Finding a competitive strategy

Adapting strategies through time

Complex interaction networks

Competitive strategies in changing environments
Finding a competitive strategy

Paradox of the plankton

(Hutchinson 1961)
Context matters

Galapagos finches (Grant & Grant 2006)

Medium finch beak size

Year


-1.5 0 0.5 1

medium ground finch

large ground finch

large finch arrives

drought

drought
Adapting strategies through time

Competition - colonization tradeoff

colonize → compete
Side-blotched Lizard

(Sinervo and Lively 1996)
Side-blotched Lizard

(Sinervo and Lively 1996)
Keystone species

Piaster starfish
(Paine 1966)
With otters
amnh.org
Killer whales
(Estes et al. 1998)
Without otters

amnh.org
Intermediate disturbance principle

Species Diversity

High

Low

Disturbance

Frequent
High intensity

Infrequent
Low intensity

(Connell 1978)
Algae on boulders

(Sousa 1979)
Competitive strategies in changing environments

Diverse strategies provide

resistance
resilience
Sea-stars & mussels
(Sanford et al. 1999)
Resistance

Marine invertebrates

(Stachowicz et al. 1999)
Resilience

### Resilience

![Graph showing resilience of seagrass over time](image1)

- **# shoots / m²**
- **% shoots remaining**

#### Seagrass

(Hughes & Stachowicz 2004)

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**Resistance**

![Graph showing resistance of seagrass](image2)

- **Genotypic Diversity**
  - 1
  - 2
  - 4
  - 8

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**Resilience**

- **Date**: 7/13/02, 8/9/02, 9/7/02, 10/22/02, 12/22/02, 1/1/03, 2/1/03, 2/27/03, 4/19/03, 5/19/03
- **# shoots remaining**
- **% shoots remaining**

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**Seagrass**

(Hughes & Stachowicz 2004)
System sensitivity to change varies

Density compensation

(MacArthur et al. 1972)
**Mainland vs. Island**

- **# competitors**
  - Mainland: 105, 104, 103, 102
  - Island: 100, 101, 102, 101.5

- **# predators**
  - Mainland: 105, 104, 103, 102
  - Island: 100, 101, 102, 101.5

- **Lizards/ha**
  - Mainland: 105, 104, 103, 102
  - Island: 100, 101, 102, 101.5

- **Graphs**
  - Mainland vs. Island comparisons for competitors and predators.
  - Scatter plots showing the relationship between competitors and predators.
  - Logarithmic scales for both x and y axes.

**Legend**
- Islands
- Mainland
Lessons from ecological systems

Optimal competitive strategy is context dependent

Changes percolate through networks

Disturbance maintains diversity

Diversity promotes resilience and resistance