lecture resources

...bringing science to life

An introduction to growth curves

Dr Peter Henderson,

Pisces Conservation & University of Oxford

A complete lecture on CD-ROM.

PowerPoint presentation introducing growth curves and their fitting

This single lecture covers the following topics:

Commonly used growth curves:

- Exponential
- Logistic
- Gompertz
- Von Bertalanffy
- Morgan-Mercer-Flodin (MMF)
- Weibull
- Janoschek
- Richards
- Seasonally-adjusted models

Methods of solution
Deciding between models

We will take you through the main features of the different models, moving from the simplest to the most complex.

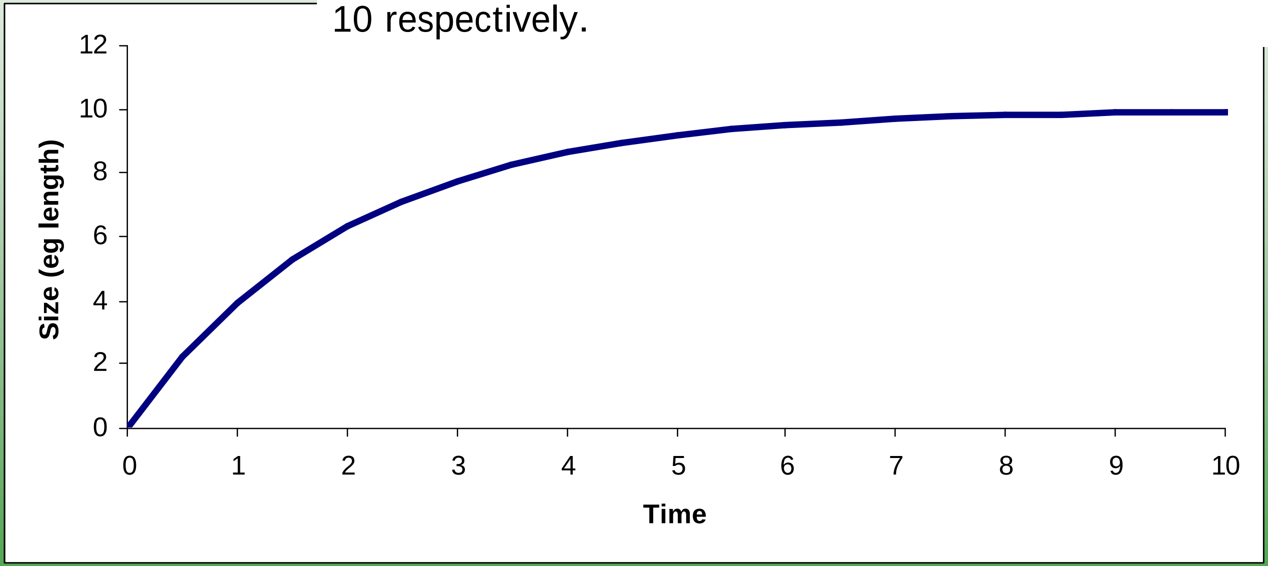
Lecture layout

The general growth models we will present have been used to describe the growth of many organisms. While we will use them to describe growth in size, some of these same equations, particularly the logistic, are also used to describe the growth in populations.

The general use of growth equations

A negative exponential equation is one of the simplest descriptions of growth, and describes a smooth deceleration to an upper asymptote.

In this example, the lower and upper asymptotes are zero and 10 respectively.



