Transactions of the Illinois State Academy of Science
(1998), Volume 91, 1 and 2, pp.85-90
received 4/26/97
accepted 10/21/97

Ant Fauna of Reconstructed Tallgrass Prairie in Northeastern Illinois

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ABSTRACT

Ants were inventoried in a reconstructed tallgrass prairie plot located on the campus of College of DuPage, Illinois. The objective was to investigate whether ants found in natural tallgrass prairie have been able to colonize the plot. Sampling involved pitfall trapping, surface digging, and hand collection during the summer months. Eleven species were recorded, of which nine have been found in tallgrass prairie elsewhere, including four from prairie in northeastern Illinois over 50 years ago. The remaining two have been found in open fields. All are known from Illinois and have a widespread distribution. Ants found in natural tallgrass prairie have probably been able to colonize the reconstructed plot because of their environmental tolerance to anthropogenic disturbance.

INTRODUCTION

Prior to 1820, Illinois was covered by an estimated 8,900,000 ha of tallgrass prairie (Samson and Knopf 1994). The invention by John Deere of the self-scouring, steel-bladed plow, plus land incentives from the federal government and the Illinois Central Railroad, led to rapid conversion of the prairie to agricultural land (Burt 1969, IDENR 1994). Urbanization and fire suppression further reduced prairie habitats. Today, about 930 ha remain (IDENR 1994). Only 3.5 ha of higher quality tallgrass prairie of the estimated 74,800 ha present in 1820 remain in urbanized DuPage County where the current study was located (IDENR 1994). This northeastern Illinois county covers an area of 97,400 ha.

In our study, ants (Formicidae) colonizing a reconstructed, tallgrass prairie plot on the campus of College of DuPage were surveyed. The objective was to investigate whether ants found in natural tallgrass prairie were able to colonize the plot. Ants are important to tallgrass prairie dynamics due to their contributions to soil mixing, soil aeration, and seed transport (Baxter and Hole 1967, Holldobler and Wilson 1989). Over 120 ant species have been recorded from Illinois (DuBois and LaBerge 1988) of which 11 were found in prairie that persisted in the northeastern sector during the first half of the century (Table 1)(Talbot 1934, Gregg 1944).

STUDY SITE

College of DuPage is located within the heart of residential DuPage County, which contributes to the metropolitan area of Chicago. Reconstruction of the tallgrass prairie began as an academic exercise by Russell Kirt and his students in 1975. Prior to acquisition by the college in 1965, the land was farmed. Clay excavated during campus construction provides the foundation to the reconstructed plot that covers 4 ha today.

The reconstructed tallgrass plot contains some 150 species, which have been established after seed broadcasting and seedling transplant. The flora is characteristic of the mesic prairie which once dominated the area (Swink and Wilhelm 1994). Big bluestem (*Andropogon gerardii* Vitman), Indian grass (*Sorghastrum nutans* (L.) Nash) and prairie dropseed (*Sporobolus heterolepsis* Gray) are the dominant grasses. A comprehensive listing of plants found within the reconstructed plot is provided by Kirt (1989). The plot is burned each spring.

METHODS

Ants were collected from April to October, 1995 using pitfall traps (plastic specimen jars 5 cm diameter partly filled with ethylene glycol as a preservative), surface digging, and hand collection. Twice per month, five pitfall traps were evenly spaced along each of six randomly selected transects for a 24-hour period. Surface digging and hand collection were done every 5 days along 12 randomly selected transects. Surface digging involved turning over the top 7 to 10 cm of soil to locate subterranean nests. The taxonomic keys of Creighton (1950), Francoeur (1973), Gregg (1944), Ross et al (1971), and Talbot (1934) were used to identify ants. Gregg (1944) and Talbot (1934) also provided information on ants recorded from northeastern Illinois during the first half of the century.

During October, 1995, soil pH, organic content, and soil texture were measured by taking 3 cores of 20 cm depth and 2 cm width every 4 m distance along each of 6 randomly placed transects. Soil pH was measured using a LaMotte chemical kit (LaMotte Products Chemical Co., Chestertown, MD). Organic content was determined as the fraction of dry mass lost after burning at 600ºC for 6 hours in a muffle furnace. Soil texture was evaluated using the Keck SS-94 Sand Shaker (Keck Instruments, Inc., Williamston, MI).

