**Background**

The population dynamics are governed by the sex- and age-structured population dynamics model underlying Stock Synthesis. Stock Synthesis also provides the expected values for the proportion of the catch in each age-class and length-class, as well as expected values for the index of abundance (*file data\_exp.txt*). The model is run for 42 years (the first 11 years have zero catches to simulate an unexploited stock). Such a short time series is typical of data moderate fisheries such as Australia.

Table 1 lists the values for the biological parameters of the population dynamics model and Figure 1 plots the time-series of catches and the selectivity patterns of the fishery and survey.

**Data generation**

*Catch data*

The catches (in numbers and by mass; files *CatchNum.csv* and *Catches.csv*, respectively) is assumed are assumed to be known without error.

*Composition data*

The simulated length-composition data (17 size-classes; 10-15cm cm to 90cm+) and age-composition data (ages 1-25, age-0+1 animals are combined and the last age-class is a plus-group ) are assumed to be Dirichlet distributed with effective sample sizes of 100 (length-frequency) and 75 (age-composition), and 10 (conditional age-at-length by length-class). The length-composition and age-composition data are respectively stored in the files *LengthData.csv* and *AgeData.csv* respectively. The code also reports the true (no observation error in the file *TrueCAA.csv*. These values will differ from the information in *AgeData.csv,* which are expressed in proportions multiplied by the effective sample size.

The reported catch-at-age data aggregated over stock (*TotalCatchAge.csv*) is computed by summing the generated catch-at-age by sex over sex to compute age-aggregated catch-at-age data. The weight-at-age by year, , is computed according to the equation

 (1)

where  is the weight of animals of sex *s* and age *a* in the middle of the year, and  is the catch of animals of sex *s* and age *a* during year *y* (in numbers).

*Index data*

The index data (file *CPUE.csv*) are lognormally distributed with a CV of 0.3

*Proportion of females data*

This quantity (which is measured without error and reported in *PropFem.csv*) is the proportion of the population that is female by age and year.

*Proportion mature data*

This quantity (which is measured without error and reported in *PropMature.csv*) is female fecundity by age (proportion mature x weight-at-age) divided by the maximum fecundity over age.

*Catch weight data*

This quantity (which is measured without error and reported in *CatchWght.csv*) is the weight of animals by sex and age in the middle of the year.

*Selectivity data*

The parameters (50% and 95% points) defining selectivity by age and length are provided (without error) in the files *AgeSel.csv* and *LenSel.csv*.

*Stock weight data*

This quantity (which is measured without error and reported in *StockWght.csv*) is the weight of animals by age and sex at the start of the year in the stock (not the catch), , and is computed according to the equation

 (2)

where  is the weight of animals of sex *s* and age *a* at the start of the year, and  is the number of animals of sex *s* and age *a* during year *y*.

Table 1. Values for the biological parameters

|  |  |  |
| --- | --- | --- |
|  | Females | Males |
| Ages considered (years) | 0 – 40+ | 0 – 40+ |
| Growth (length-at-age) (*Growth.csv*) |  |  |
| *L*∞ (cm) | 81.44 | 67.35 |
|  κ (yr-1) | 0.15 | 0.20 |
| *L*(age 0) (cm) | 20 | 16 |
| CV of length-at-age | 0.1 | 0.1 |
| Length-weight relationship (*LenW.csv*) |  |
| α | 2.44 x 10-6 |
| β | 3.34694 |
| Maturity-at-length (*Maturity.csv)* |  |  |
| Length-at-50% maturity (cm) | 45 |  |
| Length-at-95% maturity (cm) | 56.78 |  |
| Natural mortality (*Natural\_Mortality.csv*) | 0.2 | 0.25 |
| Selectivity (*LenSel.csv*) |  |  |
| Length-at-50% selectivity (cm) | 50 |
| Length-at-95% selectivity (cm) | 70 |

**Input files**

The file (*Data.ss*) is produced by Stock Synthesis and contains a single stochastic replicate, and also the specifications for the number of years. The file *Data\_exp.txt* is also produced by Stock Synthesis and contains the expected values for the index and composition data – these values form the basis for simulating the data set.



Figure 1. The catch time-series.