Simmons LW, Emlen DJ.2006. Evolutionary trade-off between weapons and testes. PROC NATL ACAD SCI USA. 103(44):16346-51. By: Leigh W. Simmons and Douglas J. Emlen

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What is Sexual Selection

- Mating success
- Competition to obtain gametes
  - Mating dance
- Two forms
  - Contest between males for access to females
  - Female choice of some male phenotype over others
- Can be seen as competition

Examples


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http://www.everythingbiology.com/sexualselection.htm

Introduction

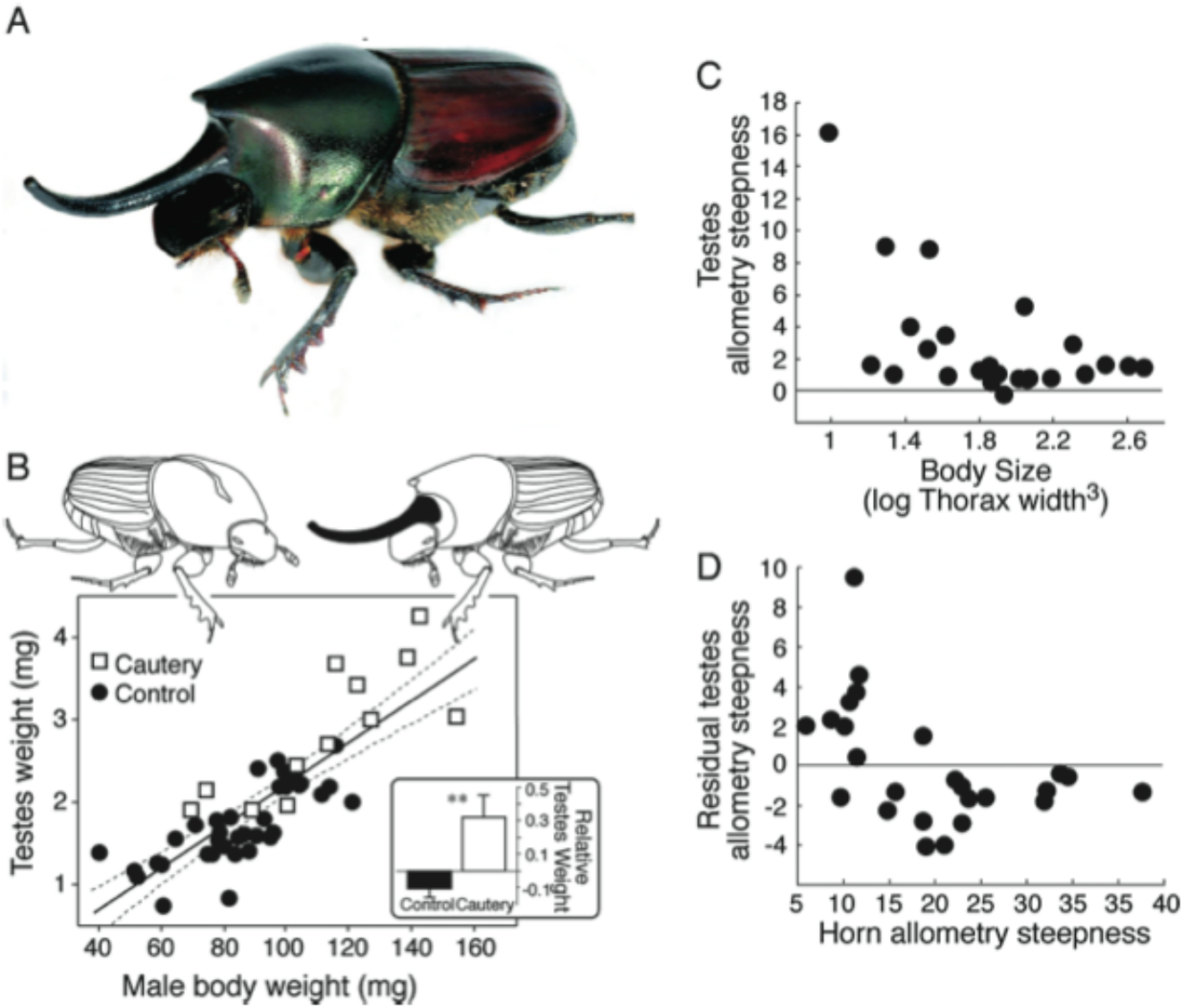
- Sexual selection strong force
- Females may mate with more than one male
- Must find different ways to compete
- Sperm competition theory
  - Salmon
  - Trade-offs

Onthophagus

- Horned beetle
  - Usually only found in males
  - Expensive to develop
  - Competitive tool for mates
  - Under selective pressure for both testes and horns
- Objective:
  - Does resource allocation to either horn size or teste size shape the evolution of these beetles?

