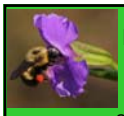
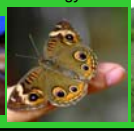


Insect Natural History and Diversity
Biology 495 -602
SS1 5/16 – 6/18, Noon – 3:30
at UA Field Station (Bath Nature Preserve)

- **Learn more about the most abundant group of living things!**
- Become expert at identifying common insects.
- Learn to make and care for an insect collections
- Explore how the natural history of insects affects Ohio's Ecology.
- Many field trips.
- Develop Field Biology skills



Competition

Chapter 13

Two-Species interactions

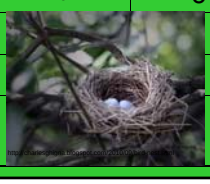
- How might the presence of one species affect another's abundance or fitness?
  - increase + (Facilitation)
  - decrease - (Antagonism)
  - have no effect 0 (Neutral)

Pairwise Interaction Types

Effect on X	Effect on Y	Type of Interaction
0	0	Neutralism
-	0	Amensalism

Pairwise Interaction Types

Effect on X	Effect on Y	Type of Interaction
0	0	Neutralism
-	0	Amensalism
+	0	Commensalism



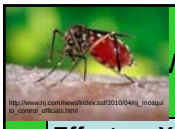
Pairwise Interaction Types

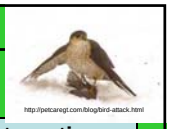
Effect on X	Effect on Y	Type of Interaction
0	0	Neutralism
-	0	Amensalism
+	0	Commensalism
-	-	Competition

Pairwise Interaction Type

Effect on X	Effect on Y	Type of Interaction
0	0	Neutralism
-	0	Amensalism
+	0	Commensalism
-	-	Competition
+	+	Mutualism

...ise Interaction T





Effect on X	Effect on Y	Type of Interaction
0	0	Neutralism
-	0	Amensalism
+	0	Commensalism
-	-	Competition
+	+	Mutualism
+	-	Predation or Parasitism

Your Muddy Points 2011 Spring

58 replies

- Intraspecific vs. Interspecific (3)
- Self thinning (6)
- Competitive Exclusion Principle (10)
- Mathematical models (26 total):
  - General (12)
  - Coefficients (6)
  - Isoclines (8)
- Character Displacement (7)
- Other (5)

Intra- vs Inter-Specific Competition

- How are they different and how are they the same?
- Planthopper example (fig 13.6)

Types of Competition

- General Definitions of Competition
  - Interaction that negatively affects both participants (- / -)
  - Use of a resource that reduces the availability of that resource to others
- Types of participants
  - Within species (INTRA-specific)
    - We used the Logistic model to understand this
  - Between species (INTER-specific)

Intraspecific Competition in Animals (planthoppers)

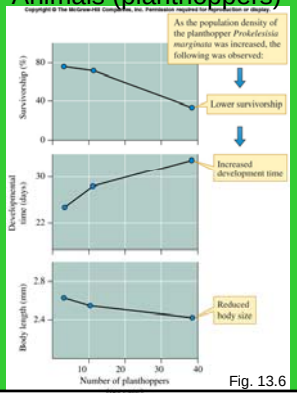


Fig. 13.6

Prokelisia marginata

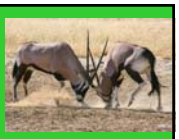
Intra- vs. Inter-Specific Competition

- Similarities
  - Negative interaction via common use of limited resource

Mechanisms of Competition

- Interference
  - Actively prevent competitor from using resource
    - hummingbird territoriality
- Resource (exploitation)
  - Use resource before competitor
  - Deplete resource below levels profitable to competitor
    - Insects visiting flowers

Intra- vs. Inter-Specific Competition



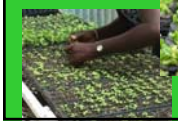
- Similarities
  - Negative interaction via common use of limited resource
    - Interference
    - Resource
- Differences
  - Participants may be very dissimilar
  - Unequal effects are common 'amensalism' (they are together, one species suffers, other unaffected)
  - Exclusion of one species may result

http://ahs-enviro.blogspot.com/2009/11/blog-7.html

http://hyenas.zoology.msu.edu/research/crocuta/interspecific-compe

Self Thinning

- How does it work?
- What is so unique about it that it is wide accepted?
- Is that a dash or a 'minus-sign'?
- Graphs
- -3/2, -1/2… ugh



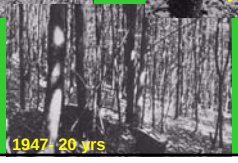
Self-Thinning in Allegheny National Forest, PA

