

# Mutualism

## Chapter 15

**Mutualism:** Interactions between individuals of different species that benefit both partners



<http://www.youtube.com/watch?v=z3bWqlPLpMg>

# Types of mutualism

- ❖ **Facultative Mutualism** occurs when a species can live without its mutualistic partner.
- ❖ **Obligate Mutualism** occurs when a species is dependent on a mutualistic relationship.

This wrasse and a barracuda!  
Clogged gills for barracuda, food source for wrasse!  
Why could this be considered obligate mutualism?



## Is mutualism important?

- Without mutualism, there wouldn't be
  - ❖ Coral reefs
  - ❖ Animal-pollinated plants
  - ❖ No apples
  - ❖ No bees or hummingbirds
  - ❖ Herbivores that depend on animal-pollinated plants
  - ❖ Wind-pollinated plant populations would be reduced – no mycorrhizae
  - ❖ No herbivores
  - ❖ No eukaryotes!!! No you!!!



# Plant Mutualisms

- Many mutualistic relationships
  - ❖ Bacteria
  - ❖ Animals
  - ❖ **Fungi - mycorrhizae**

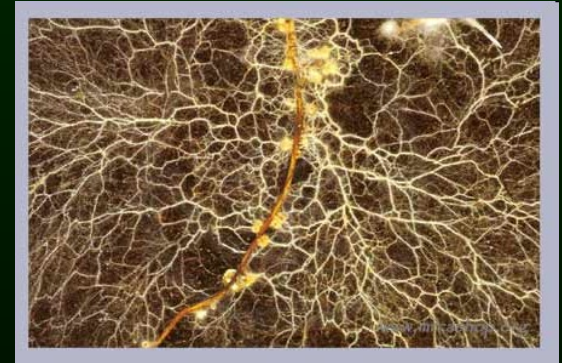


<http://www.youtube.com/watch?v=bq1bTduTzC0>

# Mycorrhizae and Plant Water Balance

- Plants with mycorrhizae maintained higher leaf water potentials.
  - mycorrhizal fungi provide more contact with moisture in the soil

Plant gets more access to water and nutrients  
Mycorrhizae get photosynthetic product



# Plant Mutualisms

- Many mutualistic relationships
  - ❖ Bacteria
  - ❖ **Animals - Ants and Swollen Thorn Acacia**
  - ❖ Fungi

Can have up to  
30,000 ants in the  
colony!!!

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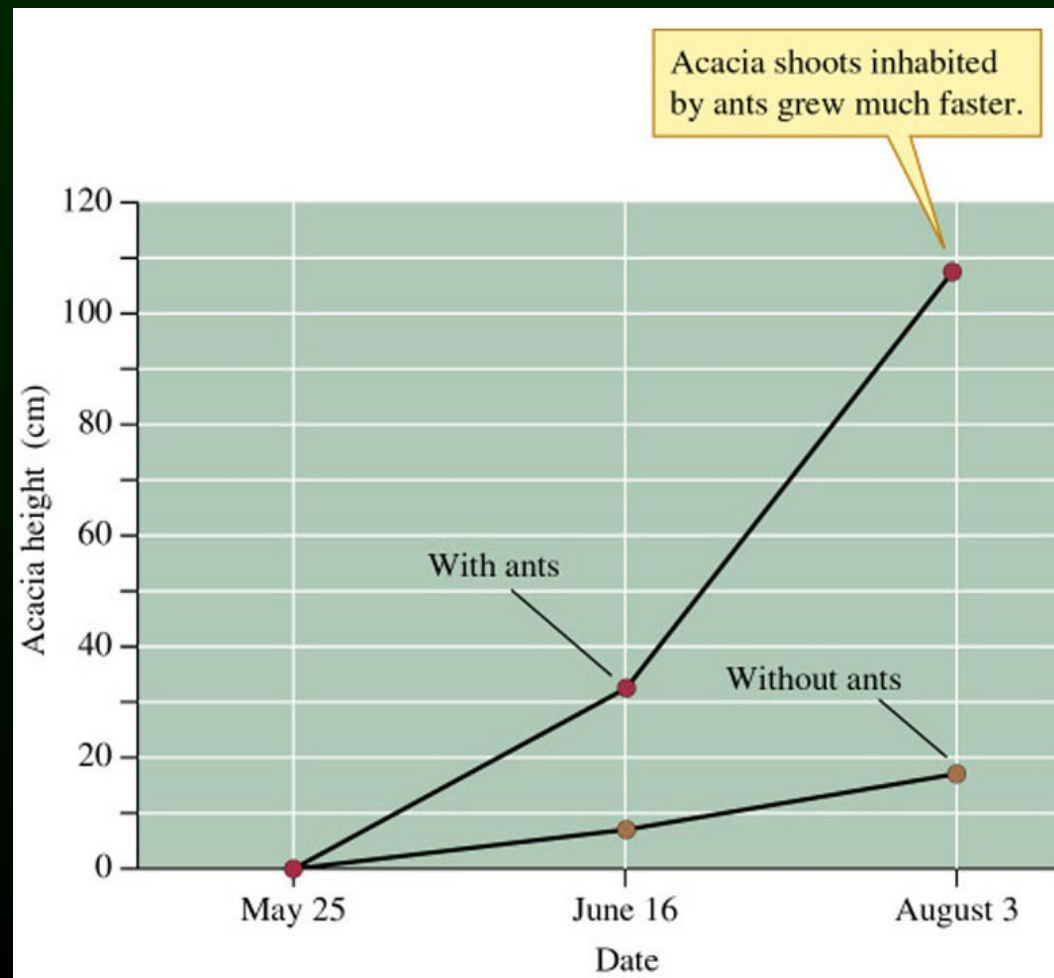
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[http://video.nationalgeographic.com/video/player/animals/bugs-animals/ants-and-termites/ant\\_acaciatree.html](http://video.nationalgeographic.com/video/player/animals/bugs-animals/ants-and-termites/ant_acaciatree.html)



