Ecology notes summary

Adaptations that we see are caused by selection pressure. It causes an increase in evolutionary fitness

Evolutionary fitness- the survival and reproduction of a individual as determined by its characteristics

Proximate factors- directly affects animal physiology by environmental stimuli. Ex snowshoe hare’s coat molts into different colors in different season

Ultimate factors-evolutionary factors, change color to avoid predators

Biological organization lever: molecule- organelle- cell- tissue- organ.

Phenotype- influence by environment, expressed.

Genotype- genetic makeup, born with.

Rules of fitness

* Offspring must survive to reproduce
* Most maladaptive traits
* Survival and reproduction correlate

Refer to note for graphs of stabilizing, disruptive, and directional selection

Genetic variation be caused by either mutations or genetic recombination

Causes of mutations

* Random copying error when DNA replicates prior to cell division
* Action of certain chemicals
* Ionizing radiation

Changes in the environment that may change genes (selection pressure)

* Climate
* Change in predator/prey
* Disease
* Invasive species
* Man’s chemicals conditions, or habitats
* Natural disaster

Refer to hardy Weinberg equilibrium

Assumption that may be violated with hardy-Weinberg law

* Non random mating- inbreeding, preferences
* New mutations or directional mutation
* Natural selection
* Genetic drift
* Net immigration, emigration, gene flow

Speciation- the formation of a new species by evolution

Species- one kind of organism, individuals having the ability to interbreed and produce fertile offspring

Reproductive isolation

* Reproductive barrier
* Prezygotic barrier
* Postzygotic barrier

Allopatric speciation is speciation that occurs when biological populations of the same species become or isolated from each other to an extent that prevents or interferes with genetic interchange.

Sympatric speciation is the process through which new species evolve from a single ancestral species while inhabiting the same geographic region.

Gradual model of speciation- slight morphological changes over long time spans

Punctuation model of speciation- brief periods of rapid change

Darwins “branching descent” hyposthesis- modern form of macroevolution (come from a common ancestor)

Events, ideas, and observations lead to Darwin’s hypothesis

-went on HMS beagle to map improve maps of the coast of south America, collected and observed plants. He studied the finches and found that they come in a variety of variation. Had idea that the fiches changed because of natural selection.

Evidence for macroevolution

1. Fossil records

* Older layers contain simpler life forms
* Shows evolution history from older to newer
* Fossil records are incomplete
  + Movement of earths crust
  + Soft bodied organisms don’t leave fossils
  + Scientific study is limited and biased

1. Comparative embryology
2. Comparative anatomy

* Homology- similarity in body parts in different organisms that may have same ancestor

1. Vestigial structures- functionless organs that remain from evolution
2. Comparative biochemistry

* All life has build protein from same 20 amino acids

1. Biogeography

* Islands- many unique speciers (more related to animals of the mainland than animals from similar islands)

6 kingdoms

* Fungi
* Bacteria
* Plante
* Animalia
* Protista
* Archaea

How we see imperfections in species’ adaptations

* Laws of physics and chemistry
* Lack of genetic variation
* Modification of existing structures (panda thumb)
* Varied or changing environments (drought
* coevolved traits and tradeoffs (greater size in offspring, but lower number)

tolerance limits- maximum levels beyond which a particular species cannot survive or is unable to reproduce

phenotypic plasticity= the genetically based capacity of an individual to respond to environmental variation by changing its form, function, or behavior (can alter tolerance limits)

acclimation= reversible changes in morphology and/or physiology in response to anew range of environment conditions

* involoves changes in tolerance range
* bullhead catfish. Change in water temp in different season will affect fish

direct effects of temperature

* high tempertures
  + processes run uncontrolled
  + proteins denature
  + lipid fluidity changes
  + adaptations
    - thermophilic bacteria can resist denaturing
    - mechanisms to avoid getting hot
      * evaporative cooling (sweat)
      * reduce activity
      * seek shade
      * plants- vertical orientation of leaves
      * plants- dense hairs and spines to protect surfaces from direct sunlight
* low temperature
  + processes become unbalanced and may be too slow to sustain life, ice formation in cells (burst)
  + adaptations
    - glycerol and glycoproteins in blood and body tissues
    - alterations of plant chemistry
    - shivering
    - goose bumps
* increasing effects of temperature:
  + increased water loss
  + altered plant metabolism
  + plant adaptations
    - close stomata
    - modified photosynthesis
    - curling leaves

endotherms

* + rate of metabolic heat generation is regulated by
    - “set point” thermostat response of response of adjusting metabolic heat generation
    - Behavior- get shade, hibernate
  + Advantages
    - Remain active at low temp
    - Great endurance for activity
  + Disadvantages
    - High BMR- Basal metabolic rate, (at rest). Must consume a lot of food
  + Minimum size requirement
    - Animals lose heat to the environment in proportion to the surface area exposed
    - Smaller than 5g: cannot maintain temp
    - How baby birds and mammals survive

Ectotherms

* advantages
  + Generally lack homeostatic temperature control devices
  + Regulate temperature is behavior
    - Two most common:
      * Seek microhabitats according to need to heat up or cool down
      * Changing orientation of body to the sun
  + Advantages
    - Low bmr- more energy goes to growth and reproduction, don’t require much metabolism
* Can reduce metabolic activity
* Disadvantages
  + Only active during warm parts of the day and year
  + Limited duration of high speed activity
    - Muscles cannot obtain enough oxygen to sustain aerobic respiration for long periods of activity (causes muscle cramps and fatigue

Heterotherms- sometime internal heat adjustment (when flies fly)