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Behavioral Ecology of Vertebrates

Unit 14. Conclusions

Module 5 Cooperation
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Learning, Discovering and Sharing Knowledge

Four themes run through this textbook: (1) natural selection, (2) trade-offs, (3) the social environment edits genotypes and (4) the physical environment edits genotypes in gene pools.

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Learning Objectives   (Davies et al. 2012:441)

Overview of Behavioral Ecology:

1. **Optimality models:** "selfish gene", value/limitations, multi-level selection (genotype, individual, group, population)

2. **Proximate/ultimate:** integration of cause & function; critique: development & phylogenetic history often missing

3. **Future**: growth, expansion in novel new directions; critique: over emphasis on invertebrate systems to test complex theoretical predictions (loss of field ecology)

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The good, the bad and the indifferent
1. OPTIMALITY MODELS

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1.1 Group Selection (Davies et al. 2012, Fig. 15.1)

- H
- A
  – N
- U

Credit: J. Travis

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1.4 Poll- lets see if you understand

About which topics would you like to chat more?

a) Appl

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Davies et al. 2012, Fig 5.12

The two fisted baby

2. PROXIMATE/ULTIMATE

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2.1 What is missing? (Davies et al. 2012)

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2.2 Cause/Function *(Davies et al. 2012:437, Fig. 15.4)*

- Black-tailed Prairie dogs (*Cynomys ludovicianus*) are colonial and make underground tunnels.
- Tunnels appear to be U-shaped, up to 15 meters long, and with an entrance on either end (Vogel et al. 1973).
- Note that one entrance has steep mounds (left) while other has low dome mounds (right).
- Thought to be just lookout points for predators or flood prevention.
  - But "why" are the mounds shaped differently on either end?

Credit by F. Cartaya

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2.2 Cause/Function *(Davies et al. 2012:437, Fig. 15.4)*

- If we want to know **why** an organism performs certain a behavior, we are seeking a functional explanation.
- Control of the exchange of air currents.
- Domed shape mounds allows fresh air to be sucked in easier and is expelled through the steep mound.
- Fresh air exchange is a key survival factor for prairie dogs.
- Take Home: Though causal and functional explanations may ask different questions, they are complementary of each other.
- Base point of Behavioural ecology is through the observation and discovery of functional explanations.

Photo credit by Elaine M. Bond

Credit by F. Cartaya

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14. Linked Genes *(Davies et al. 2012: 433)*

- Traits can be genetically linked:
  - Selection on one trait can influence another trait
  - It can appear that a trait is selected for or against, when it is actually a by-product of selection on another trait

Soay Sheep Example:
→ Phenotypic variation in coat color
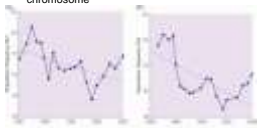→ No apparent selection pressure on coat color

(credit: K. Wedemeyer)

This can occur as a result of proximity of alleles on a gene or through pleiotropy (a locus affects more than one trait/process)

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14. Linked Genes: Soay Sheep Example
(Davies et al. 2012: 433, Fig. 15.3)   *(credit: K. Wedemeyer)*

- There is selection on a gene that is genetically linked to coat color
  - Linked by proximity on the chromosome or pleiotropy
    - Pleiotropy: a locus affects more than one trait/process
      - Locus: location of a gene on the chromosome
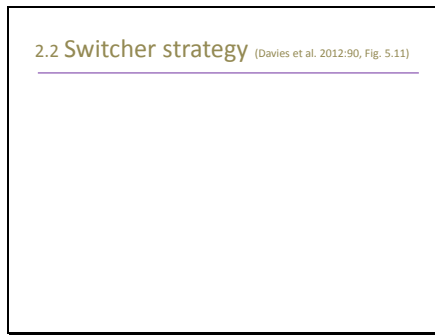
*Note: different y axis scales

Notes to talk through the class with:

- There is a fitness "disadvantage" for the allele linked to the G allele in coat color, resulting in homozygous G individuals having a reduced fitness

  - This results in the decline we see in the graphs from homozygous G to heterozygous and homozygous recessive individuals
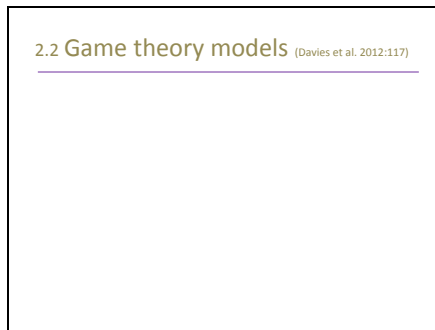
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2.1 Economic defendability (Davies et al. 2012, Fig. 5.7)

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2.2 Switcher strategy (Davies et al. 2012:90, Fig. 5.11)

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2.2 Game theory models (Davies et al. 2012:117)

Adding a "tool" to our toolkit.
Assumptions are a better match to reality than optimality theory. Predicts which genotype will increase in % in a gene pool, based on the other genotypes present.
Basis for prediction how individuals choose to switch tactics depending on what others are doing in the social context

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2.5 Poll- lets see if you understand

About which topics would you like to chat?

   a) Concept
   b) I'm good, let's move on

Lets dialogue more about this using the elearning discussion tool

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Davies et al. 2012 Fig. 5.13

Keeping the ecology in behavioral ecology

3. FUTURE DIRECTIONS

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3.1 "Personalities" (Davies et al. 2012:143)

- Phen

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3.2 Genetic polymorphism (Davies et al. 2012:139)

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3.1 Lizard polymorphism (Davies et al. 2012, Fig. 5.19)

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3.4 Poll- lets see if you understand

About which topic would you like to chat more?
a) Concept
b) I'm good, let's move on

Lets dialogue more about this using the elearning discussion tool

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Summary   (Davies et al. 2012:441)

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