Age_2 76.3778 1 76.3778
6 Trend_Fall_Age_3+ 74.4223 1 74.4223
7 Trend_Hydroacoustic_3+ 15.9366 1 15.9366
8 Trend_Larval_Herring_Index 42.1214 1 42.1214
9 Trend_ICNAF_and_USA_CPUE 0 0 0
10 Trend_Canadian_Larval_Survey 6.06144 1 6.06144
11 Trend_Canadian_Age_2 28.226 1 28.226
12 Trend_Canadian_Age_3+ 27.046 1 27.046
Subotal All NA NA 413.441
#--------------------------------------
Goodness_of_fit_prior_survey_Q:
#--------------------------------------
SurveyNo Survey_Name NegLogLike Emphasis Product
1 PriorQ_Spring_Age_2 0 0 0 (not_used)
2 PriorQ_Spring_Age_3+ 0 0 0 (not_used)
3 PriorQ_Winter_Age_2 0 0 0 (not_used)
4 PriorQ_Winter_Age_3+ 0 0 0 (not_used)
5 PriorQ_Fall_Age_2 0 0 0 (not_used)
6 PriorQ_Fall_Age_3+ 0 0 0 (not_used)
7 PriorQ_Hydroacoustic_3+ 0.0642656 1 0.0642656
8 PriorQ_Larval_Herring_Index 0 0 0 (not_used)
9 PriorQ_ICNAF_and_USA_CPUE 0 0 0 (not_used)
10 PriorQ_Canadian_Larval_Survey 0 0 0 (not_used)
11 PriorQ_Canadian_Age_2 0 0 0 (not_used)
12 PriorQ_Canadian_Age_3+ 0 0 0 (not_used)
Subtotal All NA NA 0.0642656
#--------------------------------------
Goodness_of_fit_survey_Q_process_errors:
#--------------------------------------
SurveyNo. Survey_Name NegLogLike Emphasis Product
1 survey_q_devs_Spring_Age_2 0 0 0 (not_used)
2 survey_q_devs_Spring_Age_3+ 0 0 0 (not_used)
3 survey_q_devs_Winter_Age_2 0 0 0 (not_used)
4 survey_q_devs_Winter_Age_3+ 0 0 0 (not_used)
5 survey_q_devs_Fall_Age_2 0 0 0 (not_used)
6 survey_q_devs_Fall_Age_3+ 0 0 0 (not_used)
7 survey_q_devs_Hydroacoustic_3+ 0 0 0 (not_used)
8 survey_q_devs_Larval_Herring_Index 0 0 0 (not_used)
9 survey_q_devs_ICNAF_and_USA_CPUE 0 0 0 (not_used)
10 survey_q_devs_Canadian_Larval_Survey 0 0 0 (not_used)
11 survey_q_devs_Canadian_Age_2 0 0 0 (not_used)
12 survey_q_devs_Canadian_Age_3+ 0 0 0 (not_used)
Subtotal All NA NA 0 (not_used)
#--------------------------------------
Goodness_of_fit_survey_Q_profile_details
#--------------------------------------
For_survey_no NOT_USED named NOT_USED
Q Q_Scaled_For_Calcs Target  Residual  GOF  Weight  Product
Total NA NA NA NA NA 0 NA NA NA
#--------------------------------------
```

```
Goodness_of_fit_prior_on_log_variance_recruit_model_residuals:
#---------------------------------------
Constraint_on_log(Variance)_log_recruit_model_residuals_turned_ON
Variance_recruit_model_residuals 0.151574
Log_variance -1.88668
target_log_rvar -0.82124
std_log_rvar 1.01475
Scaled_residual -1.04996
#---------------------------------------
Goodness_of_fit_to_center_survey_survey_q_devs
#---------------------------------------
#n_surveys_with_survey_q_devs= 0
SurveyNo SurveyName Ndevs Component_Value  Emphasis  Product MeanDev Target Residual
1 CENTER_Spring_Age_2 0 0 0 0 0 0 0 (not_used)
2 CENTER_Spring_Age_3+ 0 0 0 0 0 0 0 (not_used)
3 CENTER_Winter_Age_2 0 0 0 0 0 0 0 (not_used)
4 CENTER_Winter_Age_3+ 0 0 0 0 0 0 0 (not_used)
5 CENTER_Fall_Age_2 0 0 0 0 0 0 0 (not_used)
6 CENTER_Fall_Age_3+ 0 0 0 0 0 0 0 (not_used)
7 CENTER_Hydroacoustic_3+ 0 0 0 0 0 0 0 (not_used)
8 CENTER_Larval_Herring_Index 0 0 0 0 0 0 0 (not_used)
9 CENTER_ICNAF_and_USA_CPUE 0 0 0 0 0 0 0 (not_used)
10 CENTER_Canadian_Larval_Survey 0 0 0 0 0 0 0 (not_used)
11 CENTER_Canadian_Age_2 0 0 0 0 0 0 0 (not_used)
12 CENTER_Canadian_Age_3+ 0 0 0 0 0 0 0 (not_used)
Subtotal All NA NA NA 0
#---------------------------------------
Goodness_of_fit_constrain_Bzero_details
#---------------------------------------
Model_biomass_1959= 1216.61
