Project # 6

Protea punctata

Protea venusta

Nora Mitchell
April 18, 2017

Quantitative Genetics

Evolution of continuous phenotypic traits

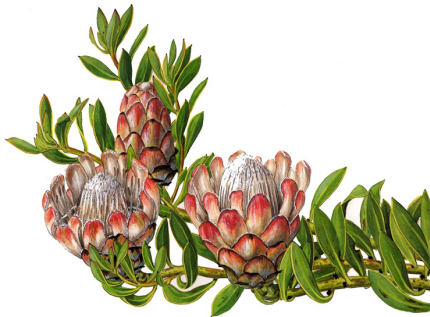$$Var(P) = Var(G) + Var(E)$$

Quantitative Genetics

$$h_n^2 = \frac{Var(A)}{Var(P)}$$

$$R = h_n^2 S$$

Protea

This week's project deals with two species of *Protea*, *Protea venusta* and *Protea punctata*

Protea punctata

Protea venusta

Protea

These two species co-occur and were measured on Blesberg Mountain

- 147 individuals measured (61 venusta, 86 punctata) in the field
- Measured:
  - Number seedheads (proxy for fitness)
  - LMA (leaf mass per area)
  - FWC (leaf water content, $\frac{freshweight - dryweight}{freshweight}$)
  - LWR (leaf length-width ratio, $\frac{leaflength}{leafwidth}$)
- Grew seedlings in greenhouse
  - 19 punctata moms (245 indivs)
  - 13 venusta moms (192 indivs)
  - LMA, FWC, LWR measured on seedlings

Questions

1. What is the heritability of each trait in each species? (3 traits, 2 species)
2. What is the selection differential for each trait in each species?
3. If heritability estimate from greenhouse were applicable to wild pops, what would be the predicted response to selection for each trait in each species?
4. For each trait/species combo, is there any evidence that selection favors higher or lower trait values?

Hints

- Treat offspring of the same mother as half-siblings
- Use lecture notes to get expressions for V_a and V_e in terms of within- and among-maternal family variance components
- $S = \beta_1\left(\frac{V_p}{\bar{w}}\right)$
- Regression for fitness on trait
- Standardize trait values
- Normalize individual fitness measures
- Use functions and code in handout
- Include uncertainty