Passive Re-colonization of the Spider Assemblage on an Ohio Restored Tall Grass Prairie Compared to Nearby Remnant Prairies and Old Fields

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ABSTRACT. The reconstructed prairie on the Marion Campus of The Ohio State University was established in 1977. Since then restoration has focused on plants. Animals on the site have recolonized without active management. Spider assemblages were sampled in 2000 and compared to those sampled at the time on 2 remnant prairies and 2 old fields. Pitfall traps and sweep nets were used for sampling. In 2000, spiders (n = 1,541) representing 94 species were captured; 91% of these were captured with pitfall traps. The restored Marion Campus Prairie was inhabited by an assemblage of spiders resembling those on nearby remnant prairies and old fields.

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INTRODUCTION

In recent decades there has been a movement to restore prairie habitat in North America (Samson and Knopf 1996). This effort followed the realization that tall grass prairies have been largely replaced by agricultural development in North America. Currently, less than 5% of this once widespread biome remains (Whiles and Charlton 2006). Ohio lies at the eastern end of an area that was characterized by patches of tall grass prairie and oak savannah openings referred to as the *Prairie Peninsula* by Transeau (1935). Cusick and Troutman (1978) estimated that these openings covered approximately 294,000 ha in Ohio during pre-settlement times. One of the larger patches, referred to as the Sandusky Plains, was in Crawford, Marion, and Wyandot Counties in Ohio. Researchers estimate that the Sandusky Plains once covered approximately 77,700 ha (Clutter 2001). What remains of the original Sandusky Plains flora are mostly relatively small remnants comprising about 100 ha (Troutman 1981).

The arthropod fauna of North American prairie grasslands has been studied by many workers (Rice 1932; Shackleford 1942; Peck 1966; Lussenhop 1976; Kirchner 1977; Rottman and Capinera 1983; Siemann et al. 1997; Siemann 1998; Harper et al. 2000; Jonas et al. 2002; Panzer 2002; Fay 2003). Most of these studies were inventories of species present, with a focus on insects. Much of this work has been done on the influence of disturbance, especially fire, on arthropod communities—primarily focused on insects in grasslands (Rice 1932; Bulan and Barrett 1971; Riechert and Reeder 1972; Seastedt et al. 1986; Weaver 1987; Hansen 2000; Harper et al. 2000; Jonas et al. 2002; Panzer 2002). Fire can depress populations briefly, but these studies generally conclude that arthropod populations recover relatively quickly.

In an extensive review of the literature on arthropods in prairies, Whiles and Charlton (2006) point out that there is a need for work that determines what species of other arthropod predators, in particular, spiders, are present in North American prairies. Very few studies provide detailed information about prairie spiders in the North American context (Lowrie 1948; Muma and Muma 1949; Peck 1966; Riechert and Reeder 1972; Bruggeman 1981; Bultman et al. 1982; Weaver 1987; Okins and Johnson 2005). More study of spiders in grassland habitats has been conducted in Europe—see references in Curry (1994) and Bell et al. (2001). These studies have highlighted the importance of spiders as mid-level arthropod predators in structuring grassland communities.

Spiders in abandoned or fallow agricultural fields, often referred to as "old fields," have been examined by a few workers in North America (MacMahon and Trigg 1972; Peck and Whitcomb 1978; Haskins and

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Shaddy 1986; Cangialosi 1989; Okins and Johnson 2005). Again, more work has been conducted in Europe (see review by Bell et al. 2001). Because old fields are often located in regions where the principal native vegetation with this physiognomy are tall grass prairies, it has been assumed that they would be colonized by species of animals that inhabit prairies. There appear to be no published studies that explicitly compare the spider faunas of tall grass prairies and old fields. There is 1 study of a similar design that investigated ground beetles (Coleoptera: Carabidae) in original and restored prairies in Iowa (Larsen and Work 2003). These authors found that ground beetle diversity was highest in tall grass prairie, but that activity density was low. They speculate that the high stem density impedes ground beetle activity on the ground surface.