Model_escapment_1960= 1115.55
Z=M+F-G_in_1959= 0.0867248
Escapement_by_projecting_b-zero= 1115.55
Difference= -2.4864e-06
#---------------------------------------
#Survey_stuff
#---------------------------------------
Survey_name Spring_Age_2
Likelihood_weight: 1
Biomass_in_goodness_of_fit_calcs_scaled_by 0.001
N_all_observations 35
Nobs_used_for_tuning= 35
Root_mean_square_residual= 1.06068
#---
Survey_CVs NOT_USED
Min_survey_CV= 0.185
Max_survey_CV= 0.683
Mean_survey_CV=  0.340086
CV_implied_by_goodness_of_fit= 1.44234
#---
Prior_Q_NOT_SPECIFIED
Emphasis 0
#---
Q_for_adj_biomass 0.109291
#---
N_covariates_for_survey_Q 2
survey_covariate_names: Spring_Age2_Effort_Dummy Spring_Age2_Door_Dummy
Covariate_pars: not_used 2.76925
Phase_survey_covariate_pars  -9 1
#---
Catchability_process_errors  OFF
N_survey_Q_process_errors 0
Mean_log_Q_process_error NA
Target_std_dev_log_Q_process_errors= NA
Obs_RMSE_log_Q_process_errors= NA
Target_arith_CV_Q_process_error NA
Obs_arith_CV_Q_process_error NA
#---
Linear_survey_with_I=qB
#---
```

```
SurvIdNum Year Sex Area Time Datum ArithCV LogStd LikelihoodWt_(1/LogStd^2) AvailB AvailB_Adj Yhat RawResid StdResid
Q=Yhat/AvailB  Covariate_Spring_Age2_Door_Dummy
1 1968 0 0 1968.24 0.0385175 0.385  1 1 0.163362 0.163362 0.017854 0.768887 0.724902 0.109291 0
1 1969 0 0 1969.22 0.004641 0.683  1 1 0.114362 0.114362 0.0124987 -0.990693 -0.934019 0.109291 0
1 1970 0 0 1970.27 0.242537 0.282  1 1 0.241313 0.241313 0.0263733 2.2188 2.09187 0.109291 0
1 1971 0 0 1971.25 0.0098343 0.296  1 1 0.138847 0.138847 0.0151747 -0.433756 -0.408942 0.109291 0
1 1972 0 0 1972.25 0.024021 0.361  1 1 0.264499 0.264499 0.0289072 -0.185164 -0.174571 0.109291 0
1 1973 0 0 1973.27 0.0036018 0.456  1 1 0.0799019 0.0799019 0.00873253 -0.885621 -0.834958 0.109291 0
1 1974 0 0 1974.27 0.0013674 0.295  1 1 0.0515949 0.0515949 0.00563884 -1.41677 -1.33572 0.109291 0
1 1975 0 0 1975.27 0.0019482 0.433  1 1 0.1117 0.1117 0.0122078 -1.83517 -1.73019 0.109291 0
1 1976 0 0 1976.25 0.0018354 0.208  1 1 0.0654665 0.0654665 0.00715488 -1.36053 -1.2827 0.109291 0
1 1977 0 0 1977.3 0.0024738 0.659  1 1 0.0602433 0.0602433 0.00658403 -0.978892 -0.922893 0.109291 0
1 1978 0 0 1978.3 0.004888 0.526  1 1 0.0485109 0.0485109 0.00530179 -0.0812621 -0.0766134 0.109291 0
1 1979 0 0 1979.29 0.145027 0.406  1 1 0.0696591 0.0696591 0.0076131 2.94705 2.77846 0.109291 0
1 1980 0 0 1980.29 0.0046453 0.295  1 1 0.0488929 0.0488929 0.00534354 -0.140033 -0.132022 0.109291 0
1 1981 0 0 1981.31 0.000864 0.377  1 1 0.0333999 0.0333999 0.0036503 -1.44099 -1.35856 0.109291 0
1 1982 0 0 1982.29 0.0198009 0.309  1 1 0.0445741 0.0445741 0.00487153 1.40232 1.3221 0.109291 0
1 1983 0 0 1983.27 0.0084095 0.416  1 1 0.0656051 0.0656051 0.00717003 0.159453 0.150331 0.109291 0
1 1984 0 0 1984.25 0.098532 0.319  1 1 0.0947988 0.0947988 0.0103606 2.25237 2.12352 0.109291 0
1 1985 0 0 1985.23 0.0956823 0.411  1 1 0.0452013 0.720808 0.0787776 0.194404 0.183283 1.74282 1
1 1986 0 0 1986.26 0.0896972 0.457  1 1 0.0535027 0.853187 0.0932454 -0.0387948 -0.0365754 1.74282 1
1 1987 0 0 1987.29 0.0571987 0.246  1 1 0.100841 1.60808 0.175748 -1.12252 -1.0583 1.74282 1
1 1988 0 0 1988.24 0.109776 0.335  1 1 0.0794978 1.26772 0.13855 -0.232791 -0.219473 1.74282 1
1 1989 0 0 1989.22 0.0762634 0.471  1 1 0.107352 1.71191 0.187095 -0.897425 -0.846086 1.74282 1
1 1990 0 0 1990.24 0.130737 0.292  1 1 0.14812 2.36202 0.258146 -0.680339 -0.641419 1.74282 1
