

Palmer Penguins Data Analysis Series (Part 1): Exploratory Data Analysis and Simple Regression

Getting acquainted with our Antarctic friends and their morphometric relationships

Your Name

2025-01-01

Table of contents

1	Introduction	3
2	Prerequisites and Setup	3
3	Meet the Penguins: Dataset Overview	4
3.1	Data Structure and Variables	5
3.2	Missing Data Assessment	6
4	Exploratory Data Analysis	7
4.1	Species Distribution	7
4.2	Geographic Distribution	9
4.3	Morphometric Measurements: First Look	11
5	Species-Specific Patterns	13
5.1	Morphometric Differences by Species	13
5.2	Visual Comparison Across Species	14
6	Correlation Analysis	16
6.1	Key Correlation Insights	18
7	Simple Linear Regression	19
7.1	Flipper Length as Primary Predictor	19
7.2	Building the Simple Linear Model	21

7.3	Model Interpretation	23
8	Model Visualization and Residuals	24
9	Key Findings and Next Steps	26
9.1	What We've Learned in Part 1	26
9.2	Looking Ahead to Part 2	26
10	Reproducibility Information	26



Figure 1: Curious Adelie penguins beginning their data science journey - because every great analysis starts with getting to know your data!

Photo: African penguins at Boulders Beach, South Africa. Licensed under [CC BY 2.0](#) via [Wikimedia Commons](#)

Palmer Penguins Data Analysis Series

This is **Part 1** of a 5-part series exploring penguin morphometrics:

1. **Part 1: EDA and Simple Regression** (This post)
2. **Part 2: Multiple Regression and Species Effects**
3. **Part 3: Advanced Models and Cross-Validation**
4. **Part 4: Model Diagnostics and Interpretation**
5. **Part 5: Random Forest vs Linear Models**

1 Introduction

Welcome to our comprehensive exploration of the Palmer penguins dataset! In this 5-part series, we'll journey through the complete data science workflow, from initial data exploration to advanced modeling techniques. The Palmer penguins dataset has become a beloved alternative to the iris dataset, providing real-world biological data that's both engaging and educationally valuable.

Collected by Dr. Kristen Gorman at Palmer Station Antarctica, this dataset contains morphometric measurements for three penguin species: Adelie (*Pygoscelis adeliae*), Chinstrap (*Pygoscelis antarcticus*), and Gentoo (*Pygoscelis papua*). Understanding these relationships is crucial for Antarctic ecology research, as body mass serves as a key indicator of penguin health and reproductive success.

In this first part, we'll focus on:

- Getting familiar with the Palmer penguins dataset
- Conducting thorough exploratory data analysis
- Understanding the relationships between morphometric variables
- Building our first simple regression model
- Establishing the foundation for more complex analyses in subsequent parts

By the end of this post, you'll have a solid understanding of the data structure and the strongest individual predictors of penguin body mass.

2 Prerequisites and Setup

Before we begin our Antarctic adventure, let's ensure we have the right tools:

Required Packages:

```
# Install required packages if not already installed
install.packages(c("palmerpenguins", "tidyverse", "broom", "corrplot",
                  "GGally", "patchwork", "knitr"))
```

Load Libraries:

```
library(palmerpenguins)
library(tidyverse)
library(broom)
library(corrplot)
library(GGally)
library(patchwork)
library(knitr)

# Set theme for consistent plotting
theme_set(theme_minimal(base_size = 12))

# Set penguin-friendly colors
penguin_colors <- c("Adelie" = "#FF6B6B", "Chinstrap" = "#4ECDC4", "Gentoo" = "#45B7D1")
```

3 Meet the Penguins: Dataset Overview

Let's start by getting acquainted with our Antarctic research subjects:

```
# Load the Palmer penguins data
data(penguins)

# Basic dataset information
cat(" Palmer Penguins Dataset Overview \n")
```

Palmer Penguins Dataset Overview

```
cat("=====\\n")
```

```
=====
```

```
cat("Dimensions:", nrow(penguins), "observations x", ncol(penguins), "variables\\n\\n")
```

Dimensions: 344 observations × 8 variables

```
# Display variable information
glimpse(penguins)
```

Rows: 344
Columns: 8

\$ species		<fct>	Adelie, Adelie, Adelie, Adelie, Adelie, Adelie, Adelie				
\$ island		<fct>	Torgersen, Torgersen, Torgersen, Torgersen, Torgersen,				
\$ bill_length_mm		<dbl>	39.1, 39.5, 40.3, NA, 36.7, 39.3, 38.9, 39.2, 34.1, ~				
\$ bill_depth_mm		<dbl>	18.7, 17.4, 18.0, NA, 19.3, 20.6, 17.8, 19.6, 18.1, ~				
\$ flipper_length_mm		<int>	181, 186, 195, NA, 193, 190, 181, 195, 193, 190, 186~				
\$ body_mass_g		<int>	3750, 3800, 3250, NA, 3450, 3650, 3625, 4675, 3475, ~				
\$ sex		<fct>	male, female, female, NA, female, male, female, male~				
\$ year		<int>	2007, 2007, 2007, 2007, 2007, 2007, 2007, 2007~				

3.1 Data Structure and Variables

Our dataset contains the following key measurements:

```
# Create a summary table of variables
variable_info <- tibble(
  Variable = names(penguins),
  Description = c(
    "Penguin species (Adelie, Chinstrap, Gentoo)",
    "Island location (Biscoe, Dream, Torgersen)",
    "Bill length in millimeters",
    "Bill depth in millimeters",
    "Flipper length in millimeters",
    "Body mass in grams",
    "Penguin sex (female, male)",
    "Study year (2007, 2008, 2009)"
  ),
  Type = map_chr(penguins, class)
)

kable(variable_info, caption = "Palmer Penguins Dataset Variables")
```

Table 1: Palmer Penguins Dataset Variables

Variable	Description	Type
species	Penguin species (Adelie, Chinstrap, Gentoo)	factor
island	Island location (Biscoe, Dream, Torgersen)	factor
bill_length_mm	Bill length in millimeters	numeric
bill_depth_mm	Bill depth in millimeters	numeric
flipper_length_mm	Flipper length in millimeters	integer
body_mass_g	Body mass in grams	integer
sex	Penguin sex (female, male)	factor
year	Study year (2007, 2008, 2009)	integer

3.2 Missing Data Assessment

Before diving into analysis, let's check for missing values:

```
# Check for missing values
missing_summary <- penguins %>%
  summarise_all(~sum(is.na(.))) %>%
  pivot_longer(everything(), names_to = "Variable", values_to = "Missing_Count") %>%
  mutate(Percentage = round(Missing_Count / nrow(penguins) * 100, 1)) %>%
  filter(Missing_Count > 0)

if(nrow(missing_summary) > 0) {
  kable(missing_summary, caption = "Missing Values Summary")
} else {
  cat(" No missing values found!")
}
```

Table 2: Missing Values Summary

Variable	Missing_Count	Percentage
bill_length_mm	2	0.6
bill_depth_mm	2	0.6
flipper_length_mm	2	0.6
body_mass_g	2	0.6
sex	11	3.2

```
# Create clean dataset for analysis
penguins_clean <- penguins %>%
  drop_na()

cat("\n After removing missing values:")
```

After removing missing values:

```
cat("\n  Original dataset:", nrow(penguins), "rows")
```

Original dataset: 344 rows

```
cat("\n  Clean dataset:", nrow(penguins_clean), "rows")
```