Prairie restorations have generally depended upon passive re-colonization for their arthropod faunas (Trager 1990). The exceptions to this passive approach are exemplified by work with charismatic Lepidoptera (e.g., the Karner blue Butterfly, *Plebejus melissa samuelis* (Nabokov, 1944) (Andow et al. 1994)). It is unknown whether passive colonization is effective at restoring native arthropod assemblages to restored prairies. The current study compared 2 small prairie remnants of the Sandusky Plains—the Claridon Railroad Prairie (CRP) and the Daughmer Prairie Savannah State Nature Preserve (DPSSNP)—and 1 small reconstructed prairie, the 1977 restored Marion Campus Prairie (MCP). Additionally, contemporaneous sampling of 2 old fields in Big Island Wildlife Area (BIWA) and Delaware Wildlife Area (DWA) provide a comparison with local, early successional habitats. ***This work tested the hypothesis that passive re-colonization has established a spider assemblage similar to that in remnant prairie sites of the Sandusky Plains, Ohio***.

METHODS AND MATERIALS

Sampling Localities

Spiders were sampled at 5 locations: 2 were remnant prairies (DPSSNP, CRP), 1 was a reconstructed prairie (MCP), and 2 were old fields (BIWA, DWA).

Daughmer Prairie Savannah State Nature Preserve (DPSSNP): a 13.8 ha tall grass prairie-bur oak (*Quercus macrocarpa*) savannah (Troutman 1981). This Crawford County site is surrounded primarily by row-crop agricultural fields and distant woodlots. At the time of sampling, it was subject to relatively frequent grazing by sheep (lat 40°43'50.9"N, long 83°05'38.9"W).

Claridon Railroad Prairie (CRP): a 2.2 ha tall grass prairie located along a railroad right-of-way. This remnant supports a diverse plant community including 5 state-listed plant species (2 threatened and 3 potentially threatened) (Klips 2003). This site is located in Marion County and surrounded primarily by row-crop agricultural fields and nearby low-density industrial development. It is managed primarily by selective removal of both non-native species and woody plants (lat 40°37'08.4"N, long 83°01'33.8"W).

The Marion Campus Prairie (MCP): a restored prairie on The Ohio State University at Marion campus, Marion County, Ohio. Plantings at the MCP were initiated by Larry Yoder and his students on 1.1 ha in 1977 (Klips 2004). The restoration effort has continued, and at the time of this study the Marion Campus Prairie occupied approximately 2 ha. The restoration was accomplished by planting seeds and transplanted clumps of vegetation exclusively from sites within the historic Sandusky Plains, primarily from the Claridon Railroad Prairie. The Marion Campus Prairie is surrounded by row-crop agriculture, a small creek with riparian edge, lawns, parking lots, and residential and campus development. Management activities on the site include periodic controlled burning (at approximately 2-year intervals), selective removal, and herbicide treatment of weedy invasive and native woody species (lat 40°34'32.3"N, long 83°05'18.0"W).

Big Island Wildlife Area (BIWA): a 830 ha old field in a 2,036 ha wildlife area surrounded by wooded areas, wetlands, riparian floodplain, low-density residential, and row-crop agriculture (lat 40°34'37.5"N, long 83°15'22.4"W).

Delaware Wildlife Area (DWA): a 311 ha old field in a 2,625 ha wildlife area surrounded by woodlots, wooded riparian floodplain, reservoir, state park, and some row-crop agriculture (lat 40°26'20.1"N, long 83°03'25.1"W).

The 2 old field sites (BIWA, DWA) are located in state-owned wildlife areas and are managed primarily by periodic mowing and woody plant removal. They are dominated by herbaceous perennial forbs (*Solidago* spp., *Aster* spp.), herbaceous annual and biennial forbs (*Brassica* spp., *Cirsium* spp., *Daucus carota*, *Erigeron* spp.), and non-native grasses (*Setaria* spp., *Bromus* spp., *Festuca* spp.).

Collecting Methods—Pitfall Trapping and Sweep Net Sampling

Pitfall trapping. Open pitfall traps were placed in 2 lines of 5 traps each. The individual traps were spaced 5 m apart and the 2 lines were separated by at least 25 m and more than 10 m from any edge. Each trap was an open 1-liter plastic cup with a top opening diameter of 11 cm and a depth of 15 cm. Traps were buried so that the lip was flush with the soil surface. Traps were filled approximately one-third full of a 1:1 solution of propylene glycol and water. Traps were left open at each site for 7 days during the sampling period and the contents were collected at the end of the period. There were 4 sampling periods: 18 to 27 June, 17 to 25 July, 13 to 21 August, and 19 to 27 September 2000. All organisms trapped were sorted by taxon and transferred to 70% ethanol for identification and storage.

