Intro to linear models (for scared ecologists)

Lesson 1: Introduction

Guy F. Sutton

Centre for Biological Control, Department of Zoology and Entomology, Rhodes University, Makhanda

2021

Intro to linear models (for scared ecologists)

Lesson 1: Introduction

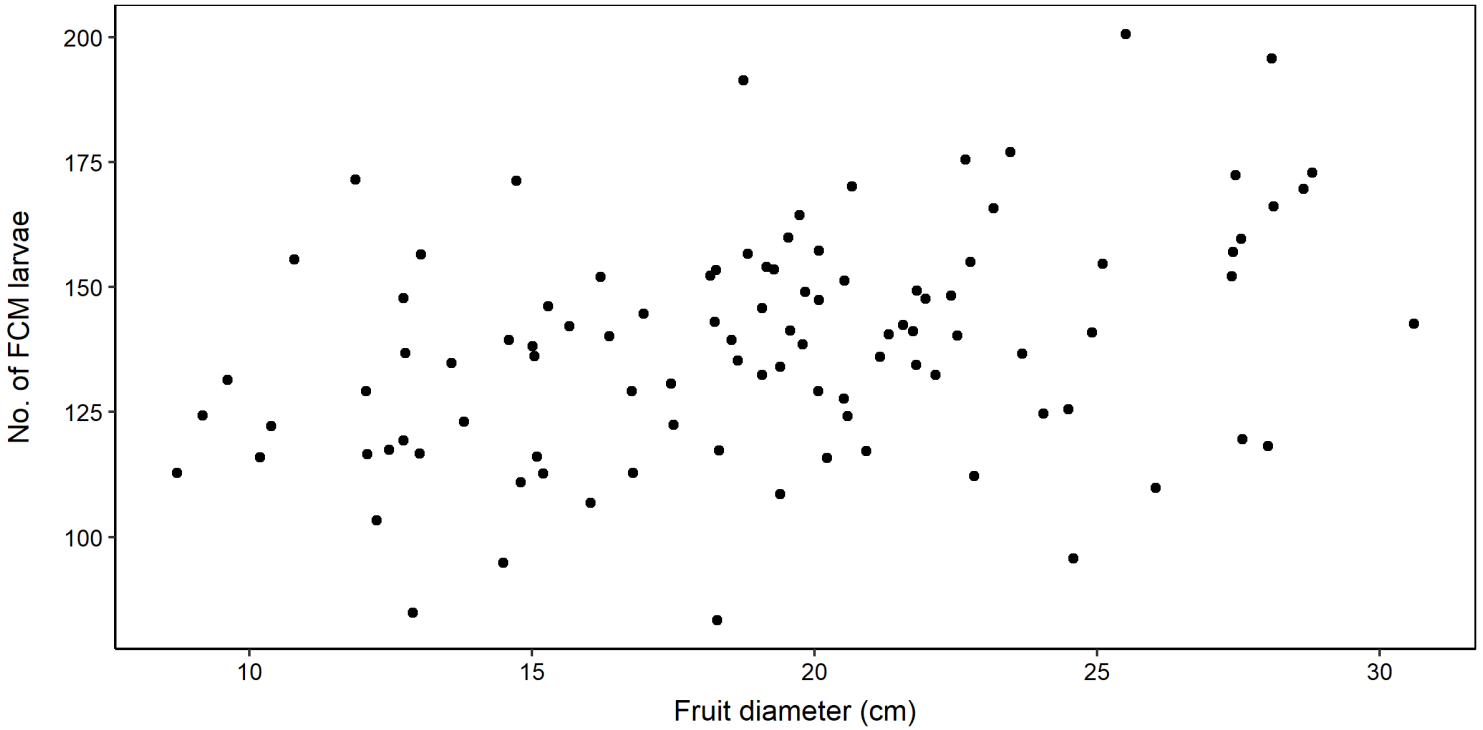
Guy F. Sutton

Centre for Biological Control, Department of Zoology and Entomology, Rhodes University, Makhanda

