Unit 2 – Ecology

Ch 5 Community Ecology & Evolution

Bkgd:

We study and learn evolution because it answers questions about the world. (Correctly.)

I) Evolution

A) Definition:

1) In the literal/normal world: Evolution – change over time.
   (a) All kinds of things undergo evolution.
2) Contemporary Science Definition: evolution – a change in a population's/ species' genepool over time (*biological evolution*)
   (a) A genepool is…
      i Recall that DNA is the code for all life.
      ii the individual unit is called a 'gene'
      iii genes code for proteins, which do ~everything in the body
      iv not every individual in a population has the same genes
         - that's why there are blondes and brunettes
      v the number of times a gene occurs in a population, and the number of genes in that population is the gene pool.

B) Causes (How it happens)

1) Mutation - DNA 'constantly' undergoes random changes
   (a) These changes can be good, bad, or (usually) neutral
   (b) Genetic drift – the random change in a population's gene pool
2) Inheritance - Traits/genes are passed to kids (not all genes get passed on)
3) Migration - Individuals migrate (moving genes)
4) Natural Selection – An individual can be more or less fit for their environments
   (a) better at living
   (b) better at making living children
   (c) These things pass on more of your genes

C) Conditions (When it happens)

1) A lot of offspring need to die
2) Individuals need different characteristics (if they're all the same, nothing happens)

D) Evidence

1) Microevolution – the change from one generation to the next
   (a) Much evidence exists
2) Macroevolution – The development of whole new species, families, gena, and phyla over time
   (a) This area is hotly debated. There is evidence, but many do not believe it. Although not concrete it is very persuasive.
3) Artificial selection - When humans change a populations genepool over time
   (a) Considered a strong argument for evolution

i "if we can do it, so could nature"

(b) ex: Dogs.

i every dog comes from the same population (~14,000 BC)

ii Chihuahua vs. Great Danes

iii Humans made these variations

(c) ex: Crops

i none of this stuff really existed in nature

E) Speciation – creation of new species

**This is the most challenged portion of evolutionary theory.

1) (allopatric speciation) – location causes new species
   (a) Two populations become separated
   (b) they both change.
   (c) when they come back into contact, they don't recognize each other, and don't reproduce.
2) Other types of speciation exist based on resource consumption etc.

F) Extinction – When a species ceases to exist

1) Always happening somewhere to something
   (a) Lots of reasons
2) mass extinction When the rate of extinctions exceeds background extinction
   (a) there have been about 6 in history
   (b) one appears to be occurring now.

II) Species Interactions

A) The Niche - Role

1) Niche – Basically, individual economics
   (a) The literal place that individual gets resources
   (b) It's the individual's exact job description
   (c) Every interaction an individual has (biotic, abiotic)
2) Tolerance - How much change/variation a species can handle
   (a) A realized niche is the actual niche of an individual/population
   (b) A fundamental niche is where they would prefer to be.
   (c) Some species have a small niche
      i ex: Pandas eat only bamboo

B) Competition – When more than one individual wants a resource

1) Intraspecific competition – within a species
2) Interspecific competition – with another species
3) Exclusion - when a species is better suited (more fit) for a niche, it will take resource away from other species (excluding them).
   (a) Resource Partitioning – when two species "learn" to "split" a resource
   (b) Character displacement – the evolution of species reflecting this "sharing"
      i ex: Some birds eat nuts. As one population grows bigger beaks another may grow smaller beaks. Over time each species will start eating different nuts.

C) Species interactions
    1) Coevolution – 2 species grow traits together
        (a) ex: Cheetahs & Gazelles
        (b) ex: A salamander evolves poison skin. If the snake that eats him evolves resistance to that poison, it is coevolution.
    2) Standard: (+/-) {btw: that means good for one, bad for the other}
        (a) Predator – prey; Parasitism
        (b) Parasitism – one lives 'on' the other (not killing it)
        (c) Herbivores – primary consumers
D) Special Relationships
    1) Mutualism (+ / +)
        (a) Mychorizzae – the fungus that grow on tree roots
    2) Commensalism (+ / 0)
        (a) Sleeping in the shade of a tree.

III) Ecological Communities
A) Almost all energy starts at the sun
    1) geothermal energy – the heat that comes from earth (thought to be remnants of a star exploding billions of years ago)
B) Producers make the food (primary producers)
C) Consumers gotta eat somethin'!
    1) Primary consumers eat plants
D) Detritus – dead stuff
    1) detrivores eat it (carrion is dead bodies)
    2) decomposers live in it (worms, bacteria)
E) The Energy Pyramids
    1) Trophic level – how many steps from the sun
        (a) 1st – plants, 2nd – primary consumers, 3rd – secondary consumers
    2) Each level can feed only 10% of its biomass in the next level
        (a) i.e. 10,000 tons of plants supports 1,000 tons herbivores, 100 tons predators, 10 tons keystone species
        (b) pic p 145
F) Food chain – one possible path (for an ecosystem) up the trophic levels
G) Food Web – all possible paths (for an ecosystem)
    1) see p 147
H) Keystone species
    1) Usually (not always) on top of the Trophic Pyramid
    2) like a 'keystone' it holds the ecosystem together.
        (a) ex. If otters are removed from a kelp forest, than the species it eats (mostly clams) will multiply and kill all the kelp. Than the clams will die too. And everything else that uses the food web.

IV) Community Change and Stability - No Community will last forever, and none existed in the "beginning"

A) Primary Succession – when there was no prior community
   1) ex: A glacier recedes after thousands of years
   2) Takes a very long time – Thousands of years
   3) Pioneer species are the first that live there. They require few resources.
      (a) ex: lichens – algae and fungus symbiosis (mutualism)
B) Secondary Succession – Something was there before
   1) ex: forest fire
   2) Short (decades to centuries)
   3) the resources are still around
C) Climax communities – the identifying factors of biomes these occur when a community can proceed without interruption
D) Invasive Species – Species that are displaced from their natural habitat and grow far outside of the niche they were meant for.
   1) Not all transplants are invasive
   2) must have viable resources and few/no predators & parasites
   3) ex: Asian Stink Bugs!