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

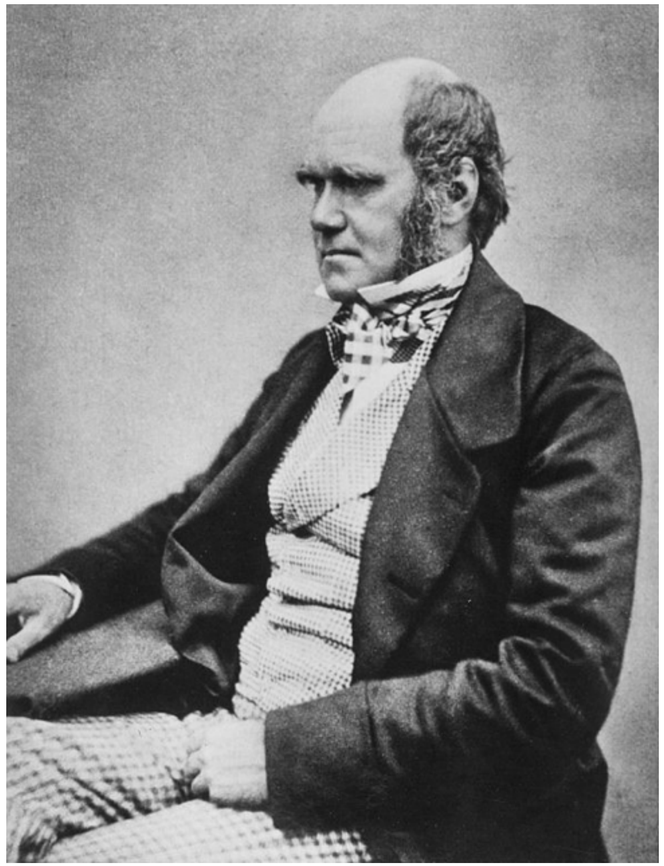


Image: Public domain, US

Image: NASA

The island of Daphne Major

Image: Grant and Grant, 2014

The finches of Daphne Major

Geospiza fortis

Geospiza scandens

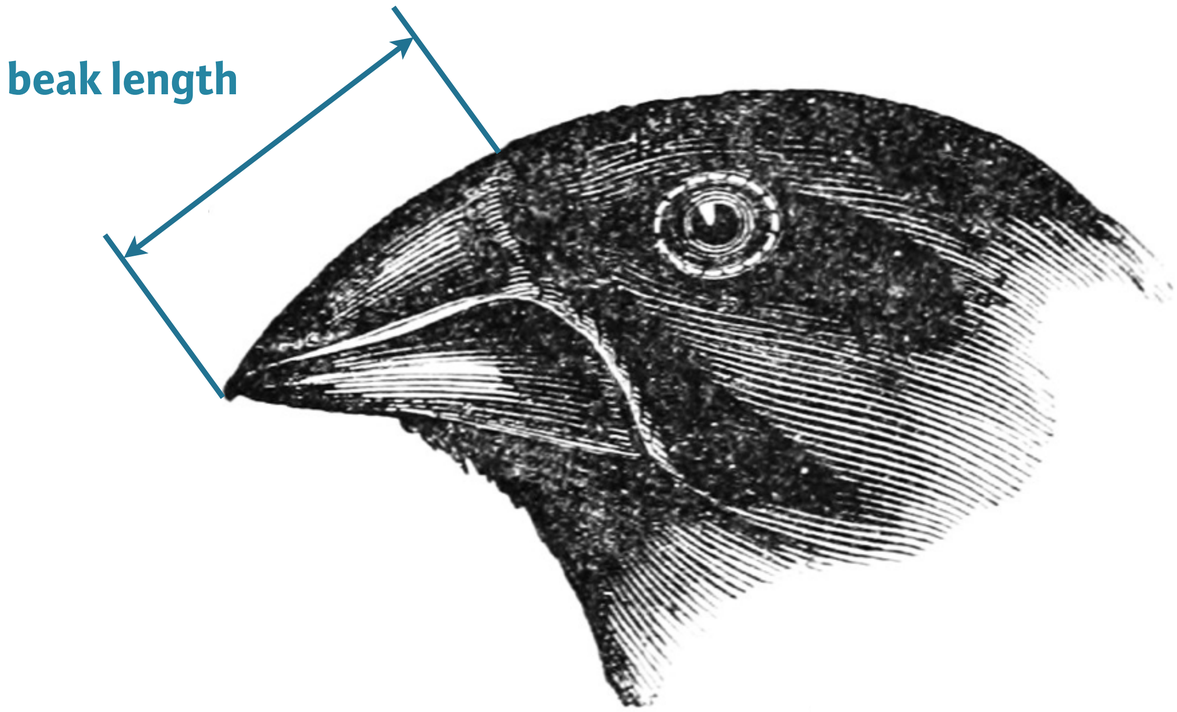
Source: John Gould, public domain

Our data source

- Peter and Rosemary Grant
  40 Years of Evolution: Darwin's Finches on Daphne Major Island
  Princeton University Press, 2014

