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Preliminary study of the soil nematode community at Machu Picchu Station, King George Island, Antarctica

Accepted: 14 January 2001 / Published online: 21 March 2001
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Abstract We studied the distribution and abundance of nematodes in one of the most extreme terrestrial environments in the world, at Machu Picchu, King George Island, off the coast of Admiralty Bay, Antarctica. We can report that the nematode community structure under the two most common plant covers was composed of three to four species. These species were found to belong functionally to microbial and omnivore/predator feeding types. Abundances of each of the nematode species were found to be negatively correlated to soil water content, generally decreasing their abundance with increasing soil water content. The results of this study demonstrate the importance of moisture availability to the nematode community and its species composition in this Antarctic soil ecosystem.

Introduction

Nematodes are a diverse group of roundworms and constitute a numerically important component of soil fauna in extreme ecosystems (Freckman and Mankau 1986; Wall and Virginia 1999; Liang et al. 2000). They are aquatic animals confined to the water films surrounding soil particles and soil aggregates. Some species can survive desiccation by entering into an inactive state of anhydrobiosis or cryptobiosis, or they may live in a soil microsite where moisture availability is sufficient for their activity (Steinberger et al. 1989; Steinberger and Loboda 1991). Extreme low moisture, temperature and productivity of continental Antarctic polar deserts were not found to limit nematode distribution (Freckman and Virginia 1989).

Containing a wide spectrum of trophic groups, nematodes interact in ecosystems as consumers of microflora, thus regulating decomposition and the release of nutrients to plants (Coleman et al. 1990). Since the most complex Antarctic soil communities contain mosses, lichens, blue-green and green algae, the food source or the abiotic conditions will be reflected in the biodiversity of the nematode community in the Antarctic ecosystem.

Similar assumptions have been made by many authors (Freckman and Ettema 1993; Wasilewska 1997), while Bongers (1990), Yeates et al. (1993), Robertson and Freckman (1995) and others have suggested using nematode community composition or life-history indices as indicators of ecosystem change. Moreover, the close association of nematode population with higher plants in warm deserts is well documented while studies on the cold deserts, such as Antarctica, are very scattered. Most of the studies were conducted at the McMurdo Dry Valleys of southern Victoria Land. Our objective in this study was to provide some insight into how the less extreme abiotic conditions in the maritime Antarctic affect the responses of soil nematodes. Since nematode populations in particular and soil organisms in general are proposed to be sensitive biological markers, we assume that their diversity will be affected by minute changes in this harsh ecosystem.

Materials and methods

Study site

The study area was located in the vicinity of Machu Picchu Station (56°20′50.3″, W58°28′12.6″), King George Island, on the coast of Admiralty Bay, about 10 m above sea level (Fig. 1). The annual mean air temperature is −1.6°C, mean wind speed 7 m s−1 and multi-annual precipitation 510 mm, as reported by the Arctowski Station, 5 km south of Machu Picchu. At this site, where a narrow plain strip of about 300 m divides the sea and moraine formation, moss carpets of Sanionia uncinata and a vascular perennial plant Deschampsia antarctica, were found to cover a large part of the site. In addition, moss cushions grow between the stones which cover
Fig. 1 Map showing the Northern Antarctic Peninsula and King George Island. The location of the Machu Picchu Station on Mackellar Inlet, Admiralty Bay is indicated.