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Ants (Hymenoptera: Formicidae) of Arkansas Post National Memorial

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Abstract.—A combination of techniques was used to collect ants at the Arkansas Post National Memorial, Arkansas County. The techniques were wood breaking, leaf-litter sifting with Berlese extraction, tree baiting, pitfall trapping, and visual searching. Twenty-five genera and 46 species were collected. Three genera are new distributional records for the state: namely, *Discothyrea, Proceratium, Protomognathus, and Strumigenys.*. Nine species are new state records. Fourteen of the genera and 32 of the species collected are new records for Arkansas County.

Key words.—Ants, Arkansas County, *Protomognathus, Discothyrea, Strumigenys.*

Introduction

Ants partition the environment into many different niches, both spatially and temporally. This explains the high diversity and dominance of ants on the forest floor (Hölldobler and Wilson, 1990). Different techniques have been developed to collect ants occupying different niches or belonging to different guilds (Bestelmeyer et al., 2000).

This inventory was undertaken at the request of Arkansas Post National Memorial (APNM) as part of a longer term study of the ants in selected habitats and to determine if centers of diversity correspond with particular patterns in the landscape. Our objective here is simply to present a list of species found.

Methods

Study Site.—Arkansas Post National Memorial is an historical park managed by the National Park Service. APNM, located northeast of Dumas, Arkansas County, is a peninsula bounded on its southeastern tip by an inlet from the Arkansas River. It is the site of the first French settlement in the lower Mississippi Valley. APNM has a total land area of about 114 hectares. Within APNM there are 5 general land cover types; although most cover consists of forests of oak mixed with other hardwoods and some conifers. From the 5 general stand types at APNM, 10 stand pairs were selected for ant sampling to provide contrasting "younger" and "older" stand types that included a separating ecotone. The 10 stand pairs included mixed oak stands contrasted with young and old sweetgum, pine, red cedar, black locust, tall grass with weeds, and mowed areas with and without overhead trees. Because we are only presenting a species list, details on where the ants were collected at APNM are not provided.

Sampling Methods.—Ants were sampled in each stand pair over 2 years. The species list generated by this sampling is an assemblage of ants collected over all stand pairs and years, even though they were sampled differently in each year. Pitfall trapping was conducted over a 3-day period 4 times in 2005: June 15-17, July 19-21, August 9-11, and September 29-October 1. The intensive plot sampling began in mid-May and ran through July 2006. This schedule generally included field work in the mornings when temperatures were cooler and the ants were active and lab work in the warmer afternoons when the ants became inactive. Ants generally function poorly below 20°C and above 32°C (Hölldobler and Wilson, 1990). Lab work included processing the samples collected in the morning.

Pitfall Traps.—Thirty pitfall traps in each stand pair were located on 2 parallel transects 10 meters apart (15 traps per transect, Fig. 1). Trap stations within transects were 5 meters apart, with the transects centered on the stand-pair ecotone. The traps sampled the ground-foraging ants for about 72 hours, collecting both diurnal and nocturnal species.

A pitfall trap is established by drilling a hole, 3 cm in diameter and 10 cm deep, in the ground with an auger, using an 18-volt

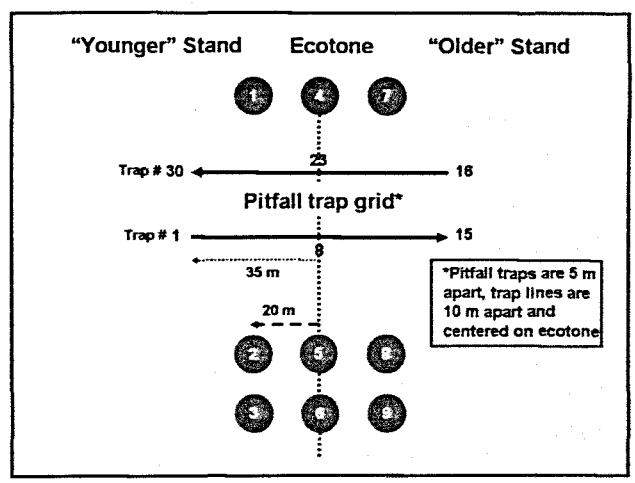

Fig 1. Diagram of pitfall trap grid and subplots along ecotone of a stand pair (not to scale).

battery-powered drill. Each pitfall trap consists of a plastic vial (3 cm in diameter, 8 cm long, Thornton Plastic Co., product # 55-15) partially filled with propylene glycol and inserted into the hole so that the lip of the vial is level with the ground. The propylene glycol acts as both the killing fluid and preservative. The vial was retrieved after 72 hours and labeled with typical field information: trap type, stand type, date of collection, trap number, and collector's name. The vials were capped and placed upright in boxes for transport to the laboratory.

