

Preliminary Survey of Ants (Hymenoptera: Formicidae) and Grasshoppers (Orthoptera: Acrididae) of the Big Thicket Region of Texas.

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The Big Thicket region of Texas is a southerly tilted topographical basin bounded between the Trinity and Sabine rivers in southeast Texas (Watson 2006). The Big Thicket has been called " the biological crossroads of North America", as species from the east and west occur relatively near each other within a mosaic of habitats such as arid sandylands, bottomland hardwood forests and cypress sloughs, palmetto hardwood flats, wetland pine savannah, upland pine forests, and mixed grass prairies (NPS 2010). Over 1,396 species of plants, 185 species of birds, and 60 reptile species have been documented within the Big Thicket (Big Thicket Association 2014).

Since the 1930s, the Thicket has had a very active army of citizen scientists who have fought for the conservation of the region's biota. In 1974, all their efforts paid off when the Big Thicket National Preserve was established (it was also the first National Preserve in U.S. history). The preserve consists of over 100,000 acres in 15 units spread out across seven counties. Additionally, The Nature Conservancy, the state of Texas, and several other entities have preserves established throughout the region.

In 2006, an All Taxa Biodiversity Inventory (ATBI) began in the Big Thicket to document every living species within the region. As part of the ATBI, surveys of ants (Hymenoptera: Formicidae) and grasshoppers began in 2011, and should continue for at least another year. Among insects, ants are typically the most dominant and influential force in terrestrial ecosystems, often comprise a large amount of the animal biomass, and are very sensitive to habitat changes making them ideal choices for such baseline inventories such as the ATBI. Grasshoppers (Orthoptera: Acrididae) are often influential herbivores in temperate grasslands, major food sources for vertebrates, and vectors of several bird parasites, making them ideal focus taxa for inventory based studies as well.

Methods

Sampling of the ant and grasshopper fauna of the Big Thicket region was conducted during 14-18 September 2011, 19-22 June and 23-26 September 2012, 19-22 June and 29-30 September 2013, and 26-28 July 2014 across twenty-two sites (**Table 1**). Sites were typically visited several times across different seasons to better document the fauna of the area. Ants were sampled using various methods including visual searching for ants on the ground, in leaf litter, and plant parts. Leaf litter and other decaying organic matter was collected and placed in a Berlese funnel in the laboratory for extraction of ants. Foraging ants were collected by hand and with the use of baits, namely peanut butter and cookies, at each locality. Grasshopper specimens were acquired by capturing individuals with a standard insect net once a collector on foot flushed them from the vegetation or ground. Ant and grasshopper specimens are deposited in the Mississippi Entomological Museum at Mississippi State University.

Table 1. Collection locality and habitat data for survey sites in the Big Thicket region of Texas. Habitat types after Watson (2006).

Unit	Lat/Long	Habitat Type
R. E. Larsen Sandyland Sanctuary	30°20'54"N 94°14'13"W	Arid sandyland
Big Thicket NP: Turkey Creek Unit	30°27'42"N 94°21'04"W	Bottomland hardwood forest
Big Thicket NP: Turkey Creek Unit	30°28'02"N 94°20'45"W	Bottomland hardwood forest
Big Thicket NP: Turkey Creek Unit	30°36'48"N 94°20'39"W	Upland Pine Savannah
Big Thicket NP: Turkey Creek Unit	30°34'56"N 94°20'10"W	Mesic longleaf savannah
Big Thicket NP: Turkey Creek Unit	30°31'15"N 94°20'37"W	Upland Hardwood Forest
Big Thicket NP: Turkey Creek Unit		
Big Thicket NP: Hickory Creek Savannah Unit	30°32'53"N 94°23'34"W	Mesic Longleaf Savannah
Big Thicket NP: Lance Rosier Unit	30°15'03"N 94°29'12"W	Bottomland hardwood forest
Big Thicket NP: Lance Rosier Unit	30°15'30"N 94°30'44"W	Bottomland hardwood forest
Big Thicket NP: Lance Rosier Unit	30°18'22"N 94°22'24"W	Cutover Pitcher Plant Bog
Big Thicket NP: Lance Rosier Unit	30°18'21"N 94°26'54"W	Palmetto hardwood flat
Marysee Prairie	30°15'16"N 94°40'43"W	Coastal Prairie
Big Thicket N.P. Visitors Center	30°27'30"N 94°40'13"W	Upland Pine Savannah
Watson Preserve	30°34'45"N 94°22'40"W	Mesic Pine Savannah
Big Thicket NP: Big Sandy Creek Unit	30°40'46"N 94°41'58"W	Upland Pine Savannah
Big Thicket NP: Big Sandy Creek Unit	30°36'52"N 94°40'14"W	Upland Pine Savannah
Big Thicket NP: Big Sandy Creek Unit	30°38'34"N 94°39'41"W	Upland Pine savannah
Big Thicket NP: Big Sandy Creek Unit	30°34'22"N 94°38'32"W	Bottomland Cypress forest
Big Thicket NP: Beech Creek Unit	30°43'10"N 94°13'37"W	Beech hardwood forest
Big Thicket NP: Neches Bottom & Jack Gore Baygall Unit	30°29'50"N 94°11'25"W	Pine-hardwood forest
Village Creek State Park	30°15'17"N 94°10'16"W	Pine-hardwood forest
1 mi E Evadale	30°21'13"N 94°05'43"W	Mesic hardwood forest

