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Density of Nests of the Western Harvester Ant, *Pogonomyrmex occidentalis* (Hymenoptera: Formicidae) in Suburban and Urban Environments of Metropolitan Denver, Colorado

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Cover Photograph: Western Harvester Ant (*Pogonomyrmex occidentalis*) mound on a commercial property in Littleton, CO. Photograph © Grant D. De Jong.

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Density of Nests of the Western Harvester Ant, *Pogonomyrmex occidentalis* (Hymenoptera: Formicidae) in Suburban and Urban Environments of Metropolitan Denver, Colorado

Grant D. De Jong*

Abstract - *Pogonomyrmex occidentalis* (Western Harvester Ant) is a conspicuous inhabitant of the Great Plains ecoregion and can be a pest in urban areas. In 1995 and 2004, I determined Western Harvester Ant nest distribution at three 200-ha plots in metropolitan Denver, CO, contrasting in median household income and degree of urbanization. Nest densities ranged from 0.01–0.51 nests/ha (much lower than published values for rangeland ecosystems) and occurred at the lowest densities in high-income neighborhoods.

Introduction

Pogonomyrmex occidentalis (Cresson) (Western Harvester Ant) is a common, conspicuous inhabitant of the Great Plains ecoregion. This granivorous species builds large, distinctive mound-nests and removes vegetation in the immediate vicinity, possibly for thermoregulation (Cole 1968). The resulting disk represents a loss of forage for range animals as well as increased erosion potential (Clark and Comanor 1975, Rogers and Lavigne 1974). Nest densities of 30–80 nests/ha have been reported for rural rangeland areas, apparently independent of the extent of grazing to which the area has been subjected (Soulé and Knapp 1996).

Past studies on harvester ants have primarily been conducted in rural rangeland situations or desert regions (Soulé and Knapp 1996, and references therein), although there has also been some research in urban areas (e.g., Terranella et al. 1999). Harvester ants tend to nest in sandy soils (Tashiro 1987). In urban areas, suitable sites occur in residential yards, unpaved lots and alleys, and parks (e.g., manicured areas as well as natural open spaces). Terranella et al. (1999) found that Western Harvester Ants preferred to nest near disturbed areas within open spaces and vacant areas in Colorado Springs, CO. Knight and Rust (1990) found that *Pogonomyrmex* spp. (harvester ants) comprised 4.6% of reports of perceived pest ants submitted by pest-control operators from urban areas in California. Given harvester ants' minor pest status, I investigated the extent of Western Harvester Ants in 3 environments in the Denver, CO, metropolitan area, contrasting the study areas by median household income.

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Field-site Description

I selected 3 study areas (Fig. 1) in the Highland, Littleton, and Cherry Creek neighborhoods. Each 200-ha study area has experienced over a century of human settlement, with extensive tracts covered by asphalt, concrete, or structures. Each study area was comprised of 9–11 US Census Bureau (USCB) block groups (statistical divisions generally defined to contain between 600 and 3000 people). I determined the median household income of each neighborhood from USCB (2004) data and chose sites to include contrasting levels of household income among the study areas—Cherry Creek income > Littleton > Highland). Income is correlated with other socioeconomic metrics, such as education, household density, and employment opportunities. It may also be linked to the ability to effectively control pest-species presence.

Methods

In 1995 and 2004, I surveyed Western Harvester Ant nests in the 3 study areas. I walked every street, sidewalk, and alleyway, mapped the location of each nest, and collected 10 individuals from each nest. I preserved specimens in 70% ethyl alcohol. I noted property characteristics (e.g., commercial, residential, or open space; vacant, or inhabited by humans) on the nest map; not all types of properties were present within each USCB block group. Using USCB block groups as replicates, I

