Just to keep it simple to implement I just write the model as a matrix such that $A_{t+1} = T * A_t$. Note that currently F is just the number of eggs, but it could easily be some sort of density dependent function. The nice thing about doing things this way is that simply replacing the matrix T with a new matrix effectively changes the model without much code rewriting. I made a version with repeat spawners and without repeat spawners.

I spent some time trying to fit to the age data. However, there are a lot of parameters. Initial abundance in each class, freshwater survival, marine survival, the proportion of age 4 and 5 fish that spawn. Many of these parameters get effectively multiplied by each other to predict age 4,5,6 fish. It did not seem to work that well. I will spend some more time trying to calibrate after the meeting tomorrow. Certainly marine survival could change overtime, but we need a likelihood function to maximize.

I am currently not keeping direct count of age 7+ fish, but 6+ year old fish always spawn and mostly die. The spreadsheet says there are 6 percent age 6 fish and almost no age 7 fish. However, it is certainly possible to add more age classes.

I apologize for not knowing how to cut and paste matrices between word and R. I am trying to develop my word skills, but I also wanted to make sure that the matrices in this document were exactly as in the R code.

0.1 No Repeat Spawners

This is shown by the simple model under "Are there Repeat Spawners?".

$$T = \begin{matrix} 0 & 0 & 0 & F & 0 & F & 0 & F \\ SF & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & SF & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & a*SP & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & (1-a)*SP & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b*SM & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & (1-b)*SM & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & SM & SM \end{matrix}$$

Or equivalently

$$\begin{aligned} A1_{T+1} &= F \cdot A4_T s + F \cdot A5s_T + F \cdot A6_T \\ A2_{T+1} &= SF \cdot A1_T \\ A3_{T+1} &= SF \cdot A2_T \\ A4s_{T+1} &= aSP \cdot A3_T \\ A4o_{T+1} &= (1-a)SP \cdot A3_T \\ A5s_{T+1} &= bSM \cdot A4_T o \\ A5o_{T+1} &= (1-b)SM \cdot A4_T o \\ A6_{T+1} &= SM \cdot A5o_T + SM \cdot A6_T \end{aligned}$$

0.2 Repeat Spawners

$$T = \begin{matrix} 0 & 0 & 0 & F & 0 & F & 0 & F \\ SF & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & SF & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & a*SP & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & (1-a)*SP & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & R*SM & b*SM & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & (1-b)*SM & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & R*SM & SM & SM \end{matrix}$$