Viewpoint

In defense of species

The substantial gap between ecology and systematics is of concern to many biologists despite examples of productive collaboration between these disciplines. Frequently, ecological research of many types results in the summing of species and their activities, particularly in areas of ecology where processes are emphasized. Ecosystem research, by its very nature, masks the activities of individual species in favor of processes and organization. The emphasis in ecological research is shifting toward landscape ecology as the scientific community prepares for the International Geosphere-Biosphere Program, sponsored by the International Council of Scientific Unions, in which global phenomena will be emphasized.

As this ecological scaling occurs, let us not forget the species. Why? Because the species provides us with pivotal levels of organization where many changes occur. David Schindler of the Freshwater Institute, Winnipeg, Manitoba, has demonstrated that, under stress, some ecosystem processes may continue while species turnover occurs, and species richness also may change through time. We know little about the sensitivity of these processes to changes in species composition. For example, changes in keystone species could have a significant impact on particular ecological processes. Therefore, the study of species and species interactions should be particularly rewarding and important. As E. O. Wilson of Harvard University has reminded us, we are remarkably ignorant at the species level.

Nowhere is this shortage of information at the species level more painfully obvious than in soil biology. Biologists have focused on species diversity and richness in the tropics, but few realize that in temperate woodland soils species richness may approach one thousand species of animals per square meter, with populations exceeding two million individuals. When microfloral communities are added, the numbers are even more impressive.

This great species richness is baffling. Soil is a difficult medium in which to work, and this difficulty has delayed scientific progress. The low level of systematic and associated biological knowledge of soil organisms has been a significant barrier to a better understanding of the processes involved. Wilson decries the appalling state of termite systematics (only two systematists are capable of providing species identification), but at least most of the termite genera are known and the majority of species described. Less than one-third of the soil-inhabiting oribatid mites found in North America have even been described, and there are only two systematists on this continent working on this group. Although these important organisms are intimately involved in the decomposition process, detailed knowledge is limited to only a few species. The same may be said for the Collembola (small, primitively wingless arthropods), free-living nematodes, protozoa, bacteria, soil fungi, and even many insect groups. There are only two North American systematists working on the Collembola and two on the free-living nematodes.

We are unlikely to resolve the intractable problems associated with the ecology of soil fauna and flora until we are able to cope with the problem of species. This challenge requires collaborative research, scientific personnel, programs involving both ecologists and systematists, and adequate funding.

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