Orthopteran Diversity of the Cowling Arboretum and McKnight Prairie in Northfield, MN

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Introduction

The order Orthoptera is a taxonomic division of insects that includes the species commonly referred to as grasshoppers, crickets and katydids (Figure 1). Orthopteran diversity of North America is relatively well-known compared to other insect orders, due to the large size of individuals and a large number of species in the region (Whiles, 2006). Orthopterans are collected opportunistically especially in terms of forb species (Whiles, 2006). Ritchie and Tilman (1995) found that excluding grasshoppers increased legume plant litter (Belovsky and Slade, 2000). Also, they have been observed to have an impact on the plant communities of prairies, particularly species in red (Figure 2) and McKnight prairie restorations. Additionally, the Orthopteran community composition appears very different between the locations. It is possible that the Orthopteran assemblage of the prairie restorations of the Cowling Arboretum and the McKnight Prairie remnant. There appear to be more species and higher densities of Orthopterans at McKnight compared to the arboretum prairie restorations. Additionally, the Orthopteran community structure of the arboretum prairie restorations is more consistent between locations, in terms of the absolute number of Orthopteran individuals per trap at McKnight was marginally significant to Arboretum traps (t = 2.07, d.f. = 22, Pr = 0.089) and the average number of Oedipodinae was higher for McKnight (U = 54, Pr = 0.037) observed per trap. The higher abundance of Orthopterans at McKnight, as shown by the trap data, also indicates a more species-rich environment. The Orthopteran community is more species-rich at McKnight Prairie found a total of 36 unique species across both sites. McKnight Prairie is a 13 ha tallgrass prairie remnant located 11 km from the arboretum. Both sites are located in Northfield, MN, USA.

Methods

Figure 1. Examples of Orthopterans from various taxonomic groups: A. a grasshopper (Acrididae) B. a katydid (Tettigoniidae) C. a cricket (Gryllidae)

A pitfall trap experiment was conducted.

Figure 2. Aspects of trap experiment design (Red diamonds represent individual pitfall traps). A. Location of traps in the arboretum restorations B. Location of traps in McKnight Prairie C. A pitfall trap at McKnight Prairie

Figure 3. Species lists for Orthoptera of the Cowling Arboretum and McKnight Prairie. Species in red are present in the arboretum but not at McKnight while species in blue are present at both McKnight and in the arboretum.

Figure 4. Average number of different groups of Orthopteran taxa (shown in Figure 4) per trap at McKnight Prairie and the arboretum prairie restorations. Error bars represent a standard error.

Orthopterans are the subject of much research due to their ecological and economic importance (Whiles, 2006) and their suitability as model systems for basic questions about biology (Chapman, 1999). Species richness has been used to the ecological role of grasshoppers in grazedlands, where they, along with grazing mammals, can be considered the dominant herbivores (Whiles, 2006). In prairie ecosystems, grasshoppers have been found to influence nutrient cycling by affecting the amount of and type of decomposing plant litter (Belovsky and Slade, 2000). Also, they have been observed to have an impact on the plant communities of prairies (Belovsky and Slade, 2000). Orthopterans are collected opportunistically especially in terms of forb species (Whiles, 2006). Ritchie and Tilman (1995) found that excluding grasshoppers increased legume plant litter (Belovsky and Slade, 2000). Orthopterans from various taxonomic groups: A. a grasshopper (Acrididae) B. a katydid (Tettigoniidae) C. a cricket (Gryllidae)

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Abstract: Carleton College Cowling Arboretum covers 360 ha of land and includes a range of habitats such as restored tallgrass prairie and oak savannah, upland deciduous forest, floodplain deciduous forest, and coniferous forest. McKnight prairie is a 13 ha tallgrass prairie remnant located 11 km from the arboretum. Both sites are located in Northfield, MN, USA.

The data from the trap experiment are suggestive of several differences between the Orthopteran assemblages of the prairie restorations of the Cowling Arboretum and the McKnight Prairie remnant. There appear to be more species and higher densities of Orthopterans at McKnight compared to the arboretum prairie restorations. Additionally, the Orthopteran community structure of the arboretum prairie restorations is more consistent between locations, in terms of the absolute number of Orthopteran individuals per trap at McKnight was marginally significant to Arboretum traps (t = 2.07, d.f. = 22, Pr = 0.089) and the average number of Oedipodinae was higher for McKnight (U = 54, Pr = 0.037) observed per trap. The higher abundance of Orthopterans at McKnight, as shown by the trap data, also indicates a more species-rich environment. The Orthopteran community is more species-rich at McKnight Prairie found a total of 36 unique species across both sites. McKnight Prairie is a 13 ha tallgrass prairie remnant located 11 km from the arboretum. Both sites are located in Northfield, MN, USA.

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References


