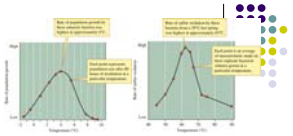
Adaptations



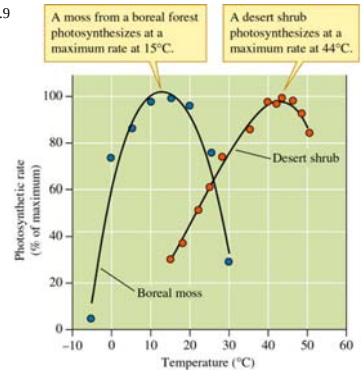
These differences in temperature tolerance between species of bacteria are genetically fixed "adaptations"

- Adaptations are
  - Traits that increase the ability of a population to live in a particular environment
  - Evolutionary changes that arise over long periods of time (across generations)
- "Acclimations" are
  - Trait adjustments that allow an individual to live in a particular environment.
  - Reversible changes that occur within the life of an individual (within generations)

See: pg 89, 185-186 4th ed
pg 198-199 3rd ed.

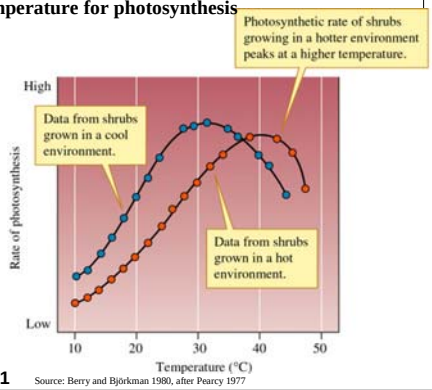
Temperature and photosynthesis

Figure 4.9



4-10 Source: Kallio and Kärenlampi 1975, Pearcy and Harrison 1974

Growing temperatures and optimal temperature for photosynthesis

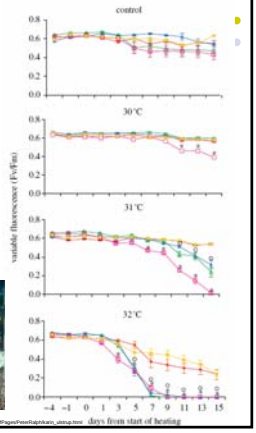


4-11 Source: Berry and Björkman 1980, after Pearcy 1977

Coral Thermal Tolerance

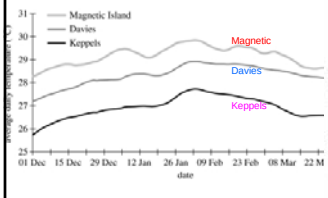
- Raised Coral from different parts of Australia's Great Barrier Reef in tanks
  - All 12 tanks at 27.5C for 5 days
  - Then heated each tank to a different set temperature.
- Low fluorescence indicates bleaching.
- Each line indicates data from a different coral collection.

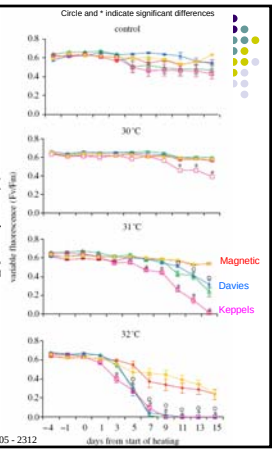
- Which hypothesis does this experiment test?
- Do these data reject or support the hypothesis?
- Why were the corals kept at 27.5C for 5 days?



Berkelmans and van Oppen.2006. PRSLB. 273:2305 - 2312

Coral Thermal Tolerance





- Which hypothesis does this experiment test?
- Do these data reject or support the hypothesis?
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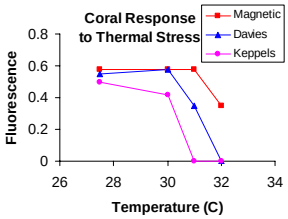
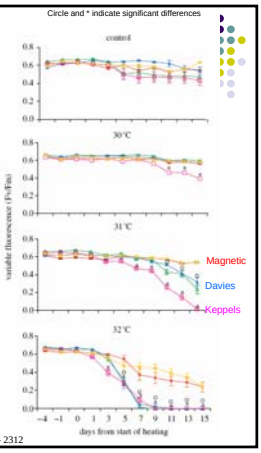
Berkelmans and van Oppen.2006. PRSLB. 273:2305 - 2312

Coral Thermal Tolerance

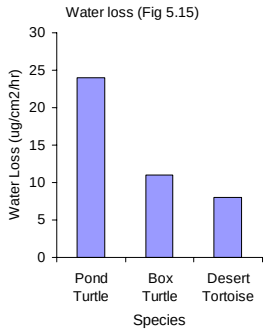




Berkelmans and van Oppen.2006. PRSLB. 273:2305 - 2312

Differences between species in rates of water loss

These differences probably reflect different adaptations for water conservation

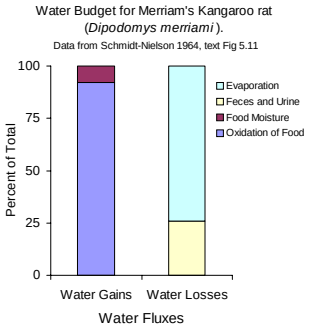


Water Balance

- Water gains must balance water losses
- For Animals:

