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The Value of Research Collections

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The value of research collections

Everyone has budget problems, but biological collections are being particularly hard hit. Although they don't have the novelty of gene synthesizers or satellite imaging techniques, collections of living and preserved organisms, their tissues, and other materials of biological origin still play a basic role in biology. They are essential in animal and plant identification in the wild and in the laboratory. To be of use, each specimen in a collection must be associated with labels, catalogs, field notes, photographs, and other materials. Together, the specimens and associated records tell us about the living world; this information is subject to verification. These collections support not only the field of systematic biology, but also ecology, physiology, behavior, wildlife management, and conservation.

After 250 years of work in systematic biology, why can't we make reliable identifications of animals and plants by using the literature, rather than collections? The reasons are many. Criteria used to separate two species in one area often fail to work somewhere else, because there can be wide geographic variation in one or both species. In addition, the distinguishing criteria may be difficult to describe in text and depict in illustrations. Many species of common genera of shrews, bats, and mice, for example, can be identified only by close examination of the skull and teeth. To identify reptiles, amphibians, and fishes, one must study details of such external features as head plates, scales, and color patterns. Distinguishing some groups of fishes requires examination of such internal structures as gill rakers and pharyngeal teeth.

There are few technical identification guides available for many groups of nongame vertebrates, and the technical literature must be supported by an adequate reference collection. For all vertebrate classes except birds, accurate identifications with available aids require training at the master's degree level with an experienced taxonomist. For most invertebrate groups, identification by nonsystematics specialists verges on hopeless.

Most people assume that we already have a basic inventory of North American fauna and flora, but in fact the inventory is far from complete; for much of the world, we have only skimmed the cream of biotic diversity. Today, when it is urgently needed, the inventory progress is slowing because fewer taxonomists are being trained. We no longer have any systematic experts in the United States for many groups of organisms. Greatly improved techniques, identification aids, and manuals for use by a wider range of biologists can only be developed by specialists having the use of good systematics collections.

The irreplaceable material in biological collections also can provide a wealth of information about species of the past. For example, DNA was extracted recently from muscle tissue of a salted hide of the extinct quagga and recombinant DNA techniques revealed the differences in genetic material—thus the phylogenetic relationship between the quagga and its living relatives, the zebra and horse.

Successful management of wildlife resources, as well as biological research, must be based on facts learned and verified from organisms and their environmental conditions. Reports, books, data banks, and simulation models are all secondary sources, their usefulness dependent on the validity of the facts. Biological collections are a national resource of primary materials essential to all secondary sources. The unique nature of these resources, and our need for them, deserve wider recognition and support.

[Further details on the history and value of research collections can be found in "Why biological research collections?—the US Fish and Wildlife Service experience," submitted to the *Wildlife Society Bulletin*.]

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