

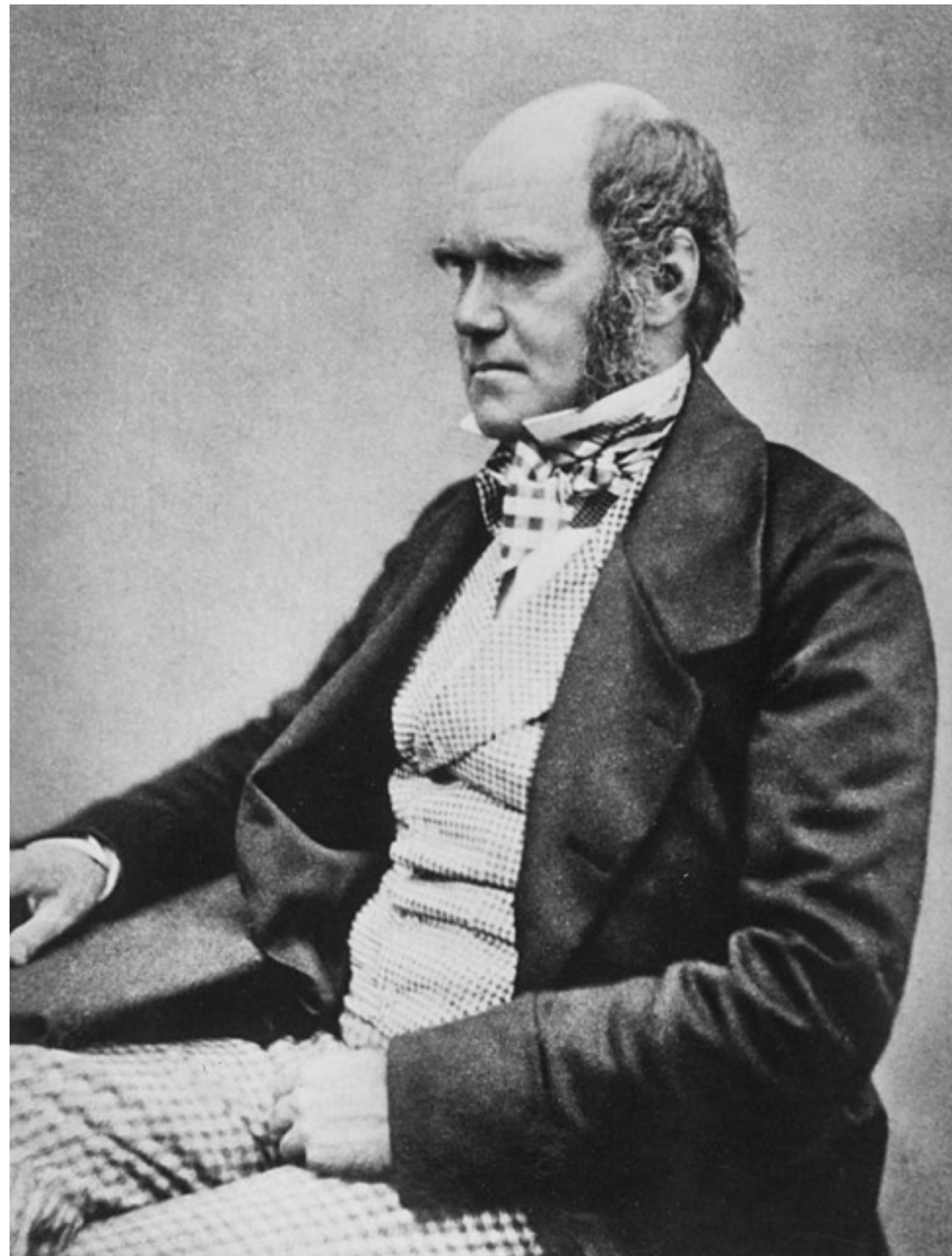


STATISTICAL THINKING IN PYTHON II

# **Darwin's finches: A full-blown statistical analysis**

# Your well-equipped toolbox

- Graphical and quantitative EDA
- Parameter estimation
- Confidence interval calculation
- Hypothesis testing











