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Trophic position of soil nematodes in boreal forests as indicated by stable isotope analysis

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Despite the well-developed trophic classification of soil nematodes, their position in soil food webs is still little understood. Observed deviations from the typical feeding strategy indicate that a simplified trophic classification probably does not fully reflect actual trophic interactions. Furthermore, the extent and functional significance of nematodes as prey for other soil animals remains unknown. Stable isotope analysis (SIA) is powerful tool for investigating the structure of soil food webs, but its application to the study of soil nematodes has been limited to only a few studies. We used stable isotope analysis to gain a better understanding of trophic links of several groups of soil nematodes in two boreal forests on albeluvisol. We investigated four taxonomic groups of nematodes: Mononchida, Dorylaimida, Plectidae and Tylenchidae (mostly from the genus Filenchus), that according to the conventional trophic classification represent predators, omnivores, bacterivores and root-fungal feeders, respectively. To assess the trophic position of nematodes, we used a comparison against a set of reference species including herbivorous, saprophagous and predatory macro-invertebrates, oribatid and mesostigmatid mites, and collembolans. Our results suggest that trophic position of the investigated groups of soil nematodes generally corresponds to the conventional classification. All nematodes were enriched in 13C relative to Picea abies roots and litter, and mycorrhizal fungal mycelium. Root-fungal feeders Tylenchidae had δ15N values similar to those of earthworms, enchytraeids and Entomobrya collembolans, but slightly lower δ13C values. Bacterivorous Plectidae were either equal or enriched in 15N compared with saprophagous macroinvertebrates and most mesofauna species. Omnivorous Dorylaimida and predatory Mononchida were further enriched in 15N and their isotopic signature was similar to that of predatory arthropods. These data confirm a clear separation of nematodes into saprophagous/microbial feeders (Tylenchidae and Plectidae) and predators (Mononchida and Dorylaimida). Furthermore, they suggest that Mononchida and Dorylaimida use different sources of carbon, though exact trophic links remain unclear. As a rule, nematodes were either equal or higher in δ15N values relative to most microbivorous microarthropods, contradicting an emerging view that soil nematodes can be an important prey for a wide range of oribatid mites and collembolans. Patterns of the isotopic signatures suggest that soil nematodes and the bulk of soil animals depend on resources derived from a dominating upper-canopy tree (Picea abies) via the detrital, rather than mycorrhizal pathway.