ECOLOGY, LECTURE 3: POPULATION ECOLOGY I: DEMOGRAPHY & LIFE HISTORY (1174–1181)

Population ecologists study the role of abiotic and biotic factors in the size, density, distribution, and age structure of populations. A **population** is a group of individuals of a single species living in the same general region. A deme is a **local**, interbreeding group (a subpopulation). A **metapopulation** is a group of spatially separated populations that are connected by the movement of individuals.

We take a dynamic approach to **population size** and **density**, because all populations are in flux. The four forces that influence the number of individuals in local populations are **births**, **deaths**, **immigration**, and **emigration**. Population size may be determined by simply counting all individuals, but more often, population size is estimated on the basis of some type of subsampling, such as in the **mark-recapture method** ($N=mn/x$). What assumptions are associated with this latter method?

Most populations are not distributed **randomly** or **uniformly**, but rather they are **clumped** (i.e., patchy). Patterns of **dispersion**, however, are dependent on the **scale of observation**. At one scale, for example at the level of the landscape, fungi might be patchily distributed because of an association with rotting wood (which itself is clumped in patches of trees); however, at the level of a fallen tree trunk, the fungi might be uniformly distributed. Please be familiar with some of the biotic and abiotic forces that influence spatial dispersion patterns (such as **territoriality**, **allelopathy**, **resource competition**).

Demography is the study of the vital statistics of populations and how they change over time. **Life tables** summarize the survival patterns across the **cohorts** of a population. From a life table (based on the proportion of individuals alive at the start of each time interval multiplied by some factor, such as 1000), we can construct **survivorship curves** to plot the relative numbers of individuals surviving over time.

Please understand the difference between **Type I, III, and III** survivorship curves, and please be familiar with species that exhibit demographic patterns that reflect these ideals. You should relate the shapes of these curves to other natural history features of the organism, such as the number of offspring produced, level of parental care, and lifespan.

Life history traits are those that relate to an organism's schedule of reproduction and survival, and three of the basic parameters in the life history of an organism are the age at first reproduction (maturity), frequency of reproduction, and number of offspring produced. Natural selection acts on all of these parameters, but it cannot optimize all of them simultaneously. There are always **trade-offs** and constraints.

Some organisms concentrate their entire reproductive effort into a single event (**semelparity**), others reproduced repeatedly throughout their lives (**iteroparity**). The two critical factors that influence this aspect of the reproductive schedule are (i) offspring survival rate, and (ii) the probability that the parent will survive to reproduce again. Please be familiar with some of the selective pressures related to the evolution of semelparity and iteroparity, as well as the pressures that influence the number and size of the offspring produced.