2021

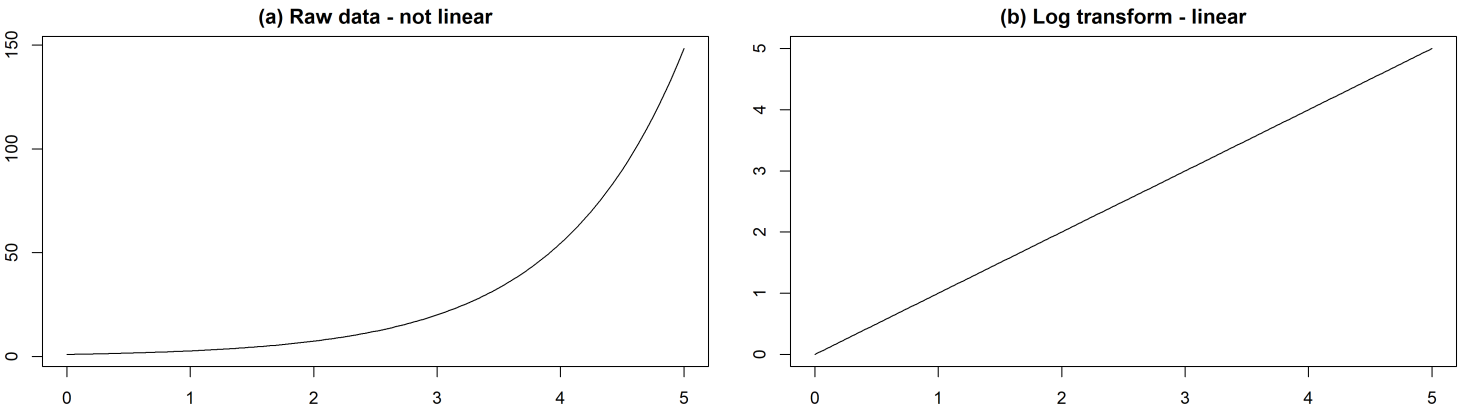
What is a statistical model?

- *A model* shows how a variable of interest (Y - response variable) is related to one or more predictor variables (X - explanatory/independent variables).
  - E.g. Do larger fruits contain more FCM larvae?



What is a LINEAR model?

- A *linear model* represents how a variable of interest (Y - response variable), or **some distribution of Y** (e.g. log transformed version of Y), is related to a linear combination of one or more predictor variables (X - explanatory/independent variables).
  - A linear model DOES NOT necessarily expect a straight line between Y and X.
  - There just needs to be a straight line between X and some version of Y.

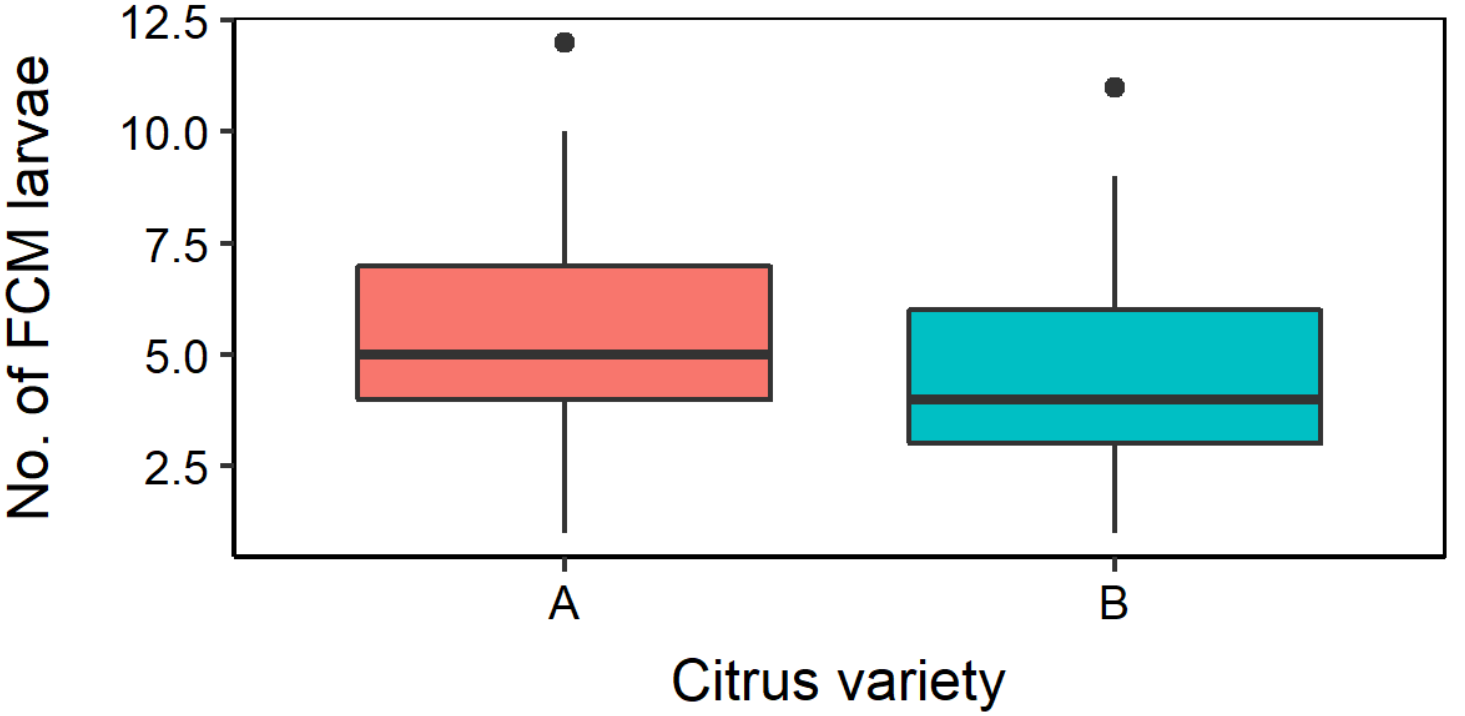


- As long as we can transform Y to some linear relationship with X, we can model it, without very fancy statistics.

