
Biological control of rabbits

Problem raised by [Oxford Centre for Collaborative Applied Mathematics, Oxford](#)



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Exposition of the problem

After rabbits were introduced into the wild in Australia in 1859, their population rapidly increased and they quickly became a pest species. Rabbits continue to be a problem throughout southern and eastern Australia, where they eat large quantities of vegetation, depriving livestock and native animals of food. Furthermore, this loss of vegetation leads to severe erosion, causing long-term damage to the Australian ecology.

Several techniques have been used to try and control the rabbit population. Most notably, the deliberate introduction of the myxoma virus to Australia in 1950 and the release of rabbit calicivirus in 1995 led to significant decreases in the rabbit population. The most effective and promising method for controlling rabbits in Australia, or perhaps even for eradicating them, appears to be biological control using viruses.

In order to understand why some viruses are more success at controlling the rabbit population than others, we would like to explore the relationship between different properties of an infective agent (lethality, communicability, incubation time, *etc.*) and its effect on the rabbit population. Hopefully, our results can be used to determine the desirable properties of a biological control agent, and should also indicate the relative importance of contagiousness, deadliness and other viral properties.

Summary of work to be done

1. Introduction to the general problem.
2. Construction of mathematical models for healthy and infected rabbit populations.
3. Analysis of model using phase portraits and related techniques for dynamical systems.
4. Development and analysis of more complicated models (e.g. incorporating incubation time).