Toronto Beach Data*

Data Analysis of the Relationship Between Date, Air Temperature, Whether It Rains or Not, Water Temperature, and Observations of Water Fowls

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This report analyzes environmental data collected in the summer of 2023 regarding Toronto's beaches, focusing on variables such as air temperature, water temperature, rainfall, and waterfowl observations. The findings reveal that ?increased water temperatures correlate with higher waterfowl activity, while rainy conditions tend to reduce sightings?. These insights emphasize the importance of understanding how weather patterns affect wildlife behavior and beach usability, suggesting that public awareness and management strategies should be adapted accordingly. Future research should explore the impact of these environmental factors on beachgoer experiences and the broader ecological implications.

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*Code and data supporting this analysis is available at: https://github.com/Stary54264/Toronto-Beach-Data

1 Introduction

In 2014, Toronto experienced an extremely cold summer that impacted its beaches Gough and Sokappadu (2016). During this period, data on key environmental factors, such as air temperature, water temperature, rainfall, and observations of waterfowl activity, was collected at various beaches across the city Gelfand (2022). These factors are critical as they directly influence the ecological balance of the beaches, the safety of recreational activities, and the overall enjoyment of beachgoers R.-Toubes, Araújo-Vila, and Fraiz-Brea (2020).

Consequently, analyzing this environmental data is essential to understanding how these variables affect the behavior of waterfowl and the suitability of the beaches for public use. According to Mallory, Venier, and McKenney (2003), waterfowl presence can be influenced by temperature changes, precipitation, and human activity on the beaches. This study focuses on examining the relationships between air temperature, water temperature, rainfall, and waterfowl observations, and how these conditions might correlate with fluctuations in bird activity and potential impacts on beachgoers.

To conduct this analysis, a dataset collected by Gelfand (2022) was utilized, as described in Section 2. Based on the initial findings, it was observed that ???higher water temperatures coincided with an increase in waterfowl activity, while rainy days led to a decrease in sightings ???(Section 3). As discussed in Section 4, ???these trends highlight the potential for waterfowl to congregate under specific environmental conditions, potentially affecting beach safety and cleanliness. Further recommendations include improving public awareness of how wildlife interactions and weather patterns influence beach environments???. This paper's structure includes an overview of the data and methods in Section 2, the results of the analysis in Section 3, a detailed discussion of the results in Section 4, and supplementary insights in Section A.

2 Data

2.1 Overview

2.1.1 Preview of the Dataset

Our data (Table 1) is about beaches in Toronto, from Gelfand (2022).

Table 1: Preview of Data

year	month	day	air_temp	rain	water_temp	water_fowl	date
2010	08	03	31	Yes	22.6	12	2010-08-03
2010	08	03	31	Yes	21.9	30	2010-08-03
2010	08	03	31	Yes	24.3	20	2010-08-03

Table 1: Preview of Data

year	month	day	air_temp	rain	water_temp	water_fowl	date
2010	08	03	31	Yes	21.3	12	2010-08-03
2010	08	03	31	Yes	21.3	30	2010-08-03
2010	08	03	30	Yes	21.3	10	2010-08-03

This dataset records the date (which was separated into year, month, and day), the air temperature, whether it rains or not, the water temperature, and the observations of water fowls. We will analyze the relationship between these variables in the following part.

2.1.2 Air Temperature

This histogram (Figure 1) shows the distribution of air temperatures of beaches in Toronto.