Why do we use linear models?

1a. Hypothesis testing: Categorical X variable

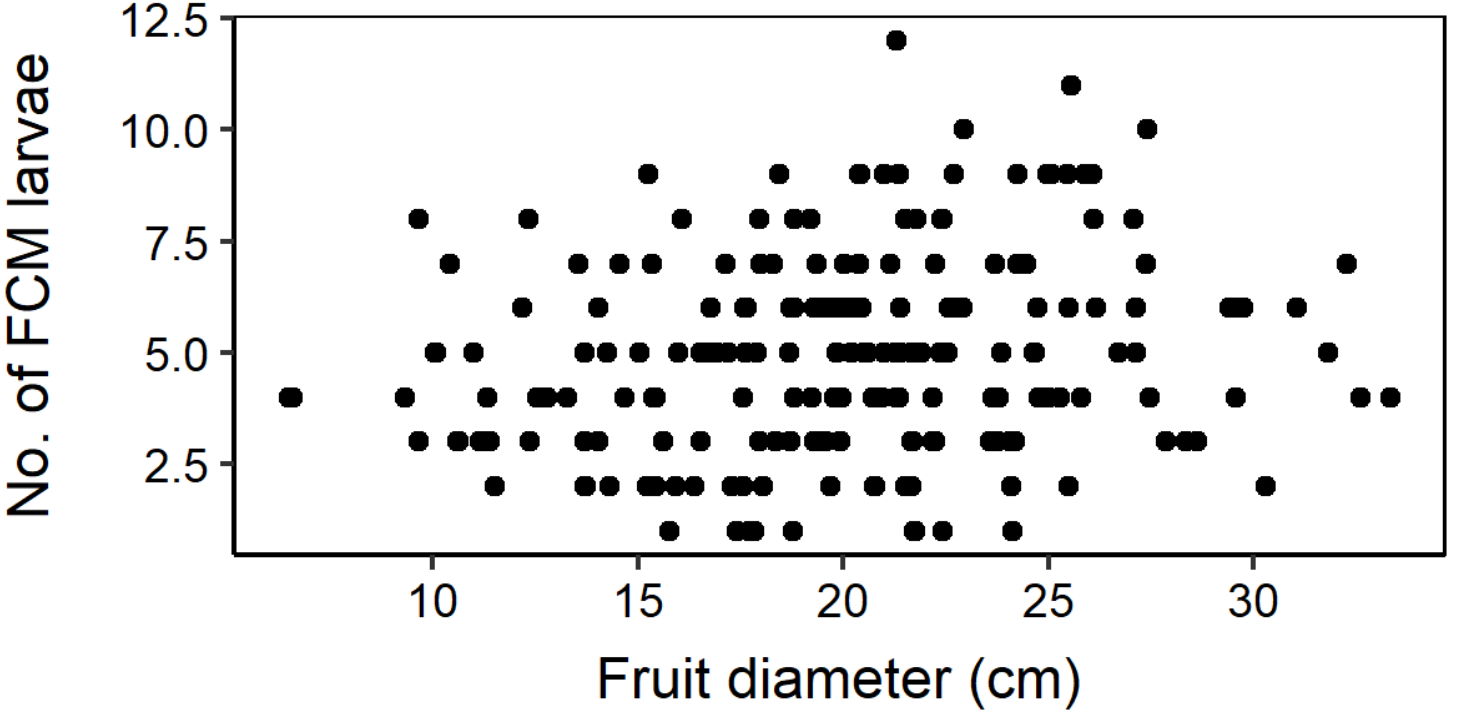
- We want to test for a statistical relationship between X and Y.
  - E.g. Are there more FCM larvae found in citrus variety A versus B?



Why do we use linear models?

1b. Hypothesis testing: Numeric X variable

- We want to test for a statistical relationship between X and Y.
  - E.g. Are there more FCM larvae found in larger fruits?



Why do we use linear models?

1c. Hypothesis testing: Numeric X variable and categorical X variable

- We want to test for a statistical relationship between two X's and Y.
  - E.g. Are there more FCM larvae found in larger fruits, and does this relationship vary among citrus varieties?

Why do we use linear models?

2. Prediction

- We want to predict Y from X
  - E.g. On average, how many FCM larave will you find in a fruit of diameter X?
  - Remember: $y = mx + c$

Choosing a statistical analysis

General(ized) Linear Model (GLM)

Hello World

Install the **xaringan** package from Github:

[1] Bolker *et al*. (2009). *Trends in Ecology and Evolution*.