

Practise Exam (Section 2)

BIOB11 2025

Instructions

The exam has two sections. Each section can award a maximum of 15 point (30 points total). The pass mark (godkänt) is 60%, the high pass mark (väl godkänt) is 80%. You do not need to pass both sections to pass the exam.

This is Section 2.

In this section, you are permitted to access course materials and search online for help with coding. Under no circumstances are you allowed to communicate with anyone during the exam. Write your answers in an RMarkdown file in either Swedish or English. **At the end of the exam, submit the RMarkdown file (and any other document you wish to be reviewed) via the assignment in Canvas.**

The dataset has been uploaded to Canvas. It is called `damselfly.csv`.

Your Rmarkdown file will be reviewed and the code re-run, so you do not need to spend time copying figures in/out of a document. If you know what you want to do, but cannot get your code to work, write clearly what your intentions were. You can still receive points if your code does not work if you write what you wanted to do clearly. Additionally, if you make a mistake early in your code, but then follow the logic through to the end of the question, you can still receive points for the parts after the mistake.

Remember, this is not a programming course. The focus is on the statistics and your ability to reason and argue for your decisions during the analysis.

Good luck!

Setup tips

Just as you have done for each exercise, remember to:

1. Make a new folder in your course folder for the exam (e.g. `biob11/exam`)
 2. Open RStudio
 3. Set your working directory by going to *Session -> Set working directory -> Choose directory*, then navigate to the folder you just made for this exercise.
 4. Create a new Rmarkdown document (*File -> New file -> R markdown..*). Give it a clear title.
 5. Download the dataset from Canvas and put it in your working directory folder.
 6. Load the required packages (`tidyverse` and `infer`) using `library()`.
 7. Read in your data using `read_csv()`.
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Questions

The dataset was collected by Erik Svensson's lab at Lund University. They performed standardised sampling of three different populations (`population`) of the damselfly *Ischnura elegans* (större kustflickslända in Swedish). For every damselfly they caught, they recorded the `sex` and if `sex == "female"` they also recorded the `morph`. This damselfly species has two broad female types (`morph`). One female morph, "`androchrome`" looks very similar to males, while the other female morph, "`gynochrome`" looks different from males. Males all look roughly the same, so have `morph == NA`. For a subset of the damselflies caught, they also measured the body length in mm (`body_length_mm`) and the wing length in mm (`wing_length_mm`).

For each question:

- 1) State your chosen variable(s) and test statistic(s). Briefly justify why they are appropriate to answer the question.
- 2) State your null and alternative hypotheses.
- 3) Produce a figure that is illustrative of the hypothesis.
- 4) Perform a test of the hypothesis.
- 5) Write a brief conclusion in words that makes reference to your results and the original question.

Question 1 (5 points)

While sampling at the "`Bunkeflostrand`" population, Cara (a field assistant) says that she thinks the damselflies seem much smaller here than at any of the other populations. Pelle (another field assistant) disagrees, and says he thinks that the damselflies are approximately the

same size at all populations. Using the dataset they collected, investigate the field assistant's claims.

Question 2 (5 points)

Erik, who has been sampling these populations for many years, thinks he has noticed that populations differ in their proportion of `morph == "androchrome"` females. Is Erik correct?

Question 3 (5 points)

Instead of measuring both wing length and body length, a clever field assistant wonders if they could measure only one, and then later predict the other. To see if this would be possible, they need to know if there is a linear relationship between wing length and body length. Is this true?