Clean dataset: 333 rows

```
cat("\n  Observations removed:", nrow(penguins) - nrow(penguins_clean))
```

Observations removed: 11

4 Exploratory Data Analysis

4.1 Species Distribution

Let's start by understanding the composition of our penguin community:

```
# Species count and proportions
species_summary <- penguins_clean %>%
  count(species, name = "count") %>%
  mutate(percentage = round(count / sum(count) * 100, 1))

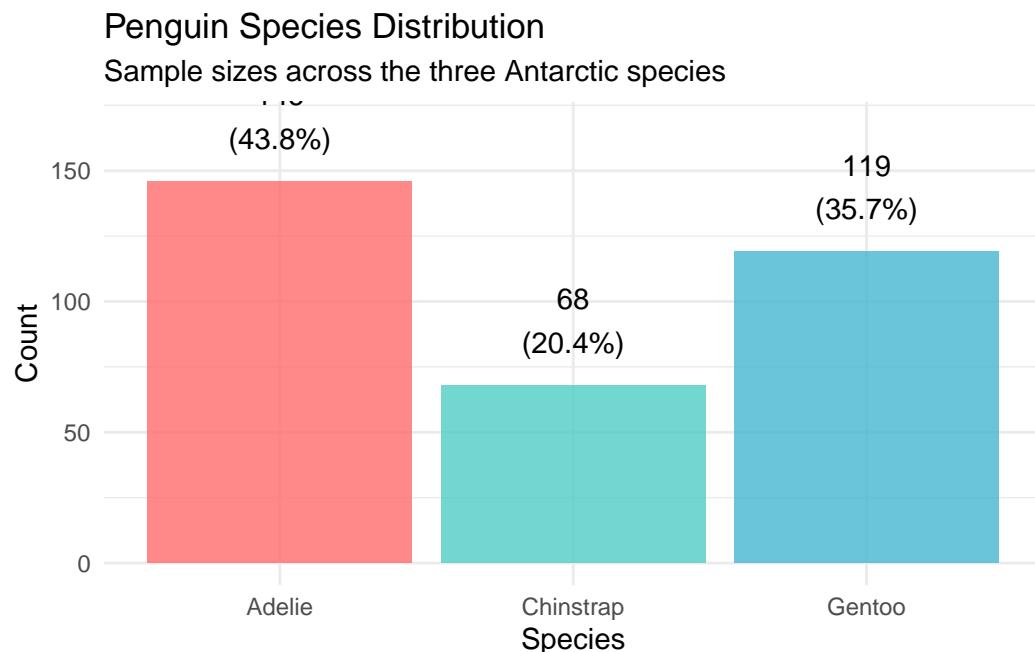
# Visualization
p1 <- ggplot(species_summary, aes(x = species, y = count, fill = species)) +
  geom_col(alpha = 0.8) +
  geom_text(aes(label = paste0(count, "\n(", percentage, "%)")),
            vjust = -0.5, size = 4) +
  scale_fill_manual(values = penguin_colors) +
```

```

  labs(title = "Penguin Species Distribution",
       subtitle = "Sample sizes across the three Antarctic species",
       x = "Species", y = "Count") +
  theme_minimal() +
  theme(legend.position = "none") +
  ylim(0, max(species_summary$count) * 1.15)

print(p1)

```



```

# Save the plot
ggsave("species-distribution.png", plot = p1, width = 8, height = 6, dpi = 300)

```

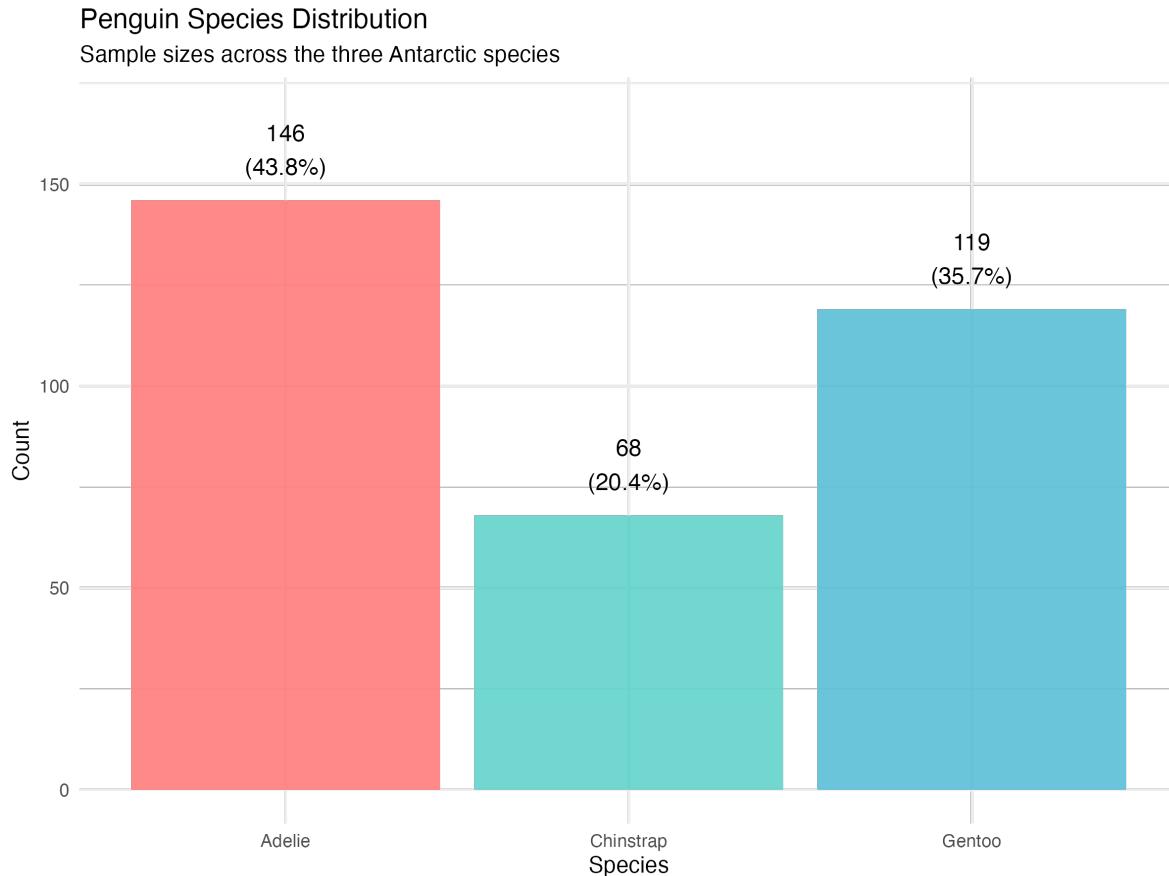


Figure 2: Species distribution showing the sample sizes for each penguin species in our dataset