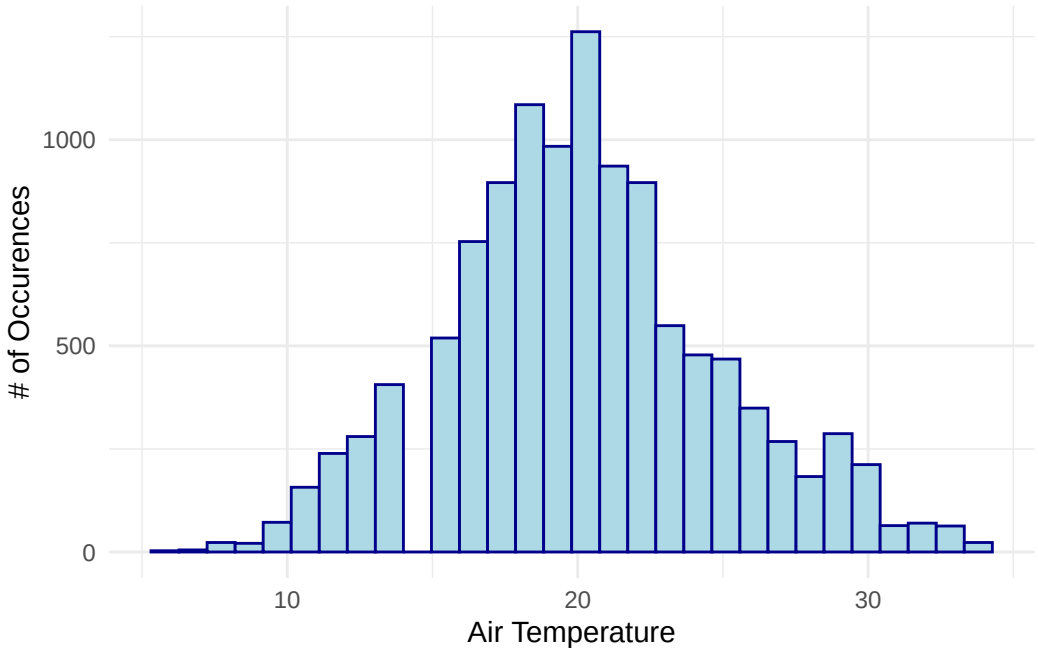

Figure 1: Air Temperature at Toronto Beaches from

We can clearly see the data is unimodal and is not skewed.

2.1.3 Rain

This bar graph (Figure 2) shows the distribution of whether it rains of not at beaches in Toronto.

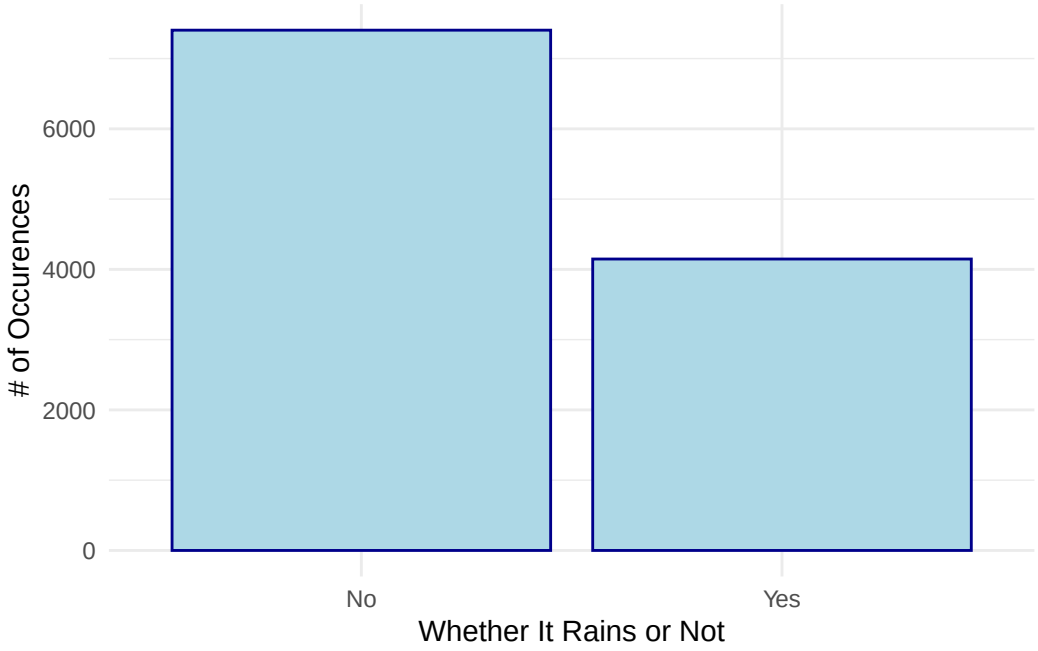

Figure 2: Bar Graph of Whether It Rains or Not

We can clearly see that there are less raining days.

2.1.4 Water Temperature

This histogram (Figure 3) shows the distribution of water temperatures of beaches in Toronto.

We can clearly see the data is unimodal, which is the same as air temperatures, but it is left-skewed.

2.1.5 Observations of Water Fowls

This histogram (Figure 4) shows the distribution of observations of water fowls of beaches in Toronto.

We can clearly see the data is unimodal but highly right-skewed.

