Pedobiologia **50** (2006) 31—41

Available online at www.sciencedirect.com

SCIENCE DIRECT®

Pedobiologia

www.elsevier.de/pedobi

A comparison of microarthropod assemblages with emphasis on oribatid mites in canopy suspended soils and forest floors associated with ancient western redcedar trees

Zoë Lindo*, Neville N. Winchester

Department of Biology, University of Victoria, P.O. Box 3020, Victoria, BC, Canada V8W 3N5

Received 10 May 2005; accepted 30 September 2005

KEYWORDS
Canopy;
Oribatid mites;
Suspended soils;
Temperate rainforest;
Arboreal microarthropods

Summary

Microarthropod abundance, oribatid mite species richness and community composition were assessed in the high canopy (ca. 35 m) of an ancient temperate rainforest and compared with microarthropod communities of the forest floor. Microarthropods were extracted from 72 core samples of suspended soils and 72 core samples from forest floors associated with six western redcedar trees in the Walbran Valley on the southwest coast of Vancouver Island, Canada. Total microarthropod abundances, mesostigmatid and astigmatid mites, Collembola and other microarthropod abundances were significantly greater in forest floors compared to canopy habitats. Oribatid and prostigmatid mite abundance were not significantly different between habitats. The relative abundances of all microarthropod groups considered in this study differed significantly between habitats. Eighty-eight species of oribatid mites were identified from the study area. Eighteen of the 53 species observed in suspended soils were unique to the canopy. Cluster analysis indicates that the arboreal oribatid mite community is distinct and not a taxonomic subset of the forest floor assemblage, however, canopy oribatid mite communities are more heterogeneous in species composition than in the forest floor.

Introduction

Oribatid mites (Acari: Oribatida) are typically the dominant component of the microarthropod fauna in most forest floor systems (Petersen and Luxton 1982). Oribatid mites are also species rich and numerically dominant in temperate and tropical

*Corresponding author. Tel.: +1 250 721 7099; fax: +1 250 721 7120.
E-mail address: zlindo@uvic.ca (Z. Lindo).

0031-4056/$ - see front matter © 2005 Elsevier GmbH. All rights reserved.
doi:10.1016/j.pedobi.2005.09.002

forest canopies (Behan-Pelletier and Walter 2000). Oribatid mites are observed in many arboreal habitats, including bark and trunks of trees (Nicolai 1993; Prinzing 2001; Proctor et al. 2002), leaf domatia and stems (Spain and Harrison 1968; Walter and O'Dowd 1995), moss, lichen and other corticolous epiphytic cover (Seyd and Seaward 1984; André 1985), and in accumulations of organic matter known as suspended soils (Paoletti et al. 1991; Wunderle 1992; Behan-Pelletier et al. 1993; Winchester et al. 1999). Factors affecting the diversity and abundance of arboreal oribatid mite communities include tree species, elevation and size of suspended soil patches (Fagan and Winchester 1999; Wardle et al. 2003), as well as random dispersal events of individual species (Behan-Pelletier and Winchester 1998).

Canopy oribatid mite communities contribute significantly to overall forest biodiversity and are functionally important components of forest systems. In canopy/ground comparison studies, the number of oribatid mite species in common between the two habitats is typically 40%. For example, Wunderle (1992) found 40% of oribatid mite species in a tropical forest in Peru were common to both canopy and forest floor habitats, Behan-Pelletier et al. (1993) revealed 41% of oribatid mite species in a Venezuelan forest were common to both canopy and forest floor samples, and Winchester et al. (1999) found 43% of 71 oribatid mite species collected from Sitka spruce canopy and forest floor habitats were shared in common.

In this paper, we compare the abundance of microarthropods and the species richness and composition of oribatid mite communities in suspended soils of the high canopy and forest floors associated with ancient western redcedar trees in the Walbran Valley on Vancouver Island, British Columbia, Canada. This study complements other studies of soil fauna in temperate Canadian forest systems, and specifically other canopy systems on Vancouver Island such as the Carmanah Valley (Winchester et al. 1999), Mt. Cain (Fagan and Winchester 1999) and the Montane Alternative Silviculture Systems (MASS) project (Behan-Pelletier et al. 2002).

Materials and methods

Site description

The Walbran Valley is located on the southwest coast of Vancouver Island, British Columbia, Canada between the towns of Port Renfrew and Bamfield. This watershed is 13 147 ha, largely intact, and lies entirely in the Coastal Western Hemlock biogeoclimatic zone (Meidinger and Pojar 1991). The climate is characterized by wet, humid, cool summers and mild winters, and a mean annual precipitation of 2990.5 mm is typical for this area (http://climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html [cited 4 April 2005]). The dominant conifers in this valley are western hemlock (*Tsuga heterophylla* (Rafn.) Sarg.), Sitka spruce (*Picea sitchensis* (Bong) Carr.), silver fir (*Abies amabilis* (Dougl.) Forb.), and western redcedar (*Thuja plicata* D. Don).

The study area within this valley (48°39′N, 124°35′W) is approximately 8 km from the Pacific coast at an elevation of 200 m above sea level and is characterized by a high abundance of ancient (>800 years old) western redcedar. These ancient western redcedars have a multi-furcated main trunk, a unique morphology referred to as a candelabra structure, which allows for the accumulation of organic matter and the formation of many discrete, isolated patches of suspended soil of varying depth.

Sample collection and experimental design

Single rope climbing methods (Perry 1978; Barker and Standridge 2002) and techniques that have been devised over 10 years for canopy research in association with the University of Victoria were used to access the suspended soils within the crowns of six western redcedar trees. Sampling was conducted September 10–14, 2004. Individual PVC corers (160 series, 3.175 cm diameter, 25 cm length) were used to collect three replicate core samples from each of four large suspended soils within each tree. Three replicate core samples were also collected at cardinal directions on the forest floor at 1.5 m from the trunk of each tree for a total of 144 core samples collected (72 from the canopy and 72 from the forest floor). Core samples were left in the corers to minimize disturbance during transport from the field to the laboratory.

In the laboratory, each intact core sample was extruded from the plastic corer and measured for depth and wet weight before extraction of microarthropods. Microarthropods were extracted into 75% EtOH using Berlese funnels for 48 h. Following extraction core dry weights were measured and the percent moisture content (expressed as percent dry weight (dwt)) was calculated gravimetrically by recording the change in mass.