Practice Quiz

Labs 4-5

In addition to reproduction list the three conditions necessary in order for evolution by natural selection to occur. Be sure you understand the meaning of each condition.

When measuring evolution, we are interested in changes in:

- a. the number of species at a particular location
- b. how population size changes over time
- c. how individuals acclimate to environmental stress
- d. genetic and/or phenotypic changes in a population over time
- e. how populations maintain themselves near carrying capacity

In Lab 4 you studied the mustard plant (*Brassica rapa*). What evidence is there, from what you learned in that lab, that phenotypic variation has a genetic basis?

- Fitness is defined as _____.

- With natural selection we are interested in relative fitness. Why?

Which treatment(s) below is/are an example of intermorph competition?

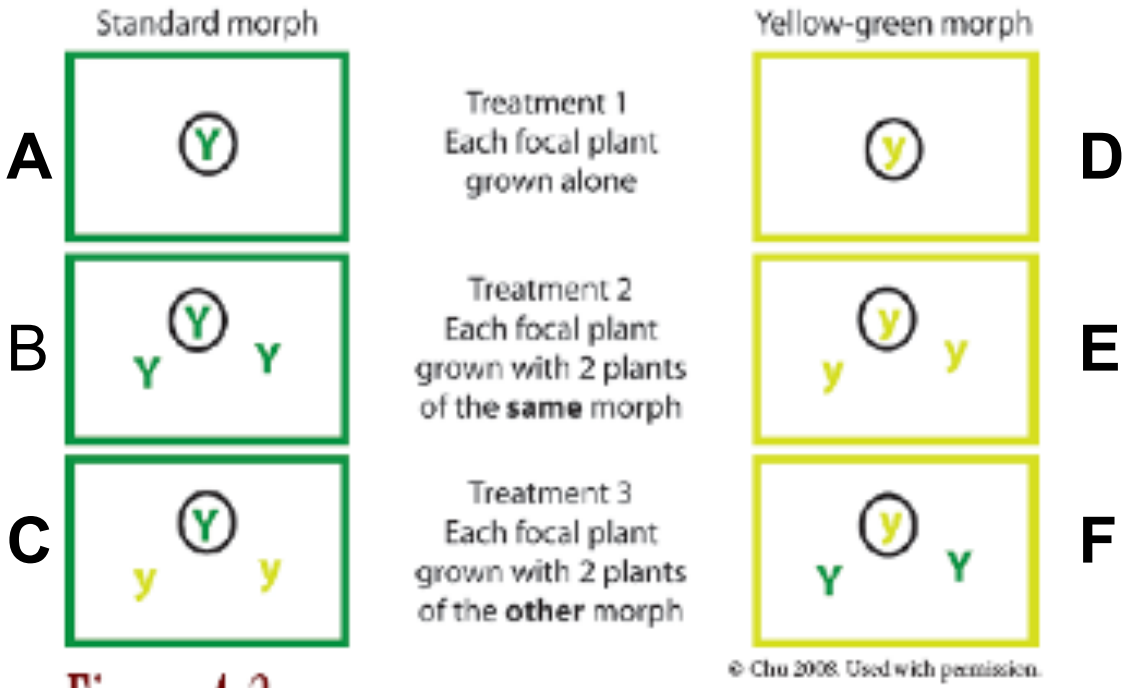

Figure 4-2

Lab 4 dealt with intra-specific interactions. This means that we were looking at:

- a. interactions between populations of different species
- b. interactions between individuals living in the same habitat
- c. interactions between individuals of the same species
- d. interactions between individuals of different species

Natural selections acts directly on the

- a. phenotype
- b. genotype
- c. allelic frequencies
- d. Mendelian Laws of Inheritance

- The next slide is an example of natural selection on a real population. Read the summary available and answer the questions in the next slide.

The Fastest Way to Change a Species: Start Eating It

by Elsa Youngsteadt on January 12, 2009 12:00 AM | Permanent Link | 0 Comments

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From the dwindling Atlantic cod to the increasingly rare American ginseng plant, species are racing to adjust to relentless human exploitation. According to a new analysis, the rate at which hunted and harvested species are changing their size and breeding schedules is unmatched in natural systems. Ecologists say the results point to errors in the way we manage fisheries and other harvested populations.

ENLARGE IMAGE

Shrinking. Atlantic cod have become smaller due to fishing.

Credit: Esben Olsen

Researchers have noted rapid changes in heavily exploited fish and other species since the 1970s. To name one famous example, adult Atlantic cod (*Gadus morhua*) have decreased 20% in size over the past 30 years, and females now reproduce a year earlier than they used to (*Science*NOW, 31 January 2007). Although such hunting-induced alterations seem rapid, evolutionary biologist Chris Darimont of the University of Victoria in Canada, and colleagues wanted to determine whether they outpace changes in nonharvested organisms.

The team compiled 34 scientific papers that measured shifts over time in exploited species' breeding schedules, overall size, or size of specific body parts. The studies included 29 species--mostly fish but also a few invertebrates, mammals, and plants. The team compared these studies with two databases: one for species such as Galápagos finches that had changed through natural selection and one for nonhunted species exposed to other human influences such as pollution or introduction to new habitats. All three categories included some rapid modifications, so "comparing the databases was kind of a showdown," Darimont says.

Hunted organisms won hands down, the team reports online this week in the *Proceedings of the National Academy of Sciences*. Exploited species transformed on average three times faster than those in natural systems and 50% faster than species subject to other human interference. Moreover, almost all the exploited species--from bighorn sheep to the Himalayan snow lotus-- were shrinking, breeding earlier, or both.

