MATHS TREATS
BY LUCIANA THE POSSUM

Teachers can photocopy this page to use in class

POPULATION MODELLING

Population modelling uses mathematics to study population dynamics. This includes population size and age distribution; birth and death rates; and immigration and emigration rates. Key factors include whether there is sufficient food and resources to enable procreation, and the impact of disease and predators on life span. Population models are used to understand the spread of parasites, viruses and disease; predict regional populations for government planning and manage natural resources such as fisheries.

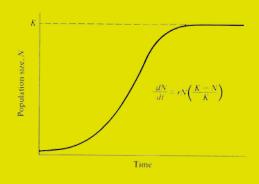### ACTIVITY 1:
CONSTRUCT A SIMPLE POPULATION MODEL

A simple equation for population size is:
Population (t_2) = Population (t_1) + Births – Deaths

Use Excel to calculate and graph population size over time. Choosing a particular population of organisms will impact the assumptions made. What is the average lifespan? At what age do the organisms procreate? How often? How many offspring are created at one time?

ACTIVITY 2:
TWO WELL-KNOWN POPULATION MODELS

Here are diagrams for two well-known population models. What assumptions cause the shape of the graph? What issues might there be with the models?

VERHULST'S LOGISTIC MODEL
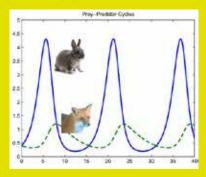

$$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$$

INTRODUCING LUCIANA

Luciana is a Leadbeater's Possum from the forests in the Victorian highlands. Discovered in 1867, her family became the faunal emblem of Victoria in 1971. Unfortunately, Leadbeater's Possums have recently been declared critically endangered and recent estimates suggest there could be as few as 2,000 left living in the wild. The main threats to the possums are bushfires and logging of their habitat.

LOTKA–VOLTERRA PREDATOR-PREY MODEL

ACTIVITY 3:
POPULATION VIDEO TO WATCH AND DISCUSS

Hans Rosling has produced an interesting video on the changes in the global human population which you can watch and discuss: www.gapminder.org/videos/dont-panic-the-facts-about-population/. The video runs for an hour.

REFERENCES AND FURTHER READING

http://en.wikipedia.org/wiki/Leadbeater%27s_possum
www.zoo.org.au/healesville/animals/leadbeaters-possum
www.abc.net.au/news/2015-04-23/leadbeaters-possum-declared-critically-endangered/6414284

http://en.wikipedia.org/wiki/Population_dynamics
Leadbeater possum image credit: Steve Kuiter