1 1991 0 0 1991.24 0.242798 0.233  1 1 0.18914 3.01614 0.329636 -0.30576 -0.288269 1.74282 1
1 1992 0 0 1992.24 0.506074 0.283  1 1 0.206174 3.28778 0.359324 0.342458 0.322867 1.74282 1
1 1993 0 0 1993.26 0.318608 0.295  1 1 0.122416 1.95213 0.213349 0.401032 0.37809 1.74282 1
1 1994 0 0 1994.25 0.213091 0.267  1 1 0.135895 2.16706 0.23684 -0.105664 -0.0996191 1.74282 1
1 1995 0 0 1995.26 0.339567 0.25  1 1 0.135637 2.16296 0.236391 0.362184 0.341465 1.74282 1
1 1996 0 0 1996.27 2.20928 0.27  1 1 0.406622 6.48424 0.708667 1.13704 1.07199 1.74282 1
1 1997 0 0 1997.24 0.978834 0.261  1 1 0.21686 3.45818 0.377947 0.951608 0.89717 1.74282 1
1 1998 0 0 1998.24 0.191786 0.278  1 1 0.138668 2.21128 0.241673 -0.231204 -0.217977 1.74282 1
1 1999 0 0 1999.25 0.127084 0.206  1 1 0.102729 1.63819 0.179038 -0.342752 -0.323145 1.74282 1
1 2000 0 0 2000.27 0.921753 0.272  1 1 0.396903 6.32927 0.69173 0.287081 0.270658 1.74282 1
1 2001 0 0 2001.25 0.305769 0.185  1 1 0.110272 1.75846 0.192184 0.464379 0.437813 1.74282 1
1 2002 0 0 2002.25 0.2 0.185  1 1 0.137792 2.19732 0.240147 -0.182934 -0.172469 1.74282 1
#------------
Survey_name Spring_Age_3+
Likelihood_weight: 1
Biomass_in_goodness_of_fit_calcs_scaled_by 0.001
N_all_observations 35
Nobs_used_for_tuning= 35
Root_mean_square_residual= 0.699456
#---
Survey_CVs NOT_USED
Min_survey_CV= 0.185
Max_survey_CV= 0.683
Mean_survey_CV=  0.340943
CV_implied_by_goodness_of_fit= 0.794402
#---
Prior_Q_NOT_SPECIFIED
Emphasis 0
#---
Q_for_adj_biomass 3.84788
#---
N_covariates_for_survey_Q 2
survey_covariate_names: Spring_Age3_Effort_Dummy Spring_Age3_Door_Dummy
Covariate_pars: not_used not_used
Phase_survey_covariate_pars  -9 -1
#---
Catchability_process_errors  OFF
N_survey_Q_process_errors 0
Mean_log_Q_process_error NA
Target_std_dev_log_Q_process_errors= NA
Obs_RMSE_log_Q_process_errors= NA
Target_arith_CV_Q_process_error NA
Obs_arith_CV_Q_process_error NA
#---
Linear_survey_with_I=qB
#---
SurvIdNum Year Sex Area Time Datum ArithCV LogStd LikelihoodWt_(1/LogStd^2) AvailB AvailB_Adj Yhat RawResid StdResid
Q=Yhat/AvailB
2 1968 0 0 1968.24 4.02381 0.385  1 1 0.754476 0.754476 2.90313 0.32644 0.466706 3.84788
2 1969 0 0 1969.22 2.85755 0.683  1 1 0.509091 0.509091 1.95892 0.377572 0.539809 3.84788
2 1970 0 0 1970.27 0.781455 0.282  1 1 0.303478 0.303478 1.16775 -0.401673 -0.574264 3.84788
2 1971 0 0 1971.25 0.332553 0.296  1 1 0.319569 0.319569 1.22966 -1.3077 -1.86959 3.84788
2 1972 0 0 1972.25 0.441679 0.361  1 1 0.235205 0.235205 0.905038 -0.717394 -1.02564 3.84788
2 1973 0 0 1973.27 1.48675 0.456  1 1 0.312113 0.312113 1.20097 0.21346 0.30518 3.84788
2 1974 0 0 1974.27 0.998222 0.295  1 1 0.18841 0.18841 0.724977 0.319836 0.457264 3.84788
2 1975 0 0 1975.27 0.212204 0.433  1 1 0.0824059 0.0824059 0.317088 -0.401631 -0.574204 3.84788
```

```
2 1976 0 0 1976.25 0.196818 0.208  1 1 0.0637615 0.0637615 0.245346 -0.220391 -0.315089 3.84788
2 1977 0 0 1977.3 0.172891 0.659  1 1 0.05423 0.05423 0.20867 -0.188094 -0.268914 3.84788
2 1978 0 0 1978.3 0.457187 0.526  1 1 0.0683088 0.0683088 0.262844 0.553532 0.791375 3.84788
2 1979 0 0 1979.29 0.626994 0.406  1 1 0.0568788 0.0568788 0.218862 1.05249 1.50473 3.84788
2 1980 0 0 1980.29 1.04988 0.295  1 1 0.0585413 0.0585413 0.22526 1.53918 2.20053 3.84788
2 1981 0 0 1981.31 0.504389 0.377  1 1 0.0411085 0.0411085 0.15818 1.15961 1.65788 3.84788