Results

During this survey, 48 ant species and 23 grasshopper species were documented across various habitats within the Big Thicket (**Tables 2 and 3**). The documentation of three ants, *Aphaenogaster miamiana* Wheeler, *Dolichoderus pustulatus* Mayr and *Strumigenys angulata* Smith represent new state records for Texas. Additionally, nine exotic ant species were documented in the region with three species (*Brachymyrmex patagonicus* Mayr, *Solenopsis invicta* Buren, and *Pheidole morens* Wheeler) being extremely abundant, even in apparently undisturbed habitats. Molecular analysis of several *S. invicta* colonies from the region indicated that both the monogyne and polygyne social forms of *S. invicta* are present in the region. Additionally, the tawny crazy ant, *Nylanderia fulva* Mayr, and emerging invasive species, is now documented in the area. An undescribed species of grasshopper belonging to the *Melanoplus*

scudderi species group was documented in several habitats in the region, and a revision of the group is being undertaken by the author.

Discussion

The region experienced drought condition during the first two years of the study, which seemingly resulted in lower numbers of litter dwelling and many epigeic species during those years, and may be the reason for the apparent dominance of invasive species even in deep forests. Native ant abundance appeared to be recovering in 2014. Additional ant species will likely be documented with further sampling as several species that occur in the southeastern United States have yet to be found, including several that should occur in the region, based on county level maps depicted by O'keefe et al. 2000. Of special note is the appearance of *Nylanderia fulva*, the tawny crazy ant, at the NPS Field Research Station. Colonies of *N. fulva* have multiple queens and are capable of reproducing by budding. These ants will readily colonize parked vehicles. Care should be taken to reduce the possibility that individuals of *N. fulva* do not enter vehicles parked at the station, as it is likely they will be spread to other areas. A rare reddish variant of *Myrmecina americana* (Fig. 3D) was collected during the final sampling period in the palmetto hardwood flats. Originally described as the subspecies *Myrmecina americana brevispinosa*, these smaller, less sculptured, and lighter colored variants were synonymized with *M. americana* by Brown (1951) after he discovered that a lab reared colony of typical *M. a. americana* that was starved in an artificial nest produced workers that corresponded to *M. a. brevispinosa*.

Grasshopper diversity in the Big Thicket has proven to be comparable to studies of other mosaic habitats in the southeastern United States (Hill 2007, 2009, 2012). Two species, *Romalea microptera* (Beauvois) and *Melanoplus angularis* Little, were not collected during this survey. The record of *R. microptera* was a sight record, as the individual was observed on from a bridge where the ground below was not easily accessible. However, the species is very unique, thus the determination is certain. No individuals of *M. angularis* were detected during this survey, though several special attempts were made to visit localities where it was previously known, in addition to other localities. Potentially suitable habitat was detected at the Watson Preserve, likely one of the original locales, but nowhere else in the area. One undescribed grasshopper species, which will be placed in the genus *Melanoplus*, was documented from several locales in the Big Thicket. This species is distributed in east Texas, southwestern Arkansas and western Louisiana and should be described in the next year.

