Environmental Stochasticity, Part 2

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What we are going to do in this section is try and develop a model for what happens in going from one century to the next if there is a flu epidemic in that century.

And the heuristic we use is never try to develop a model without first going back to your word statement. So let's go back to our word statement for the roc model. If you look at this, this is what we wrote some time ago. Rocs next century equals rocs this century minus deaths plus births. That holds true irrespective if there's flu, whether there's silver bullets or not, whether we develop giant crocodiles that catch rocs. It doesn't matter. That statement is always true. In a century in which there is no flu, we followed through those words and came up with this model. Rocs next century equals average clutch size into rocs this century minus the number of effective silver bullets.

What we need to do now is to redevelop this model in the case in which there is roc flu. Let's go back to the words. We now are going to assume we're working in a century in which there is flu. So rocs next century will be R_{T+1}. Rocs this century will be R_T minus deaths. Remember, rocs are now dieing of flu, and rocs are also dieing of silver bullets. But no matter how they die, in 100 years every single roc is going to die. So we are going to have rocs this century as R_T, deaths as $R_{T.}$ And those two are going to cancel themselves out as they have done in every example we've had of this particular model. So what really matters is the number of births.

What I'm going to do is I'm going to expand the concept of births a little bit. Because if you think about it, births is clutch size times nests with sailors. In fact, let's write that up top here. We want clutch size times nests with sailors. Without flu, clutch size was C and nests with sailors was R_T minus S. With flu, clutch size is still C, but nests with sailors is going to not be R_T minus S, but those rocs that survive the flu epidemic minus S. A roc that died in the flu epidemic will never get a chance to go and even look for a sailor. I'm going to write that as Q times R_T, where Q represents the proportion of rocs that survive an epidemic. I'm going to write ‘survival proportion’. And we were told that that's somewhere between .3 and .4. Q R_T and then those that survive could still be killed by silver bullets. So we're going to get a formula that looks like that.

In other words, the formula for roc flu is $R_{T \text{ plus } 1}$ equals C into (times) QR_T minus S.   .3 and .4 is the proportion that die.   .6 to .7 is the proportion that survive.

The next thing we have to do is to take this formula and try and put it back into a spreadsheet. But before we do that, if you had tried to guess at what the formula is, I bet you would have put the Q not inside the parentheses, but outside. And I can say that because, when I guessed, that's what I did. For years I went around teaching people using a model that was wrong, because I hadn't followed by own rule of every time you redevelop a formula, go back to the word statement first.

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