2 1982 0 0 1982.29 0.042464 0.309  1 1 0.026285 0.026285 0.101141 -0.867862 -1.24077 3.84788
2 1983 0 0 1983.27 0.0685557 0.416  1 1 0.0395403 0.0395403 0.152146 -0.797196 -1.13974 3.84788
2 1984 0 0 1984.25 0.154971 0.319  1 1 0.095021 0.095021 0.365629 -0.858381 -1.22721 3.84788
2 1985 0 0 1985.23 0.346548 0.411  1 1 0.18164 0.18164 0.698926 -0.701524 -1.00296 3.84788
2 1986 0 0 1986.26 4.2002 0.457  1 1 0.193556 0.193556 0.744778 1.7298 2.47307 3.84788
2 1987 0 0 1987.29 0.809923 0.246  1 1 0.208208 0.208208 0.80116 0.0108788 0.0155532 3.84788
2 1988 0 0 1988.24 1.41009 0.335  1 1 0.274565 0.274565 1.05649 0.2887 0.412749 3.84788
2 1989 0 0 1989.22 1.19425 0.471  1 1 0.305701 0.305701 1.1763 0.0151464 0.0216546 3.84788
2 1990 0 0 1990.24 0.873336 0.292  1 1 0.352796 0.352796 1.35751 -0.44109 -0.630619 3.84788
2 1991 0 0 1991.24 2.27234 0.233  1 1 0.459866 0.459866 1.76951 0.250109 0.357576 3.84788
2 1992 0 0 1992.24 2.72562 0.283  1 1 0.630981 0.630981 2.42794 0.115654 0.165348 3.84788
2 1993 0 0 1993.26 7.60452 0.295  1 1 0.810598 0.810598 3.11908 0.891205 1.27414 3.84788
2 1994 0 0 1994.25 3.89002 0.267  1 1 0.879217 0.879217 3.38312 0.139617 0.199608 3.84788
2 1995 0 0 1995.26 2.9269 0.25  1 1 0.945179 0.945179 3.63693 -0.217197 -0.310522 3.84788
2 1996 0 0 1996.27 3.21558 0.27  1 1 0.98002 0.98002 3.771 -0.159331 -0.227793 3.84788
2 1997 0 0 1997.24 4.76961 0.261  1 1 1.34898 1.34898 5.1907 -0.0846044 -0.120957 3.84788
2 1998 0 0 1998.24 5.51109 0.278  1 1 1.48786 1.48786 5.72509 -0.0380961 -0.0544653 3.84788
2 1999 0 0 1999.25 10.796 0.206  1 1 1.48664 1.48664 5.72041 0.635135 0.908041 3.84788
2 2000 0 0 2000.27 2.65571 0.272  1 1 1.41238 1.41238 5.43467 -0.716087 -1.02378 3.84788
2 2001 0 0 2001.25 3.73244 0.185  1 1 1.71055 1.71055 6.58199 -0.567275 -0.811022 3.84788
2 2002 0 0 2002.25 2.5 0.215  1 1 1.65139 1.65139 6.35435 -0.932848 -1.33368 3.84788
#------------
Survey_name Winter_Age_2
Likelihood_weight: 1
Biomass_in_goodness_of_fit_calcs_scaled_by 0.001
N_all_observations 11
Nobs_used_for_tuning= 11
Root_mean_square_residual= 2.00321
#---
Survey_CVs NOT_USED
Min_survey_CV= 0.192
Max_survey_CV= 0.619
Mean_survey_CV=  0.353273
CV_implied_by_goodness_of_fit= 7.36908
#---
Prior_Q_NOT_SPECIFIED
Emphasis 0
#---
Q_for_adj_biomass 0.608126
#---
N_covariates_for_survey_Q 0
survey_covariate_names: NONE
Covariate_pars NONE
phase_estimation NA
#---
Catchability_process_errors  OFF
N_survey_Q_process_errors 0
Mean_log_Q_process_error NA
Target_std_dev_log_Q_process_errors= NA
Obs_RMSE_log_Q_process_errors= NA
Target_arith_CV_Q_process_error NA
Obs_arith_CV_Q_process_error NA
#---
Linear_survey_with_I=qB
#---
SurvIdNum Year Sex Area Time Datum ArithCV LogStd LikelihoodWt_(1/LogStd^2) AvailB AvailB_Adj Yhat RawResid StdResid
Q=Yhat/AvailB
3 1992 0 0 1992.15 0.354412 0.26  1 1 0.201417 0.201417 0.122487 1.06245 0.530377 0.608126
3 1993 0 0 1993.13 0.014014 0.255  1 1 0.117949 0.117949 0.0717282 -1.63283 -0.815107 0.608126
3 1994 0 0 1994.11 0.003969 0.31  1 1 0.130606 0.130606 0.0794247 -2.99629 -1.49575 0.608126
3 1995 0 0 1995.14 0.0040992 0.286  1 1 0.131076 0.131076 0.0797105 -2.96761 -1.48143 0.608126
3 1996 0 0 1996.13 4.02681 0.368  1 1 0.390957 0.390957 0.237751 2.82951 1.41249 0.608126
3 1997 0 0 1997.12 0.0810106 0.619  1 1 0.209696 0.209696 0.127522 -0.453706 -0.22649 0.608126
3 1998 0 0 1998.13 0.0689128 0.261  1 1 0.134428 0.134428 0.0817492 -0.170814 -0.0852705 0.608126