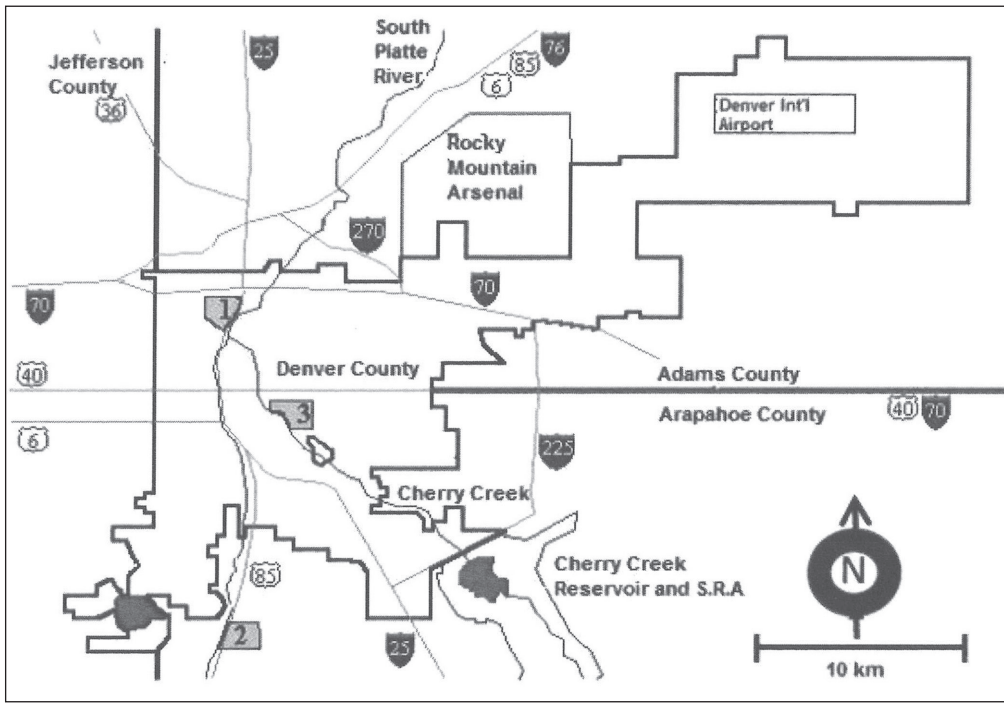

Figure 1. Denver metropolitan region, indicating locations of Western Harvester Ant study areas. 1 = Highland, 2 = Littleton, 3 = Cherry Creek.

compared study areas and years in terms of nest density/USCB block group using a repeated measures ANOVA (Hintze 2009), with study areas nested within years. I employed a linear regression to examine the relationship between nest density and median household income at the study-area level. I deposited voucher specimens in the C.P. Gillette Museum of Arthropod Diversity at Colorado State University, Fort Collins, CO.

Results

In 1995, I documented 95 nests in the Highland study area, 95 in Littleton, and 2 in Cherry Creek. In 2004, totals were 89, 101, and 0, at the 3 sites, respectively. Within-year nest density per USCB block group was different among the study areas (F = 17.24, df = 1, P < 0.001). However, a Tukey-Kramer multiple comparison test, conducted a posteriori, indicated that the differences were due to low nest densities in the Cherry Creek study area. Differences between years were not statistically significant (F = 0.00, df = 1, P = 0.979). Nest densities were negatively correlated with median household income (F = 18.06, df = 1, P = 0.013).

Western Harvester Ant nests occurred most frequently on residential and commercial properties in the Highland study area and on commercial, utility, and open-space properties in the Littleton study area. The 2 nests found in the Cherry Creek study area were both on commercial properties.

Discussion

When I excluded the Cherry Creek nests from the analysis (n =2), nest densities ranged from 0.01 to 0.51 nests/ha. This range is considerably lower than the 3–80 nests/ha densities reported from rangeland and desert studies (Soulé and Knapp 1996), likely because much of the land surface at my sites was inhospitable to these ants.

Nest densities in Highland may have been higher because the residents either were not troubled by the Western Harvester Ants and their mounds or they were unable to remove the nests. Human presence on the sites did not appear to be a factor because 72% of nest-bearing properties in the Highland study area were also occupied by human residents. Although the median annual household income in the Highland study area more than doubled ($14,227 to $31,868) between the 2 sampling years, the neighborhood remained in the low-income range (USCB 2004).

At the Littleton study site, the immediate areas in which the nests were located (commercial, utility, and open-space properties) were not frequented by humans; therefore, the aesthetic or economic impact of the large number of mounds was minimal, and, as reported by Terranella et al. (1999), nests were most common along trails in the open-space park. Ant nests in residential properties were limited to large, untended lots. The median household income in the Littleton study area was higher than in the Highlands study area, ranging from $25,174 in 1990 to $36,496 in 2000, and property owners appeared to restrict Western Harvester Ants from colonizing their yards via maintenance activities.

Despite the abundance of suitable residential yard and open-space habitat available for nests in the Cherry Creek study area, it is likely that vigilance of property owners in maintenance of their properties precluded establishment of Western Harvester Ant nests. This area was an upper middle- to high-income neighborhood, with a median annual household income of $59,716 in 1990 and $78,595 in 2000. The 2 nests I found in 1995 were located on commercial properties scheduled for redevelopment and were destroyed in the summer of 1996. I found no ant nests within the Cherry Creek study area in October 2004.

In the urban and suburban localities I studied, permanent human presence appeared to suppress nest density of Western Harvester Ants below values reported for rangeland habitats, and the extent of the suppression may be affected by socioeconomic impact on humans' ability to control the ants, as indexed by median annual household income. The relative lack of change in nest densities within study areas and on property types despite nearly a decade between samples and substantial increases in household income is noteworthy and is worthy of further research.

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