Lab 5

INVESTIGATING PREDATOR-PREY INTERACTIONS

by Drs. Bonnie B. Amos and Michael T. Dixon

NOTE: I have tried to make this pdf identical to the web pages BUT if there is a mistake you are responsible for the information on the web pages.

INTRODUCTION

Last week we saw that when population growth is unchecked by limitations even a slowly reproducing species will reproduce to staggering numbers. But "unchecked by limitations" is never realistic. Populations will always be limited by various factors in the environment. Such "Limiting Factors" include abiotic conditions, such as soil pH and available moisture, and other living things, the "biota." Biotic factors include all living members of a community including bacterial disease, parasites, food and predators. In this week's lab we will look at interactions between predator populations and their prey.

I suggest that you reread last week's pre-lab exercise to refresh your memory.

Points for the lab will be earned from a pre-lab quiz, lab activity and a post-lab quiz.

THE ACTORS

The term predator can be used for any organism that feeds on other organisms. Lions feeding on a zebra carcass may come to mind but we can also consider the zebra to be a predator on grasses. Fungi can feed on plants or animals. Disease can digest flesh. There may even be parasites preying on the lions from within their gut.

With such a broad definition of predator, it shouldn't surprise you that prey species include those that are entirely consumed, think snake-eaten mouse, as well as examples when death is not the end result. Grazed grasses live on. Humans with athlete's foot scratch but usually live to complain about it.

THE ACTION

The interaction between predators and prey is the main point of this week's lab (hence the title). To summarize what we will see: when there are more predators, the number of prey will decrease because they are weakened or killed. When the number of prey decreases, the number of predators will drop because they have less food. This creates a cycle: prey numbers up, predators up; prey down, predators down.
**TERMINOLOGY**

In addition to understanding the terms **Predator** and **Prey** you will need to understand some other terms this week. Several terms carry over from last week.

- **A Population** is all the members of one species that live in the same area. All of the largemouth bass in Lake Nasworthy are a population. Lions and zebras are not members of the same population because they are different species.

- Different species that live in the same area and interact with each other are part of a **Community**. Lions and zebras in the Ngorongoro crater are part of a community that includes elephants, leopards, grasses, herbs and a variety of parasites and bacteria. It does not include the abiotic factors. Your textbook discusses the basics of population and community ecology on page 130.

- The number of live births over a specific time is the basis of **Birth Rate**. We will be using percentages to report birth rates. If a population doubles, like bacteria do, then we consider that to be a 100% birth rate. The original 16 bacteria added 16 new bacteria over one generation. If this spring a herd of 100 goats gives birth to 180 kids then the birth rate is 180/100 * 100 = 180%.

- **Death Rate** is defined similarly, the number of deaths over a specific time. If 40 of 80 squid died last year the annual death rate was 50% (40/80). A death rate of 100% cause the extinction of a population, they are all dead!

- **Carrying Capacity** is the maximum number of individuals a specific environment can support. This limit is impacted by abiotic factors like the weather and biotic factors like predators and the availability of prey. Last week we abbreviated it "K" which is a standard abbreviation in biology but the computer program we are using this week calls it "CC".

- **A Limiting Factor** is any component of the environment that can inhibit population growth. This includes both biotic (living) and abiotic (not living) factors.

In discussing the interactions between predator and prey there are two more specific terms you need to understand.

- **Escape ability** refers to the chance that prey will escape from a predator. It is usually presented as a percentage. Mice might avoid owls only 5% of the time (if 95 out of 100 owl attacks on mice are successful). If you are able to avoid a cold 9 out of 10 times that you encounter the virus then you are 90% successful in escaping colds.

- **Energy use efficiency** is the amount of energy from the prey that the predator can use for its own energy needs. This is also represented as a percentage. Some prey are harder to digest than others. Some predators are better at digesting their prey. Snakes can digest all of the bones of a mouse whereas owls regurgitate pellets of bones and fur when they eat mice. Snakes get more nutrients out of each mouse. A predator that is able to use 85% of the energy it consumes will not have to eat as often as a similar animal that has only 65% efficiency. Among domesticated animals, horses have lousy efficiency compared to cows.

**THE PRE-LAB QUIZ**

This week's quiz includes some definitions, a couple of questions to see if you understand the general idea and a few simple calculations. The math isn't too hard but you might want a calculator.

Make sure that you take the pre-lab quiz on [blackboard](#) before you come to class.