1927 – Age 0

1998 – 71 yrs

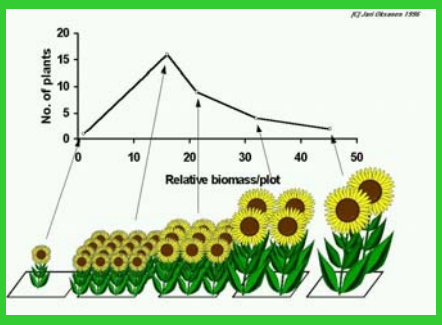
1957 – 10 yrs

1972 – 45 yrs



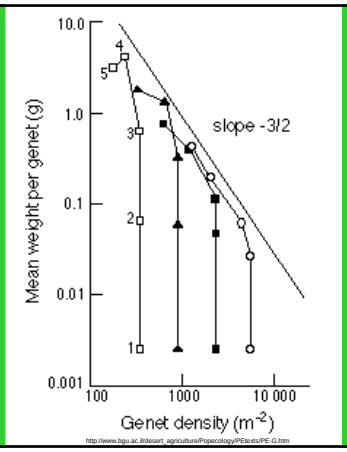
1947 – 20 yrs

http://www.fs.fed.us/ne/warren/longterm.htm



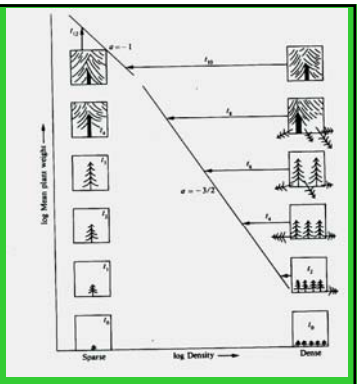
http://diseaseecologyspring2010.wordpress.com/page/3

Self-thinning in ryegrass (*Lolium perenne*)
(After Kayes and Harper 1974)



Self Thinning

- Population gradually changes to have fewer, but larger, plants
- Slope of -3/2:
  - average plant weight increases faster than density decreases.
  - There is no precise answer for why the slope is -3/2, although it has to do with:
    - Weights increase with volume (power of 3)
    - Densities increase with area (power of 2)



Competitive Exclusion

- General
- Why can't complete competitors coexist?
- How related to niches?
- Salt marsh grass example
- Barnacles
- Subtle Niche differences interesting

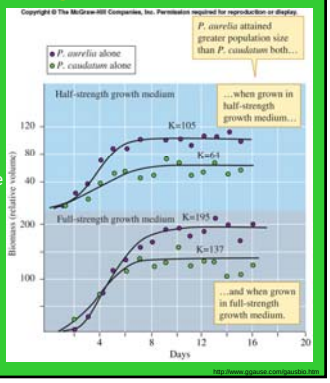
Competitive Exclusion

- When resources are limited, one competitor will 'lose' (locally excluded)

Timiriasev Institute, Russia
1910-1986
also developed the antibiotic Gramicidin

Two species of *Paramecium* rely on the same growth medium

- Alone, they reach larger populations when resources are increased.



Paramecium

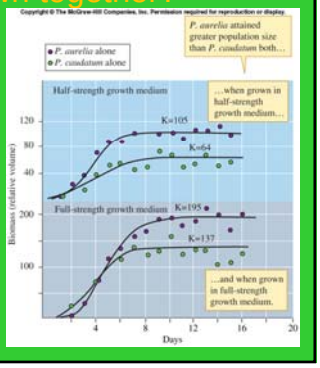
If grown together, are they likely to compete?

A. YES
B. NO

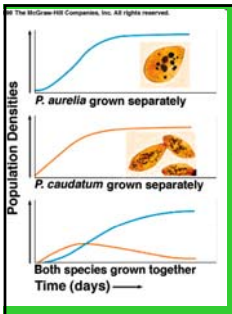
WHY?

What will happen if these *Paramecium* are grown together?

A. *P. aurelia* will exclude *P. caudatum*
B. *P. caudatum* will exclude *P. aurelia*
C. They will coexist
D. Not enough information



The Competitive Exclusion Principle
("Gause's Principle")

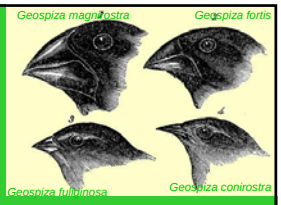


Competition between *Paramecium* in the lab

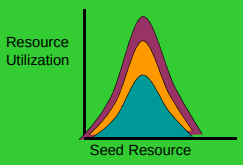
- Two species that use the same resources (have the same niche) cannot coexist in the same area at the same time
  - One species will "exclude" the other (locally extinct)
  - CCCC (complete competitors cannot coexist)
- "Niche Partitioning" may result
  - Each species may specialize on one aspect of the resource

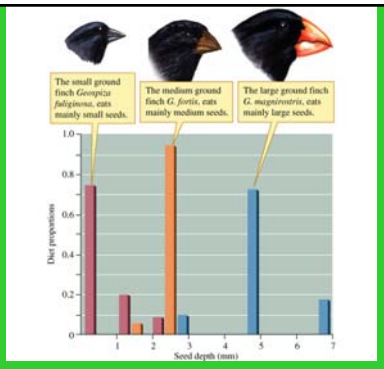
Application – Galapagos Finches

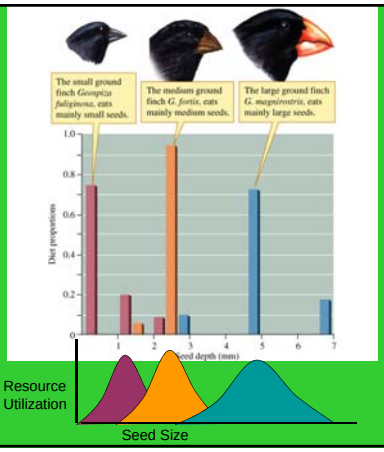
- Several finch species on these islands
- All eat seeds
- Are they competing?
  - Shared, limited resource
- How can they coexist?



Rosemary Grant
Peter Grant
~1940-
Princeton University







MacArthur's Warblers
All eat 'insects', but they coexist

Niche Partitioning
Figure 1.2

Robert MacArthur
Princeton University
(1930-1972)

- Niche Partitioning
  - Use different resources
  - Use different portions of the resource
  - Use the same resources at different times
  - Use the same resource in different places