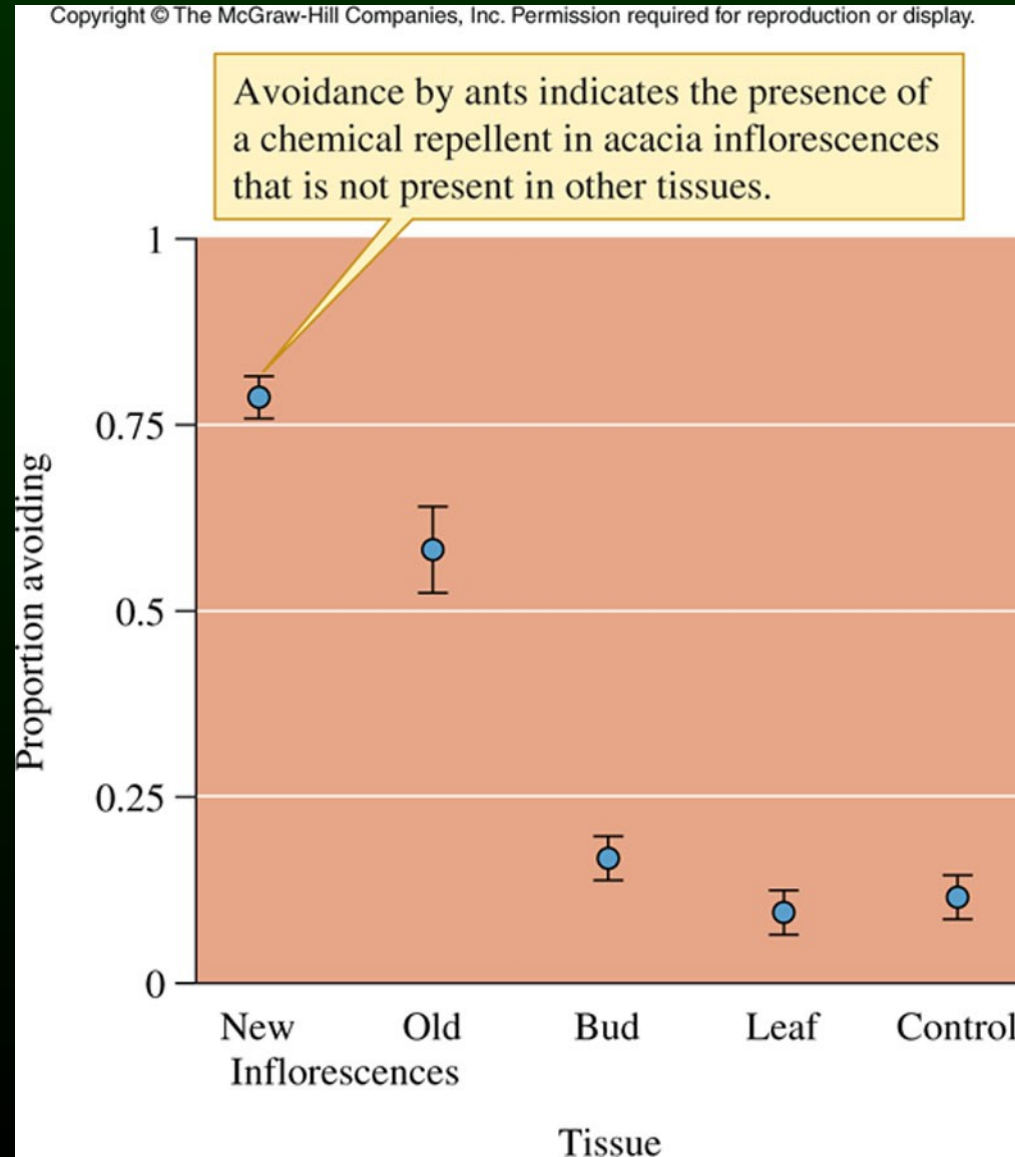
# Ants and Swollen Thorn Acacia

- Acacia gets protection!
- Ants get:
  - ❖ Thorns provide living space.
  - ❖ Foliar nectaries provide sugar.
  - ❖ Beltian bodies are a source of oils and protein.



# Competition between Mutualists???!?

- If the ants protect the acacia from other organisms...what happens with potential pollinators (i.e. other mutualistic partners)???





