Untitled

MHHS

2022-10-25

Contents

Preface

Placeholder

Chapter 1

Theory in Ecology

Placeholder

1.1 Examples of theories

1.1.1 Hierarchy theory

1.1.2 A general theory of ecology

1.1.3 Efficient theory

1.2 An example: Metabolic Theory of Ecology

1.2.1 Body-size dependence

1.2.2 Temperature dependence

1.3 Power law scaling implies constant relative differences

1.4 Meet METE: Maximum Entropy Theory of Ecology

1.5 *In fine*

Chapter 2

Optimal Foraging

Placeholder

2.1 A prey model

2.1.1 Our intuition

2.1.2 Mathematical support

2.2 The patch model

2.3 A simulation of a prey model

2.3.1 Lab exercise

Chapter 3

Simple density-independent growth

Placeholder

3.1 Discrete growth rates of fruit flies in my kitchen

3.2 Fruit flies with continuous overlapping generations

3.3 Properties of geometric and exponential growth

3.3.1 Average growth rate

3.4 Modeling with Data: Simulated Dynamics

3.4.1 Data-based approaches

3.4.2 Creating and visualizing the data

3.4.3 One simulation

3.4.4 Multiple simulations

3.4.5 A distribution of possible futures

3.4.6 Analyzing results

3.4.7 Extinction probability: expectation and uncertainty

3.4.8 Inferring processes underlying growth rate

3.5 $1/f$ environmental noise

3.5.1 Reddened Song Sparrow growth

3.6 *In fine*

Chapter 4

Density-independent Demography

Placeholder

Chapter 5

Density-dependent growth

Placeholder

5.1 Continuous logistic growth

5.2 Dynamics around the equilibria

5.2.1 A marble and a wok

5.2.2 Analytical linear stability analysis

5.2.3 Projection with numerical integration

5.2.4 Effects of N on birth and death rates

5.2.5 Theta-logistic growth

5.2.6 Allee effect

5.2.7 The integral of logistic growth

5.3 Discrete Density-dependent Growth

5.3.1 Effects of r_d

5.3.2 Bifurcations

5.3.2.1 Sensitivity to initial conditions

5.3.2.2 Boundedness, and other descriptors

5.3.3 The Ricker model

5.4 Nonlinear Discrete Density-dependence in Single-species Populations of Plants

5.5 Maximum Sustainable Yield

Chapter 6

Populations in Space

Placeholder

6.1 Source-sink Dynamics

6.1.1 Complications and cases

6.2 Metapopulations

6.2.1 The classic Levins model

6.2.2 Propagule rain

6.2.3 The rescue effect and the core-satellite model

6.2.4 Parallels with Logistic Growth

6.2.5 Levins *vs*. Hanski

6.2.6 Habitat Destruction

6.2.7 Illustrating the effects of habitat destruction

6.2.8 Different assumptions lead to different predictions about rates of extinction

6.3 Hanski's incidence function

Chapter 7

Direct competition and mutualism

Placeholder

7.1 Interspecific competition

7.1.1 Equilbria

7.1.1.1 Isoclines

7.1.1.2 Finding equilibria

7.1.1.3 Coexistence — the invasion criterion

7.1.1.4 Other equilibria

7.1.2 Dynamics at the Equilibria

7.1.2.1 Determine the equilibria

7.1.2.2 Create the Jacobian matrix

7.1.2.3 Solve the Jacobian at an equilibrium

7.1.2.4 Use the Jacobian matrix

7.1.2.5 Three interesting equilbria

