

A Study on Penguins: A Minimal Reproducible Example

Josephine Zerna and Christoph Scheffel
Faculty of Psychology, Technische Universität Dresden

This document is a minimal, reproducible manuscript using the penguins data set as an example.

Keywords: penguins, reproducibility, minimal, example

Introduction

Penguins are fascinating creatures that inhabit various regions of the Southern Hemisphere, including Antarctica and surrounding islands. The study of penguins provides valuable insights into ecosystem dynamics, climate change impacts, and evolutionary biology (Jones, 2018; Smith, 2020).

This manuscript presents a minimal reproducible example utilizing the penguins dataset to demonstrate scientific workflows in R.

Methods

We conducted a two-sample t-test to compare the average bill lengths between male and female penguins. The null hypothesis (H_0) states that there is no difference in bill lengths between male and female penguins, while the alternative hypothesis (H_1) suggests a significant difference.

The t-test was performed using the `t.test()` function in R, with a significance level of 0.05.

Results

Descriptive statistics of the data set are displayed in Table 1.

The t-test revealed a significant difference in bill lengths between male and female penguins ($t(329.29) = -6.67$, $p < 0.001$). Female penguins ($M = 42.1\text{ mm}$, $SD = 4.9\text{ mm}$) exhibited shorter bill lengths compared to male penguins ($M = 45.85\text{ mm}$, $SD = 5.37\text{ mm}$).

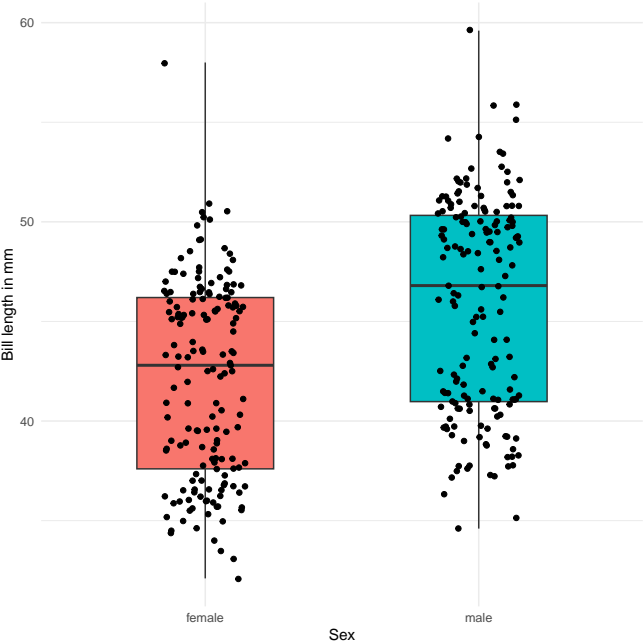
Table 1

Summary Statistics

species	Adelie			Chinstrap			
Variable	N	Mean	SD	N	Mean	SD	N
island	146			68			119
... Biscoe	44	30%		0	0%		119
... Dream	55	38%		68	100%		0
... Torgersen	47	32%		0	0%		0
bill_length_mm	146	39	2.7	68	49	3.3	119
bill_depth_mm	146	18	1.2	68	18	1.1	119
flipper_length_mm	146	190	6.5	68	196	7.1	119
body_mass_g	146	3706	459	68	3733	384	119
sex	146			68			119
... female	73	50%		34	50%		58
... male	73	50%		34	50%		61
year	146	2008	0.81	68	2008	0.86	119

Figure 1

Histogram with Scatter Plot of Bill Lengths by Sex



Josephine Zerna
 Christoph Scheffel

Author roles were classified using the Contributor Role Taxonomy (CRediT; <https://credit.niso.org/>) as follows: Josephine Zerna: conceptualization, writing; Christoph Scheffel: project administration, methodology

Correspondence concerning this article should be addressed to Christoph Scheffel, Email: christoph_scheffel@tu-dresden.de

Discussion

The significant difference in bill lengths between male and female penguins suggests potential sexual dimorphism in this trait. This finding aligns with previous research indicating differential foraging strategies and resource partitioning between male and female penguins (Brown, 2015; Wilson, 2019).

Understanding the factors influencing bill morphology in penguins is crucial for conservation efforts and ecosystem management, particularly in the face of ongoing environmental challenges.

References

- Brown, E. F. (2015). Sexual dimorphism in bill lengths of penguins. *Journal of Ornithology*, 20, 67–79.
- Jones, C. D. (2018). Penguins and climate change: An overview. *Environmental Science Review*, 8, 45–58.
- Smith, A. B. (2020). Penguin behavior: A comprehensive review. *Journal of Penguin Studies*, 15, 123–135.
- Wilson, G. H. (2019). Foraging strategies in male and female penguins. *Behavioral Ecology*, 25, 102–115.