Methods

- Study 25 different species of Onthophagus
- Look at allometric relationship of horn size and teste size
- Create control experiments
- Comparative analysis

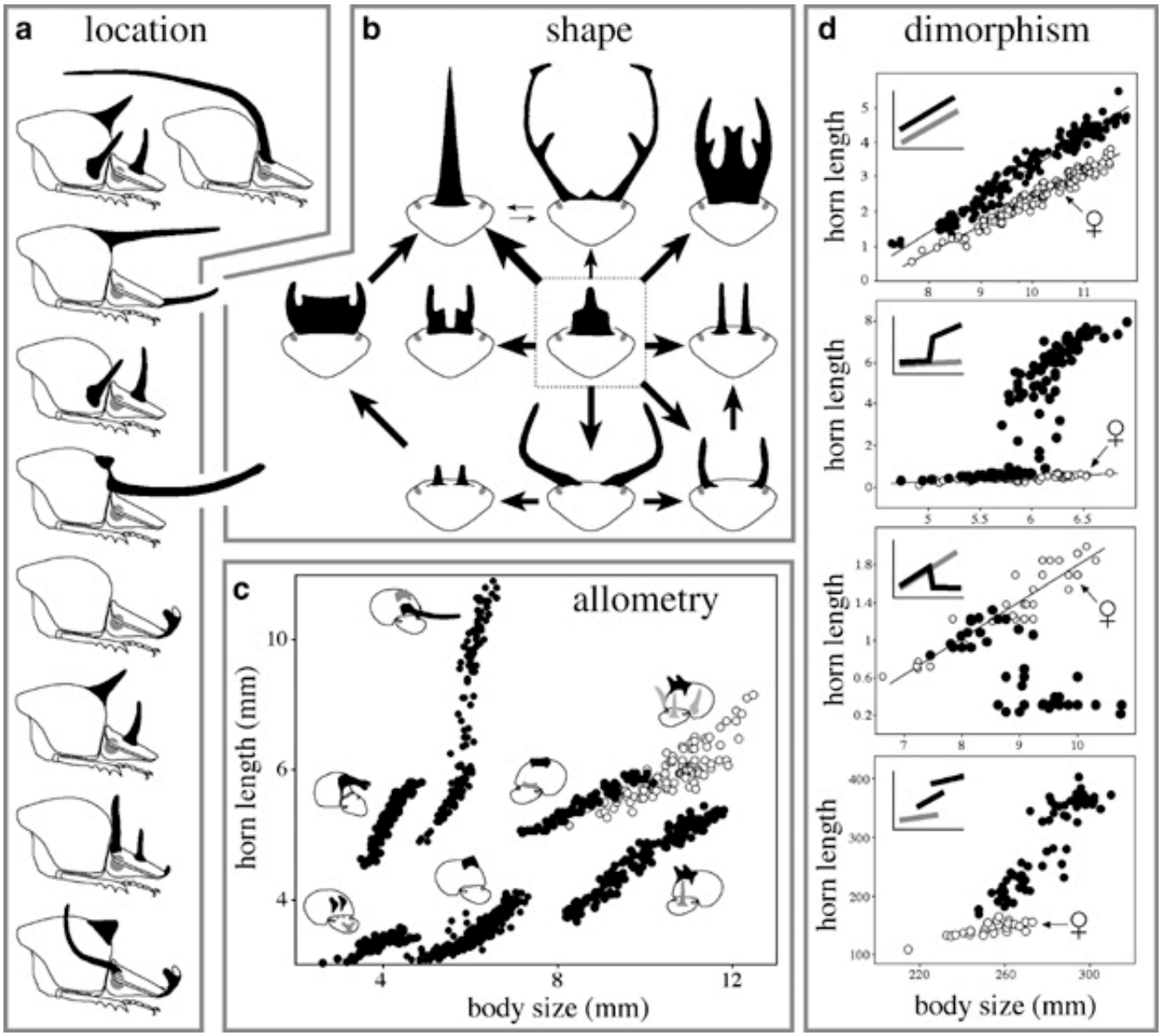

A
B
Cautery
Control
Testes weight (mg)
Male body weight (mg)
40 60 80 100 120 140 160
1 2 3 4
**
Relative Testes Weight
0.5 0.3 0.1 -0.1
Control Cautery
C
Testes allometry steepness
0 2 4 6 8 10 12 14 16 18
1 1.4 1.8 2.2 2.6
Body Size
(log Thorax width3)
D
Residual testes allometry steepness
10 8 6 4 2 0 -2 -4
5 10 15 20 25 30 35 35 40
Horn allometry steepness

Predictions

- Is there evidence for an evolutionary trade-off in investment of horns and testes?
  - Prediction: If phenotypic variation trade-off found, beetles evolving with large horns will have lower investment in testes
  - Comparative analysis of 25 species

Results

- 1.) Larger species had larger testes
  - Allocation trade-offs not important in shaping evolution of trait size
- 2.) Showed that these traits are evolutionarily plastic
- 3.) Allocation of horns (thorax vs. head) will effect size of testes
  - Dimorphism in thorax horned species



http://www.nature.com/hdy/journal/v97/n3/fig_tab/6800868f2.html

Discussion

- Control experiments show trade-off
- Resource allocation trade-offs have not effected long term beetle evolution
  - Enough time to evolve independently
- Found 2 evolutionary patterns
  - Allometry couples developmental trait growth with nutrition
  - Evolution of horn location

Conclusion

- Sperm competition plays an important but not always intuitive role in shaping secondary sexual traits (horns)
- Thus contributes to evolutionary diversification of male morphology

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