Animal ecology

1) Introduction to ecology
   a) **Ecology** is how an animal interacts with its organic and inorganic environment.
      i) The main point of ecological studies is to understand how these diverse interactions influence the geographical distribution and abundance of animal populations
   b) In an environment that has more **heterogeneity** there is more availability for species to co-exist.
   c) The **Competitive exclusion principle** says that no two species can occupy the same **niche** at the same time.
      i) A niche is what an animal does in its environment- this can be what it feeds on, how it reproduces, how it interacts with similar species and so forth.
2) Populations
   a) A **population** is a reproductive interactive group of a single species.
      i) Isolated populations of the same species is called a **deme.** (example. Brown trout in Georgia and Brown trout in Germany)
         (1) Members within a deme are of the same gene pool and thus subject to different environmental conditions than another deme. Natural selection may over generations cause differences in appearance or eventually lead to new species if given enough time.
            (a) Islands biogeography
            (b) Extinction
            (c) Bottle necks (cheetahs)
   b) Population characteristics
      i) **Demography** is the study of the characteristics that measure how a populations interacts (i.e. growth rates, sex ratio, survivorship etc..)
      ii) The health of a population can be determined by demographic terms.
         (1) In a population that has no juvenile's in the population this could be a sign that something is hindering reproduction
         (2) **Survivorship** tells us how many individuals from any given **cohort** will likely make it to maturity. There are many factors that affect survivorship like lack or resources, or increased predation but it could also be just a part of the life history of the species. We calculate survivorship on a curve with percent of individuals surviving on the y-axis and time on the x-axis.
            (a) There are three theoretical survivorship curves

Number of Survivors

I

II

III

Age (As Percentage of Maximum Life Span)

            (i) Curve 1 is where most individuals die of old age, this is where most people fall
            (ii) Curve 2 is a species that takes care of offspring but is subject to mortality by other means than age (i.e. predation, lack of food)
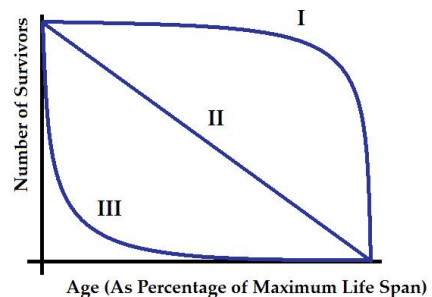
(iii) Curve 3 is a species that has many offspring but only a few survive to adult hood (i.e. many fish, insects, and clams)

(3) As it turns out the human reproduction plan of being able to reproduce multiple times in a life time (called **Iteroparity**) is not the norm, the vast majority of animals on earth exhibit **Selmelparity**, where they reproduce once then die (i.e. most insects, salmon).

(4) While survivorship deals with a single cohort, **population growth** is the difference between the rates of births in a population and the rates of deaths in a population.

(a) If a population has just as many deaths as births that population is considered stable it would be at the top of the curve on the right

(b) If a population has more births than deaths then the population is growing

(c) If a population has more deaths than births then the population is decreasing.

(d) How much a population increases or decreases is dependent of the resources available. Every environment has a finite amount of resources available called the **carrying capacity.** When a population is below its carrying capacity it can grow, if it exceeds the carrying capacity it must decrease.
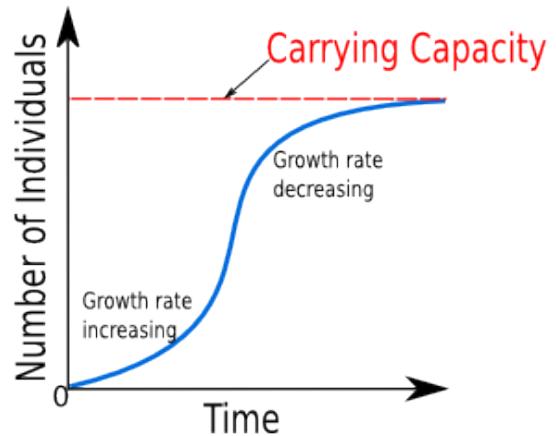
3) Communities

a) A **community** is groups of populations interacting with each other.

i) Interactions between populations can be detrimental (-), beneficial (+), or neutral (0).

b) The interaction between a predator and prey is beneficial for the predator (+) but detrimental for the prey (-).

c) **Parasitism** also has the (+-) interaction where the parasite benefits and the host is decremented.

d) **Commensalism** is an interaction that benefits one population (+) but has no effect on another (0). There have been many proposed examples of this however further study into the interaction shows the neutral party has a benefit or detriment.

e) **Mutualism** is both populations getting some benefit from an interaction (++).

f) **Competition** (--) is by far the most common and probably the most important interaction in nature. In an environment that has finite amount of resources populations will have to compete for those resources or risk becoming extinct.

i) in a community each population will have a niche. The competitive exclusion principle tells us that no two populations can share the same niche but most species niche's overlap to a degree where resources are shared. When niches overlap species become specialized by **partitioning** the resource.

(1) Cichlids

(2) Wood warblers

g) Sometime a population is so important if it is removed the entire community will change, this is called a **keystone species**.
    i) Star fish
h) **Biodiversity** is the amount of species in a defined area.
    i) on average rates of speciation exceed rates of extinction in earths history.
    ii) It has been shown that competition between populations actually drives biodiversity up.
    iii) The more resources (habitats, food, water etc...) the more biodiversity a community can have.