Northwest Atlantic   Fisheries Organization

SCIENTIFIC COUNCIL MEETING – SEPTEMBER 2000
Workshop on Assessment Methods

Lowestoft Stock Assessment Suite.

Tutorial 4

Extended Survivors Analysis (XSA)

by

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Abstract

This document is the fourth in a series of tutorials designed to assist users of the Lowestoft VPA Suite assessment software. The tutorial takes the user through the options required for running the Extended Survivors Analysis assessment model.

Extended Survivors Analysis

Open the VPA suite program and read in the index file C:\VPAS\DATA\BLACKFIN.IND Use the default year, age and summary means settings until the main menu is reached.

```
C:\WINNT\PROFILES\cdd00\DESKTOP\VPA95.exe



      *****      LOWESTOFT UPA PROGRAM      *****
      *****           CENTRAL MENU         *****


      Assessment methods:


           1  User-defined UPA/Cohort analysis
           2  Separable UPA
           3  Ad hoc tuning
           4  Extended Survivors Analysis

           9  Print input data and results
           0  Stop


   < You have so far selected the options marked < * > >


           Please select one of the options : ----> 4_
```

Type 4 ¿ to select the XSA model.
Type ¿ to select the default tuning data file.
Type a path and name for the tuning output file.

```
C:\WINNT\PROFILES\cdd00\DESKTOP\VPA95.exe




             *****  XSA tuning module  *****




Please give [path]name of fleet effort and catch data file
Default =   c:\vpas\data\blacktun.dat

   --->


Default accepted



Enter report filename
(LPT1 for line printer) ---> c:\vpas\results\xsatun.csv_
```

The program reads the data file and then requires the user to select the range of years of tuning data to be used for calibrating the VPA. The current fad within ICES is to use only the last 10 years of data.

Type 1985 ¿

```
C:\WINNT\PROFILES\cdd00\DESKTOP\VPA95.exe                    _ □ ×
Please select the range of years to be used for
tuning the VPA. The years used will be from your
chosen year up to 1994. The earliest year allowed is 1963
Please select a year ( Default =  1963 ) ---> 1985


Title of fleet catch file is Blackfin: NAFO course 2000.  Tuning data.



++++++  Reading fleet data  ++++++




***************
 XSA analysis
***************

Enter the first age for normal (stock-size) independent
catchability analysis. If in doubt use the default.
( Age range :  1 -  8 ). ( Default :  3> ---> _
```

We now have to set up the catchability models for each age. Unlike ADAPT and ICA, XSA uses currently uses the specified model for the catchability of all fleets or surveys with CPUE data at the selected age. If we use a power model at age 1 all series will have this model fitted to the data. This is not as bad as it seems, due to the models converging to the same structure if catchability is directly proportional.

```
VPA95                                                       _ □ ×
 Auto    ▼  ☐ ☐ ☐  ☒  ☐ ☐  A

Title of fleet catch file is Blackfin: NAFO course 2000.  Tuning data.


++++++  Reading fleet data  ++++++

First CPUE data year reset from 1963 to 1975



***************
 XSA analysis
***************

Enter the first age for normal (stock-size) independent
catchability analysis. If in doubt use the default.
( Age range :  1 -  8 ). ( Default :  3> ---> 3

Enter the first age at which q is considered to be independent of age.
( Range :  3 -  8 ). (Default :  7 ) --->5_
```

In this tutorial we shall fit a power model for catchability at age 2, that is use the proportional to population abundance mo del (there is no calibration index data for age 1). Note that the program requires us to input the first age which DOES NOT require the power model.

Type 3 ¿

The next model specification required is the age at which we wish to constrain (fix) catchability. XSA reduces the number of parameters that are estimated by constraining catchability at the oldest ages to be equal to that at a younger age. Here we shall constrain catchability for ages greater than 5 to be equal to the value estimated at age 5, for each of the indices.

Type 5 ¿

```
C:\WINNT\PROFILES\cdd00\DESKTOP\VPA95.exe                              _ □ ×

  Time series :

    Tapered time weighting applied power = 3 over 20 years

  Catchability analysis :
    Catchability dependent on stock size for ages <    2

       Regression type = C
       Minimum of    5 points used for regressions
       Survivor estimates for ages less than    2
       shrunk to the mean population at each age

    Catchability independent of age for ages >=    5

  Terminal Population estimates for cohorts:
    Survivor estimates shrunk towards the mean F
    for the last  5 years or  5 ages.

    Estimated standard error of the means =  .500

    The minimum S.E. permitted for fleet terminal
    population estimates =   .30

Do you wish to change these settings ? Y/<N> --->
```

We are next presented with the default setting for the XSA time series weights, regression model and shrinkage. In this case the settings are not appropriate we do not require the time series weights as we have reduced the time series for the indices to the data collected for the last 10 years. The range of ages used for the shrinkage mean is also too large, extending into ages that are not fully recruited.

Type Y ¿ in order to change the settings provided

The first question allows us to set time series weights to down - weight older data in the time series. In this example we have only selected the last 10 years and this is not required.

Type N ¿ to use all data in the time series with equal weight.

Next we specify the regression model to be used to estimate the catchability parameters within the power model. We shall use Calibration regression which assumes that the errors are greatest in the survey observations used to predict population abundance. Setting a minimum for the number of data points to which a regression model is fitted prevents the user from using times series of data that are too short. In this case we can take the default as there are 10 years of data.

