



Papers published in *Zootaxa* concerning Nematoda from 2001 to 2020

MIKE HODDA^{1*}

¹ Australian National Insect Collection, CSIRO, GPO Box 1700 Canberra ACT 2601 Australia.

*Corresponding author: MIKE HODDA, [✉ mike.hodda@csiro.au](mailto:mike.hodda@csiro.au)

Abstract

In the first twenty years of the publication of *Zootaxa*, nearly 500 papers on nematodes have been published, ranging from complete classifications of the entire phylum to single species descriptions, revisions, catalogues and faunal checklists. In terms of species descriptions, this has represented a substantial and increasing proportion of all descriptions of new nematode species. A total of 488 authors have published, with over 20 authors contributing at a rate of more than one paper every two years.

Key words: Nematoda, authorship, bibliometrics

Introduction

Nematodes are a major part of biodiversity by any measure. Even the smallest estimates of their total species richness put the total number of species at half a million, while the largest are 20 times that (Grassle 1989, Grassle & Maciolek 1992, Hodda 2021a, Hodda & Khudhir 2021, Hugot *et al.* 2001, Lamshead 1993, Lamshead & Boucher 2003, May 1988, Stork 1993). The extreme variance in these estimates shows how little is definitively known about nematode species. Estimates of the proportion of nematode species known are around 3 to 5%, making them among the least described taxa, and certainly the least described of the mega-diverse animal phyla (Andrassy 1999, Hodda 2021a).

Nematode diversity is of considerable ecological and economic importance (Barker *et al.* 1994, Hodda & Khudhir 2021, Hodda *et al.* 2009, Lamshead 1993, 2004, Yeates *et al.* 2009). They are major components of food webs, consuming microbes, plants and other animals (Hodda 2021b, Yeates *et al.* 2009). On larger scales, they perform critical ecological functions such as decomposition, carbon and nutrient cycling (Baldwin *et al.* 2000, Bloemers *et al.* 1997, Hunt & Wall 2002, Ingham *et al.* 1985, Nielsen *et al.* 2011, Wall & Moore 1999). They are used for biomonitoring and as indicators for broader ecosystem properties, such as resilience, evolutionary hotspots, energy and nutrient transfers (*e.g.*, Austen & McEvoy 1997, Balsamo *et al.*, 2012, Blair *et al.* 1996, Bongers & Ferris 1999, Hodda & Nicholas 1986, Hodda *et al.* 2009, Lamshead 1986, Niles & Freckman 1998, Platt *et al.* 1984). The economic value of nematode parasitism of plants, invertebrates and vertebrates is enormous and difficult to calculate with any precision (Barker *et al.* 1994, Hodda 2009a, Sasser & Freckman 1986). Furthermore, the economic value can be either a cost (when losses to nematode parasitism are from a host desirable to humans), or a benefit (when nematode parasitism controls species undesirable to humans) (Hodda 2009b).

Despite the evolutionary, ecological and economic importance of nematodes, their taxonomy remains very much a work in progress. Nematodes were recognized in some of the earliest written documents of humanity, and binominal names were assigned to several species at the very outset of modern nomenclature, but nematodes were not recognized as a monophyletic group until about 90 years ago (see Hodda 2007, 2011). Even since that time there have been frequent major changes in nematode classification at all levels, from the species concept all the way up to the number and composition of classes (Hodda 2007, 2011 2021a,c). These changes continue as nematode classification continues to evolve.

General trends in nematode systematics have been reviewed recently (Hodda 2021c). The rate of nematode descriptions has been increasing since the introduction of binominal nomenclature, and currently stands at nearly

400 new species per annum (Hodda 2021c). The role of journals such as *Zootaxa* in maintaining and even increasing the rate of new species descriptions was noted briefly in that paper, but not described in detail. This paper provides more detail on the publications on nematodes in *Zootaxa*, covering revisions, catalogues and other taxonomic publications in the period since the journal's inception (2001). It updates earlier summaries of publications on nematode systematics in *Zootaxa* (Zhao 2007, Xu *et al.* 2013).

Zootaxa and the last 20 years of nematode systematics-species

There were no papers published on nematodes for the first 2 years of the journal's existence (2001 and 2002). The first paper on nematodes was published in March 2003, describing 2 new species of the free-living marine nematode genus *Sabatieria* (Pastor de Ward 2003). Another 2 papers were published in 2003, one a redescription of an existing species, and the other a revisionary work (Kaisa 2003, Nguyen & Adams 2003). (Nematodes were also mentioned in a checklist of metazoan parasites of fish: Oktener 2003.) The number of papers doubled to 6 in 2004, and has been increasing ever since (Figure 1).