# The island of Daphne Major





# The finches of Daphne Major



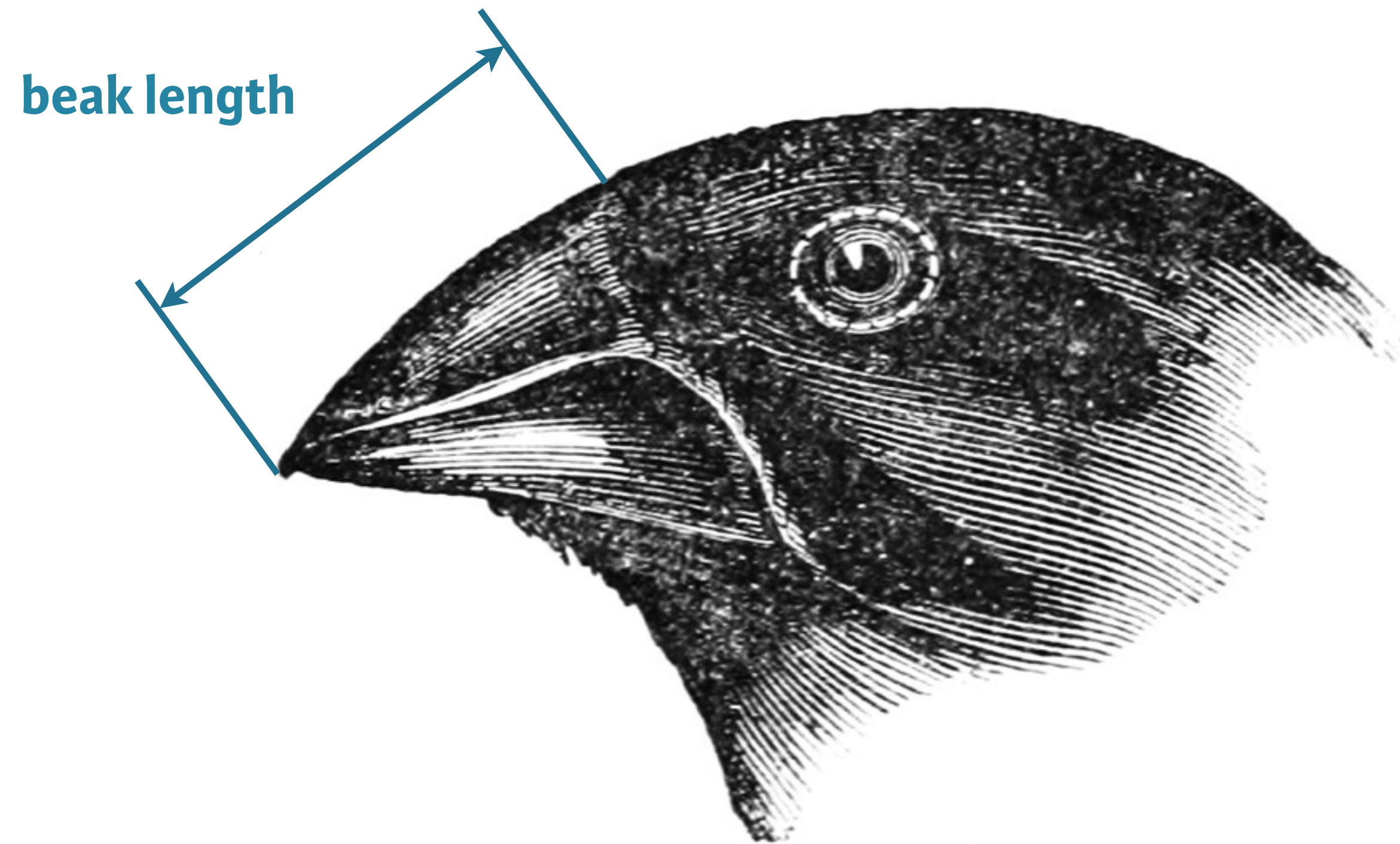


# Our data source

- Peter and Rosemary Grant  
*40 Years of Evolution: Darwin's Finches on Daphne Major Island*  
Princeton University Press, 2014
- Data acquired from Dryad Digital Repository  
<http://dx.doi.org/10.5061/dryad.g6g3h>

