Program to estimate growth in weight of Caribbean conch
By Nelson Ehrhardt
Conch, *Strombus gigas*, Stock Assessment Manual
EXCEL PROGRAM DOOCUMENTATION

1) "Growth template in the Growth_Mortality.XLS file is a spreadsheet program to create sigmoid growth curves of weight as a function of age.
2) Assumes that growth follows a logistic growth in weight function.
3) Needs: a) point estimates (weight at age) for the first three years of life usually obtained from growth parameters obtained from tagging studies, and b) the average observed weight of the largest individuals landed in a fishery. Assign this weight to arbitrarily selected old ages (for example ages 13 to 15).
4) Growth in length parameters are needed for he immature age classes (usually for ages 0 through 3). Insert the von Bertalanffy parameters for the growth equation adopted for this juvenile period in cells G9:G11 in the order indicated in the template.
5) A siphonal length versus clean weight function parameters are needed to transform the juvenile length to juvenile weight. For this purpose insert the parameters of the length-weight relationship in cells B8:B9 in the order indicated in the template.
6) Automatically lengths and weights will appear in cells B15:B18 and C15:C18 for ages 0 through 3 or for the ages that parameters of the von Bertalanffy growth parameters are valid.
7) Insert the weight of the older ages defined in 3b) above in cells C28:C30.
8) Insert any initial value for the parameter r in cell H15; similarly insert a value for the parameter W_∞ in cell H17.
9) Go to Tools, click and select SOLVER and click Solve in the cell in the upper right-hand side. The model fitted a function that plotted the expected data in column D15:D30 as the fitted function and the observed data in column C15:C30.
10) Parameters estimated in H15 and H17 will be linked to templates that estimate natural mortality and total mortality.

Program to estimate natural (M) mortality rate of Caribbean conch
By Nelson Ehrhardt
Conch, *Strombus gigas*, Stock Assessment Manual
EXCEL PROGRAM DOOCUMENTATION

This program will generate natural mortality at age automatically once the growth function in weight is obtained from the template designed as Growth.

The average natural mortality can be changed for any range of weights observed in the landings. Therefore, click in either cell D37 or E37 to check the range of weights (or ages) that covers the average value shown in these cells. Modify the range as appropriate.

Program to estimate total (Z) and fishing (F) mortality rates of Caribbean conch
By Nelson Ehrhardt
Conch, *Strombus gigas*, Stock Assessment Manual
EXCEL PROGRAM DOOCUMENTATION

This program is linked to the Growth and Natural mortality templates and introduces the values of the growth parameters in cells B43:B44 for growth and K36 for the natural mortality according with the weight version of the age based Appeldoorn formulation. If the Valle formulation is desired there is a need to change the reference cell in cell K36 to that of E37 in the Natural mortality template.

The steps required to run this program are as follows;

1) Copy the weight frequencies in cells B13:B40. For this to be correct you need to check that the first frequency correspond with the code (Column A13:A40) with the initial size range in column A46:A73. This is very important otherwise the weight frequencies will not coincide with the actual weight class they should belong to. For example, the weight frequency 2607 in cell B18 correspond to code 6, and code 6 in A51 corresponds to size class 60 to 70 grams of clean meat..
2) There is a need to select a range of size classes for regression. This is done by changing the starting and ending code in cells H9 and H10, respectively. The regression should correspond to the fully recruited weight frequency. In the example, the Starting Code is 13 corresponding to the size class 130 to 140 grams or relative age 3.255883 in cell D25. Similarly, the End Code is 23 because a larger value will fall in a size range that is above the value of the asymptotic weight (note that code 24 corresponds to a weight class between 240 and 250).
3) The range for regression analysis can be define by eye by changing the starting and ending codes.
4) The slope of the line is an estimator of Z, the total instantaneous mortality rate with a positive sign and is found in cell J33.
5) The fishing mortality rate is the difference between Z and the natural mortality rate adopted. In this case is found in cell K37.