CLASSIFICATION OF BIODIVERSITY

Biological diversity infers a richness of living forms or species that have developed usually over a long period of geological time and that are adapted to the wide array of ecological habitats that exist on earth. In our search to understand the natural world, to appreciate both scientifically and aesthetically the variety of life we see, it is necessary to note the basic characteristics of organisms and to decipher how those characteristics developed. In addition, knowledge of the taxonomic and phylogenetic relationships of organisms permits the construction of classification systems and provides information that is critical both in selective breeding programs and in determining which habitats should be set aside for preservation or conservation.

In plants, as in animals and other groups, certain morphological characteristics tend to be 'conservative' in their expression, that is, they do not vary when the organisms grow in different habitats. These 'conservative' characters are the ones that taxonomists have used to define species and to construct classifications. Such characters are reliable and remain consistent from one generation to the next. Characters that vary in differing environmental conditions are not consistent or taxonomically useful in distinguishing different groups. In plants, reproductive characters tend to be more conservative than vegetative characters.

The ordering of diversity into a recognizable pattern is the basis of any classification scheme. Studies of pre-European indigenous cultures have shown that there is a distinct correlation between the use of language and the ordering of organisms into a few accessible categories that are hierarchical in form. The sets within sets of all folk classifications likely reflect a real pattern in nature in which organisms show genealogical descent with modification. In modern-day systematics, we strive to construct classifications that are phylogenetic using numerous sources of data, such as morphological, molecular, reproductive, cytological, ecological, physiological, and chemical. Ideally, these classifications reflect the evolutionary history of groups of organisms that are monophyletic, that is, descended from a common ancestor. In many cases, though, our data are not sufficient to identify monophyletic groups with certainty and the classification that results has to be treated as a hypothesis of phylogenetic relationships that can be tested in the future with new or additional characters or data.

The categories, or ranks, in the hierarchy are applicable to all types of organisms and follow a given sequence. The principal categories are: **kingdom**, **phylum** (**division** is sometimes used in plants), **class**, **order**, **family**, **genus**, and **species**. If more categories are needed, they are intercalated between or added to the principal ones and are denoted by prefixes sub- or super- (as in **subclass**, **subspecies**, and **superorder**) or by the introduction of supplementary terms (e.g., **section** between genus and species or **series** between section and species). Infraspecific ranks that are used commonly are **subspecies** and **variety**. The rank or level of a category usually can be recognized by a standardized ending (e.g., -idae for subclass, -ales for order, -aceae for family [pronounced a, c, e]). The term **taxon** (**taxa**, plural) is used to refer to a taxonomic group of any rank.

The scientific name for a species is an italicized binomial, consisting of both the generic name and the specific name or epithet. Each scientific name pertains to only one kind of organism. For example, *Quercus garryana* is the scientific name for garry oak. The name of a genus is one word, such as *Quercus* (the oaks), and can be used alone, whereas the name of any species must include the generic name and the species name, such as *Quercus garryana*. The generic name can be abbreviated to the first letter, when written, provided the meaning is clear (*Q. garryana*). The specific epithet *garryana* cannot be used for any other species of the genus *Quercus*, although it can be used in another genus for an entirely different organism. Certain epithets are commonly used. For instance, you will find many different genera with a species name *columbiana* or *linearis* or *virginiana*. Scientific names are always latinized and in the Roman alphabet and provide a means for communicating about specific organisms on a worldwide basis.

The plant kingdom is distinguished from others in that plants are generally green and autotrophic (nutritionally independent). There are several groups of plants, but the one that we are interested in here is the group of vascular plants. Recent phylogenetic analyses indicate that this group is a monophyletic one. Vascular plants form special thick-walled cells, tracheids and vessels (xylem tissues), which transport water and dissolved nutrients throughout a plant. A vascular system provides considerable strength and support to organs and enables a plant, if genetically disposed, to achieve heights of several meters. Vascular plants include ferns and their allies, which reproduce by spores, and "gymnosperms" and angiosperms, which reproduce by seeds.

Classifications of vascular plant families are in an active state of revision. New sources of data, particularly molecular data, have provided new insights that have led to rearrangements of genera and families within classification schemes. The placement of families within orders and the positioning of many orders within classifications remain controversial. Questions concerning vascular plant classifications can be resolved once sufficient new data can be obtained and used to interpret the relationships of the families, orders, and classes. In this course, you will be introduced to several common flowering plant families.