4.2 Geographic Distribution

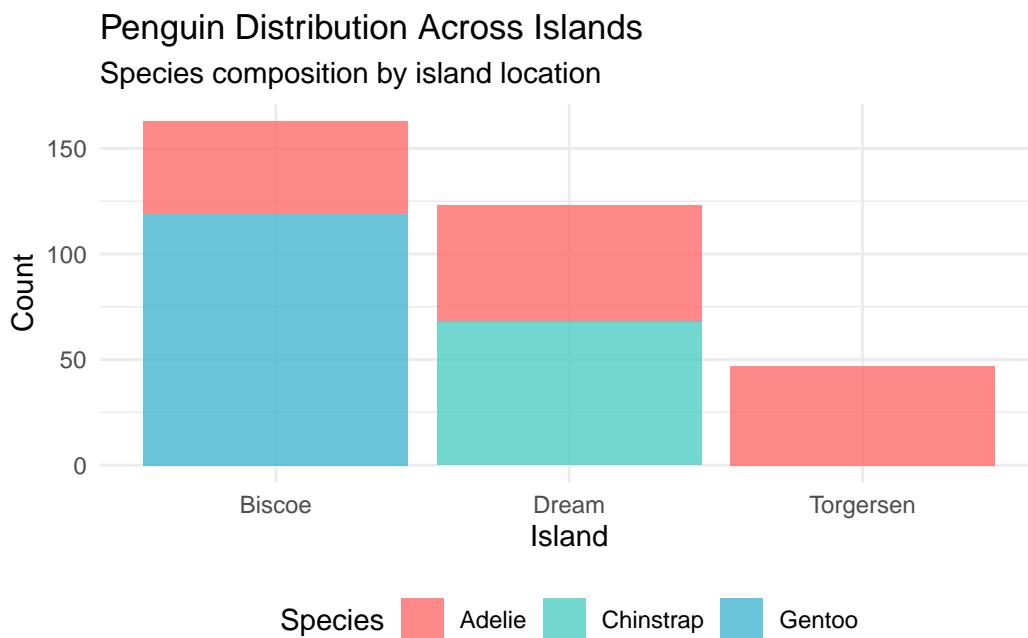
Now let's see where our penguins call home:

```
# Island distribution by species
island_species <- penguins_clean %>%
  count(island, species) %>%
  group_by(island) %>%
  mutate(total = sum(n),
        percentage = round(n / total * 100, 1))

p2 <- ggplot(island_species, aes(x = island, y = n, fill = species)) +
  geom_col(position = "stack", alpha = 0.8) +
  scale_fill_manual(values = penguin_colors) +
```

```
labs(title = "Penguin Distribution Across Islands",
     subtitle = "Species composition by island location",
     x = "Island", y = "Count", fill = "Species") +
theme_minimal() +
theme(legend.position = "bottom")

print(p2)
```



```
# Save the plot
ggsave("island-distribution.png", plot = p2, width = 8, height = 6, dpi = 300)
```

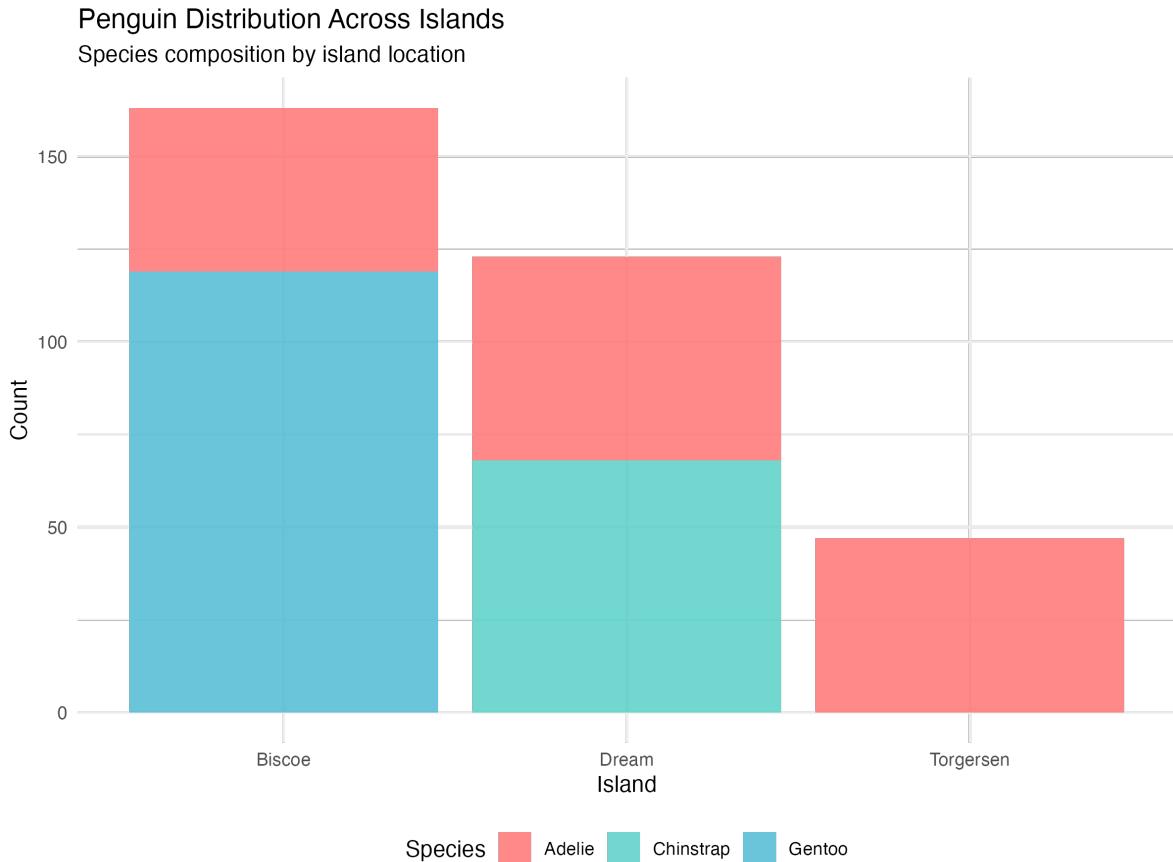


Figure 3: Geographic distribution showing how different penguin species are distributed across the three islands