3 1999 0 0 1999.12 0.0129708 0.192  1 1 0.0988834 0.0988834 0.0601336 -1.53387 -0.765707 0.608126
3 2000 0 0 2000.14 2.91682 0.323  1 1 0.381422 0.381422 0.231953 2.53172 1.26383 0.608126
3 2001 0 0 2001.11 0.364207 0.471  1 1 0.105869 0.105869 0.0643819 1.73289 0.865058 0.608126
3 2002 0 0 2002.14 0.4 0.541  1 1 0.132991 0.132991 0.0808754 1.59855 0.797998 0.608126
#------------
Survey_name Winter_Age_3+
Likelihood_weight: 1
Biomass_in_goodness_of_fit_calcs_scaled_by 0.001
N_all_observations 11
Nobs_used_for_tuning= 11
Root_mean_square_residual= 0.64889
```

```
#---
Survey_CVs NOT_USED
Min_survey_CV= 0.192
Max_survey_CV= 0.619
Mean_survey_CV=  0.353273
CV_implied_by_goodness_of_fit= 0.723584
#---
Prior_Q_NOT_SPECIFIED
Emphasis 0
#---
Q_for_adj_biomass 4.36407
#---
N_covariates_for_survey_Q 0
survey_covariate_names: NONE
Covariate_pars NONE
phase_estimation NA
#---
Catchability_process_errors  OFF
N_survey_Q_process_errors 0
Mean_log_Q_process_error NA
Target_std_dev_log_Q_process_errors= NA
Obs_RMSE_log_Q_process_errors= NA
Target_arith_CV_Q_process_error NA
Obs_arith_CV_Q_process_error NA
#---
Linear_survey_with_I=qB
#---
SurvIdNum Year Sex Area Time Datum ArithCV LogStd LikelihoodWt_(1/LogStd^2) AvailB AvailB_Adj Yhat RawResid StdResid
Q=Yhat/AvailB
4 1992 0 0 1992.15 3.25676 0.26  1 1 0.637187 0.637187 2.78073 0.158018 0.243521 4.36407
4 1993 0 0 1993.13 6.54461 0.255  1 1 0.821733 0.821733 3.5861 0.601576 0.927084 4.36407
4 1994 0 0 1994.11 0.588561 0.31  1 1 0.892221 0.892221 3.89372 -1.88944 -2.9118 4.36407
4 1995 0 0 1995.14 2.66092 0.286  1 1 0.962097 0.962097 4.19866 -0.456094 -0.702883 4.36407
4 1996 0 0 1996.13 5.87763 0.368  1 1 1.00045 1.00045 4.36603 0.2973 0.458166 4.36407
4 1997 0 0 1997.12 8.62009 0.619  1 1 1.36346 1.36346 5.95024 0.370663 0.571227 4.36407
4 1998 0 0 1998.13 6.66305 0.261  1 1 1.50629 1.50629 6.57355 0.0135233 0.0208407 4.36407
4 1999 0 0 1999.12 7.67709 0.192  1 1 1.51435 1.51435 6.60874 0.149847 0.230928 4.36407
4 2000 0 0 2000.14 9.15969 0.323  1 1 1.44061 1.44061 6.28695 0.376337 0.57997 4.36407
4 2001 0 0 2001.11 8.71385 0.471  1 1 1.73903 1.73903 7.58924 0.138183 0.212952 4.36407
4 2002 0 0 2002.14 9.3 0.541  1 1 1.67619 1.67619 7.31501 0.240086 0.369995 4.36407
#------------
Survey_name Fall_Age_2
Likelihood_weight: 1
Biomass_in_goodness_of_fit_calcs_scaled_by 0.001
N_all_observations 37
Nobs_used_for_tuning= 37
Root_mean_square_residual= 1.29538
#---
Survey_CVs NOT_USED
Min_survey_CV= 0.096
Max_survey_CV= 0.913
Mean_survey_CV=  0.381351
CV_implied_by_goodness_of_fit= 2.08684
#---
Prior_Q_NOT_SPECIFIED
Emphasis 0
#---
Q_for_adj_biomass 0.00388664
#---
N_covariates_for_survey_Q 3
survey_covariate_names: Fall_Age2_Temp_Anomaly Fall_Age2_Effort_Anomaly Fall_Age2_Door_Dummy
Covariate_pars: not_used not_used 4.22564
Phase_survey_covariate_pars  -1 -9 1
#---
Catchability_process_errors  OFF
N_survey_Q_process_errors 0
Mean_log_Q_process_error NA
Target_std_dev_log_Q_process_errors= NA
Obs_RMSE_log_Q_process_errors= NA
Target_arith_CV_Q_process_error NA
Obs_arith_CV_Q_process_error NA
#---
Linear_survey_with_I=qB
#---
SurvIdNum Year Sex Area Time Datum ArithCV LogStd LikelihoodWt_(1/LogStd^2) AvailB AvailB_Adj Yhat RawResid StdResid
Q=Yhat/AvailB  Covariate_Fall_Age2_Door_Dummy
5 1963 0 0 1963.91 0.0007125 0.259  1 1 0.179024 0.179024 0.000695804 0.0237126 0.0183055 0.00388664 0
5 1964 0 0 1964.86 0.0006375 0.308  1 1 0.185988 0.185988 0.000722867 -0.125672 -0.0970151 0.00388664 0