Avenues for Water Gain	Avenues for Water Loss
Drinking	Evaporation
Water in Food	Secretion
Water absorbed from Air	

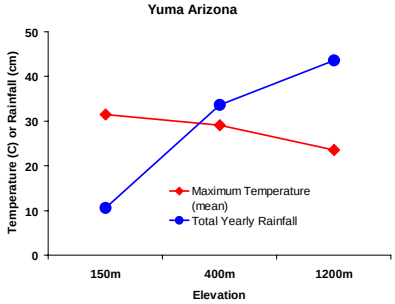
Kangaroo Rat Water Budget



Never need to drink, yet maintain their water balance! (Gains - Losses)

http://nasa.utep.edu/chih/theland/animals/mammals/dime.htm

Kangaroo Rats along a Climatic Gradient



In which environment would there be the greatest danger of a negative water balance? (Loss > Gain)

a) 150m
b) 400m
c) 1200m
d) they are equal

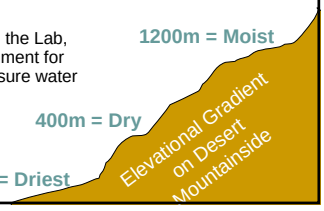
Text pg 120

Which method best tests the Ho that these populations of Kangaroo rat differ in rates of evaporative loss? Why?

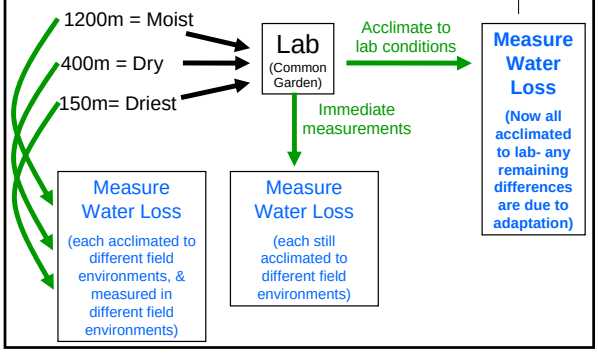
a) Measure water loss in each field site separately

b) Bring K-rats from all sites back to the Lab and measure water loss rates immediately

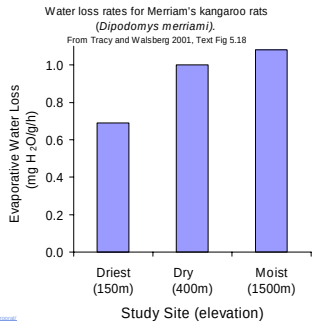
c) Bring K-rats from all sites to the Lab, keep there in one environment for several weeks, then measure water loss rates



'Common Garden' Experiment



Water loss in a common garden experiment after acclimatizing there



Things to know

- Know Chapter 1
- Know the major features of Chapter 2 and 3
- Know Chapter 4
- Know Chapter 5
- Know page 197-201 (adaptation)

Muddy Point Assignment. Due Monday (Jan 27) at NOON

- After today's lecture, and after reading Chapter 6, identify <u>one important point</u> that was unclear ("muddy") to you. Write out and send to me a sentence or two that explains which concept is muddy, what is muddy about it, <u>and</u> why this concept is important. DO NOT use questions such as "will this be on the test?" Your muddy points should concern concepts that are important for understanding. You are always welcome to ask questions about exam coverage, but not for credit!
- Send your assignment to me (email: rjm2@uakron.edu, put the words "MUDDIEST POINT" in the subject line; or drop off at my office – ASEC 177; or my mailbox in the biology office).

Back to the Florida Reefs from Day 1

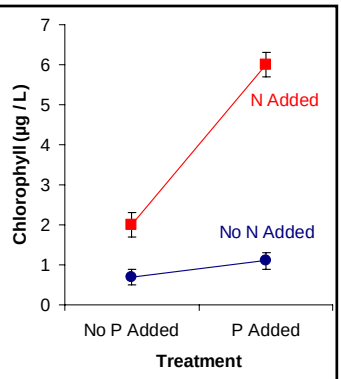
- One hypothesis to explain the loss of corals and seagrasses in the Florida Keys is contamination of the water with the nutrients N and P.
- These are plant fertilizers that we use to fertilize our gardens and agricultural fields. How can they also act as "pollutants"?

Chlorophyll content (micrograms per liter) in coastal seawater in 4 treatments (Nitrogen and phosphorus together, N alone, P alone, and Control with no addition) over 6 days.

How you would <u>describe</u> these results?

How would you <u>interpret</u> them? How do they relate to coral decline?

Then explain your understanding to your neighbor (~5 min)



Vince, S. and I. Valiela. 1973. The effects of ammonium and phosphate enrichment on chlorophyll a, pigment ratio, and species composition of phytoplankton of Vineyard Sound. *Marine Biology* 56: 111-134).