SA #7- 8	Characterizing Biotic Communities

LOOKING BACK: Our introduction to ecology in SA #6 has emphasized the variety of interesting approaches that are used by ecologists, all in an effort to understand how organisms interact with one another and with their environment. We will now focus our discussion of ecology upon the *biotic community* level to complement our field laboratory studies of forest and prairie communities as we take advantage of favorable season and weather.

FORWARD: Recall your last experience in a relatively undisturbed setting, perhaps in a forest or alpine meadow or an underwater coral reef. Now consider what may have been an awesome number of species of plants and animals living in what we perhaps casually refer to as a *biotic community*. The purpose of this assignment is to learn how to characterize biotic communities – that is, what "measuring sticks" can be applied to compare them, describe their structure, judge their "health", and quantify their biodiversity.

READING: SA #7 -- Textbook: Molles Ch. 16, p 371-377 (Other chapters will be included on p 7.2-->)
SA #8 -- Lab Ex. #3: "Plant Community Structure & Diversity"– Read and bring to lecture

PROCEDURE: Is your "study plan" beginning to mesh and bear fruit in good learning? Hopefully the suggestions within this guide are helpful. In Chapter 16, we will focus on the first three concept statements, page 372. Read them several times and then again with the "Summary Concepts" on page 388. Finally, after skimming the assigned pages, read carefully and write answers to the STUDY QUESTIONS below. This assignment is intended as a resource for our upcoming field lab experiments. Please look for how they relate.

STUDY QUESTIONS:

1. Define the following terms:

biotic community	relative abundance of species	species richness
community structure	percent cover (see #4 below)	species evenness
guild	lognormal distribution	species diversity
life-(growth) form	rank-abundance curve	

2. What key question about biotic communities grew out of G. Evelyn Hutchinson's paper?

3. What pattern among most communities is evident with respect to relative abundance of species? How can this pattern be illustrated graphically?

4. How is abundance of plant populations, sponges, corals, and algae often expressed instead of "number of individuals (see Fig 16.3a)?" Why is this done? Does the relationship in #3 still hold when this alternate expression of abundance is used?

5. Distinguish *evenness* from *plant height diversity* with respect to the following:
   a. How one defines each – i.e. the property of a biotic community in question for each
   b. What kind of data (e.g. measurements, chart) is needed to establish each of these "measuring sticks?"

6. How would you measure environmental heterogeneity of a prairie community or forest? What relationship did the MacArthur's observe between heterogeneity and species diversity? What explanation for the relationship can you suggest from your reading?

LECTURE and STUDY OUTLINE:

A. Community and population – definitions

B. Community Structure – two connotations:

1. Spatial characteristics must be considered

a. Area and Surrounding Landscape – community as an island or *patch* in a larger *matrix*
Examples: i. Agricultural landscape -- See Chapter 1, Fig. 1.8; Chapter 21, Fig. 21.4
ii. Small inland lakes in Wisconsin -- Chapter 22, Fig 22.4

b. Distribution of populations – three patterns (Figure 9.10, p 217)

c. Zonation – horizontal distribution – e.g. Chapter 3, page 59-62.

d. Stratification – vertical layering (strata) Ch 1 Fig 1-5; (or foliage ht. diversity, p. 377-78)

2. Numerical characteristics as highlighted by G. Evelyn Hutchinson's question

a. Number of species – usually considered according to guilds (animal) or life forms (plant)
☛ Community ecologists tend to focus on guilds/forms to keep experiments manageable and provide a more meaningful focus.

b. Lognormal distributions [number of species f(log of number of individuals or coverage) graphically illustrate the principle that very few species are either rare or very abundant and most have moderate numbers or coverage (Fig 16.3 and 16.4)

c. Species diversity – composite of richness (density or % cover) and evenness (Fig. 16.5)

C. Plant or algal (*i.e.* "Autotrophic") forms largely determine community structure and complexity

1. Provide the "architecture" or "scaffolding" of the community

2. Provide energy income for all populations through photosynthesis or chemosynthesis

3. Plants offer greater ease of study for our purposes (hence our upcoming lab) – provided we can

a. Identify each species or population [We've been working on this ☺]

b. Accurately sample the community to determine relative abundance (cover)
Hence, the need for *sampling* -- transects, quadrats, and mathematical expressions