

Chytridiomycosis Infections in Amphibians

Chytridiomycosis is a fungal disease in amphibians and is linked to dramatic declines and extinctions of various species. In this project, you will develop a basic model of a SIR-type infection in a logistic population. How does the infection affect the stable population size and under what conditions would the infection cause the population to go to zero?

Background

Chytridiomycosis has been linked to the decline and extinction of many species of frogs and other amphibians around the world. It is caused by a fungus and there is no effective control of the infection in the wild. It infected amphibians through contact with the skin causing changes to the skin as well as behavioural changes. There are numerous resources on this disease online so feel free to research as much background as you like.

Some Model Requirements

- In the absence of the infection, the population will behave logistically with a given growth rate and an carrying capacity.
- If the population is infected, the total population will be split into two groups: Susceptible and Infected.
- The susceptible group is infected at a rate proportional to the number of susceptible and infected.
- There is no recovery from this disease for infected members.
- The logistic behaviour of the population is split between susceptible and infected groups with all birth from both the susceptible and infected groups being susceptible (no vertical transmission) and the logistic death rate (not disease related but related to predation, lack of food, etc.) is equal between both groups.
- There is an additional death rate due to the infection in the infected group only and is proportional to the size of the infected population.
- When there are no infected, the susceptible groups will behave logistically. (Set $I = 0$ in your final model and you should recover the logistic equation for S)

Some Questions to Answer

- In the absence of infected members, how does the population behave?
- When there is one infected, what is the dynamics of the populations?
- Under what conditions would there be an outbreak?

- Under what conditions would the infection become endemic?
- How does the total population change due to the infection? Can the infection cause a population that is stable in the absence of the infection to go to zero (become extinct)?