RTM course -**Ecological Rate** Laws Karline Soetaert and Lubos Polerecky June 2021 Tutorial Ecological interactions: virus infection Ecological interactions: predation Ecological interactions: algal N-uptake

In a population comprising individuals that are susceptible to a virus and infected by a virus, infection can be modelled as a

Ecological interactions: virus infection

process similar to an elementary chemical reaction: a susceptible person can become infected if he/she "collides" with an infected person. Suppose that the probability that a susceptible person meets an infected person, whereby this encounter leads to the susceptible person becoming infected, is described by a parameter b (in units of $ind^{-1}d^{-1}$). The amounts of susceptible and infected individuals in the population are denoted by S and I, respectively. What is a suitable expression for the infection rate? \square InfectionRate = $b \times (S + I)$

In a population comprising individuals that are susceptible to a virus and infected by a virus, infection can be modelled as a process similar to an elementary chemical reaction: a susceptible person can become infected if he/she "collides" with an

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To become infected, a susceptible person needs to 'collide' with one infected person, Therefore, the infection rate is *first-order* with respect to the infected and susceptible persons, i.e., InfectionRate = b imes S imes I . The

 \square InfectionRate = $b \times S$ $\sqcap InfectionRate = b \times I$ \square InfectionRate = $S \times \frac{1}{I+h}$ \square In fection Rate = $b \times I^2 \times S$

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 \square InfectionRate = $b \times (S+I) \times$

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RTM course -**Ecological Rate**

Simple differential equations - I Simple differential equations - II

Ecological interactions: virus infection

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N-uptake

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Simple differential equations - III Interactive differential equations

proportionality constant, b, describes the probability (expressed per individual per day) that a susceptible person meets an infected person and their encounter results in the susceptible person becoming infected.

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More exercises

RTM course -

Ecological Rate

To learn more about modelling of ecological interactions, solve additional exercises available in the R-package RTM. To display

these exercises, type one of the following commands in the R-console:

Laws Karline Soetaert and Lubos Polerecky

require(RTM) RTMexercise("detritus") RTMexercise("COVID") RTMexercise("npzd")

RTMexercise("crops weeds")

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