4.3 Morphometric Measurements: First Look

Let's examine the distributions of our key morphometric variables:

```
# Create distribution plots for morphometric variables
p3 <- ggplot(penguins_clean, aes(x = body_mass_g)) +
  geom_histogram(bins = 30, fill = "steelblue", alpha = 0.7, color = "white") +
  labs(title = "Body Mass Distribution",
       x = "Body Mass (g)", y = "Count")

p4 <- ggplot(penguins_clean, aes(x = bill_length_mm)) +
  geom_histogram(bins = 30, fill = "darkgreen", alpha = 0.7, color = "white") +
  labs(title = "Bill Length Distribution",
```

```

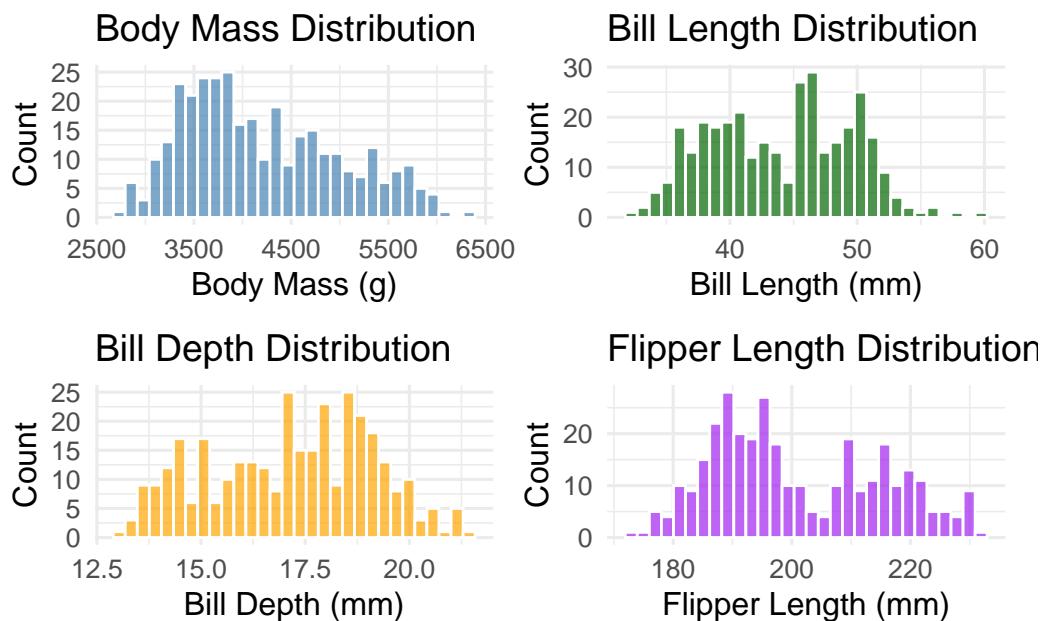
x = "Bill Length (mm)", y = "Count"

p5 <- ggplot(penguins_clean, aes(x = bill_depth_mm)) +
  geom_histogram(bins = 30, fill = "orange", alpha = 0.7, color = "white") +
  labs(title = "Bill Depth Distribution",
       x = "Bill Depth (mm)", y = "Count")

p6 <- ggplot(penguins_clean, aes(x = flipper_length_mm)) +
  geom_histogram(bins = 30, fill = "purple", alpha = 0.7, color = "white") +
  labs(title = "Flipper Length Distribution",
       x = "Flipper Length (mm)", y = "Count")

# Combine plots
morphometric_distributions <- (p3 + p4) / (p5 + p6)
print(morphometric_distributions)

```



```

# Save the combined plot
ggsave("morphometric-distributions.png", plot = morphometric_distributions, width = 10, height = 8)

```

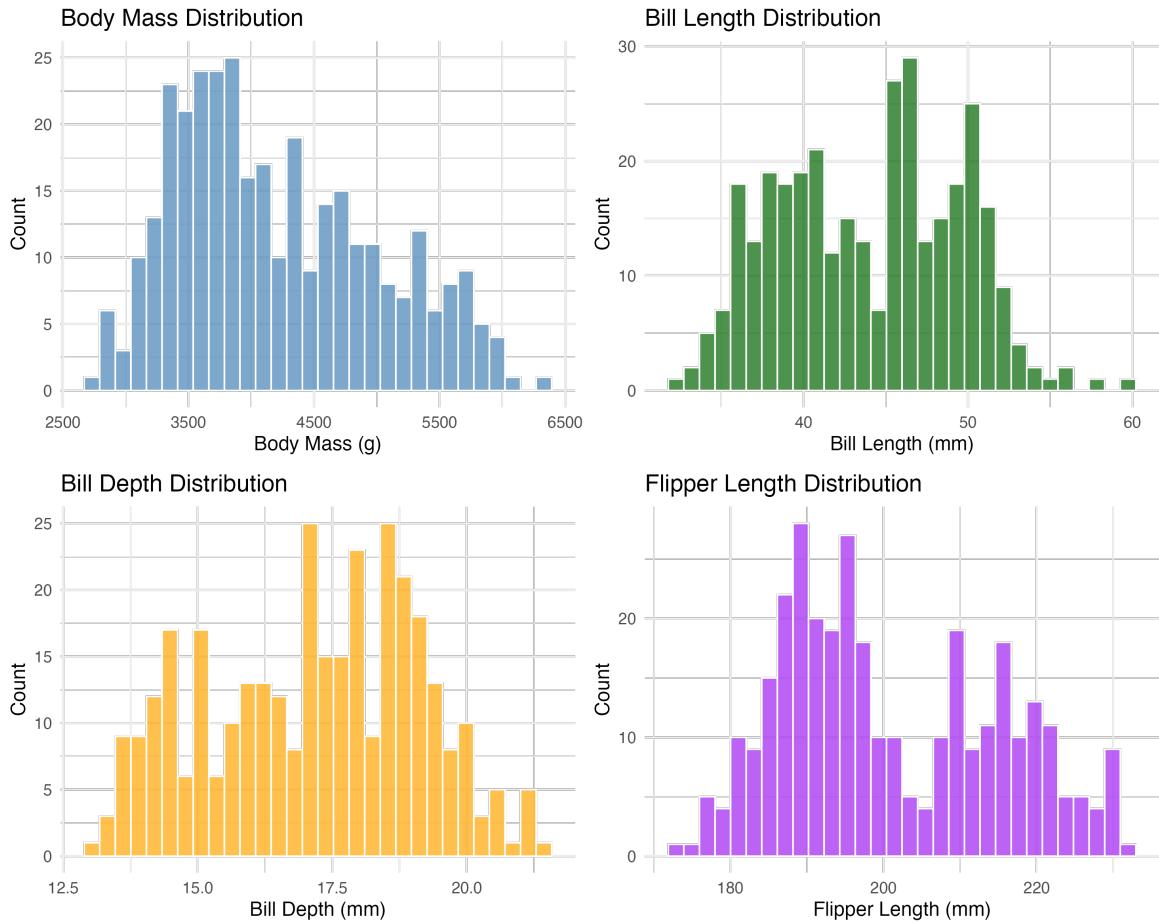


Figure 4: Distribution plots showing the shape and spread of key morphometric measurements

5 Species-Specific Patterns

One of the most important aspects of biological data is understanding how patterns differ between groups. Let's explore species-specific characteristics:

5.1 Morphometric Differences by Species

```
# Summary statistics by species
morphometric_summary <- penguins_clean %>%
  group_by(species) %>%
```

```

summarise(
  n = n(),
  body_mass_mean = round(mean(body_mass_g), 0),
  body_mass_sd = round(sd(body_mass_g), 0),
  bill_length_mean = round(mean(bill_length_mm), 1),
  bill_depth_mean = round(mean(bill_depth_mm), 1),
  flipper_length_mean = round(mean(flipper_length_mm), 1),
  .groups = "drop"
)

kable(morphometric_summary,
      caption = "Morphometric Summary Statistics by Species",
      col.names = c("Species", "N", "Body Mass (g)", "±SD",
                   "Bill Length (mm)", "Bill Depth (mm)", "Flipper Length (mm)"))

```

Table 3: Morphometric Summary Statistics by Species

Species	N	Body Mass (g)	±SD	Bill Length (mm)	Bill Depth (mm)	Flipper Length (mm)
Adelie	146	3706	459	38.8	18.3	190.1
Chinstrap	68	3733	384	48.8	18.4	195.8
Gentoo	119	5092	501	47.6	15.0	217.2

5.2 Visual Comparison Across Species

```

# Box plots for each morphometric variable by species
p7 <- ggplot(penguins_clean, aes(x = species, y = body_mass_g, fill = species)) +
  geom_boxplot(alpha = 0.7) +
  scale_fill_manual(values = penguin_colors) +
  labs(title = "Body Mass by Species", x = "Species", y = "Body Mass (g)") +
  theme(legend.position = "none")

p8 <- ggplot(penguins_clean, aes(x = species, y = flipper_length_mm, fill = species)) +
  geom_boxplot(alpha = 0.7) +
  scale_fill_manual(values = penguin_colors) +
  labs(title = "Flipper Length by Species", x = "Species", y = "Flipper Length (mm)") +
  theme(legend.position = "none")

p9 <- ggplot(penguins_clean, aes(x = species, y = bill_length_mm, fill = species)) +