# Plant Mutualisms

- Many mutualistic relationships

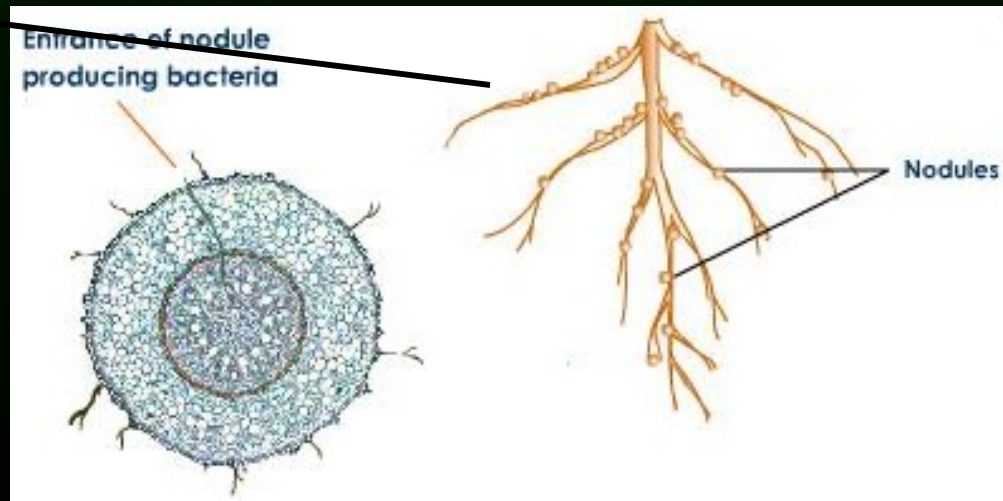
- ❖ **Bacteria – nitrogen fixation**

- ❖ Animals

- ❖ Fungi

<http://www.youtube.com/watch?v=dOV0E5FaKoQ>

**Bacteria, fungus, animal mutualism!!!**

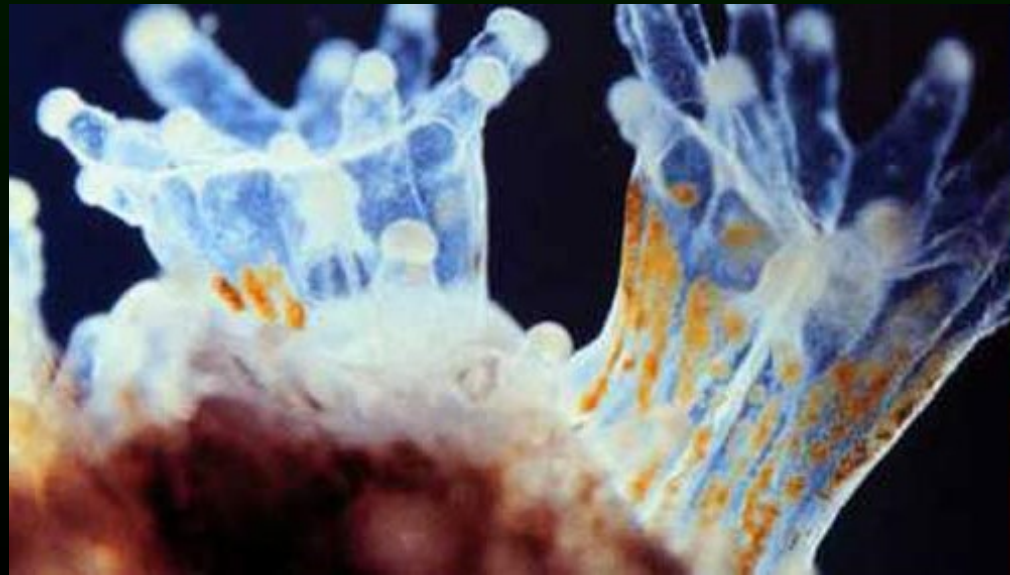