5 1965 0 0 1965.81 7.5e-06 0.29  1 1 0.103745 0.103745 0.00040322 -3.98458 -3.07599 0.00388664 0
5 1966 0 0 1966.83 0.00015 0.192  1 1 0.150449 0.150449 0.000584743 -1.36054 -1.0503 0.00388664 0
5 1967 0 0 1967.86 0.0017125 0.256  1 1 0.196463 0.196463 0.000763583 0.807687 0.623513 0.00388664 0
```

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5 1968 0 0 1968.83 0.0005575 0.222  1 1 0.145194 0.145194 0.000564319 -0.0121574 -0.00938521 0.00388664 0
5 1969 0 0 1969.83 0.0009048 0.383  1 1 0.0917125 0.0917125 0.000356454 0.931509 0.7191 0.00388664 0
5 1970 0 0 1970.8 0.0019404 0.444  1 1 0.212712 0.212712 0.000826735 0.853165 0.65862 0.00388664 0
5 1971 0 0 1971.8 0.0007448 0.72  1 1 0.107527 0.107527 0.000417917 0.577832 0.446071 0.00388664 0
5 1972 0 0 1972.81 0.0064617 0.375  1 1 0.234845 0.234845 0.000912759 1.95718 1.51089 0.00388664 0
5 1973 0 0 1973.8 3.78e-05 0.578  1 1 0.0660164 0.0660164 0.000256582 -1.91514 -1.47844 0.00388664 0
5 1974 0 0 1974.78 1.06e-05 0.581  1 1 0.0366655 0.0366655 0.000142506 -2.59853 -2.00599 0.00388664 0
5 1975 0 0 1975.81 0.0003825 0.468  1 1 0.0650081 0.0650081 0.000252663 0.41467 0.320114 0.00388664 0
5 1977 0 0 1977.83 0.0002562 0.316  1 1 0.0526148 0.0526148 0.000204495 0.225416 0.174015 0.00388664 0
5 1978 0 0 1978.8 0.000428 0.274  1 1 0.0383304 0.0383304 0.000148977 1.05533 0.81469 0.00388664 0
5 1979 0 0 1979.82 0.0003808 0.446  1 1 0.0518864 0.0518864 0.000201664 0.635672 0.490721 0.00388664 0
5 1982 0 0 1982.79 0.0001715 0.321  1 1 0.0328825 0.0328825 0.000127803 0.294097 0.227035 0.00388664 0
5 1983 0 0 1983.79 0.0020075 0.272  1 1 0.0662637 0.0662637 0.000257544 2.05346 1.58521 0.00388664 0
5 1984 0 0 1984.78 0.0004692 0.485  1 1 0.102166 0.102166 0.000397081 0.166888 0.128833 0.00388664 0
5 1985 0 0 1985.8 0.0016758 0.913  1 1 0.0482425 3.30065 0.0128285 -2.03538 -1.57126 0.265916 1
5 1986 0 0 1986.78 0.0011978 0.361  1 1 0.0573015 3.92045 0.0152374 -2.54327 -1.96333 0.265916 1
5 1987 0 0 1987.77 0.0889812 0.354  1 1 0.108114 7.39691 0.0287492 1.12982 0.872188 0.265916 1
5 1988 0 0 1988.77 0.0345474 0.521  1 1 0.0860977 5.89063 0.0228948 0.411423 0.317608 0.265916 1
5 1989 0 0 1989.77 0.0643126 0.406  1 1 0.114712 7.84838 0.0305039 0.745902 0.575817 0.265916 1
5 1990 0 0 1990.76 0.114365 0.583  1 1 0.162229 11.0994 0.0431393 0.97496 0.752643 0.265916 1
5 1991 0 0 1991.75 0.143248 0.635  1 1 0.214329 14.6639 0.0569935 0.92164 0.711481 0.265916 1
5 1992 0 0 1992.77 0.103242 0.301  1 1 0.235664 16.1236 0.0626668 0.499244 0.385403 0.265916 1
5 1993 0 0 1993.75 0.0155892 0.417  1 1 0.13957 9.54911 0.037114 -0.867416 -0.669622 0.265916 1
5 1994 0 0 1994.76 0.0311003 0.218  1 1 0.157281 10.7609 0.0418237 -0.296245 -0.228693 0.265916 1
5 1995 0 0 1995.75 0.0327376 0.368  1 1 0.154388 10.5629 0.0410544 -0.226373 -0.174754 0.265916 1
5 1996 0 0 1996.76 0.58347 0.313  1 1 0.463832 31.7344 0.12334 1.55405 1.19968 0.265916 1
5 1997 0 0 1997.76 0.083904 0.316  1 1 0.25161 17.2147 0.0669073 0.226365 0.174748 0.265916 1
5 1998 0 0 1998.79 0.0654524 0.096  1 1 0.161907 11.0774 0.0430538 0.418872 0.323358 0.265916 1
5 1999 0 0 1999.8 0.0120366 0.177  1 1 0.119709 8.19024 0.0318325 -0.972537 -0.750773 0.265916 1
5 2000 0 0 2000.75 0.0671549 0.258  1 1 0.45512 31.1384 0.121024 -0.588986 -0.454682 0.265916 1
5 2001 0 0 2001.75 0.0183549 0.25  1 1 0.126875 8.68052 0.0337381 -0.608732 -0.469924 0.265916 1