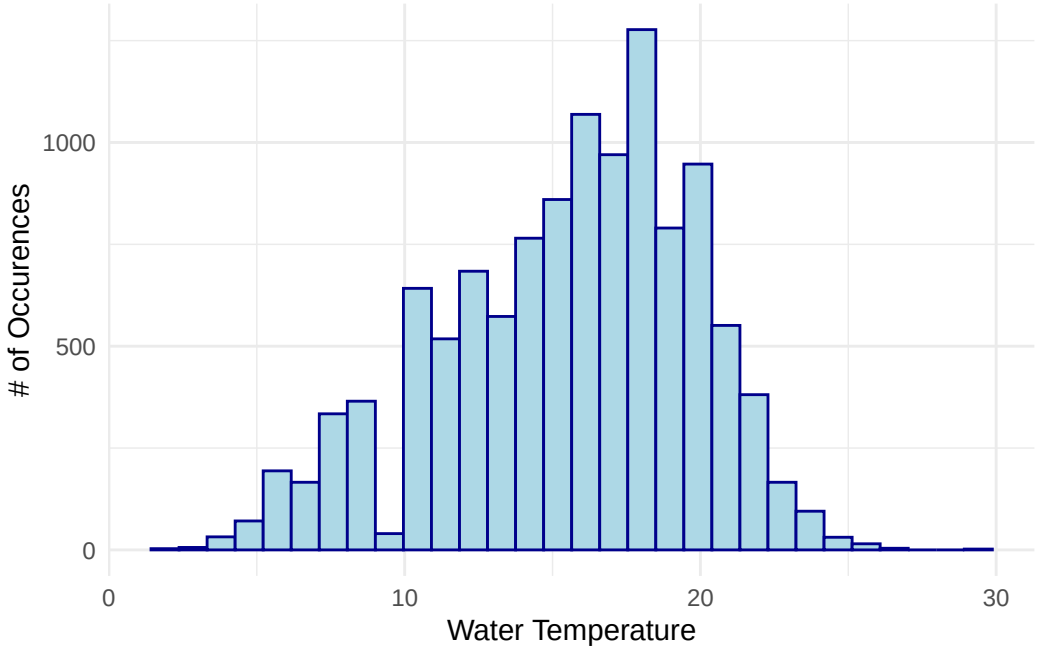

Figure 3: Histogram of Water Temperature

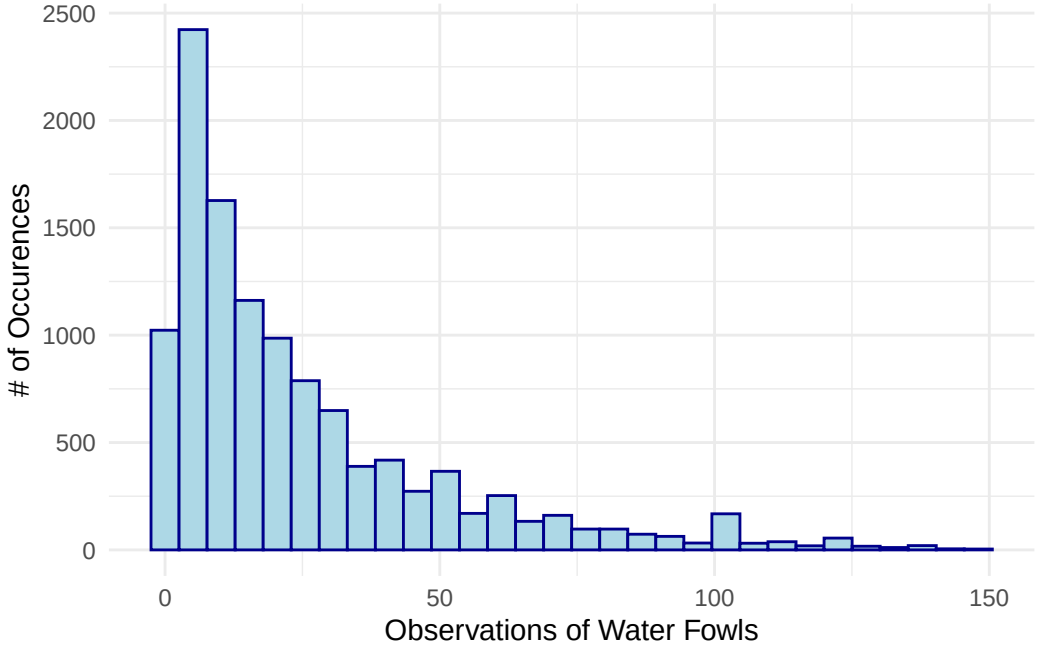

Figure 4: Histogram of Observations of Water Fowls

3 Results

Our results are summarized in.

4 Discussion

4.1 First discussion point

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

4.2 Second discussion point

4.3 Third discussion point

4.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

A Appendix

A.1 Graph and Sketches

Sketches depicting both the desired dataset and the graphs generated in this analysis are available in the GitHub Repository.

A.2 Data Cleaning

The data cleaning process involved renaming variables, filtering out useless columns from the raw dataset, filtering out observations with NAs, and removing the outliers using z-scores.

References

Gelfand, Sharla. 2022. *Opendatatoronto: Access the City of Toronto Open Data Portal*. https://CRAN.R-project.org/package=opendatatoronto.

Gough, William A, and Srishtee Sokappadu. 2016. "Climate Context of the Cold Summer of 2014 in Toronto, ON, Canada." *Theoretical and Applied Climatology* 126: 183–89.

Mallory, ML, LA Venier, and D McKenney. 2003. "Winter Weather and Waterfowl Surveys in North-Western Ontario, Canada." *Journal of Biogeography* 30 (3): 441–48.

R.-Toubes, Diego, Noelia Araújo-Vila, and José Antonio Fraiz-Brea. 2020. "Influence of Weather on the Behaviour of Tourists in a Beach Destination." *Atmosphere* 11 (1): 121.