The Land Between

Cottage Country's Conservation Organization

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# AGING TURTLES

## HOW OLD IS THAT TURTLE?

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Column and Photos: Doug Armstrong, Wildlife Ecology Group,Massey University, New Zealand

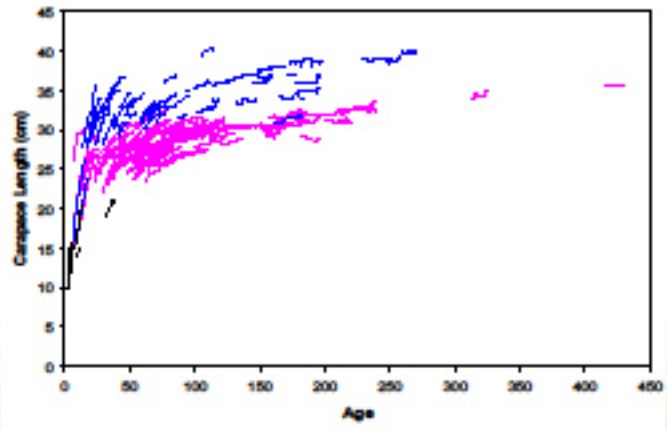
Having helped many turtles cross the road during my periodic trips home to Haliburton over the years, it was great to see The Land Between featuring turtle education and facilitating crossing signs. It's critical that people appreciate how vulnerable turtle populations can be, especially due to deaths of adult turtles. While it is also sad to see dead birds and mammals by the roadside, most bird and mammal populations are tightly regulated and have rapid reproductive rates, meaning deaths of a few individuals has negligible effect on populations. In contrast, turtles usually have very low recruitment rates (i.e. few hatchings make it to adulthood) and they reach sexual maturity very slowly, so populations can only persist if turtles have long lifespans. This is even more critical at the northern edges of turtles' ranges, because only a small proportion of the eggs develop into hatchlings over the short summers.

My colleague Dr. Ron Brooks has led a long-term research program on turtle ecology in Algonquin Park, and has annual data for individually-marked snapping turtles extending back to 1974. I was first involved in the project as a summer student at the University of Guelph in 1981, and since 2006 I've been working with Ron on analysing some of the data. Our main goal is to build a model of the population that can be used predict its long-term future under different possible scenarios, and ultimately to be able to generalize the model to other locations and species. For example, we should be able to predict the maximum number of road deaths a population could withstand, and to predict how population dynamics are likely to change with global warming.

So far we've focused mainly on one simple question, namely "How old are the turtles"? Looking at Ron's data set, the first thing you notice is that most of the adult turtles monitored over 25+ years have barely grown. So how long did it take them to get to that size? Although young turtles show growth rings on their shells, these wear off with age so you can't age old turtles by counting these rings. A simple approach would be just to work out the average growth per year from all the turtles, then extrapolate to calculate the ages when first captured. However, growth rates change with age, and more importantly, it turns out they are highly variable among individuals.

To overcome these challenges, I used an approach called Bayesian-updating that allowed me to fit realistic growth models to the data while allowing for individual variation. As well the analysis uses a distribution of expected ages based on survival rates. The results suggest that it takes Algonquin snapping turtles 10-45 years to reach breeding size (24 cm carapace length). They also indicate that males and female grow at similar rates until they reach breeding size, and then the female growth rate slows down, accounting for the fact that males get much larger than females. The slow down is presumably due to females putting most of their resources into making eggs rather than growing themselves.

Using the model I was then able estimate the age of turtles. The figure on the following page shows reconstructions of all the turtles' growth trajectories, with males in blue and females in pink. The left-most portion of each line is the turtle's estimated age when first caught, and the remainder accounts for that turtle's changes in size over time when it was recaptured (usually annually).




The results are striking, with many turtles estimated to be over 100 years and the oldest estimated to be over 400. The upshot is that the lives of adult turtles may be even more precious than we realized: Each death of an adult female (usually the ones crossing the roads to lay eggs in the spring and summer) potentially results in hundreds of years of reproduction attempts being lost.