The human custom of taking a large percentage of the prey population and targeting the largest individuals--as with cod fishing--favors small individuals that breed before reaching trophy size, says Darimont. "[It's a] perfect recipe for rapid trait change." And it's also bad news for the food supply: Smaller sizes and altered breeding schedules could decrease species' abundance, hinder their ability to recover from exploitation, and ripple through ecosystems by altering interactions with predators and competitors. "When you start monkeying around with links in food webs," Darimont warns, "there could be devastating results."

1. What is the agent of selection producing smaller organisms that reproduce earlier?

2. What type of selection is this?

3. How do the three conditions of natural selection apply (in addition to reproduction)?

To make a **standard error bar**, let the top end of the b
end of the bar be the mean minus one SE. You will need t

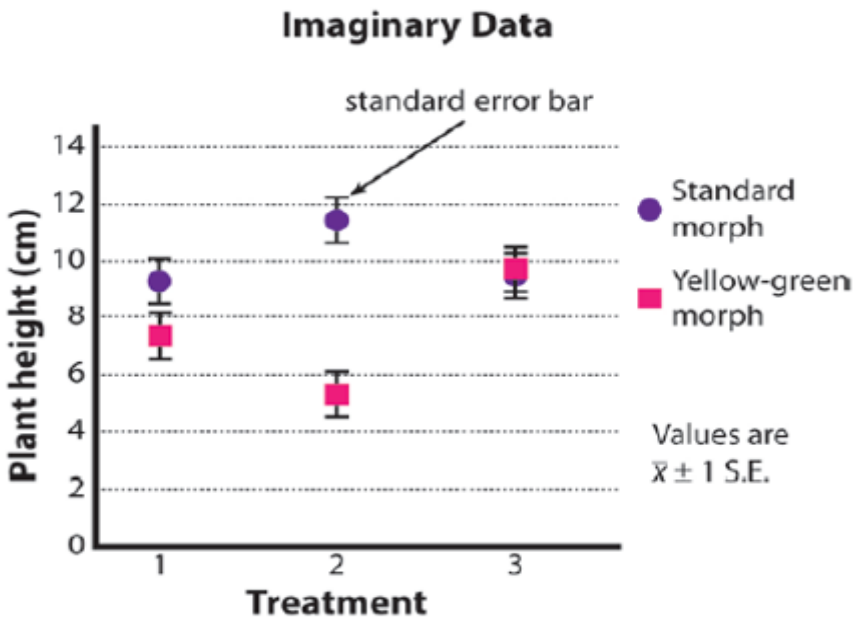


Figure 4-5

Do you understand error bars and t-tests?

What is the phenotype of the fly below?

a. Red eyes brown body
b. Eess, EESS
c. Sepia eyes brown body
d. Sepia eyes ebony body
e. Es, es

EEss Eess

Given the genotypes for the flies above, if these two flies mated, what proportion of the flies in the F1 generation should be homozygous for the eye color locus?

a.100%
b.75%
c.50%
d.25%
e.0%

- **A population of burrowing owls lives in North Davis. This population consists of only 25 individuals. Two co-dominant alleles, A1 and A2, are present in the population and the following genotype frequencies were measured: f(A1A1)=0.20; f(A1A2)=0.20; f(A2A2) = 0.60.**

- **What are the frequencies of the A1 and A2 alleles in this population?**

- **What are the expected frequencies of the three genotypes in the next generation of owls, assuming the conditions of Hardy-Weinberg are met?**

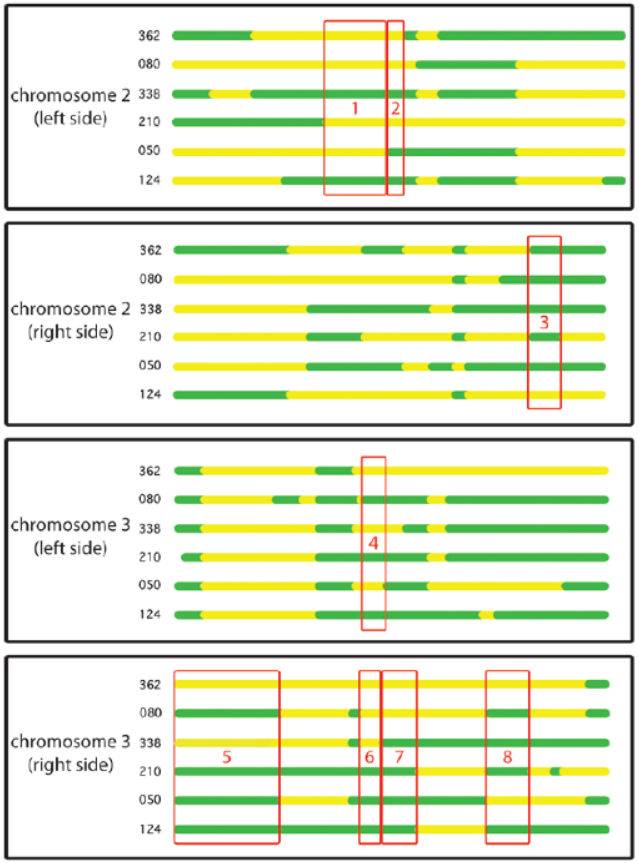
- **Is the population in Hardy-Weinberg Equilibrium? Yes or No**

- **If the population is in Hardy-Weinberg equilibrium, explain how you came to this conclusion. If the population is not in Hardy-Weinberg Equilibrium, what condition was likely violated**

- Why would there never be an unfertilized egg with the genotype EeSs?

- In a population of 100 flies that is maintained under Hardy-Weinberg conditions, 25 have white eyes. There are also red and pink eyed flies. What is the frequency of each genotype in this population?

- What do the red boxes represent?



What do the different colors indicate?

How best can we define a quantitative trait?