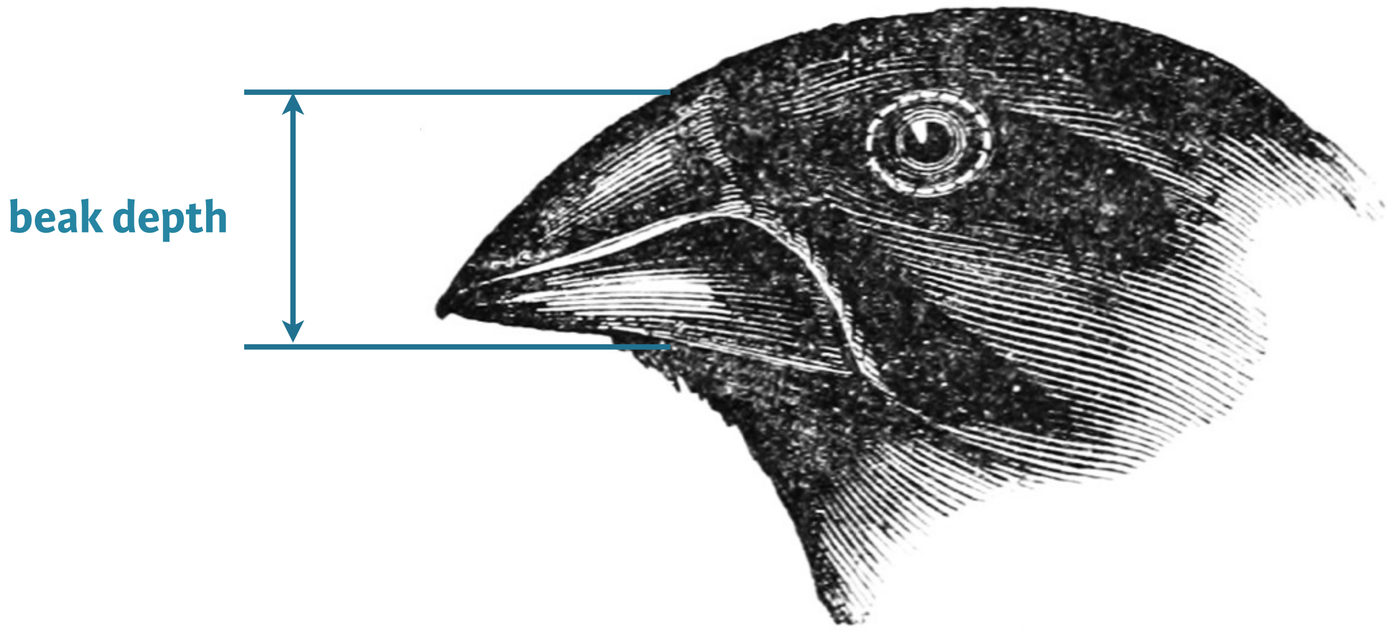
- Data acquired from Dryad Digital Repository
  http://dx.doi.org/10.5061/dryad.g6g3h

The dimensions of the finch beak



Source: John Gould, public domain

The dimensions of the finch beak



Source: John Gould, public domain

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?

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Let’s do it!

