DISTRIBUTION AND ECOLOGY OF **ROTYLENCHUS** AND **PARAROTYLENCHUS** (NEMATODA: HOPLOLAIMIDAE) IN GREAT BRITAIN

BY

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Six species of plant parasitic nematodes belonging to the Rotylenchinae were identified from 5,451 soil samples taken from throughout Great Britain. *Pararotylenchus ouensensis* was found only from Jersey, Channel Islands, *Rotylenchus pumilis* and *R. buxophilus* had distributions mainly restricted to southern England while *R. uniformis*, *R. goodeyi* and *R. robustus* were found in a wide range of soil types but *R. robustus* preferred more moist, alkaline soils and was recorded at greater altitudes than *R. goodeyi*. *Rotylenchus goodeyi* was more often found associated with beech and Scots pine while *R. robustus* preferred bog myrtle, oak and hawthorn. At the population levels encountered there was no evidence of either inter- or intraspecific competition within or between either *R. goodeyi* or *R. robustus*.

**Keywords:** spiral nematodes, prevalence, intensity, distribution, population dynamics, seasonal fluctuations.

Nematodes belonging to the genera *Rotylenchus*, *Pararotylenchus* and *Helicotylenchus* (commonly referred to as spiral nematodes) are probably the most widespread and prevalent species of plant parasitic nematodes in the British Isles (Boag, 1978). However, unlike cyst nematodes which belong to the genera *Heterodera* or *Globodera* or virus-vector species in the genera *Xiphinema*, *Longidorus*, *Paralongidorus*, *Trichodorus* and *Paratrichodorus* little is known about their distribution, ecology and pathogenicity. This is because they do not usually produce recognisable acute disease symptoms in plants but generally depress yields throughout the crops (Oostenbrink, 1972). Spiral nematodes are more uniformly distributed across fields and usually feed ectoparasitically on the root hairs and epidermal cells of the root (Klinkenberg, 1963; Boag, 1980) compared with other nematodes, e.g. longidorids and trichodorids which can have a more aggregated distribution (Boag & Topham, 1984) and cause more acute damage by stunting or galling roots when feeding near root tips (Pitcher, 1967; Boag, 1980; Robertson, *et al.*, 1984).

Of the species found in Great Britain, *R. buxophilus* has been shown to significantly reduce the growth of boxwood trees (Golden, 1956). *Rotylenchus uniformis* is known to have a wide host range and decrease the yield of a range of horticultural and agricultural crops (Oostenbrink, 1972; Boag, 1982) including pea (Seinhorst, 1968), carrot (Kuiper & Drijfhout, 1957; Boag, 1979), lettuce (*Lear et al.*, 1969), young trees (Goodey, 1965; Boag, 1978), swedes and grass (Boag, 1981).
The purpose of the present paper is to report the distribution of *Rotylenchus* and *Pararotylenchus* species occurring in Great Britain and to investigate their prevalence, intensity and the ecological factors which could be responsible for limiting their population size.

**MATERIALS AND METHODS**

The taxonomic status used in this paper of *R. robustus* (de Man, 1876) and *R. uniformis* (Thorne, 1954) follows that suggested by Seinhorst (1991), i.e. what was formally and generally considered *R. robustus* is *R. uniformis* and *R. fallorobustus* now *R. robustus*. The spiral nematode species were extracted from samples collected during nematode surveys conducted for the Natural Environmental Research Council (NERC; Boag, 1974), the North Atlantic Treaty Organisation (NATO; Taylor & Brown, 1976) and more recently, by members of staff of the Macaulay Land Use Research Institute (MLURI).

Attempts were made to take samples from the five vegetation types, viz. coniferous forest, deciduous woodland, scrubland, arable farmland and permanent pasture (grass) from within each visited 10 km grid square. At each sampling site a six figure Ordnance Survey grid reference was recorded plus information on the date, altitude, topography and vegetation. The dominant forest and woodland tree species were larch (*Larix* spp.), Norway spruce (*Picea abies* L.), Scots Pine (*Pinus sylvestris* L.), Sitka spruce (*Picea sitchensis* (Bongard) Carr.), beech (*Fagus sylvatica* L.), birch (*Betula* spp.), bog myrtle (*Myrica gale* L.), elm (*Ulmus procera* Salisb.), oak (*Quercus* sp.), sycamore (*Acer pseudoplatanus* L.) and hawthorn (*Crataegus monogyna* Jacq.). Samples were collected using a spade or trowel to a depth of 15 cm below the soil surface and returned to the laboratory in polythene bags where they were stored at c. 4°C until processed. Nematodes were extracted from 200 g field soil using a modification of the sieving and decanting technique (Boag, 1974) and were heat killed at 60°C and fixed in triethanolamine formalin (TAF) (Goodey, 1963). Numbers of *Rotylenchus* and *Pararotylenchus* in each sample were determined under a low powered binocular microscope. Where possible at least 10 specimens from each sample were mounted in glycerol and identified to species. Further soil samples from some of the sites were assessed for pH, percentage sand, silt, clay, organic matter and moisture.

The results were analysed using the computer programme ORACLE (Oracle Corporation, Redwood Shores, California, USA) and the association between species tested using a chi-squared test for contingency. To eliminate bias due to small numbers within a category only those with an expected frequency exceeding two were included. The geographical distribution of the nematodes was plotted on the Ordnance Survey 10 km grid using the computer programme GRIDMAP (Dr A. Morton, Wirkfield, Berkshire, UK).