Table 2. Ants collected in the various habitats of the Big Thicket region of Texas. Coastal Prairie (CP), Arid Sandyland (AS), Upland Pine Savannah (UPS), Palmetto Hardwood Flats (PHF), Bottomland Hardwood/Cypress Slough (BHCS), Mesic Pine Savannah, and Beech/Hardwood (BH), and Mixed Pine-Hardwood Forests (MF). * denotes a new state record for Texas and ** denotes an exotic species. ¹ Collected on the lawn at NPS Field Research Station. Taxonomy follows Bolton (2014).

Ant Species	CP	AS	UP	PHF	BHCS	MPS	BH	MF
<i>Aphaenogaster miamiana</i> Wheeler*	0	0	0	1	1	0	0	1
<i>Aphaenogaster treatae</i> Forel	0	1	0	0	0	0	0	0
<i>Atta texana</i> (Buckley)	0	1	1	0	0	0	0	0
<i>Brachymyrmex depilis</i> Emery	0	0	0	1	0	0	1	1
<i>Brachymyrmex patagonicus</i> Mayr**	1	0	1	1	0	1	0	0
<i>Camponotus castaneus</i> (Latreille)	0	1	0	1	0	0	0	1
<i>Camponotus pennsylvanicus</i> (DeGeer)	0	0	1	1	1	0	0	1
<i>Crematogaster ashmeadi</i> Mayr	0	0	0	1	0	0	0	1
<i>Crematogaster lineolata</i> (Say)	0	0	1	0	0	0	0	0
<i>Crematogaster pilosa</i> Emery	0	0	0	1	0	0	0	0
<i>Crematogaster pinicola</i> Deyrup and Cover	0	1	0	0	0	0	0	0
<i>Cyphomyrmex rimosus</i> (Spinola)**	1	1	0	1	0	0	0	1
<i>Discothyrea testacea</i> Roger	0	0	1	0	0	0	0	0
<i>Dolichoderus pustulatus</i> Mayr*	0	0	0	0	0	1	0	0
<i>Dorymyrmex bureni</i> (Trager)	1	1	0	0	0	0	0	0
<i>Forelius mccooki</i> (McCook)	0	0	1	0	0	0	0	0
<i>Formica dolosa</i> Buren	1	0	0	0	0	0	0	0
<i>Hypoponera inexorata</i> (Wheeler)	0	0	0	1	0	0	0	0
<i>Hypoconerops opacior</i> (Forel)	1	0	0	1	0	0	0	1
<i>Labidus coecus</i> (Latreille)	0	1	0	1	0	0	0	0
<i>Leptogynes elongata</i> (Buckley)**	0	0	0	0	1	0	0	0
<i>Monomorium minimum</i> (Buckley)	0	0	1	1	0	0	0	0
<i>Myrmecina americana</i> Emery	0	0	0	1	0	0	0	0
<i>Nylanderia arenivaga</i> (Wheeler)	0	1	0	0	0	0	0	0
<i>Nylanderia faissonensis</i> (Forel)	0	0	0	1	0	0	0	1
<i>Nylanderia fulva</i> (Mayr)** ¹	0	0	0	0	0	0	0	0
<i>Nylanderia terricola</i> (Buckley)	1	0	0	0	0	0	0	0
<i>Pachycondyla harpax</i> (Fabricius)**	0	1	1	1	0	0	1	0
<i>Pheidole dentata</i> M.R.Smith	0	1	1	1	0	0	1	1
<i>Pheidole dentigula</i> Smith	0	0	0	0	1	0	1	0
<i>Pheidole metallescens</i> Emery	0	1	1	1	0	0	0	0
<i>Pheidole moerens</i> Wheeler**	0	0	1	1	0	0	1	1
<i>Ponera pennsylvanica</i> Buckley	0	0	0	1	0	0	1	1
<i>Ponera exotica</i> Smith	0	0	0	0	0	0	0	1
<i>Solenopsis carolinensis</i> Forel	0	0	0	1	1	0	1	1
<i>Pseudomyrmex gracilis</i> (Fabricius)**	0	0	0	0	0	0	0	1
<i>Pseufoemyrmex ejectus</i> (Smith)	0	0	0	0	0	0	0	1
<i>Solenopsis invicta</i> Buren**	1	1	1	1	1	1	1	1