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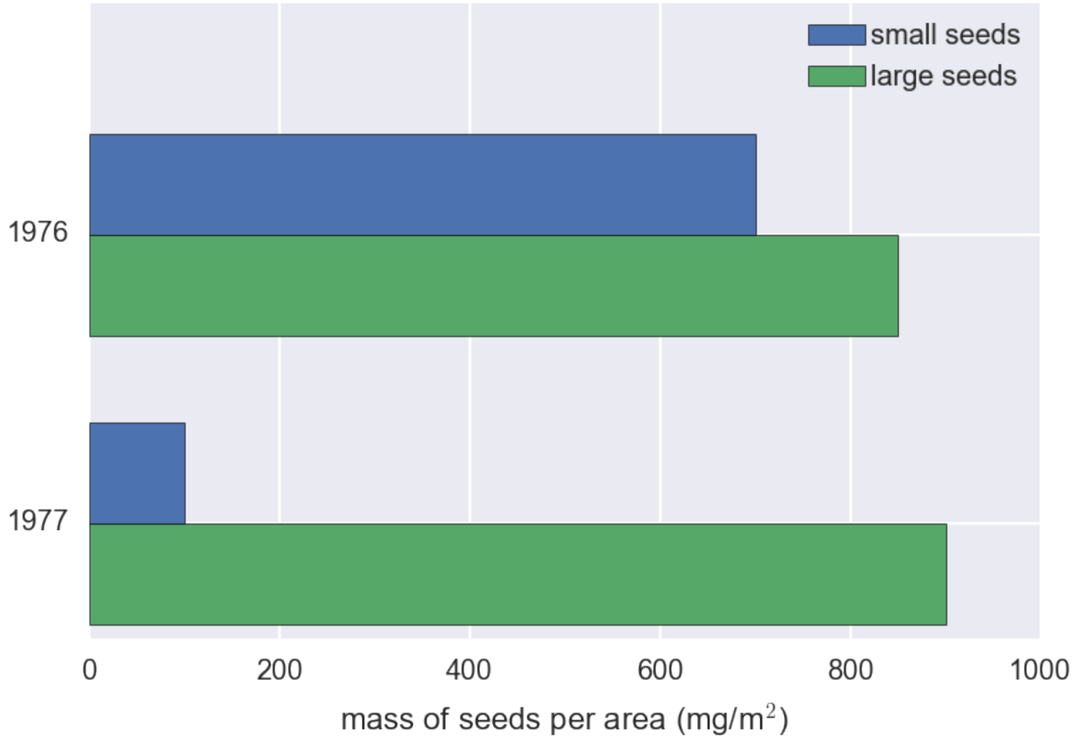
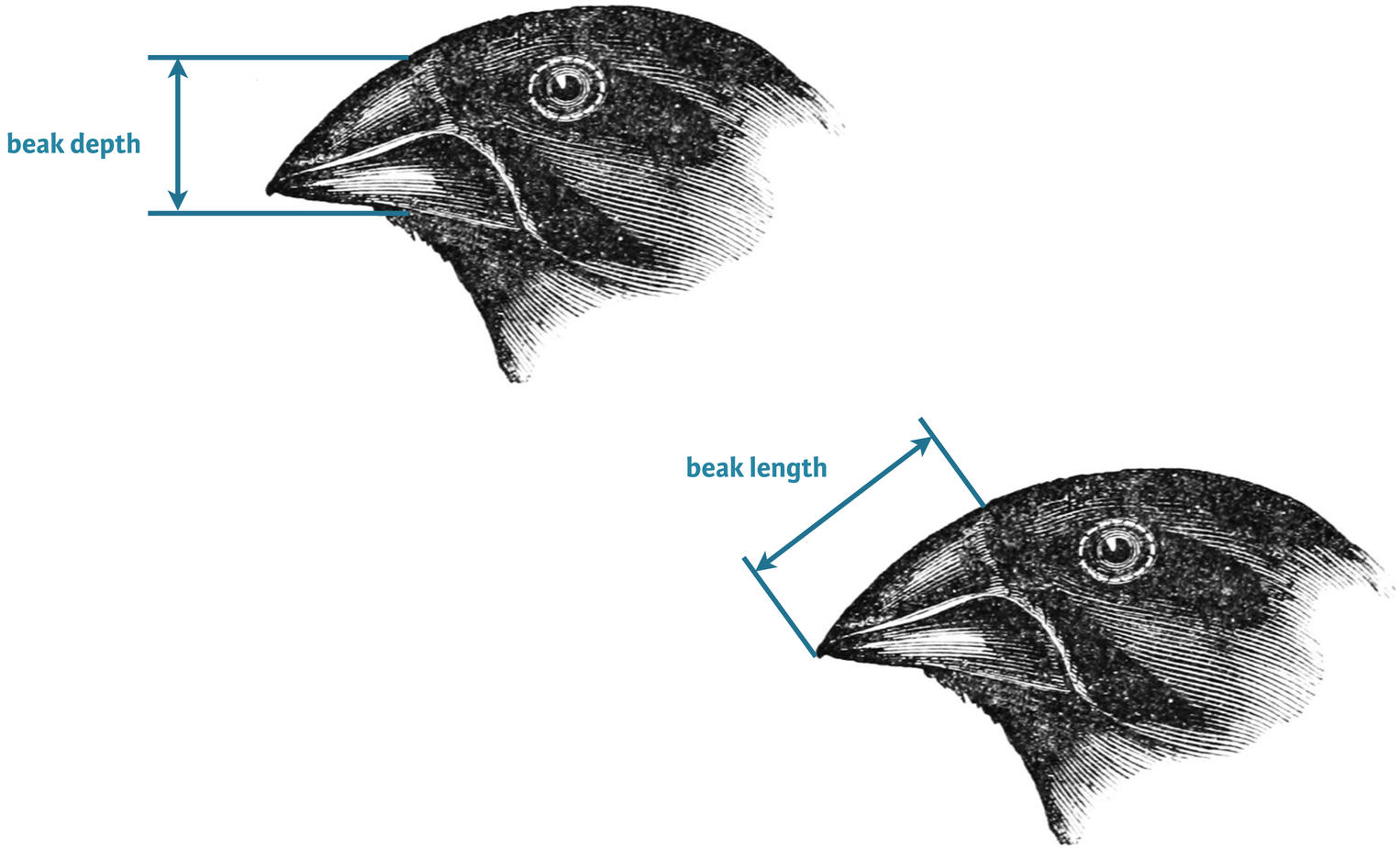
Variation in beak shapes

The drought of winter 1976/1977



Source: Grant and Grant, 2014

Beak geometry



Source: John Gould, public domain

Hint

- `draw_bs_pairs_linreg()` will come in handy

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Calculation of heredity

The finches of Daphne Major

Geospiza fortis

Geospiza scandens

Source: John Gould, public domain

Heredity

- The tendency for parental traits to be inherited by offspring

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Let’s do it!

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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

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Bon voyage!