The exponential growth curve

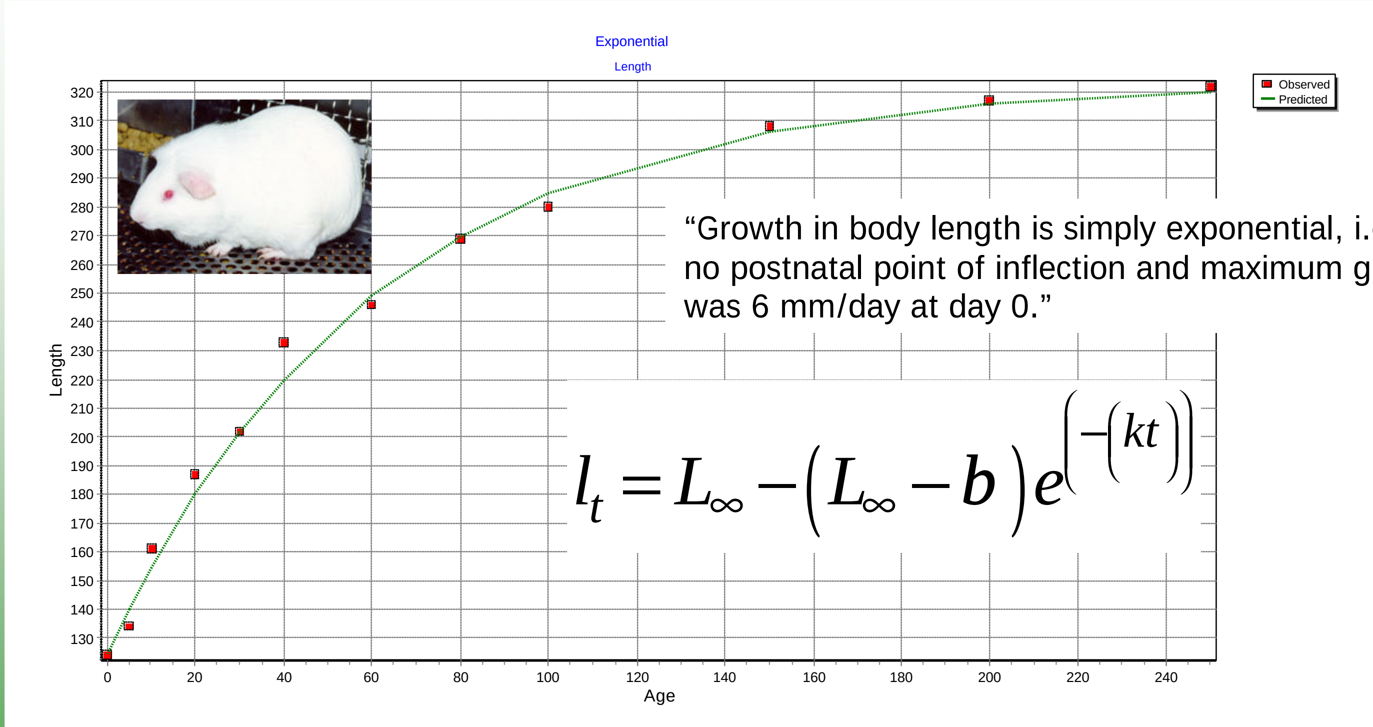
The exponential equation is:

$$l_t = L_\infty - \left(L_\infty - b\right)e^{\left(-\left(kt\right)\right)}$$

where *t* is time, *l* is length (size), *K* is the growth rate, *b* the size at t = 0, and $L_{¥}$ is the upper asymptote (maximum size reached after infinite growing time).

The exponential equation

The postnatal growth in length of male Dunkin–Hartley guinea pigs (Gericke et al. 2005).



"Growth in body length is simply exponential, i.e. there is no postnatal point of inflection and maximum growth rate was 6 mm/day at day 0."

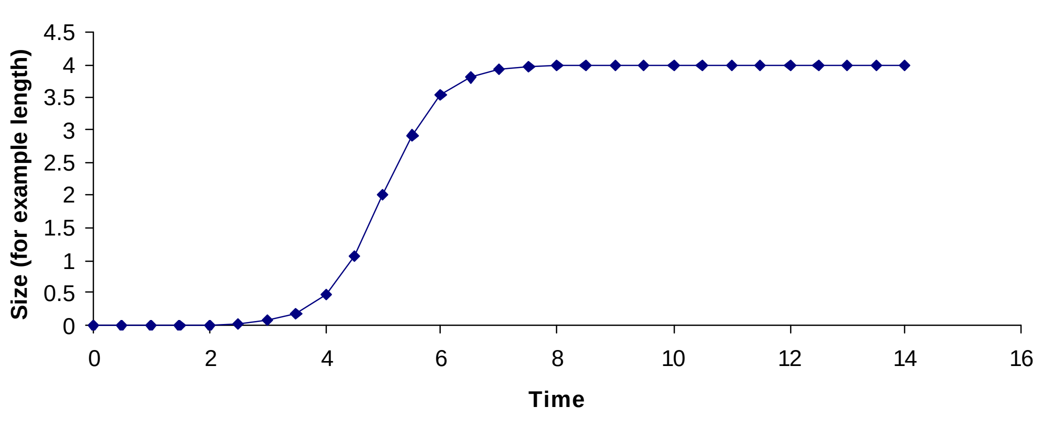
$$l_t = L_\infty - \left(L_\infty - b\right) e^{\left(-\left(kt\right)\right)}$$

Example application - exponential growth

The logistic equation is one of the most frequently used descriptions for sigmoid or S-shaped growth

In this example the lower and upper asymptotes are zero and 4 respectively. Note that the growth rate is initially almost exponential and then gradually decelerates so that given sufficient time the growth rate is almost zero. For the logistic curve there is a linear decrease in the rate of growth relative to current size as size increases.

Finally, this curve it is symmetrical about the point of inflection (the point in time where growth rate starts to slow down).



The logistic growth curve