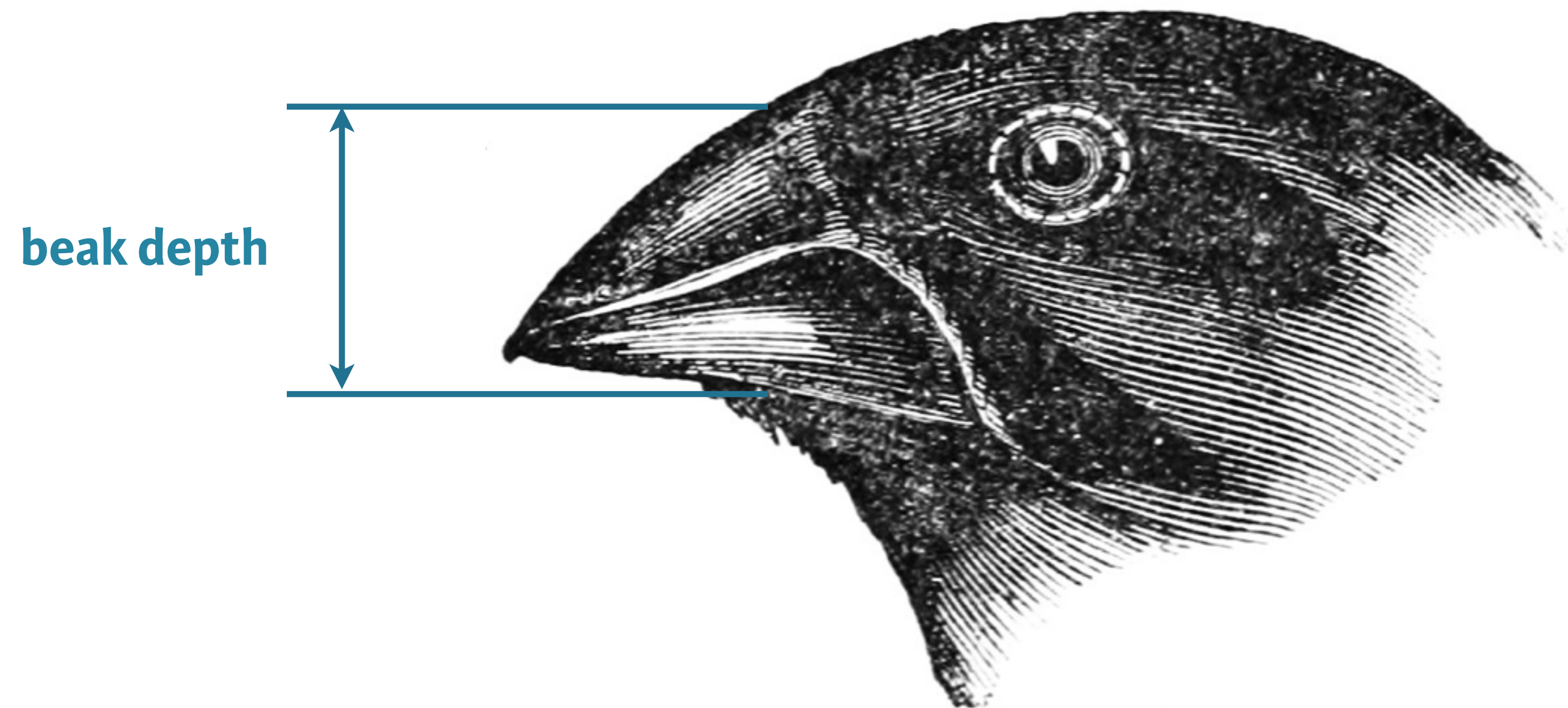


# The dimensions of the finch beak





# The dimensions of the finch beak



# Investigation of *G. scandens* beak depth

- EDA of beak depths in 1975 and 2012
- Parameter estimates of mean beak depth
- Hypothesis test: did the beaks get deeper?