In the laboratory, the vials were kept in the refrigerator until they could be processed. The processing involved pouring the contents into a white shallow plastic pan (15 cm x 20 cm), inspecting the vial contents under a stereomicroscope, and picking out and transferring the ants to a glass 4-dram vial of 80% ethanol, together with the field label. The ants were stored for later identification and counting.

Intensive Ant Sampling.—Whereas pitfall traps are a quantitative method for characterizing ant activity, they do not adequately sample the entire ant community. Among the ants that are typically not collected with pitfalls are cryptic species that live in leaf litter and arboreal ants that live in trees and shrubs.

To partially resolve this problem, we conducted intensive sampling in each stand pair at 9 subplots, systematically spaced a minimum of 10 m apart. Three subplots were placed in each stand of a pair, and 3 were placed on the ecotone itself. Figure 1 illustrates the subplots in relation to the pitfall transects. Subplots were circular with a 5-m radius, and the 9 subplots in a set were configured in a rectangular design so that they were easy to locate, and the ants collected could be conveniently related to each subplot location. Within the 5-m radius of each subplot, ants were collected using the following techniques (Bestelmeyer et al., 2000).

Tree-trunk Baiting.—If available, up to 4 trees were baited with approximately 20 grams of peanut butter spread on their trunks about 1.5 meters above the ground. After 30 minutes, the trees were inspected, and, if present, up to 20 worker ants were collected and placed into a single labeled vial.

Wood Breaking.—For a maximum of 15 minutes, two individuals simultaneously looked for and broke into rotten logs, twigs, branches, and galls to collect ant nests. Two rotten logs were selected and chopped open for a total length of one meter each. Any nest found was placed into a separate labeled plastic food storage bag or a large fabric bag for processing in the laboratory.

Leaf-litter Sifting.—For this protocol a 1-m^2 quadrat made of PVC pipe was placed on the center marker of each subplot. All leaf litter within the quadrat was collected and sifted into a fabric bag with a field label inside. The sifted leaf litter was taken back to the laboratory for processing in a Berlese apparatus. In addition, all twigs, old galls, and hickory and oak seeds from the quadrat were inspected, and those that contained ant nests were taken back to the lab for further processing. All litter sampling was done within a 4-week period from mid-May to mid-June of 2006.

Visual Searching.—For a maximum of 15 minutes, two individuals simultaneously conducted a visual search, and collected ants were placed into a labeled vial.

Species Identification.—Specimens were identified to species using the most appropriate keys (Bolton, 1994, 2000; Buren, 1968; Creighton, 1930, 1950; DuBois, 1986; Johnson, 1988; MacGown, 2006; MacKay, 1993, 2000; Trager, 1984; Wilson, 2003). Problematic specimens, e.g., single minor workers of *Pheidole* (unassociated with major workers), were mounted on pins and taken to Stefan Cover of the Museum of Comparative Zoology (MCZ) at Harvard University. Many of the other species determinations were also checked and verified by Stefan Cover.

The state and county lists were also updated to remove synonyms and unavailable trinomial names and to include the new subfamily and generic nomenclature (Bolton, 2003; Bolton et al., 2007; Shattuck, 1992). Voucher specimens will be deposited with the Arthropod Museum of the University of Arkansas at Fayetteville and the MCZ at Harvard University.