# Coral Mutualisms

- Zooxanthellae and Corals

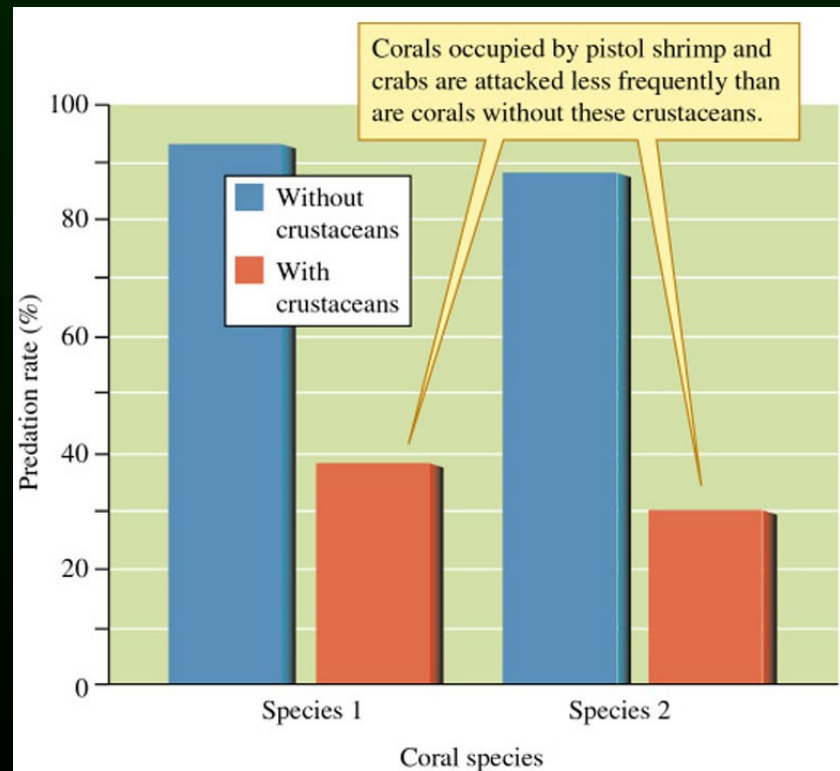
- ❖ Zooxanthellae live within coral tissues.
  - Receive nutrient from coral. In return, coral receives organic compounds synthesized by zooxanthellae during photosynthesis.