## STATISTICAL THINKING IN PYTHON II

**Let's do it!**



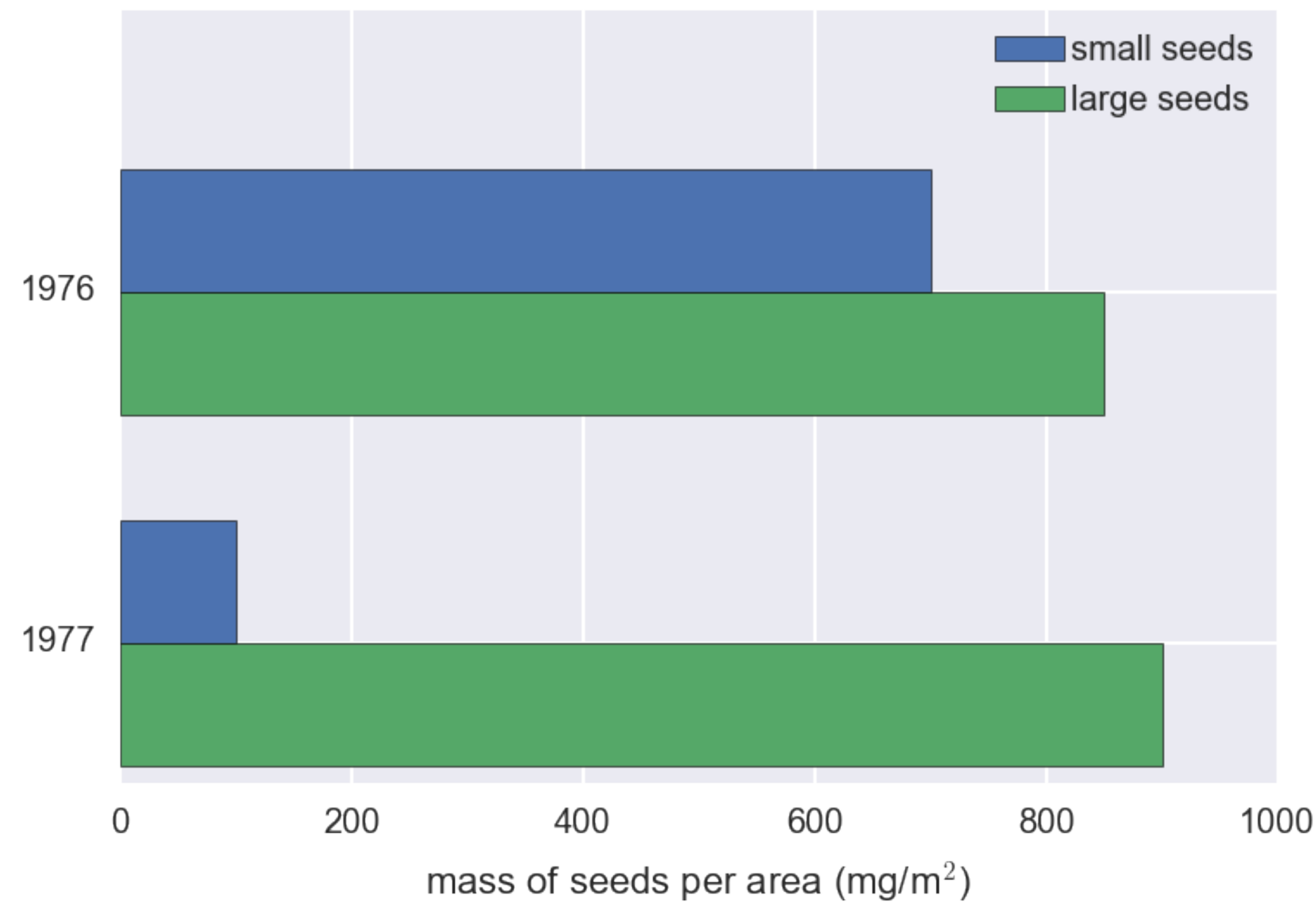
STATISTICAL THINKING IN PYTHON II

# **Variation in beak shapes**

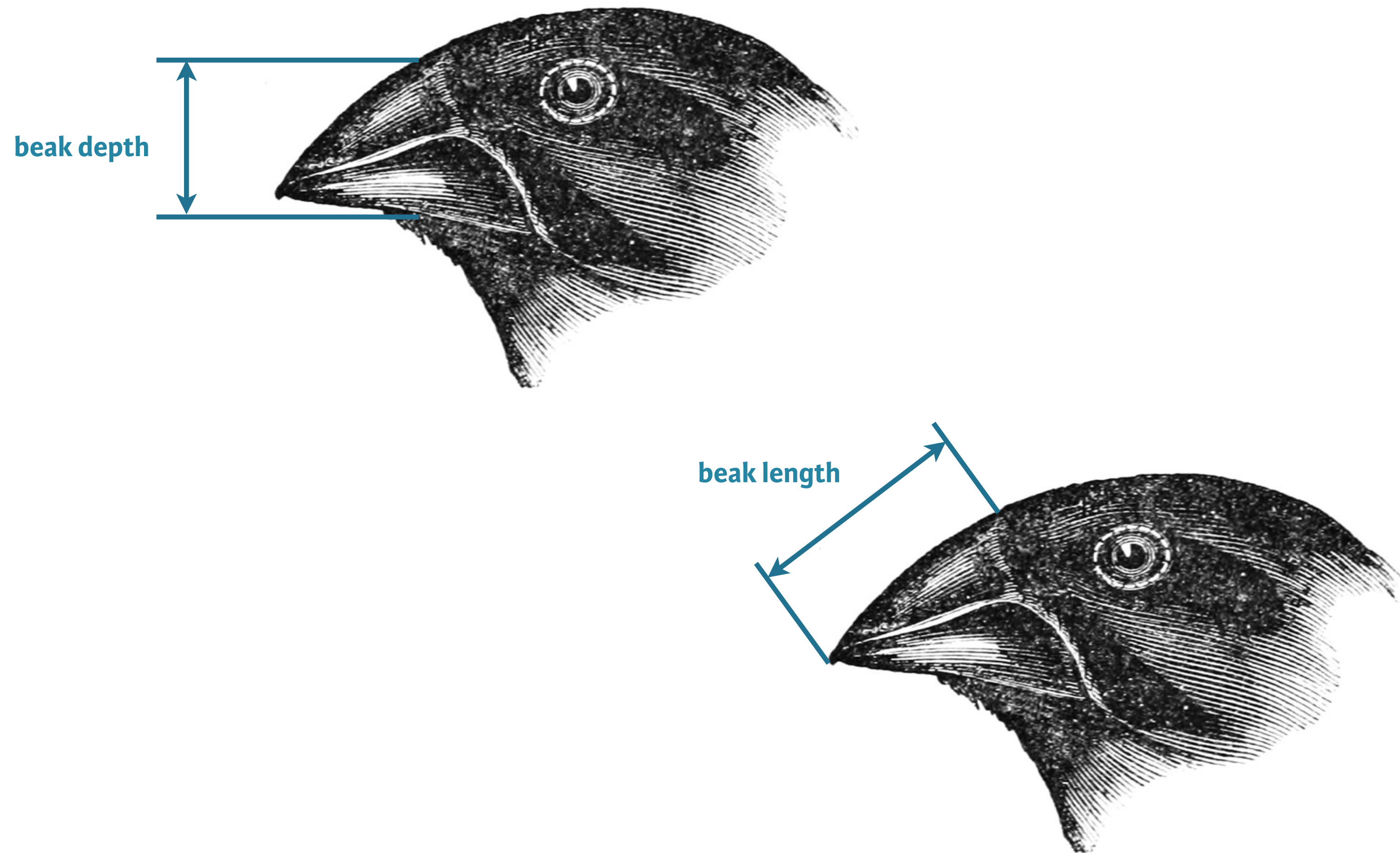




# The drought of winter 1976/1977



# Beak geometry





# Hint

- `draw_bs_pairs_linreg()` will come in handy



## STATISTICAL THINKING IN PYTHON II

**Let's do it!**





STATISTICAL THINKING IN PYTHON II

# Calculation of heredity



# The finches of Daphne Major



*Geospiza fortis*



*Geospiza scandens*



# Heredity

- The tendency for parental traits to be inherited by offspring





## STATISTICAL THINKING IN PYTHON II

**Let's do it!**



STATISTICAL THINKING IN PYTHON II

# Final thoughts

# Your statistical thinking skills

- Perform EDA
  - Generate effective plots like ECDFs
  - Compute summary statistics
- Estimate parameters
  - By optimization, including linear regression
  - Determine confidence intervals
- Formulate and test hypotheses





STATISTICAL THINKING IN PYTHON II

**Bon voyage!**