Results and Discussion

Table 1 presents a comparison of APNM with the Arkansas state and Arkansas County lists, based on The Ants of Arkansas by Warren and Rouse (1969). We found 6 subfamilies, 25 genera, and 46 species on APNM. Three genera are new distributional records for Arkansas: namely, *Discothyrea, Proceratium, Protomognathus, and Strumigenys.*. Nine species are new records for Arkansas: *Crematogaster atkinsoni, C. pilosa, Discothyrea testacea, Pheidole dentigula, P. pilifera, P. tysoni, Proceratium pergandei, Protomognathus americanus*, and *Strumigenys louisianae*. The validity of the names in the Warren and Rouse (1969) list was checked and updated (Bolton, 2003; Bolton et al., 2007). The state list now consists of 8 subfamilies and 91 valid species in 36 genera.

We have updated the Arkansas County list as well. Fourteen genera are added: *Brachymyrmex, Discothyrea, Formica, Hypoponera, Myrmecina, Myrmica, Ponera, Proceratium, Protomognathus, Pseudomyrmex, Pyramica, Strumigenys, Temnothorax*, and *Trachymyrmex*. In all, 32 species are added to the County list, bringing the total to 51 species. The increase in known species for the County is most likely a function of the collection techniques applied rather than recent colonization from neighboring counties or states. Warren and Rouse (1969) compiled their list from incidental collections by other researchers and collectors surveying for other insects, mainly crop pests.

This research updates the species list to incorporate the latest taxonomic information based on the newest catalogue of ants. It also connects the geographic information in Warren and Rouse (1969) to the current ant taxonomy, enhancing the usefulness of their list, biological information and maps.

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Table 1. Comparison of the ant species lists for the state of Arkansas (ARK), Arkansas County (Ark Co.), and Arkansas Post National Memorial (APNM).

Key to table: # Spec = Number of species; * = Based on Warren and Rouse, 1969; ^ = Based on our collection; ■ = New Arkansas state record; ▲ = New Arkansas County record.

# Spec	SUBFAMILY and *species*	ARK*	Ark Co.*	APNM^	New Rec
	Subfamily AMBLYOPONINAE				
1	*Amblyopone pallipes* (Haldeman 1844)	X			
	Subfamily DOLICHODERINAE				
1	*Dolichoderus mariae* Forel 1885	X			
2	*Dolichoderus taschenbergi* (Mayr 1866)	X			
3	*Dorymyrmex bureni* Trager 1988	X			
4	*Forelius mccooki* (McCook 1879)	X			
5	*Forelius pruinosus* (Roger 1863)	X	X	X	
6	*Linepithema humile* (Mayr 1868)	X			
7	*Tapinoma sessile* (Say 1836)	X	X	X	
	Subfamily ECITONINAE				
1	*Labidus coecus* (Latreille 1802)	X			
2	*Neivamyrmex mexicanus* (Fr. Smith 1859)	X			
3	*Neivamyrmex nigrescens* (Cresson 1872)	X			
4	*Neivamyrmex opacithorax* (Emery 1894)	X			
	Subfamily FORMICINAE				
1	*Brachymyrmex depilis* Emery 1893	X		X	▲
2	*Camponotus americanus* Mayr 1862	X	X	X	
3	*Camponotus caryae* (Fitch 1855)	X			
4	*Camponotus castaneus* (Latreille 1802)	X		X	▲
5	*Camponotus chromaiodes* Bolton 1995	X			
6	*Camponotus decipiens* Emery 1893	X	X	X	
7	*Camponotus discolor* (Buckley 1866)	X		X	▲
8	*Camponotus nearcticus* Emery 1893	X	X		
9	*Camponotus pennsylvanicus* (De Geer 1773)	X		X	▲
10	*Camponotus pylartes* Wheeler 1904	X		X	▲
11	*Camponotus sansabeanus* (Buckley 1866)	X			
12	*Camponotus subbarbatus* Emery 1893	X			
13	*Formica fusca* Linnaeus 1758	X			
14	*Formica pallidefulva* Latreille 1802	X		X	▲
15	*Formica schaufussi* Mayr 1866	X			
16	*Lasius alienus* (Foerster 1850)	X	X	X	
17	*Lasius claviger* (Roger 1862)	X			
18	*Lasius interjectus* (Mayr 1866)	X			
19	*Lasius neoniger* Emery 1893	X			
20	*Paratrechina parvula* (Mayr 1870)	X			
21	*Paratrechina terricola* (Buckley 1866)	X	X	X	
22	*Polyergus lucidus* Mayr 1870	X	X		
22	*Prenolepis imparis* (Say 1836)	X	X	X	