<http://www.youtube.com/watch?v=RCXpU6bW7II&feature=KkbyuqgT4>



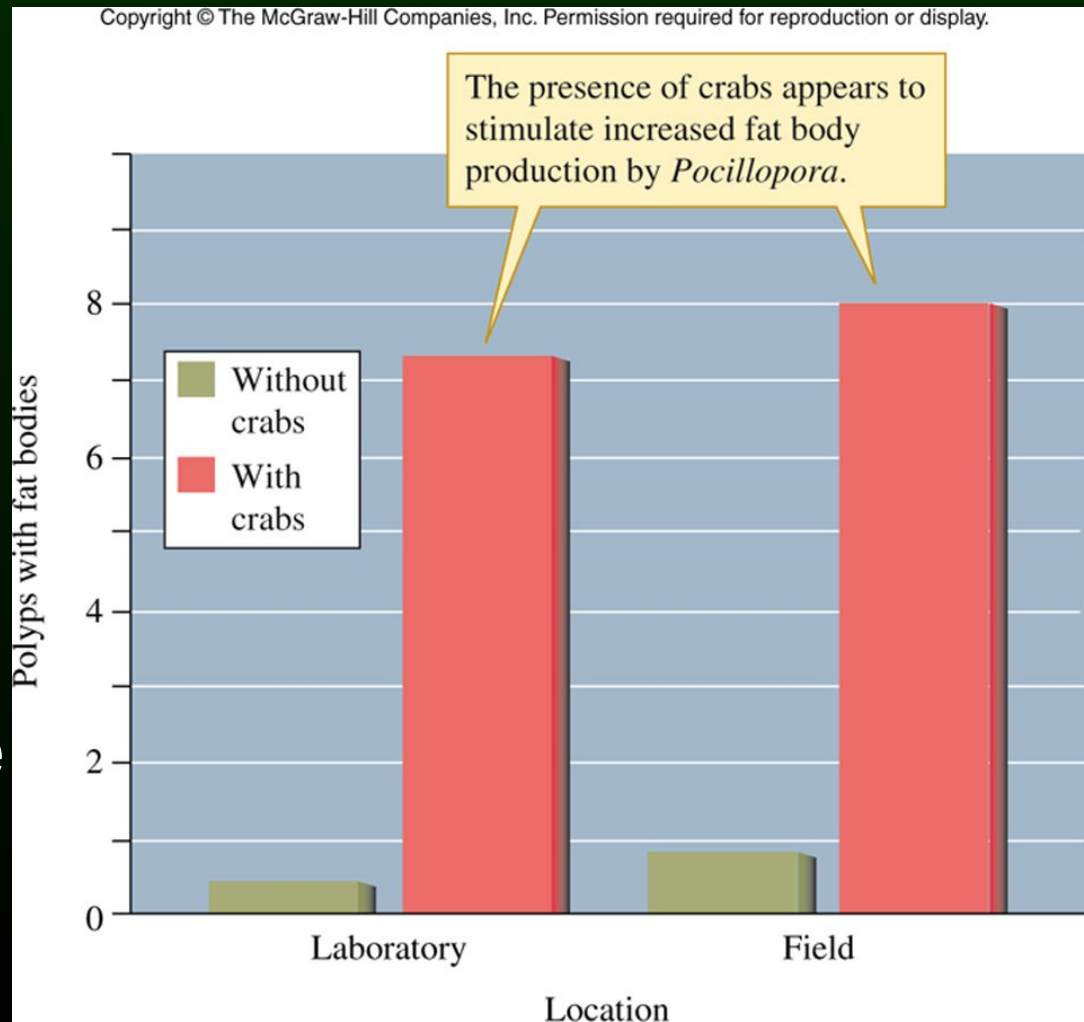
# Coral Protection Mutualism

- *Glynn* found 13 coral species protected by crustacean mutualists.
- ❖ Crustacean mutualists substantially improved chances coral will avoid attack by sea stars.



# Coral Protection Mutualism

- *Pocillopora* coral increases production of fat bodies in the presence of crabs.
  - Digestive tract of crabs inhabiting corals contained large quantities of lipids.





## More mutualism examples

- <http://www.youtube.com/watch?v=8BEKrc-aXF8>

<http://www.youtube.com/watch?v=dKuWIBjUFo8&feature=related>

<http://www.youtube.com/watch?v=e7mKSOTzqIo>

Home for Nemo,  
Food, protection,  
cleaning for  
Anemnonemo



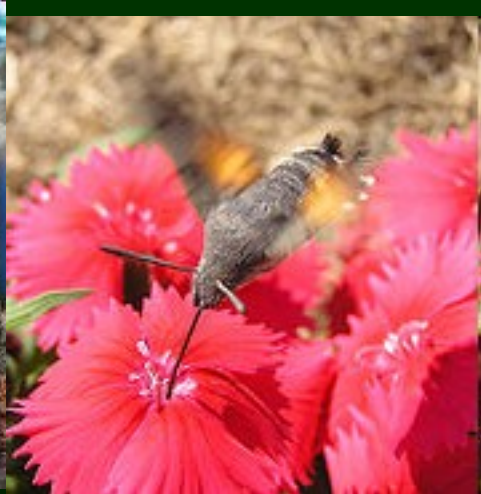
# Evolution of Mutualism

- mutualism will evolve where the benefits of mutualism exceed the costs.
  - ❖ several types of mutualistic interactions.
    - Successful mutualists
      - Give and receive benefits.
    - Unsuccessful mutualists
      - Give, but do not receive benefit.
    - Non-mutualists
      - Neither give nor receive benefit.

# Mutualism and Humans

- For a population to be mutualistic, fitness of successful mutualists must be greater than unsuccessful or non-mutualists.
  - ❖ If not, natural selection will eventually eliminate the interaction.
- Do humans have any mutualistic relationships??? Of course we do...here's a cool one!!!
- <http://dsc.discovery.com/videos/human-planet->





<http://www.sciencedaily.com/releases/2009/05/090514153139.htm>