5 2002 0 0 2002.76 0.149969 0.433  1 1 0.160507 10.9816 0.0426814 1.25667 0.970112 0.265916 1
#------------
Survey_name Fall_Age_3+
Likelihood_weight: 1
Biomass_in_goodness_of_fit_calcs_scaled_by 0.001
N_all_observations 40
Nobs_used_for_tuning= 40
Root_mean_square_residual= 1.01625
#---
Survey_CVs NOT_USED
Min_survey_CV= 0.096
Max_survey_CV= 0.913
Mean_survey_CV=  0.3907
CV_implied_by_goodness_of_fit= 1.34492
#---
Prior_Q_NOT_SPECIFIED
Emphasis 0
#---
Q_for_adj_biomass 0.43631
#---
N_covariates_for_survey_Q 3
survey_covariate_names: Fall_Age3_Temp_Anomaly Fall_Age3_Effort_Anomaly Fall_Age3_Door_Dummy
Covariate_pars: 0.522073 not_used 1.71708
Phase_survey_covariate_pars  1 -9 1
#---
Catchability_process_errors  OFF
N_survey_Q_process_errors 0
Mean_log_Q_process_error NA
Target_std_dev_log_Q_process_errors= NA
Obs_RMSE_log_Q_process_errors= NA
Target_arith_CV_Q_process_error NA
Obs_arith_CV_Q_process_error NA
#---
Linear_survey_with_I=qB
#---
SurvIdNum Year Sex Area Time Datum ArithCV LogStd LikelihoodWt_(1/LogStd^2) AvailB AvailB_Adj Yhat RawResid StdResid
Q=Yhat/AvailB  Covariate_Fall_Age3_Temp_Anomaly Covariate_Fall_Age3_Door_Dummy
6 1963 0 0 1963.91 0.639601 0.259  1 1 0.950375 0.397006 0.173218 1.3063 1.28541 0.182262 -1.672 0
6 1964 0 0 1964.86 0.0864806 0.308  1 1 0.92651 0.619172 0.270151 -1.13906 -1.12085 0.291579 -0.772 0
6 1965 0 0 1965.81 0.349221 0.29  1 1 0.964585 1.73818 0.758388 -0.77549 -0.76309 0.786232 1.128 0
6 1966 0 0 1966.83 1.00297 0.192  1 1 0.840896 1.96727 0.858341 0.15572 0.15323 1.02075 1.628 0
6 1967 0 0 1967.86 0.323385 0.256  1 1 0.710574 0.45071 0.19665 0.49742 0.489467 0.276747 -0.872 0
6 1968 0 0 1968.83 0.130374 0.222  1 1 0.518899 0.267103 0.11654 0.112176 0.110383 0.22459 -1.272 0
6 1969 0 0 1969.83 0.0647873 0.383  1 1 0.316324 0.200641 0.0875419 -0.301008 -0.296195 0.276747 -0.872 0
6 1970 0 0 1970.8 0.0583215 0.444  1 1 0.214478 0.151014 0.065889 -0.122001 -0.12005 0.307206 -0.672 0
6 1971 0 0 1971.8 0.332917 0.72  1 1 0.202766 0.195285 0.0852049 1.36283 1.34104 0.420214 -0.072 0
6 1972 0 0 1972.81 0.0733762 0.375  1 1 0.169828 0.0747455 0.0326122 0.810912 0.797946 0.19203 -1.572 0
6 1973 0 0 1973.8 0.0071231 0.578  1 1 0.216694 0.0905209 0.0394952 -1.71284 -1.68545 0.182262 -1.672 0
6 1974 0 0 1974.78 0.0179494 0.581  1 1 0.110559 0.0701267 0.030597 -0.533345 -0.524817 0.276747 -0.872 0
6 1975 0 0 1975.81 0.062106 0.468  1 1 0.0389438 0.0438666 0.0191394 1.17709 1.15827 0.491463 0.228 0
```

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6 1976 0 0 1976.82 0.0228836 0.606  1 1 0.034176 0.00990625 0.0043222 1.66666 1.64001 0.126469 -2.372 0
6 1977 0 0 1977.83 0.0045698 0.316  1 1 0.040025 0.0167199 0.00729505 -0.467727 -0.460248 0.182262 -1.672 0
6 1978 0 0 1978.8 0.0940207 0.274  1 1 0.0461341 0.0576851 0.0251686 1.31792 1.29684 0.545553 0.428 0
6 1979 0 0 1979.82 0.0023015 0.446  1 1 0.0356686 0.0278784 0.0121636 -1.66489 -1.63827 0.341018 -0.472 0
6 1980 0 0 1980.8 0.0006386 0.527  1 1 0.0361282 0.0217501 0.0094898 -2.69869 -2.65554 0.26267 -0.972 0
6 1981 0 0 1981.8 0.0011165 0.385  1 1 0.0220418 0.0212287 0.00926229 -2.11575 -2.08192 0.420214 -0.072 0
6 1982 0 0 1982.79 0.0198178 0.321  1 1 0.0164528 0.0175898 0.00767461 0.948663 0.933494 0.466463 0.128 0
6 1983 0 0 1983.79 0.0230087 0.272  1 1 0.0341814 0.0312458 0.0136328 0.52339 0.515022 0.398839 -0.172 0
6 1984 0 0 1984.78 0.224414 0.485  1 1 0.0875436 0.0986097 0.0430244 1.65173 1.62531 0.491463 0.228 0
