BIODIVERSITY

• Evolutionary processes that generate diversity
• Ecological processes that maintain diversity
BIODIVERSITY

Studies:

- Integrative
- Experimental
Anolis allisoni
GREATER ANTILLEAN
ANOLIS COMMUNITIES

• Within a community, species differ in morphology, ecology, and behavior
• Among islands, similar sets of ecological specialists
ANOLE RADIATION

- giant
- trunk crown
- twig
- trunk ground
- bush grass

(Williams, 1983)
TRUNK-GROUND

- Long Hindlimbs
- Stocky
- Small Toepads
- Brown

A. cybotes, Hispaniola
TRUNK-CROWN

- Short Limbs
- Long Head
- Large Toepads
- Often Green
CROWN-GIANT

- Large
- Big Head
- Vertebral Crest
- Green
GRASS-BUSH

- Small
- Short Forelimbs
- Slender
- Long Head
- Extremely Long Tail
TWIG

- Slender
- Short Limbs, Tail
- Long Head
- Light Color
How do we study the evolution of these island lizards?

1. Studies of Evolutionary Relationships
160 Taxa
1470 Base Pairs
(ND2, five tRNAs, COI)
1019 Parsimony Informative Characters
How do we study the evolution of these island lizards?

1. Studies of Evolutionary Relationships
2. Studies of Adaptive Basis of Morphological Differences
Ecologically Relevant Measures of Performance

1. Sprint Speed
2. Jump Distance
3. Clinging Ability
Stumbles

(m/s)

Diameter (cm)

77%

25%

20%

15%
How do we study the evolution of these island lizards?

1. Studies of Evolutionary Relationships
2. Studies of Adaptive Basis of Morphological Differences
3. Studies of the Ecological Mechanisms Driving Evolutionary Change
1. A species finds itself in a resource-rich environment
2. Speciation occurs
3. Resources become scarce
4. Species partition resources to minimize interactions
5. Species adapt to new "niches"
From Evolution to Ecology: What Processes Drive These Patterns?

- Ecological Interactions
- Drive Species to Shift Habitat Use
- Evolutionary Adaptation
Bahamas

A. sagrei (trunk-ground)

A. carolinensis (trunk-crown)

Collaborators: T. Schoener, D. Spiller
Puerto Rico

A. evermanni
(Trunk-Crown)

A. gundlachi
(Trunk-Ground)
Leal, Rodríguez-Robles, and Losos, 1998
HOW DO ANOLES INTERACT ECOLOGICALLY?
EVIDENCE FOR INTERSPECIFIC COMPETITION IN ANOLEs

- Effects strongest on same-sized species and classes
- Interspecific aggression
- Habitat shifts in behavioral time
- Effects on foraging rates, egg production, etc.
PREDATION?
What Effects Do Predators Have on Anole Populations?

1. Habitat Use
2. Mortality Rates
3. Evolution
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What Effects Do Predators Have on Anole Populations?

1. Habitat Use
2. Mortality Rates
3. Evolution
Adult Survival: May-to-November

- **ISLAND VEGETATION HEIGHT (m)**
  - 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5

- **SURVIVAL**
  - 0.0 0.2 0.4 0.6 0.8 1.0

**Graph Details:**
- **CONTROL**
- **PREDATOR INTRODUCTION**

- **ISLAND VEGETATION HEIGHT (m)**
- **Survival**

- **Legend:**
  - Black dots: CONTROL
  - Red dots: PREDATOR INTRODUCTION
Adult Survival: May-to-November

Ancova, test for heterogeneity of slopes, $F_{1,8} = 8.94$, $p = 0.017$
What Effects Do Predators Have on Anole Populations?

1. Habitat Use
2. Mortality Rates
3. Evolution
\[ F_{1,8} = 3.72, \ P = 0.045 \]
Island Area (m²)

Control

Experimental

\[ F_{1,6} = 9.05, \ P < 0.012 \]
Hurricane Frances, September 3, 2004
Hurricane Jeanne, September 25, 2004

Tropical Depression Jeanne

LOCATION 32.2N  83.7W  TIME  2 PM EDT
35 Mi S of Macon, GA
WINDS 35 mph  MOVING NNE 14 mph
PRESSURE 29.23 in/ 990 mb (Estimated)

FINAL ADVISORY

27 Sep 2004 18:03 GMT / 27 Sep 2004 02:03 PM EDT
Biodiversity Studies: Integrative Experimental