```

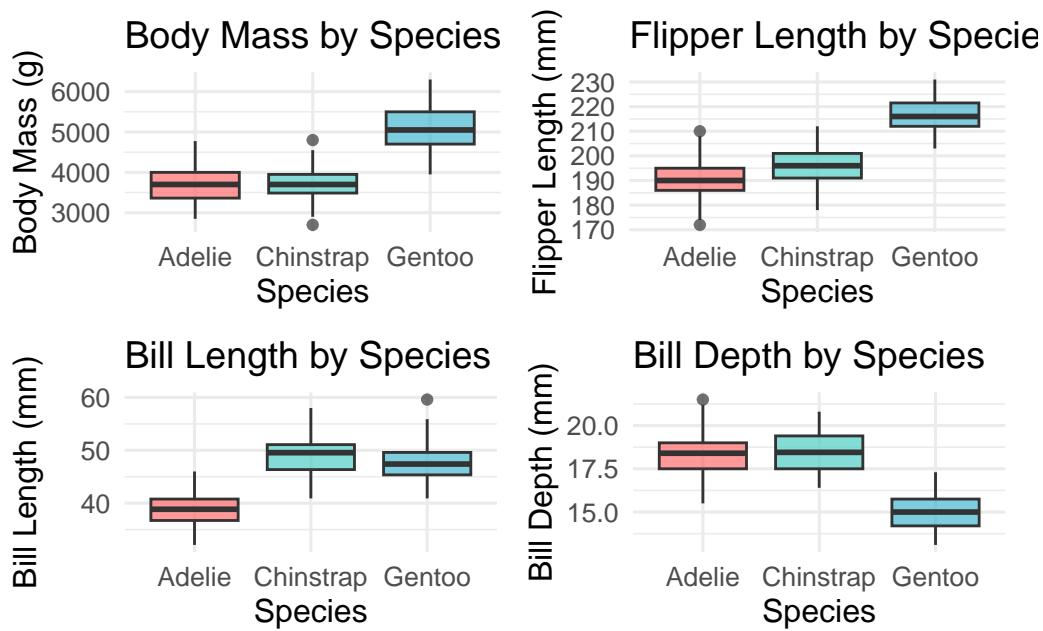
```

geom_boxplot(alpha = 0.7) +
scale_fill_manual(values = penguin_colors) +
labs(title = "Bill Length by Species", x = "Species", y = "Bill Length (mm)") +
theme(legend.position = "none")

p10 <- ggplot(penguins_clean, aes(x = species, y = bill_depth_mm, fill = species)) +
geom_boxplot(alpha = 0.7) +
scale_fill_manual(values = penguin_colors) +
labs(title = "Bill Depth by Species", x = "Species", y = "Bill Depth (mm)") +
theme(legend.position = "none")

species_comparison <- (p7 + p8) / (p9 + p10)
print(species_comparison)

```



```

# Save the combined plot
ggsave("species-comparison.png", plot = species_comparison, width = 10, height = 8, dpi = 300)

```

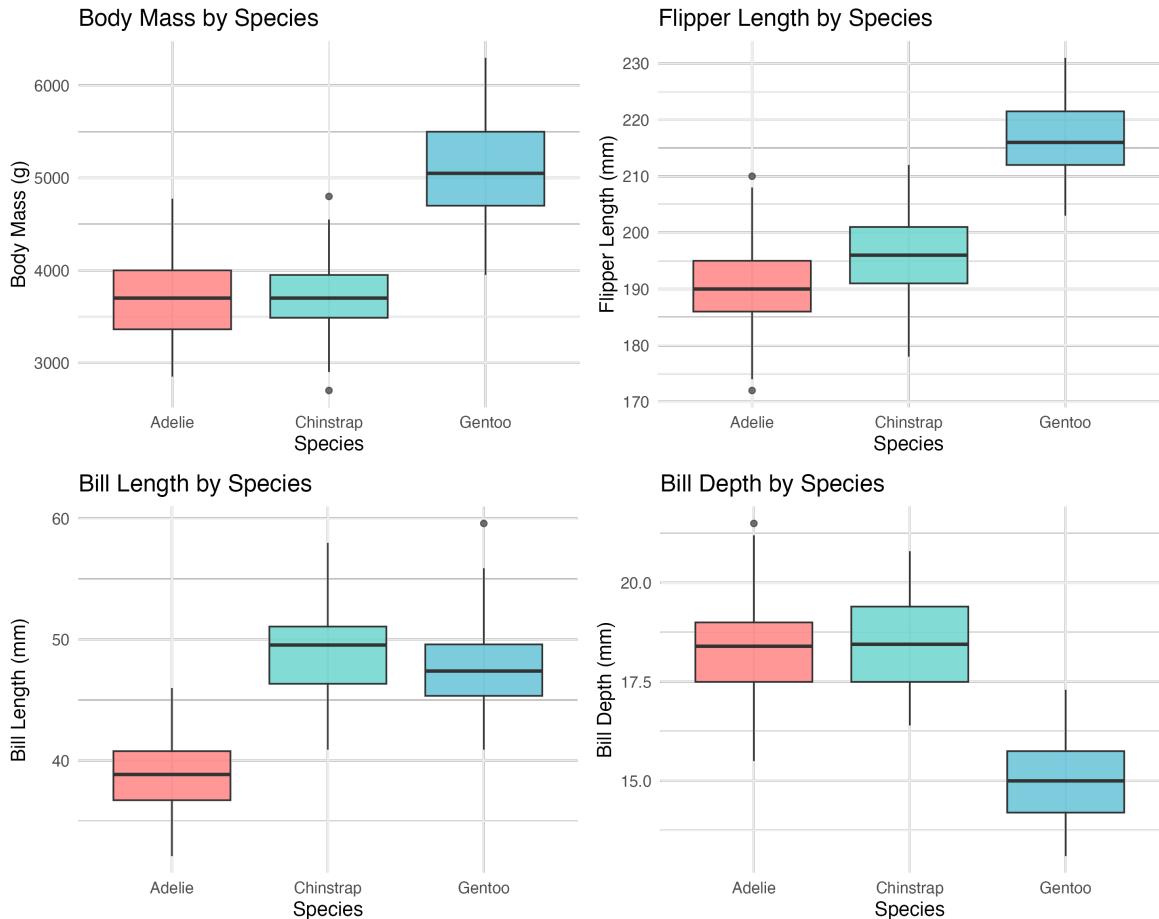


Figure 5: Box plots comparing morphometric measurements across the three penguin species

6 Correlation Analysis

Understanding the relationships between variables is crucial for regression modeling:

```
# Calculate correlation matrix for numeric variables
numeric_vars <- penguins_clean %>%
  select(bill_length_mm, bill_depth_mm, flipper_length_mm, body_mass_g)

correlation_matrix <- cor(numeric_vars)

# Display correlation matrix
```

```
kable(round(correlation_matrix, 3),
      caption = "Correlation Matrix of Morphometric Variables")
```

