UNDERSTOREY SPIDER ASSEMBLAGE RESPONSE TO SPATIAL STRUCTURAL FEATURES OF NATIVE AND MANAGED FORESTS IN SOUTHERN BRAZIL

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INTRODUCTION

Forest ecosystems worldwide have been suffering spatial transformations by human activities. The traditional land uses and management of forest resources have been dictated by the demands for, e.g., fuel wood and paper production. Forests are not static systems; therefore, management practices ultimately must be adapted to follow their developmental changes over time. To preserve biological diversity, managers need to plan and manage over very long time-frames for the range of forest ages and succession stages to be maintained in the landscape (Brown *et al*., 2001). A range of habitat conditions to the colonization and establishment of animal communities are given by the human created environmental mosaic composed of patches of distinct forest composition and/or structure (Lindenmayer & Franklin, 2002). Spiders could serve as an excellent group to access animal community changes in spatial heterogeneous areas, because they are widespread intermediate-level predators and are among the most diverse group on earth, and because their distribution and occurrence are strongly influenced by habitat structure (Coddington & Levi, 1991; Robinson, 1981; Scheidler, 1990; Uetz, 1991; Buddle *et al*., 2000; Baldissera *et al*., 2004). This study aimed to access the patterns of diversity and composition of understorey spider assemblages in four forest habitats: Araucaria forest, Araucaria plantation, Pinus plantation and Eucalyptus plantation.

MATERIAL AND METHODS

The study was carried out at the National Forest of São Francisco de Paula (29°23'S; 50°23'W), Rio Grande do Sul state, southern Brazil. The native forest is dominated by Araucaria angustifolia patches interspaced with plantations of Pinus spp., Eucalyptus spp., and A. angustifolia. Plantations were managed by selective logging and longer rotations. The study sites encompass three replicated stands of each forest type. Inside each stand, we established two 25 m × 2 m. Understorey spiders were collected by beating the vegetation between 1-2.5 m in height inside each plot in winter and summer 2003. The fallen vegetation was collected with a 1 × 1 m canvas sheet. Spiders were selected by hand at the laboratory. Vegetation cover was surveyed by taking 50 point measurements of vegetation cover at 1 m horizontal intervals and between 1-2.5 m in height. We divided the touches into five vegetation cover categories: trees, bushes, vines, ferns, and grasses. These categories of vegetation cover could offer a diverse structural substrate for understorey spiders, thus influencing their habitat selection. Differences in habitat structure were analysed by ANOVA using the total vegetation cover of stands. ANOVA was still used to verify differences in Shannon diversity index of vegetation cover types. Abundance and richness of spiders were analysed by repeated measures ANOVA. To understand how the vegetation cover types could affect the composition of understorey spiders, a canonical correspondence analysis (Makarenkov & Legendre, 2002) was performed to relate the data table of response variables abundance of spider families to the data table of explanatory variables estimated vegetation cover. Thus, we could access the association between spider families and vegetation cover type and how this association describes the forest stands. It was performed 1000 permutation tests to access the significance of the resulting CCA model (Makarenkov & Legendre 2002).

RESULTS AND DISCUSSION

Vegetation cover of Pinus plantations was significantly higher than vegetation cover of Araucaria forest and Eucalyptus plantations ($F = 4.18$; d.f. = 3,8; $P = 0.047$). Pinus plantations and

Araucaria forest presented higher numbers of trees. Pinus plantations showed higher numbers of ferns, while grasses were found only in Eucalyptus plantations. A total of 3,424 spiders were collected, divided in 23 families and seven guilds. Nine families contributed with 95% of total abundance. Anyphaenidae (24%) and Theridiidae (24%) were the most abundant families, followed by Araneidae (16%) and Salticidae (14%). The abundance of understorey spiders was significantly lower in Eucalyptus plantations compared to Araucaria forest and Araucaria plantations ($F = 6.56$; d.f. = 3,8; $P = 0.015$). The expected number of understorey spider families showed no differences among habitats ($F = 1.14$; d.f. = 3,8; $P = 0.341$). The first two canonical axes accounted for 33.8% of the variance ($P = 0.007$). The triplot showed clearly two opposite groups of vegetation covers: (1) trees and ferns, and (2) grasses, bushes and vines, although we could take grasses as a third distinct group. The most abundant spider families were positioned around the origin of CCA graphic; therefore they did not show tight correlations to particular vegetation cover types. Nevertheless, Tetragnathidae, Pholcidae, Uloboridae, and Mysmenidae were associated to the presence of trees and ferns at two Pinus patches and one Araucaria forest patch. One patch of Araucaria plantation and other of Pinus plantation were associated to vines, which influenced the occurrence of the more diverse group of spiders: two families of orb web weavers, Theridiosomatidae and Deinopidae; three families of cursorial ones, Anyphaenidae, Oonopidae and Corinnidae; and one family of sheet web builders, Hahniidae. Rare families appeared in two Eucalyptus stands correlated to grass cover.

Management employed in this subtropical forest could diminish the deleterious effects that are traditionally associated to native forest conversion to tree monocultures, at least for understorey spider assemblage. Longer rotations and selective logging provide the development of dense understorey vegetation, the stands connectivity was promoted and understorey spider families did not perceive the habitat as being fragmented, but as a continuous suitable habitat. Although we have found no differences in expected numbers of families among habitats, the direct gradient analysis of spider community composition showed the presence of some spider families associated to particular vegetation cover types. Therefore, the composition of understorey spider assemblages could be influenced by particular habitat features occurring in forest patches. Understorey spider assemblage diversity at Araucaria forest region could be maintained as long as land user managers could provide selective logging and longer rotations practices.

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