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Species Concepts Do Matter in Nematology[1]

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Abstract: Nematology is a taxon-based science, and a correct understanding of species and their relationships is basic to all nematological research. Modern methods of systematic analysis have reshaped issues concerning species recognition.

Key words: nematode, species concepts, systematics.

As organizer (with J. G. Baldwin) of the symposium on Species Concepts in Nematology for the 37th annual meeting of the Society of Nematologists in St. Louis, Missouri, 22 June 1998, I was asked why more knowledge on such a topic could be important to the work or thinking of most nematologists. My answer was as follows: You do not know what you are doing in any area of biology that involves any comparative work if you do not have a clear idea of what comprises a species, and how different species relate to one another. As many nematologists know, systematics has made quantum leaps in the last couple of decades and is no longer an intuitive, authoritarian endeavor; it is, instead, a testable science. Molecular data have added greatly to our understanding, as have new algorithms for assessing relationships and making judgments *re* species identities. Nematologists as a group, however, seem to have very little interest in modern systematics, which is a pity!

While he was president of the Entomological Society of America, George Kennedy wrote that entomology is a ''taxon-based science''—unlike other scientific disciplines that focus on processes and their consequences (Kennedy, 1998). The same thing can be said about nematology. As with entomology and insects, research in other disciplines is often conducted with nematodes as models. (Research with *Caenorhabditis elegans* should come immediately to mind for most nematologists.) Although nematology benefits from such studies on model organisms, it remains, at its core, a taxon-based science. This means, to paraphrase Ernst Mayr, that the universe of nematodes that we study is comprised of more or less distinct entities, which we call species (Mayr, 1976). Species represent an important level of integration in nature, and a correct understanding of species and their relationships to each other is the basis of all biological research. All biologists, including those who work at the molecular level, will be influenced decisively by their choices of particular species to study, and their understanding of the relationship of those species to each other.

The effort to describe and explain diversity in the natural world is known as systematics, and the convention of assigning every living organism to a species has persisted since Linnaean times. Although species have traditionally been defined by morphological criteria, the problem of how to delimit species boundaries has always existed. Does the existence of new molecular data change this? Are classical approaches still useful for nematologists? What part does persistence or loss of genetic compatibility between isolated populations play in resolving species identity? Is the designation ''species'' just a

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taxonomic convenience, as is occasionally claimed?

As a result of major conceptual and operational advances that have occurred during the past 30 years, an appreciation has grown for the importance of using phylogenetic methods for interpreting biological patterns and processes. Modern methods of analysis have reshaped the arguments and issues concerning species identity and recognition. These new methods and ideas can impact our understanding of taxon relationships and of many attributes distributed across species, including morphological, behavioral, and ecological characteristics. Testable phylogenetic relationships lead to a better understanding of the nature and history of geographic distribution of nematode species.

Dr. Baldwin and I selected our speakers with care, and trusted that each would share the excitement and enthusiasm we had discovered in their publications and talks elsewhere. Each of them works with real organisms just as most of us do, and each is highly qualified to speak on the topic of species concepts. R. L. Mayden works with fishes and authored an important concluding chapter in a book that dealt solely with the topic of species concepts (Mayden, 1997). Q. D. Wheeler is an entomologist who has made many important contributions to theoretical systematics and biodiversity, and is co-editor (and co-author of a chapter) of a new volume that comprises a debate among proponents of several competing theories of species concept (Wheeler and Platnick, 1999). D. R. Brooks, a parasitologist, has more than 200 publications, including a much-cited book that integrates study of phylogeny, ecology, and behavior (Brooks and McLennan, 1991). Many nematologists know our colleague, Byron Adams, and are acquainted with his recent thoughtful article in this journal on species concepts (Adams, 1998). It is with great pride that we recommend to you the publications that follow.

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