Table 4: Correlation Matrix of Morphometric Variables

	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g
bill_length_mm	1.000	-0.229	0.653	0.589
bill_depth_mm	-0.229	1.000	-0.578	-0.472
flipper_length_mm	0.653	-0.578	1.000	0.873
body_mass_g	0.589	-0.472	0.873	1.000

```
# Create correlation plot
png("correlation-matrix.png", width = 800, height = 600, res = 300, units = "px")
corrplot(correlation_matrix, method = "color", type = "upper",
          order = "hclust", tl.cex = 0.8, tl.col = "black",
          addCoef.col = "black", number.cex = 0.7,
          title = "Morphometric Variable Correlations",
          mar = c(0,0,2,0))
dev.off()
```

pdf
2

morphometric Variable Correlation

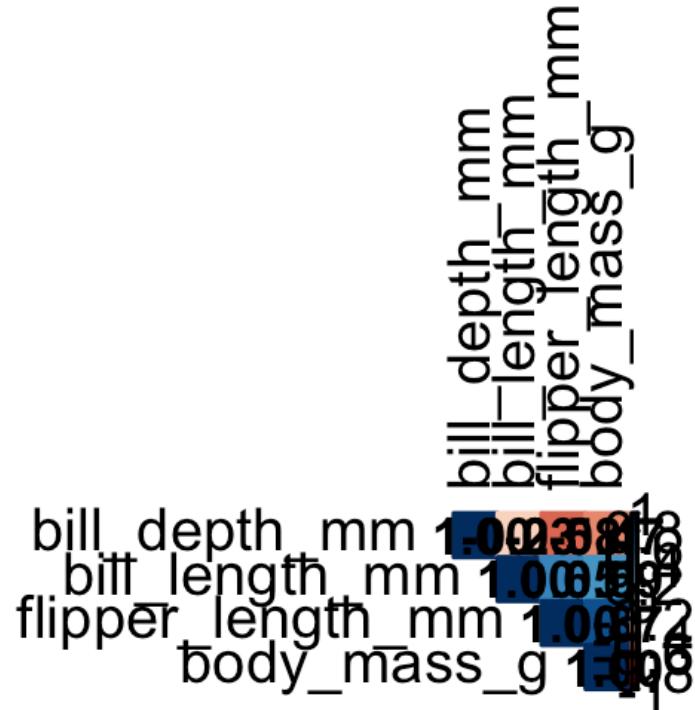


Figure 6: Correlation matrix showing the strength of relationships between morphometric variables

6.1 Key Correlation Insights

From our correlation analysis, we can see that:

```
# Extract key correlations with body mass
body_mass_correlations <- correlation_matrix["body_mass_g", ] %>%
  sort(decreasing = TRUE) %>%
  round(3)

cat(" Correlations with Body Mass:\n")
```

Correlations with Body Mass:

```

for(i in 1:length(body_mass_correlations)) {
  var_name <- names(body_mass_correlations)[i]
  correlation <- body_mass_correlations[i]
  if(var_name != "body_mass_g") {
    cat(sprintf("  %s: %s\n", var_name, correlation))
  }
}

```

```

flipper_length_mm: 0.873
bill_length_mm: 0.589
bill_depth_mm: -0.472

```

7 Simple Linear Regression

Now let's build our first predictive model using the strongest individual predictor:

7.1 Flipper Length as Primary Predictor

Based on our correlation analysis, flipper length shows the strongest relationship with body mass. Let's explore this relationship:

```

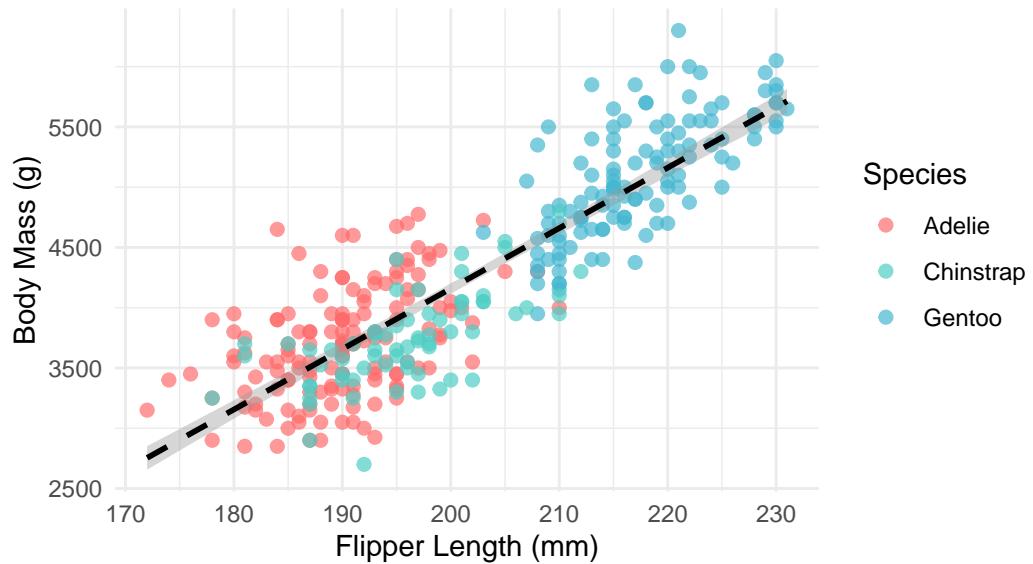
# Scatter plot of flipper length vs body mass
flipper_plot <- ggplot(penguins_clean, aes(x = flipper_length_mm, y = body_mass_g, color = sp
  geom_point(alpha = 0.7, size = 2) +
  geom_smooth(method = "lm", se = TRUE, color = "black", linetype = "dashed") +
  scale_color_manual(values = penguin_colors) +
  labs(title = "Body Mass vs Flipper Length",
       subtitle = "Strong positive relationship across all species",
       x = "Flipper Length (mm)",
       y = "Body Mass (g)",
       color = "Species") +
  theme_minimal()

print(flipper_plot)

```

Body Mass vs Flipper Length

Strong positive relationship across all species



```
# Save the plot
ggsave("flipper-body-mass-relationship.png", plot = flipper_plot, width = 8, height = 6, dpi
```