	Subfamily MYRMICINAE				
1	*Aphaenogaster carolinensis* Wheeler 1915	X			
2	*Aphaenogaster fulva* Roger 1863	X		X	▲
3	*Aphaenogaster lamellidens* Mayr 1886	X		X	▲
4	*Aphaenogaster picea* (Wheeler 1908)	X			
5	*Aphaenogaster tennesseensis (Mayr 1862)*	X			
6	*Aphaenogaster texana* Wheeler 1915	X	X	X	
7	*Aphaenogaster treatae* Forel 1886	X			
8	*Crematogaster ashmeadi* Mayr 1886	X	X	X	
9	*Crematogaster atkinsoni* Wheeler 1919			X	▲■
10	*Crematogaster laeviuscula* Mayr 1870	X	X	X	
11	*Crematogaster lineolata* (Say 1836)	X	X	X	
12	*Crematogaster minutissima* Mayr 1870	X		X	▲
13	*Crematogaster missuriensis* Emery 1895	X		X	▲
14	*Crematogaster pilosa* Emery 1895			X	▲■
15	*Monomorium minimum* (Buckley 1867)	X		X	▲
16	*Monomorium pharaonis* (Linnaeus 1758)	X			
17	*Monomorium viride* Brown 1943	X	X		
18	*Myrmecina americana* Emery 1895	X		X	▲
19	*Myrmica punctiventris* Roger 1863	X		X	▲
20	*Myrmica spatulata* M.R. Smith 1930	X			
21	*Pheidole bicarinata* Mayr 1870	X	X	X	
22	*Pheidole dentata* Mayr 1886	X	X	X	
23	*Pheidole dentigula* M.R. Smith 1927			X	▲■
24	*Pheidole morrisii* Forel 1886	X			
25	*Pheidole pilifera* Roger 1863			X	▲■
26	*Pheidole rufescens* Wheeler 1908	X			
27	*Pheidole tetra* Creighton 1950	X			
28	*Pheidole tysoni* Forel 1901	X		X	▲■
29	*Pogonomyrmex badius* (Latreille 1802)	X			
30	*Pogonomyrmex barbatus* (Fr. Smith 1858)	X			
31	*Pogonomyrmex comanche* Wheeler 1902	X			
32	*Protomognathus americanus* Emery 1895			X	▲■
33	*Pyramica clypeata* (Roger 1863)	X		X	▲
34	*Pyramica ohioensis* (Kennedy & Schramm 1933)	X			
35	*Pyramica ornata* (Mayr 1887)	X		X	▲
36	*Pyramica pilinasis* (Forel 1901)	X			
37	*Pyramica rostrata* Emery 1895	X			
38	*Solenopsis invicta* Buren 1972	X		X	▲
39	*Solenopsis molesta* (Say 1836)	X	X	X	
40	*Solenopsis texana* Emery 1895	X	X		
41	*Solenopsis xyloni* McCook 1879	X	X		
42	*Stenamma meridionale* M.R. Smith 1957	X			
43	*Strumigenys louisianae* Roger 1863			X	▲■
44	*Temnothorax curvispinosus* Mayr 1866	X		X	▲
45	*Temnothorax pergandei* Emery 1895	X		X	▲
46	*Temnothorax schaumii* Roger 1863	X		X	▲

47	*Tetramorium bicarinatum* (Nylander 1846)	X			
48	*Trachymyrmex septentrionalis* (McCook 1881)	X		X	▲
	Subfamily PONERINAE				
1	*Hypoponera opacior* (Forel 1893)	X		X	▲
2	*Ponera pennsylvanica* Buckley 1866	X		X	▲
	Subfamily PROCERATIINAE				
1	*Discothyrea testacea* Roger 1863			X	▲■
2	*Proceratium pergandei* Emery 1895			X	▲■
	Subfamily PSEUDOMYRMECINAE				
1	*Pseudomyrmex pallidus* (Fr. Smith 1855)	X		X	▲
	Total species	**83**	**19**	**46**	