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 things in R? *9*
How do I get started with using R? *11*
What do I do if I get stuck when using R? *15*

3. Preparing Biological Data For Statistical Analysis Using R **18**
Exercise 1.1: How to import data into R *20*
Exercise 1.2: How to check a data set for errors in R *27*
Exercise 1.3: How to divide a data set into subsets in R *33*
Exercise 1.4: How to join data sets together in R *38*
Exercise 1.5: How to calculate summary statistics from a data set in R *42*

4. Creating Graphs From Biological Data Using R **46**
Exercise 2.1: How to make a frequency distribution histogram *49*
Exercise 2.2: How to make a bar graph based on the number of records in different categories in a data set *57*
Exercise 2.3: How to make a bar graph of mean or median values with error bars *68*
Exercise 2.4: How to make a box plot to show the spread of data within different groups in a data set *81*
Exercise 2.5: How to make a scatter plot from biological data *89*

Sample Extract

5. Assessing And Transforming The Distribution Of Biological Data Using R **102**

Exercise 3.1: How to assess whether a biological data set has a normal distribution using R *106*

Exercise 3.2: How to normalise biological data using a mathematical transformation in R *116*

6. Using Statistical Analysis To Compare Data From Different Groups In R **127**

Exercise 4.1: How to test for a difference in the central values (means/medians) of two groups *130*

Exercise 4.2: How to test for a difference in the central values (means/medians) of two paired groups *144*

Exercise 4.3: How to test for a difference in the variances of two or more groups *154*

Exercise 4.4: How to test for differences between three or more groups *167*

Exercise 4.5: How to test for differences in frequencies of occurrence measured on an ordinal or categorical scale *177*

7. Using Correlations And Regressions To Analyse Biological Data In R **190**

Exercise 5.1: How to test for a correlation between two variables *193*

Exercise 5.2: How to test for a relationship between two variables using linear regression *207*

Appendix I: A Simple Strategy For Working Out How To Do A Specific Task In R **217**

Appendix II: How To Create An Annotated R Code Archive **223**

Appendix III: How To Round Numbers When Reporting The Results Of Statistical Analyses **229**

Index Of R Commands And Arguments Used In This Workbook **231**

Sample Extract