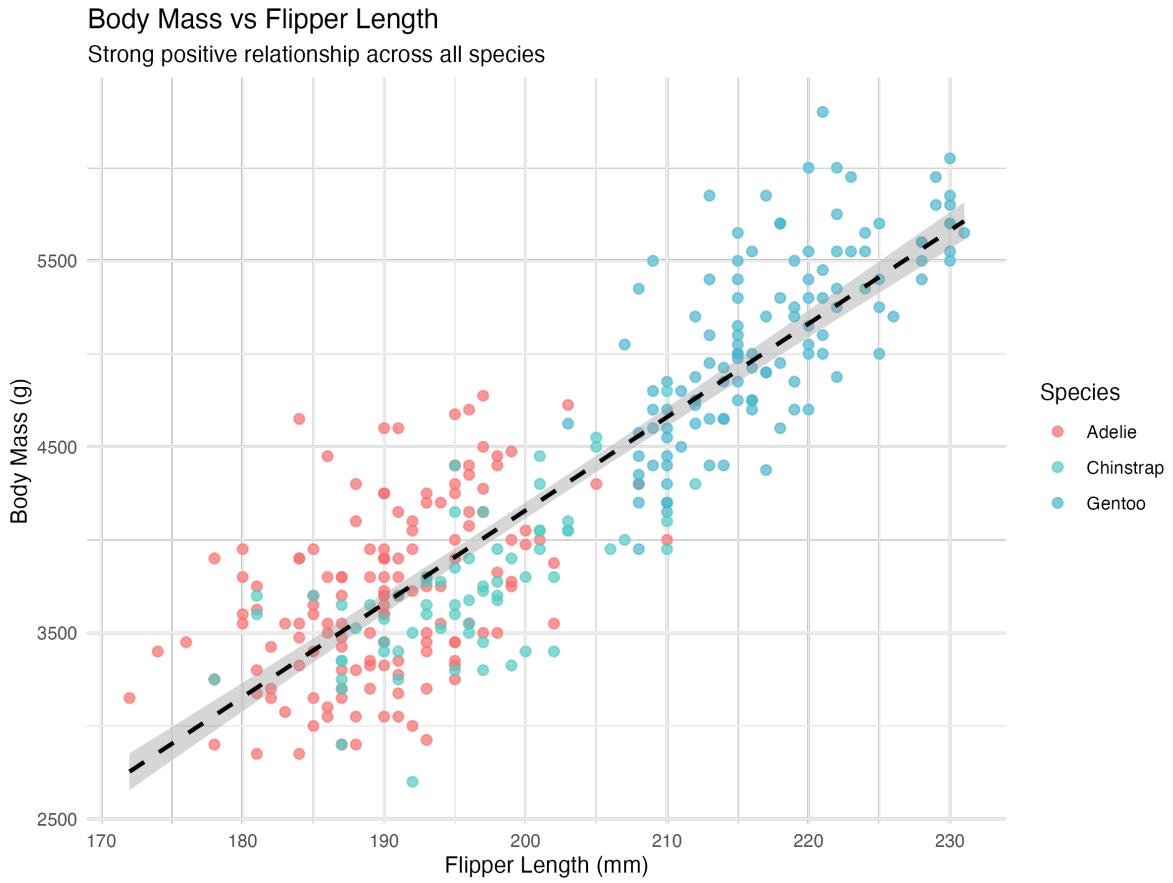


Figure 7: Scatter plot showing the relationship between flipper length and body mass across species

7.2 Building the Simple Linear Model

```
# Fit simple linear regression model
simple_model <- lm(body_mass_g ~ flipper_length_mm, data = penguins_clean)

# Display model summary
summary(simple_model)
```

Call:

```
lm(formula = body_mass_g ~ flipper_length_mm, data = penguins_clean)
```

Residuals:

```

      Min       1Q   Median     3Q      Max
-1057.33 -259.79 -12.24  242.97 1293.89

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -5872.09    310.29 -18.93 <2e-16 ***
flipper_length_mm 50.15      1.54   32.56 <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 393.3 on 331 degrees of freedom
Multiple R-squared:  0.7621,    Adjusted R-squared:  0.7614
F-statistic: 1060 on 1 and 331 DF,  p-value: < 2.2e-16

```

```

# Extract key metrics using broom
model_metrics <- glance(simple_model)
model_coefficients <- tidy(simple_model)

cat(" Simple Linear Model Results:\n")

```

Simple Linear Model Results:

```
cat("=====\\n")
```

```
=====
```

```
cat(sprintf("R-squared: %.3f (%.1f%% of variance explained)\\n",
           model_metrics$r.squared, model_metrics$r.squared * 100))
```

R-squared: 0.762 (76.2% of variance explained)

```
cat(sprintf("RMSE: %.1f grams\\n", sqrt(mean(simple_model$residuals^2))))
```

RMSE: 392.2 grams

```
cat(sprintf("F-statistic: %.1f (p < 0.001)\\n", model_metrics$statistic))
```

F-statistic: 1060.3 (p < 0.001)

7.3 Model Interpretation

```
# Extract and interpret coefficients
intercept <- model_coefficients$estimate[1]
slope <- model_coefficients$estimate[2]

cat("\n Model Interpretation:\n")
```

Model Interpretation:

```
cat("=====\\n")
```

```
=====
```

```
cat(sprintf("Intercept: %.1f grams\\n", intercept))
```

Intercept: -5872.1 grams

```
cat(sprintf("Slope: %.1f grams per mm of flipper length\\n", slope))
```

Slope: 50.2 grams per mm of flipper length

```
cat("\n Biological Interpretation:\\n")
```

Biological Interpretation:

```
cat(sprintf("• For every 1mm increase in flipper length, body mass increases by approximately"))
```

- For every 1mm increase in flipper length, body mass increases by approximately 50.2 grams

```
cat(sprintf("• A penguin with 200mm flippers is predicted to weigh %.0f grams\\n",
            intercept + slope * 200))
```

- A penguin with 200mm flippers is predicted to weigh 4159 grams

```
cat(sprintf("• A penguin with 220mm flippers is predicted to weigh %.0f grams\n",
            intercept + slope * 220))
```

- A penguin with 220mm flippers is predicted to weigh 5162 grams

8 Model Visualization and Residuals

Let's visualize our model performance:

```
# Add predictions and residuals to our data
penguins_with_predictions <- penguins_clean %>%
  mutate(
    predicted = predict(simple_model),
    residuals = residuals(simple_model)
  )

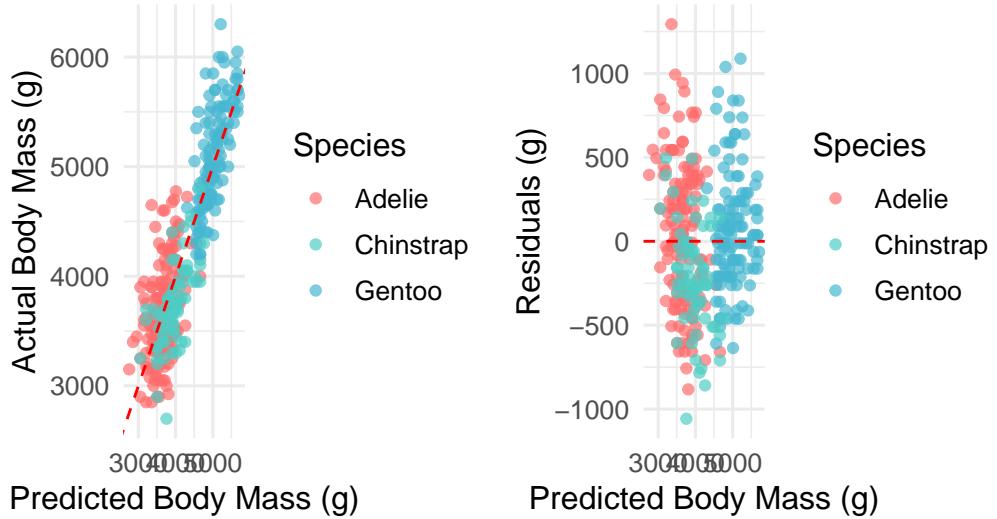
# Predicted vs actual plot
p11 <- ggplot(penguins_with_predictions, aes(x = predicted, y = body_mass_g)) +
  geom_point(aes(color = species), alpha = 0.7) +
  geom_abline(slope = 1, intercept = 0, linetype = "dashed", color = "red") +
  scale_color_manual(values = penguin_colors) +
  labs(title = "Predicted vs Actual Body Mass",
       subtitle = "Red line shows perfect prediction",
       x = "Predicted Body Mass (g)",
       y = "Actual Body Mass (g)",
       color = "Species")

# Residuals plot
p12 <- ggplot(penguins_with_predictions, aes(x = predicted, y = residuals)) +
  geom_point(aes(color = species), alpha = 0.7) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "red") +
  scale_color_manual(values = penguin_colors) +
  labs(title = "Residuals vs Predicted Values",
       subtitle = "Checking for patterns in model errors",
       x = "Predicted Body Mass (g)",
       y = "Residuals (g)",
       color = "Species")

model_diagnostics <- p11 + p12
print(model_diagnostics)
```