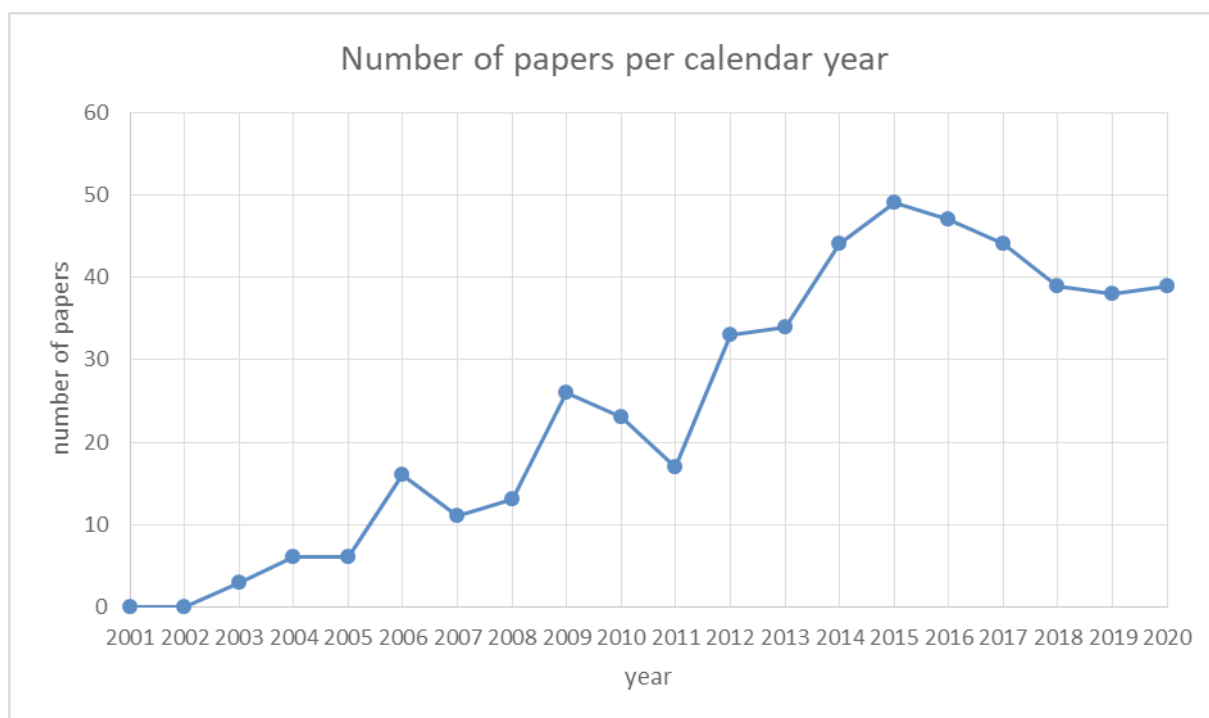


FIGURE 1. Number of papers on nematodes published in *Zootaxa* per year from 2001 to 2020.

In total, nearly 500 papers on nematodes have been published by a total of 891 authors. This is an impressive diversity of authors, although it should be noted that 21 authors contributed more than half of this total (Table 1). All of these authors contributed at an average rate of more than one paper every two years.

The papers in *Zootaxa* have ranged from complete classifications of the entire phylum to single species descriptions, revisions, catalogues and faunal checklists. In terms of species descriptions, this has represented a substantial and increasing proportion of all descriptions of new nematode species (Hodda 2021c). Single species descriptions have featured heavily from the outset (4 of the 6 papers published in 2004 were single species descriptions), but larger works containing multiple species descriptions and revisions have also been common.

The nature of nematode distributions and systematics makes single-species descriptions a common and arguably necessary feature (Hodda 2021c, Hodda & Khudhir 2021). Given the large estimated number of species and small percentage described, the task of recording nematode diversity is so huge that all contributions should be welcomed, even modest single-species descriptions based on limited material. This has been the editorial policy for nematodes in *Zootaxa*. Such a policy has been advocated as desirable for other small, cryptic organisms where amassing of collections or re-collection is often difficult (Felis & Dellaglio 2007). Although some nematode species have been found frequently, many have only seldom been collected, even at the type locality, because they are genuinely rare

in nature and have to be sorted from among the many other nematode species which together add to a huge number of nematodes in most soil or substrate samples (Hodda *et al.* 2009). Extensive studies using both conventional identification methods and metagenomics have found that many nematode species are genuinely rare (Hodda 1990, 2009, Hodda & Nicholas 1999, Norton & Niblack 1991).

TABLE 1. Authors of more than 10 papers during 2001 to 2020 in *Zootaxa*.

Author	Number of papers
Pena-Santiago Reyes	22
Abolafia Joaquin	20
Gagarin Vladimir g	20
Zhao Zeng Qi	17
Ye Weimin	16
Holovachov Oleksandr	15
Ghaderi Reza	14
Karegar Akbar	14
Davies Kerrie A	13
Giblin-Davis Robin M	13
Ahmad Wasim	12
Huang Yong	12
Pedram Majid	12
Leduc Daniel	12
Shokoohi Ebrahim	11
Bostrom Sven	10
Da Silva Maria Cristina	10
Dewi Kartika	10
Heydari Ramin	10
Pourjam Ebrahim	10
Taylor Gary S	10

The editorial policy has generally been that descriptions based on few specimens can be amended later if and when more information becomes available as a result of more specimens being found. It is important that some descriptions and data are available (and discoverable) in the potentially long periods between initial discoveries and the accumulation of the substantial amounts of data that make robust conclusions possible (Costello *et al.* 2015, Hodda 2021c). In that sense having *Zootaxa* part of bibliometric databases is essential.

