Table of Contents

Page

Preface iii

1. Introduction 1
   - *How the exercises in this workbook are structured* *3*
   - *Why are some instructions and steps repeated in different exercises?* *4*

2. What You Need To Know To Get Started With R 6
   - *What is R?* *6*
   - *Where can I get R from?* *6*
   - *How can I use R?* *7*
   - *What special terms are used when describing how to make graphs and maps in R?* *9*
   - *How do I get started with using R?* *12*
   - *What do I do if I get stuck when using R?* *16*

3. How To Create Your First Graphs In R Using GGPlot 19
   - *Exercise 1.1: How to create a basic graph in R using GGPlot* *23*
   - *Exercise 1.2: How to create a publication quality graph using GGPlot* *33*
   - *Exercise 1.3: How to create different types of graphs from the same data set* *48*
   - *Exercise 1.4: How to create a graph that shows data from more than one data series* *54*

4. How To Create Graphs Displaying Groups Of Data With GGPlot 70
   - *Exercise 2.1: How to classify data into groups and create a bar graph based on them* *73*
   - *Exercise 2.2: How to create a bar graph of count data with multiple data series on it* *86*
   - *Exercise 2.3: How to create a bar graph of means/summary statistics per group for one variable with error bars on it* *100*
   - *Exercise 2.4: How to create a point graph of summary statistics for one variable with vertical error bars* *113*
   - *Exercise 2.5: How to create a point graph of summary statistics for two variables with horizontal and vertical error bars* *123*

Exercise 2.6: How to create a box plot to summarise the data from different groups in a data set 135

5. How To Create Graphs Displaying Individual Data Points 151

Exercise 3.1: How to create an X-Y scatter plot displaying one data series using GGPlot 153

Exercise 3.2: How to create an X-Y scatter plot with multiple data series on it 166

Exercise 3.3: How to create an X-Y scatter plot with a minimum convex polygon (MCP) enclosing all the records for each data series 179

Exercise 3.4: How to create a line graph to display time series data 188

Exercise 3.5: How to create a matrix of pair plots to check for covariance between variables in a data set 203

6. How To Create Other Types Of Graphs 211

Exercise 4.1: How to make a pie chart using GGPlot 214

Exercise 4.2: How to create a bubble graph 222

Exercise 4.3: How to create a mixed type graph which shows different data series in different ways 229

Exercise 4.4: How to create a simple X-Y graph displaying the movements of a tagged animal 240

7. How To Create Maps From Biological Data Using R 254

Exercise 5.1: How to make a map showing the distribution of point locations in relation to other features 257

Exercise 5.2: How to make a map which uses pie charts as markers for a point location data set 279

Exercise 5.3: How to make a map displaying data from a raster data set 297

Appendix I: A List Of All the R Packages Used For The Exercises In This Workbook 318