Chapter 1

Introduction

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The previous version of this book was published in 2007 as Volume 5 in the Nematology Monographs and Perspectives series (Nguyen & Hunt, 2007a). At the time it was comprehensive in all major respects, but since then has rapidly become out of date, the descriptions of new species, particularly of Steinernema Travassos, 1927, continuing at a frenetic pace. In late 2014 we decided to compile an updated volume to cover just those species described since 2007. Due to restrictions on the acceptable length of the book, we decided not to update the symbiotic bacteria chapter so ably written by Heather Koppenhöfer (2007), but to have instead a chapter encompassing phylogeny and phylogeography of Steinernema and Heterorhabditis Poinar, 1976 (see Chapter 6). We also decided to reduce the length of the species descriptions to avoid much of the repetition of characters that vary little from one species to another, focusing instead on those features carrying more diagnostic weight. The tabular keys to species (see Chapter 3) have been updated and include all species listed in Chapters 4 and 5. For basic techniques the reader is referred to the appropriate sections in the original chapter by Nguyen (2007).

It should be borne in mind that the present book, which is the twelfth in the Nematology Monographs and Perspectives series, is not intended to – and indeed does not – replace the previous oeuvre, and should be envisaged as a companion volume, the two together providing a unique (hopefully indispensable!) coverage of entomopathogenic nematodes of the Steinernematidae and Heterorhabditidae.
A detailed historical account of entomoparasitic nematology was given by Hunt (2007a) and is not repeated here. With the discovery of *S. kraussei* (Steiner, 1923) Travassos, 1927 in 1917 (although not described until 1923), the study of this group of potentially useful nematodes is fast approaching its 100th birthday. From a slow beginning, the pace of discovery has increased dramatically, progress being given impetus by the increasing world-wide restrictions on chemical biocides, the potential for biological management of insect pests as part of a robust, integrated management strategy, and facilitated by the development of increasingly available molecular techniques for rapid and reliable species diagnostics in the battle against the constraints imposed by a toxic mixture of conserved morphology, variable morphometrics and fewer experienced traditional taxonomists.

The advent of molecular methodologies introduced a powerful discriminatory tool that has facilitated a rapid increase in the proposal of new species, particularly of *Steinernema* where, astonishingly, no fewer than 85 of the 95 valid species have been described since 1990 (Fig. 1.1). Figure 1.2 shows the progress since 1990, with 15 valid species described in the 1990s, 39 from 2000-2009 and 31 from 2010 to the beginning of 2016. Compare this with a mere ten valid species proposed between 1923 and 1989 (and four of those were from the late 1980s).

That *Steinernema* has been shown to be far more speciose than previously suspected would not have been possible by relying on classical taxonomy alone where its discriminatory power would have been unreliable in such a morphologically-conserved genus. To complicate matters, morphometrics, that most traditional of parameters, is highly variable in both the Steinernematidae and Heterorhabditidae, whilst morphology is also subject to much variation, including interpretation problems of three-dimensional structures due, for example, to angle of view, foreshortening effects and the interpretative skills of the observer (many not being professional taxonomists). In addition, the situation is potentially exacerbated by the fact that many descriptions appear to be overly formulaic (*i.e.*, closely following existing descriptive narratives), rather than being based on an objective morphological assessment of the material at hand.