FOREWORD

In view of their abundance and wide distribution, it is surprising that so little is known about the biology and, more particularly, the ecology of free-living soil nematodes. There are, of course, reasons for this. As members of the soil-water fauna they can only be recovered satisfactorily from soil samples by "wet" extraction methods. Soil zoologists, in the main, tend to favor "dry" extractors since the rewards are great in terms of the fauna diversity which can be recovered by these methods. Consequently, the nematode component of this diversity remains very largely overlooked. Again, soil nematodes are minute in size and species' identification requires the assistance of the specialist taxonomist. The small body size of soil nematodes is more than compensated for by their high population densities, and this fact should act as an incentive rather than a deterrent to their study. However, taxonomic obstacles remain to be overcome.

This last problem, the taxonomic one, has been solved or circumvented in part by the recognition of different trophic groups, or "feeding guilds," among soil nematodes which can form the basis for an ecological classification. Such a scheme distinguishes between phytophages, predators, fungivores, microbial-feeders and omnivores, although the distinction between these groupings is not always clearly drawn. Nevertheless, this approach emphasizes the basic functional roles of nematode species in the soil community, and provides a starting point for the formulation of ecological questions. For example, the relative proportions of different guilds within a local nematode fauna may reflect the availability of

a particular food resource and thereby indicate the precise pathway along which energy and materials are flowing. Productivity studies become more meaningful when they are directed at the guild, rather than at individual species or entire nematode faunas. Ultimately these considerations can lead to an understanding of the nature of the decomposition process occurring in soils, and the extent to which nematodes are involved in this process.

Given the impetus of this approach, ecological studies on soil nematodes are now proceeding along a number of broad fronts. The association of nematodes with such bacteria-rich microhabitats as the rhizosphere focuses attention on animal/microbial interactions at a first-order level. The possibility exists that nematodes may regulate rates of organic decomposition indirectly through their depredations on the bacterial decomposers. Such activities will bring them into direct competition with other members of the microbial feeding guild: protozoans, certain prostigmatid and cryptostigmatid mites and Collembola. The nature and intensity of these competitive interactions are largely unknown. Another dimension is added to this picture by the fact that some prostigmatid and mesostigmatid mites are known to prey directly on soil nematodes. Perturbation experiments carried out in the field in which these predators have been selectively eliminated have revealed a slowing down of the rate of organic decomposition. The inference to be drawn from this is that a relaxation of predator pressure has allowed an increase in nematode densities and an intensification of their bacteriophagous activities. Therefore, it seems possible that under natural conditions predatory mites may regulate nematode densities and positively promote the decomposition of organic material. This interpretation may be too simplistic, partic-

ularly since one can visualize similar interactions occurring between nematodes, fungi and actinomycetes. The possibility of competition between bacteria, fungi and actinomycetes for organic substrates also needs consideration. Each new parameter brings with it an added degree of complexity; a new set of cross-links is introduced into the food web system.

How, then, can we unravel this complexity? A good starting point, surely, is to select a relatively simple soil system in which microfloral/nematode/predator interactions can be identified as important determinants of the type and rate of organic decomposition. Recent work carried out in the southwestern United States strongly suggests that desert soils provide such a system. Here, nematode densities and diversity are comparable with those of cool, moist temperate forest soils, and while interactions between the soil microflora and fauna are not quite as simple as perhaps was originally supposed, these interactions can be identified and analyzed by stepwise regression techniques, as we will see later in this book. In these desert systems, perturbation experiments such as those mentioned earlier can be very useful for the identification of interactions, and this will also become apparent later.

Apart from their relationships with other biota, soil nematodes are intrinsically interesting, and those of arid soils particularly so. The successful colonization of these soils by animals which are essentially aquatic in habit may be attributable, at least in part, to their ability to assume an anhydrobiotic state during periods of drought. This exciting area of study is gaining more and more attention, particularly since it raises the possibility that other members of the invertebrate fauna of arid soils may respond in a similar manner to moisture stress. Here is a good

example of the way in which studies on soil nematodes are leading the way into new fields of physiological ecology which may have far-reaching applications.

The contributors to this volume are all actively engaged in this vigorous quest for knowledge concerning the role of nematodes in soil ecosystems. What follows is eloquent testimony to their efforts and an accurate reflection of the progress being made in this field.

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