In *Zootaxa*, a total of 641 new species or subspecies have been published, along with 52 new higher taxa, and 45 synonymizations. This represents a substantial proportion of taxonomic acts on nematodes, and another reason for inclusion in bibliometric indexes.

Bibliometric indexing is also important because most papers on nematodes in *Zootaxa*, as in most other taxonomic journals, are not open access. Authors of the 85% of nematode papers published without open access cite lack of financial resources as reasons for publishing in *Zootaxa*, rather than an open access journal requiring a fee.

As with all nematode descriptions, the species described in *Zootaxa* are heavily biased towards those with immediate economic value, most often as parasites of vertebrates, but also invertebrates and crop plants (Hodda 2021c). By contrast, nematode genera that are biological models—*Caenorhabditis* and *Pristionchus*—have had fewer descriptions and revisions in *Zootaxa* relative to their estimated actual total species richness than in the general literature: most publications on these genera are in the specialist nematological literature.

The species descriptions in *Zootaxa* have also followed general trends in geographic distribution, with an increasing number of descriptions from Asia (Hodda 2021c). From the viewpoint of editing, this has meant an increasing number of manuscripts submitted by those whose first language is not English, the language of *Zootaxa*. This has meant that many papers have required considerable time for editing grammar and syntax, a considerable

workload for editors, but has also meant a low rejection rate for these reasons, as opposed to rejection based on scientific quality. (The rejection rate of the author has been about 10%, and most frequently because the subject matter of submitted MSS was inappropriate for the journal). The payoff has been that *Zootaxa* has been an important contributor to description of the nematode fauna of Asia.

To cope with the increasing number of papers and demands of diverse English language abilities of submitting authors, the editorial team for nematodes has increased from 1 to 6. The longest serving editor (the present author) has been an editor since 2007.

As noted by several editors for *Zootaxa* and other journals, there has been a growing difficulty in finding reviewers for manuscripts submitted. This is the other side of the observation that a large proportion of published papers are authored or co-authored by a few people: a small number of reviewers have reviewed a lot of papers, together accounting for a substantial proportion of the total number of papers published. The difficulties seem to arise from several sources. One is that there are few people with training and experience to conduct reviews (Hodda *et al.* 2014, Hodda *et al.* 2017, Howie 2012). Then, the few people with expertise are—understandably—busy with many issues related to nematodes (because of nematodes' importance in the many ways outlined in the introduction). With a phylum as taxonomically and ecologically diverse as nematodes, there are issues in how far outside their particular taxonomic groups potential referees will review, a situation unlikely to change soon with a general decline in training and employment of taxonomists and nematologists (Pearson *et al.* 2011). There are also many incentives to publish and few to review (Davidoff 2004, Willis 2016).

Despite the difficulties in finding reviewers, peer review is still seen as the best way to ensure scientific quality and integrity (Allen *et al.* 2018). Potential issues remain with peer review when there are incentives for partiality, and especially where there is a limited pool of suitable reviewers (D'Andrea & O'Dwyer 2017, Fox 2017, van Rooyen 2001, Wager *et al.* 2006). However, prioritizing the integrity of content over novelty and citability, as is the case for *Zootaxa* and other mega journals can offset many concerns in this area (Allen *et al.* 2018).

A policy of prioritizing content integrity over other values has however affected the bibliometrics for the journal. Bibliometrics in turn affect inclusion in indexes and other listing services, which themselves affect authors and where they publish: this is because journals are now used for more than dissemination of scientific research, being used for ranking institutions and researchers (Statzner & Resh 2010). This is an issue which has been raised for taxonomic publications for some time with little resolution (Allen *et al.* 2018).

Another feature of publications in *Zootaxa* worthy of comment is the variation in length of published papers. In nematodes and many other taxonomic groups the length of papers has ranged from a few printed pages to many hundreds of pages. In many subject areas, journals are increasingly prescribing upper (and to a lesser extent lower) limits to article length (Statzner & Resh 2010). Although *Zootaxa* and other taxonomic journals are bucking this trend, the trend journals without length limits for articles are becoming rarer (Statzner & Resh 2010). Allowance of large variation in the length of published articles has, however allowed the continued publication of the full range of taxonomic articles, from nomenclatural notes, through single species descriptions, large revisions of genera and families, all the way to complete classifications of the phylum. Completeness and clarity need to trump brevity in taxonomic works: the relevance of taxonomic publications over long time periods means that information of limited immediate importance can become highly significant later and should be included where available, even if this increases paper length. *Zootaxa* and other taxonomic journals without page limits are a necessary feature of publishing for this reason.

This brief review has shown that *Zootaxa* has fulfilled its purpose of providing an outlet for taxonomic works for nematodes in particular, and for other animal taxa in general. The journal has had an overall positive impact on our scientific knowledge of nematodes, their evolutionary relationships and their systematics.

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