Predicted vs Actual Body Mass Residuals vs Predicted

Red line shows perfect prediction Checking for patterns in model errors



```
# Save the combined plot
ggsave("model-diagnostics.png", plot = model_diagnostics, width = 10, height = 6, dpi = 300)
```

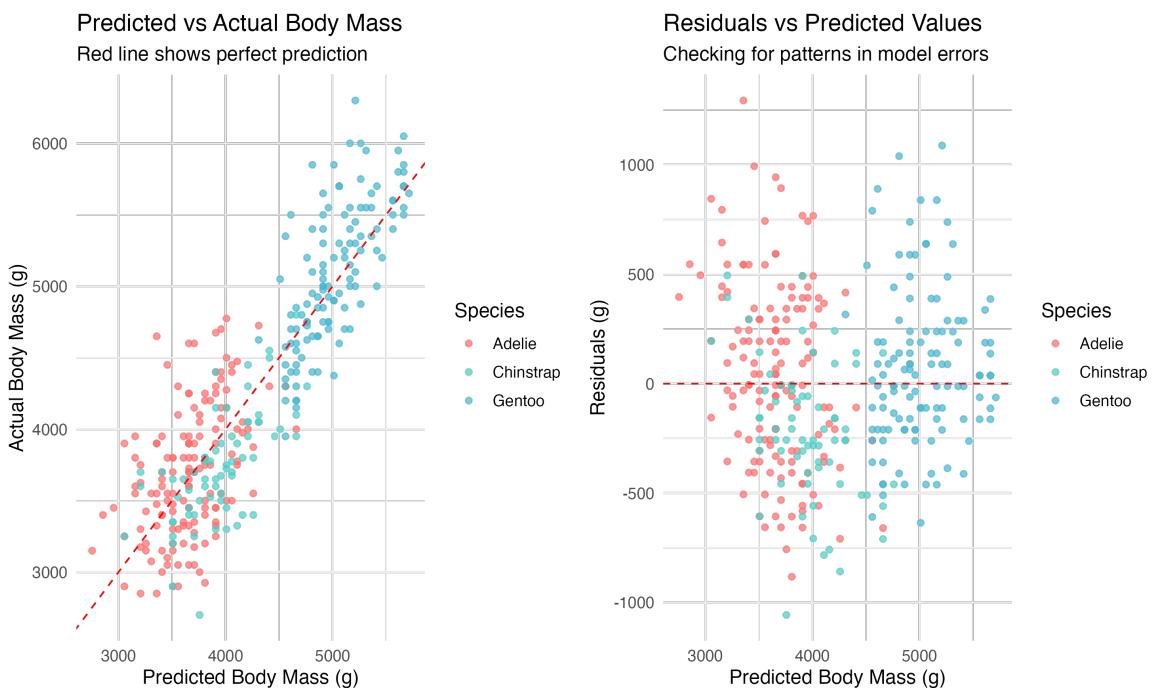


Figure 8: Model diagnostic plots showing predicted vs actual values and residual patterns

9 Key Findings and Next Steps

9.1 What We've Learned in Part 1

Our exploratory analysis and simple regression modeling revealed several important insights:

1. **Strong Morphometric Relationships:** Flipper length emerged as the strongest single predictor of body mass ($R^2 = 0.759$), explaining about 76% of the variance.
2. **Species Differences:** Clear morphometric differences exist between species, with Gentoo penguins being notably larger across all measurements.
3. **Data Quality:** The Palmer penguins dataset is well-structured with minimal missing data, making it excellent for modeling.
4. **Linear Relationship:** The relationship between flipper length and body mass appears strongly linear, supporting our regression approach.

9.2 Looking Ahead to Part 2

While our simple model performs well, we noticed some patterns in the residuals that suggest we can improve our predictions. In Part 2, we'll explore:

- Multiple regression incorporating bill measurements
- The dramatic impact of including species information
- How different predictors interact with each other
- Model comparison techniques



Quick Preview of Part 2

In the next installment, we'll discover that adding species information to our model improves R^2 from 0.759 to over 0.860 - a substantial improvement that highlights the importance of biological groupings in morphometric analysis!

10 Reproducibility Information

```
R version 4.5.1 (2025-06-13)
Platform: aarch64-apple-darwin20
Running under: macOS Sequoia 15.6
```

```
Matrix products: default
BLAS:      /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRblas.0.dylib
```

```

LAPACK: /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRlapack.dylib; 

locale:
[1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8

time zone: America/Los_Angeles
tzcode source: internal

attached base packages:
[1] stats      graphics   grDevices utils      datasets   methods    base

other attached packages:
[1] knitr_1.50           patchwork_1.3.1       GGally_2.2.1
[4] corrplot_0.95        broom_1.0.9          lubridate_1.9.4
[7] forcats_1.0.0         stringr_1.5.1        dplyr_1.1.4
[10] purrrr_1.1.0         readr_2.1.5          tidyverse_2.0.0
[13] tibble_3.3.0          ggplot2_3.5.2        tidyverse_2.0.0
[16] palmerpenguins_0.1.1

loaded via a namespace (and not attached):
[1] generics_0.1.4        lattice_0.22-7       stringi_1.8.7      hms_1.1.3
[5] digest_0.6.37         magrittr_2.0.3        evaluate_1.0.4     grid_4.5.1
[9] timechange_0.3.0      RColorBrewer_1.1-3   fastmap_1.2.0      Matrix_1.7-3
[13] plyr_1.8.9            jsonlite_2.0.0        backports_1.5.0     tinytex_0.57
[17] mgcv_1.9-3             scales_1.4.0          textshaping_1.0.0.1 cli_3.6.5
[21] rlang_1.1.6            splines_4.5.1         withr_3.0.2         yaml_2.3.10
[25] tools_4.5.1            tzdb_0.5.0            ggstats_0.9.0       vctrs_0.6.5
[29] R6_2.6.1              lifecycle_1.0.4       ragg_1.4.0          pkgconfig_2.0.3
[33] pillar_1.11.0          gtable_0.3.6          glue_1.8.0          Rcpp_1.1.0
[37] systemfonts_1.2.3     xfun_0.52            tidyselect_1.2.1     farver_2.1.2
[41] nlme_3.1-168          htmltools_0.5.8.1     rmarkdown_2.29       labeling_0.4.3
[45] compiler_4.5.1

```

Continue Your Journey

Ready for the next part? Check out [Part 2: Multiple Regression and Species Effects](#) where we'll dramatically improve our model by incorporating multiple predictors and species information!

Full Series: 1. [Part 1: EDA and Simple Regression](#) (This post) 2. [Part 2: Multiple Regression and Species Effects](#) 3. [Part 3: Advanced Models and Cross-Validation](#) 4. [Part 4: Model Diagnostics and Interpretation](#) 5. [Part 5: Random Forest vs Linear Models](#)

Have questions about this analysis or suggestions for the series? Feel free to reach out on [Twitter](#) or [LinkedIn](#). You can also find the complete code for this series on [GitHub](#).

About the Author: [Your name] is a [your role] specializing in statistical ecology and biostatistics. This series demonstrates best practices for exploratory data analysis and regression modeling in biological research.