RESULTS

Eleven species of ants were identified from the plot (Table 2). Voucher specimens have been retained at College of DuPage. Most species were rarely observed and may have remained undetected from sites if only a single sampling method was employed. Nests, as evidenced by larvae, were found for all species except *Myrmica lobicornis* and *Ponera pennsylvanica*. Thus, it was unknown if these two species nest in the prairie or strayed in from the surrounding landscape. *Lasius alienus* was the most widely distributed ant, being found at all sites. The species also nested opportunistically in soil, and under logs, plywood, stones, and paper bags. A similar opportunistic behavior was shown by *Acanthomyops claviger*. Soil pH was 6.8 ± 0.2, fraction organic content was 0.10 ± 0.02, and particle size composition was 0.07 ± 0.02 fraction by weight of particle sizes greater than 0.5mm (All $\bar{x} \pm s$; $n = 18$).

DISCUSSION

Nine of the ant species found in the reconstructed prairie plot have been found in prairie elsewhere, including four recorded from prairie in northeastern Illinois over fifty years ago (Table 2). The remaining two, *Camponotus pennsylvanicus* and *M. lobicornis*, have been found in open fields of Illinois (DuBois and LaBerge 1988, Talbot 1934). *A. claviger* was the only species not recorded from the local area by Gregg (1944) and Talbot (1934), although it was abundant in adjacent Wisconsin in 1919 (Burrill and Smith 1919).

All of the ants are widely distributed and *Tetramerium caespitum* is believed to have been introduced from Europe (Creighton 1950). Most are known from southern Canada and *T. caespitum* is believed to have been introduced from Europe. All are also known from a variety of vegetative habitats (DuBois and LaBerge 1988, Gregg 1944, Talbot 1934), although *C. pennsylvanicus* is associated with rotting wood. In conclusion, ants found in natural tallgrass prairie have been able to colonize the reconstructed plot most likely because of their environmental tolerance to anthropogenic disturbance.

Formica montana Emery (formerly *F. cinerea neocinerea* Wheeler) may be the most significant of the ants recorded by Gregg (1944) and Talbot (1934) from northeastern Illinois prairie that is missing from the reconstructed plot. This mound dwelling species once dominated the mesic prairie of northeastern Illinois. The environmental consequence of this absence on successful tallgrass prairie reconstruction remains unknown although the mound dwelling congener, *F. subsericea* has persisted. Future studies done on an expanded scale in northeastern Illinois should offer clues to how the richness of the ant fauna has changed with development over the past fifty years.

ACKNOWLEDGEMENTS

We thank Chris Bivins who helped with collections and Barbara Petersen who provided valuable criticism in the preparation of this manuscript.

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Table 1. Ant species recorded from northeastern Illinois prairie during the first half of the century by Gregg (1944) and Talbot (1934).

Subfamily	Species
Formicinae	*Formica integra* Nylander
	F. montana Emery
	F. nitidiventris Emery
	F. subintegra Emery
	F. subsericea Say
	Lasius alienus (Foerster)
	L. neoniger Emery
	Polyergus breviceps Emery
Myrmecinae	*Leptothorax ambiguus* Emery
	Myrmica lobicornis fracticornis Emery
	Solenopsis molesta (Say)

Table 2. Ant species collected from the reconstructed tallgrass prairie on the campus of College of DuPage according to adults collected outside of nests and nests discovered with larvae. Except for nests in soil, all others were found under objects, including logs (all diameters <3 cm). Symbols: Al = aluminum sheathing; B = paper bag; CB = cinder block; L = log; P = plywood sheathing; PL = plastic bag; R = stone; and S = soil. Superscripts signify species occurrence in tallgrass prairie according to reference: [a]Gregg (1944); [b]Hendrickson (1929); [c]Talbot (1934); and [d]Trager (1990).

Subfamily Species	Number of Adults Collected	Number of Nests Discovered	Nesting Location
Dolichoderinae			
Tapinoma sessile (Say) [b,d]	7	1	S
Formicinae			
Acanthomyops claviger (Roger)[d]		4	AL,CB,S
Camponotus pennsylvanicus (DeGeer)	12	1	L
Formica nitidiventris Emery [a,b,c,d]	101	5	S
F. subsericea Say [a,b,d]	22	1	L
Lasius alienus (Foerster) [b,c,d]	452	16	B,L,P,R,S
Myrmecinae			
Crematogaster lineolata (Say)[b,d]	7	1	S
Myrmica lobicornis Emery	20		
Solenopsis molesta (Say)[c,d]	3	4	R,S
Tetramorium caespitum (Linnaeus)[d]	19	3	R
Ponerinae			
Ponera pennsylvanica Buckley [b,d]	1		