6 1985 0 0 1985.8 0.382118 0.913  1 1 0.162227 0.82574 0.360279 0.0588514 0.0579104 2.22083 -0.172 1
6 1986 0 0 1986.78 0.14279 0.361  1 1 0.171641 0.747003 0.325925 -0.825292 -0.812096 1.89887 -0.472 1
6 1987 0 0 1987.77 0.907407 0.354  1 1 0.186464 1.2322 0.537623 0.523434 0.515065 2.88325 0.328 1
6 1988 0 0 1988.77 1.24556 0.521  1 1 0.245876 1.54216 0.672862 0.615801 0.605955 2.73659 0.228 1
6 1989 0 0 1989.77 1.81458 0.406  1 1 0.266473 2.53778 1.10726 0.493968 0.486069 4.15524 1.028 1
6 1990 0 0 1990.76 1.26961 0.583  1 1 0.318642 5.67785 2.47731 -0.668462 -0.657773 7.77457 2.228 1
6 1991 0 0 1991.75 1.90785 0.635  1 1 0.432285 3.90749 1.70488 0.112484 0.110685 3.94387 0.928 1
6 1992 0 0 1992.77 6.34181 0.301  1 1 0.596586 3.9424 1.72011 1.30478 1.28391 2.88325 0.328 1
6 1993 0 0 1993.75 2.36244 0.417  1 1 0.772505 6.62758 2.89168 -0.202143 -0.198911 3.74326 0.828 1
6 1994 0 0 1994.76 1.78319 0.218  1 1 0.83295 5.79936 2.53032 -0.349941 -0.344346 3.03778 0.428 1
6 1995 0 0 1995.75 9.7751 0.368  1 1 0.883794 11.5131 5.02328 0.665755 0.65511 5.68377 1.628 1
6 1996 0 0 1996.76 3.77061 0.313  1 1 0.914565 5.44446 2.37547 0.462039 0.454652 2.59738 0.128 1
6 1997 0 0 1997.76 4.32641 0.316  1 1 1.28672 9.94473 4.33899 -0.00290299 -0.00285657 3.37212 0.628 1
6 1998 0 0 1998.79 2.54039 0.096  1 1 1.39921 9.24635 4.03428 -0.462509 -0.455114 2.88325 0.328 1
6 1999 0 0 1999.8 1.68844 0.177  1 1 1.38055 6.33033 2.76199 -0.492145 -0.484276 2.00064 -0.372 1
6 2000 0 0 2000.75 3.1045 0.258  1 1 1.31942 18.1092 7.90121 -0.934163 -0.919226 5.98839 1.728 1
6 2001 0 0 2001.75 3.77602 0.25  1 1 1.61605 21.0521 9.18524 -0.888927 -0.874714 5.68377 1.628 1
6 2002 0 0 2002.76 10.8981 0.433  1 1 1.54882 13.8546 6.04489 0.589375 0.579951 3.90291 0.908 1
#------------
Survey_name Hydroacoustic_3+
Likelihood_weight: 1
Biomass_in_goodness_of_fit_calcs_scaled_by 1
N_all_observations 4
Nobs_used_for_tuning= 4
Root_mean_square_residual= 0.346342
#---
Survey_CVs USED
Min_survey_CV= 0.066
Max_survey_CV= 0.1365
Mean_survey_CV=  0.09545
CV_implied_by_goodness_of_fit= 0.356993
#---
Prior_Q_ON_(assumed_distribution_is_LOG_NORMAL)
Emphasis 1
#---
Q_for_adj_biomass 0.905171
#---
N_covariates_for_survey_Q 1
survey_covariate_names: Percent_spent_and_resting
Covariate_pars: not_used
Phase_survey_covariate_pars  -9
#---
Catchability_process_errors  OFF
N_survey_Q_process_errors 0
Mean_log_Q_process_error NA
Target_std_dev_log_Q_process_errors= NA
Obs_RMSE_log_Q_process_errors= NA
Target_arith_CV_Q_process_error NA
Obs_arith_CV_Q_process_error NA
#---
Linear_survey_with_I=qB
#---
SurvIdNum Year Sex Area Time Datum ArithCV LogStd LikelihoodWt_(1/LogStd^2) AvailB AvailB_Adj Yhat RawResid StdResid
Q=Yhat/AvailB
7 1999 0 0 1999.75 1193 0.1071  0.106795 87.6799 1448.51 1448.51 1311.15 -0.0944327 -0.884245 0.905171
7 2000 0 0 2000.73 1427 0.0722  0.0721062 192.334 1549.38 1549.38 1402.45 0.0173516 0.24064 0.905171
7 2001 0 0 2001.73 1819 0.066  0.0659283 230.068 1682.73 1682.73 1523.16 0.177499 2.6923 0.905171
7 2002 0 0 2002.73 763 0.1365  0.135871 54.1688 1635.21 1635.21 1480.14 -0.662637 -4.87697 0.905171
#------------
Survey_name Larval_Herring_Index
Likelihood_weight: 1
Biomass_in_goodness_of_fit_calcs_scaled_by 0.001
N_all_observations 24
Nobs_used_for_tuning= 24
Root_mean_square_residual= 1.18061
#---
Survey_CVs NOT_USED
Min_survey_CV= 0.2
Max_survey_CV= 0.2
Mean_survey_CV=  0.2
CV_implied_by_goodness_of_fit= 1.74078
#---
```