Type ¿ to take the default**.**

```
C:\WINNT\PROFILES\cdd00\DESKTOP\VPA95.exe                    _ □ ×

    Estimated standard error of the means =   .500

    The minimum S.E. permitted for fleet terminal
    population estimates =    .30

 Do you wish to change these settings ? Y/<N> --->y



Select required settings
Typing Rtrn/Enter will select the default value listed in <..>


Tapered time weighting required?   <Y>/N --->n




Regression type? C or P <Default C> --->c

Min. No. of years for regression < Default   5 > --->5

Shrink the survivor estimates for the recruiting ages
to their population means ? Default <Y> ---> y
```

Within XSA two forms of shrinkage are used to provide robust estimates of terminal population estimates. The first form of shrinkage is shrinkage to the population mean. This is described in detail in the user guide.

Type ¿ to take the default of using shrinkage to the population mean.

We are then asked whether we wish to use the mean F at each age and at the oldest ages to constrain the estimation process. In this model we shall use shrinkage and will use the weight 1.0.

Type ¿ to take the default of using shrinkage to the mean fishing mortality.
Type ¿ to use 5 years in the mean across years.
Type 3 ¿ to use 3 ages in the mean across ages.
Type 1.0 ¿ for the weight to be used for the fishing mortality means.

We are using inverse variance weighting within the model fitting procedure. Occasionally one data set can have too great an influence on the fitted assessment and dominate the fit of the model. In order to prevent this we set a maximum for the weight that any observation can take. The is specified by entering the minimum standard error of any observation. The default value of 0.3 is suitable for thiss model.

Type ¿ to use a minimum value for the standard error.
Type ¿ to set the minimum to 0.3.

```
C:\WINNT\PROFILES\cdd00\DESKTOP\VPA95.exe                        _ □ ×
to their population means ? Default <Y> ---> y

Shrink survivor estimates towards mean F of the
last few years or the older ages ?  <Y>/N --->y

Enter the number of years for shrinking
Maximum :  32  < Default   5 > --->
Default selected numbers of years =  5

Enter the number of ages for shrinking.
Value must be between 1 and  9 < Default   5 > --->3

Enter a minimum Log<S.E.> for the F means to  which the
estimates are shrunk <   .50 is suggested > --->
 Default selected : Minimum S.E. =    5.000000E-01

Reduce the influence of fleet estimates of survivors
which have extremely low standard errors ? <Y>/N --->

Enter a minimum Log<S.E.> for the terminal population estimates
derived from each fleet <   .30 is suggested > --->
 Default selected : Minimum S.E. =    3.000000E-01

Apply prior weights to the fleets?
<not usually necessary.> Y/<N> ---> n
```

Individual fleet weights can be used to down-weight, usually exclude, some indices from the analysis.
In this preliminary run we do not wish to use this.

Type ¿

The model now runs the iterative fitting algorithm. Initial 30 iterations are attempted if convergence is not achieved, measured by the change in terminal F between iterations, then the model asks the user if they wish to run more iterations in batches of 10.

```
C:\WINNT\PROFILES\cdd00\DESKTOP\VPA95.exe                        _ □ ×

 Enter a minimum Log<S.E.> for the terminal population estimates
 derived from each fleet <   .30 is suggested > --->
  Default selected : Minimum S.E. =    3.000000E-01

 Apply prior weights to the fleets?
 <not usually necessary.> Y/<N> ---> n
 Default selected



              ++++++  Tuning started   ++++++


              Tuning converged after   25 iterations


 Do you wish to print :
  1> The complete survivors statistics for each age
     dissaggregated by cohort and fleet.
  2> The summary tables for each age.
  Default <2> ---> 2

 Do you wish to print the adjusted catch per
 unit effort values <N> ---> n
```
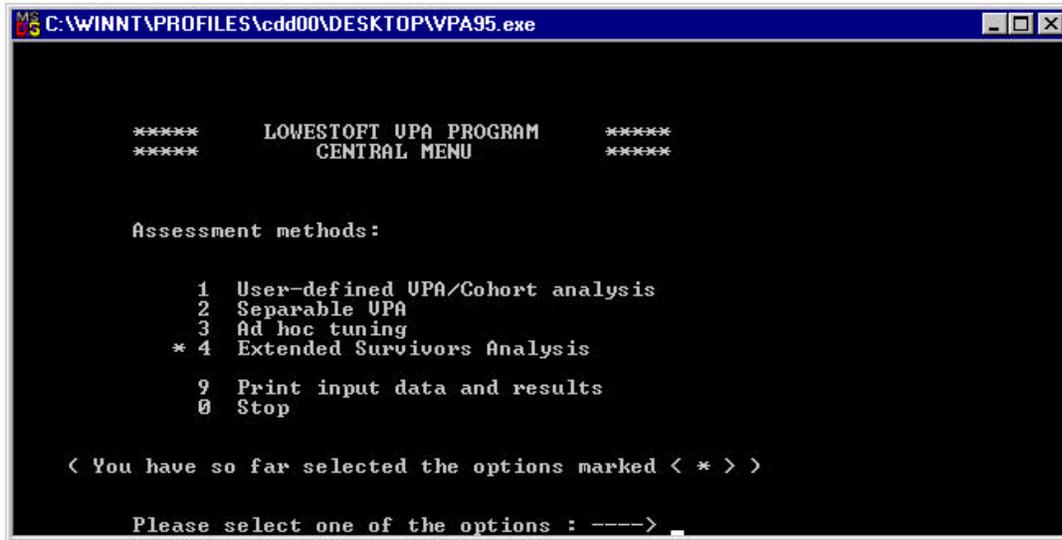
Once converged the option is given to print a detailed breakdown of the estimates contributing to the population means. This is useful in the understanding of which data sets contribute most to the fitted model. In this initial run we shall not use the option.

Type ¿ to take the summary print out of the diagnostics.
Type ¿ not to print adjusted CPUE data.

This returns us to the main menu and we can examine the diagnostics file in EXCEL.

```
C:\WINNT\PROFILES\cdd00\DESKTOP\VPA95.exe                        _ □ ×


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