Ant Species	CP	AS	UP	PHF	BHCS	MPS	BH	MF
<i>Solenopsis subterranea</i> MacKay & Vinson	1	0	0	0	0	0	0	0
<i>Solenopsis tonsa</i> Thompson	0	1	0	0	0	0	0	0
<i>Strumigenys louisianae</i> Roger	0	1	0	1	0	0	1	1
<i>Strumigenys angulata</i> Smith*	0	1	0	0	0	0	0	0
<i>Strumigenys dietrichi</i> M. R. Smith	0	0	0	0	0	0	1	0
<i>Strumigenys membranifera</i> Emery**	0	0	0	1	0	0	0	1
<i>Strumigenys ornata</i> Mayr	0	0	0	1	1	0	0	0
<i>Strymigenys silvestrii</i> Emery**	0	0	0	0	1	0	0	0
<i>Trachymyrmex septentrionalis</i> (McCook)	0	0	1	0	0	0	0	1
Totals	8	15	11	24	4	3	9	

Table 3. Grasshoppers collected in the Big Thicket of Texas. Coastal Prairie (CP), Arid Sandyland (AS), Upland Pine Savannah (UPS), Palmetto Hardwood Flats (PHF), Bottomland Hardwood/Cypress Slough (BHCS), Mesic Pine Savannah, and Beech/Hardwood (BH). ¹Literature record. Taxonomy follows Eades et al. (2014)

Grasshopper Species	CP	AS	UPS	PHF	BHCS	MPS	BH
<i>Achurum carinatum</i> (Walker)	0	0	1	0	0	0	0
<i>Amblytropidia mysteca</i> (Saussure)	1	0	1	1	0	0	0
<i>Arphia sulphurea</i> (Fabricius)	0	0	1	0	0	1	0
<i>Arphia xanthoptera</i> (Burmeister)	0	0	1	0	0	0	0
<i>Campylacantha olivacea</i> (Scudder)	0	0	1	0	0	0	0
<i>Chortophaga viridifasciata</i> (DeGeer)	1	1	1	0	0	0	0
<i>Dichromorpha viridis</i> (Scudder)	1	0	1	0	1	0	0
<i>Melanoplus angularis</i> Little ¹	0	0	0	0	0	0	0
<i>Melanoplus angustipennis</i> (Dodge)	0	1	1	0	0	0	0
<i>Melanoplus differentialis nigricans</i> Cockerell	1	0	0	0	0	0	0
<i>Melanoplus keeleri</i> (Thomas)	0	0	1	0	0	0	0
<i>Melanoplus ponderosus ponderosus</i> (Scudder)	1	0	1	1	1	0	0
<i>Melanoplus sanguinipes vulturnus</i> Gurney and Brooks	1	1	0	0	0	0	0
<i>Melanoplus sp. nov.</i>	0	1	1	0	0	0	0
<i>Orphulella pelidna</i> (Burmeister)	1	1	1	1	0	1	0
<i>Orphulella speciosa</i> (Scudder)	1	0	0	0	0	0	0
<i>Paroxya atlantica</i> Scudder	1	0	0	0	0	1	0
<i>Psinidia fenestralis</i> (Serville)	0	1	0	0	0	0	0
<i>Schistocerca alutacea</i> (Harris)	0	0	0	0	0	1	0
<i>Schistocerca americana</i> (Drury)	1	1	0	0	0	0	0
<i>Schistocerca damnifica</i> (Saussure)	1	1	1	0	0	0	0
<i>Spharagemon bolli</i> Scudder	0	1	0	0	0	0	0
<i>Spharagemon cristatum</i> (Scudder)	1	1	1	0	0	0	0
<i>Syrbula admirabilis</i> (Uhler)	0	0	1	0	0	1	0
<i>Romalea microptera</i> (Beauvois)	0	0	0	0	1	0	0
Totals	12	10	16	3	3	5	0

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