7.1.3 Return Time and the Effect of r

7.2 Interspecific mutualism

7.3 Generalized Lotka-Volterra models

7.4 Nonlinear direct competition

7.4.1 Investigate stability criteria

7.5 In fine

Chapter 8

Consumer-resource Interactions

Placeholder

Chapter 9

Host-parasitoid relations

Placeholder

9.1 Independent and random attacks

9.1.1 Simulating simple host-parasitoid dynamics

9.1.1.1 Simulating Random Attacks

9.2 Aggregation leads to coexistence

9.2.1 Equilibria for a discrete-time model

9.3 Dynamics of the May host–parasitoid model

9.4 *In Fine*

Chapter 10

Disease

Placeholder

10.1 Closed epidemics

10.1.1 Density-dependent transmission

10.1.2 Frequency-dependent transmission

10.2 Open epidemics

10.3 Modeling data from Bombay

10.3.1 Optimization

Chapter 11

Consumer-resource Competition and Mutualisms

Placeholder

11.1 Competition for one resource

11.2 Competition for Substitutable resources

11.3 Tilman's resource ratio with essential resources

11.4 Consumer-resource mutualism

11.4.1 A model of uni-directional mutualism

11.5 Plant-soil feedbacks

11.6 Simulations for learning

11.6.1 `lvg()`

11.6.2 Systematic simulations

11.6.3 Checking simulation results

11.6.4 Comparing simulation results to analytical solutions

11.6.5 One last thing: using the Jacobian matrix

11.6.6 *In Fine*

Chapter 12

Food webs and other networks

Placeholder

12.1 Food Web Characteristics

12.2 Does omnivory destablize food chains?

12.2.1 Multi-species Lotka–Volterra notation

12.2.2 Background

12.2.3 Implementing Pimm and Lawton's Methods

12.2.4 Shortening the Chain

12.2.5 Adding Omnivory

12.2.6 Comparing Chain A versus B

12.2.7 Re-evaluating Take-Home Messages

12.3 Perhaps mutualism stabilizes bipartite networks

12.3.1 Creating bipartite webs

12.3.2 Testing effects of nestedness and modularity on network resilience.

12.3.3 Path Analysis

12.4 Exploring Pandora, right here at home

12.4.1 Properties assessed

Chapter 13

Diversity

Placeholder

13.1 Background

13.2 Species Composition

13.2.1 Measures of abundance

13.2.2 Dissimilarities and Distances

13.2.3 Displaying multidimensional distances

13.3 Diversity

13.4 Species diversity

13.5 Rarefaction and total species richness

13.5.1 An example of rarefaction and total species richness

13.6 Distributions

13.6.1 Log-normal distribution

13.6.2 Other distributions

13.6.3 Pattern *vs.* process

13.7 Neutral Theory of Biodiversity and Biogeography

13.7.1 Different flavors of neutral communities

13.7.2 Investigating neutral communities

13.8 Species–area relations

13.8.1 Island biogeography

13.9 Diversity Partitioning

13.9.1 Partitioning species–area relations

13.10 In fine

Chapter 14

References

14.1 R Markdown

- x, trial
- n/J_L, asdfgdsf

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

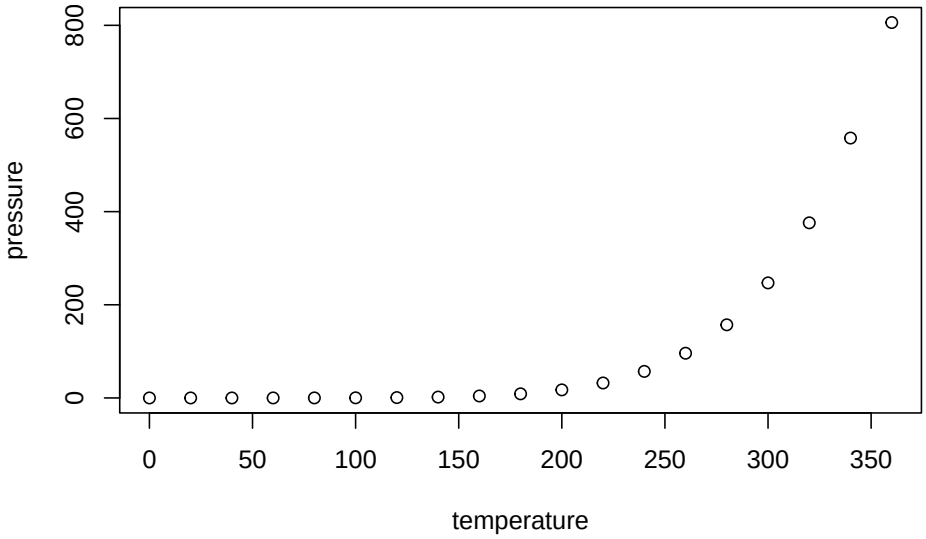
When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

14.2 Including Plots

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.