Sweep sampling. Two sets of 50 sweeps with a 39 cm diameter net were made at each site, parallel to the 2 pitfall trap lines. All arthropods captured in the sweep samples were placed in 70% ethanol. All sweeps were conducted in dry conditions on the same dates (23 June, 20 July, 21 August, and 19 September 2000) at all sites. All samples were collected between 10:00 and 16:00 on these dates.

Identification and disposition. All adult spiders were identified to species and catalogued into the Ohio Spider Survey database. The specimens were deposited into the collections of the Department of Entomology, The Ohio State University (OSAL). Immature spiders were sorted to genus or family but were not included in these analyses unless they represented a determinable genus for which no adults were recorded.

Assemblage Analyses

Collections at each site were compared using traditional similarity measures (Morisita-Horn sample similarity index and Bray-Curtis sample similarity index) as well as 2 randomization resampling-based measures that provide confidence limits for statistical inference (Chao's Jaccard abundance-based similarity index and Chao's Sorensen abundance-based similarity index) (Chao et al. 2006). These later 2 estimators are designed to reduce the negative bias in traditional similarity indices that are present with incomplete sampling of species-rich assemblages. An important feature of these later 2 tests is that they incorporate species abundance weightings in the calculations. All analyses were performed using EstimateS Version 8.0 (Colwell 2005).

RESULTS

A total of 1,541 spiders were collected. The pitfall traps were more productive than the sweep samples: 1,407 (91%) individuals were captured in the pits while 134 (9%) were captured in the sweep samples. Of 94 species captured during this study, 69 (73%) were captured exclusively in pit samples, 21 (22%) exclusively in sweep samples, and only 4 (4%) were captured by both methods. It is clear that these samples reflect only a portion of the actual species diversity found at these sites. For example, in a separate investigation at the MCP site, a total of 1,646 individuals representing 143 species have been collected between 1988 and 2006 (unpublished data). The 48 species found in the current study thus represent only 34% of the known spider fauna at this site.

Spider species (n = 94) were collected across all 5 sites (Table). The prairie remnant sites yielded samples with more individuals and species (CRP yielded 436 individuals, 49 species and DPSSNP yielded 320 individuals, 47 species) than the old field sites (BIWA yielded 239 individuals, 37 species and DWA yielded 220 individuals, 42 species). The MCP site had a diversity that was similar to the prairie sites (326 individuals, 48 species).

The Bray-Curtis similarity index is considered more conservative (typically lower estimate of similarity) than the Morisita-Horn index (Colwell 2005). This was consistently true for each comparison in the spider assemblage data. According to the Morisita-Horn and Bray-Curtis similarity indices the 2 old field sites shared the most similar spider assemblages (Morisita-Horn 0.92 and Bray-Curtis 0.64). By these indices, the 2 prairie remnants were less similar to each other (0.67 and 0.48 respectively). The 4 comparisons between the old field sites and prairie remnants yielded lower similarity estimates (Morisita-Horn range from 0.47 to 0.35 and Bray-Curtis range from 0.38 to 0.30).

When the reconstructed prairie (MCP) is compared to the 2 prairie remnants using the traditional indices, intermediate similarities are obtained (Morisita-Horn 0.55 (CRP), 0.45 (DPSSNP) and Bray-Curtis 0.44 (CRP), 0.34 (DPSSNP)). The spider assemblage from the reconstructed prairie is even more similar to that from the old field sites (Morisita-Horn 0.73 (BIWA), 0.76 (DWA) and Bray-Curtis 0.53 (BIWA), 0.55 (DWA)). Thus, it appears that using the traditional similarity indices leads to the conclusion that the reconstructed prairie supports a spider assemblage that is more similar to a local old field than a remnant prairie.

Both of the traditional similarity indices employed above share a negative bias that results from the fact that only a portion of the assemblage present at the site appears in the samples. For example, only 34% of the known species found on the MCP appear in the sample from the current study at that site. This prevalence of undetected species inevitably leads to an underestimate of the true species overlap (Chao et al. 2005; Chao et al. 2006). For this reason, similarity indices were employed that attempt to estimate this negative bias and adjust the similarity indices accordingly. Because this method involves multiple re-sampling, it has the additional advantage of generating confidence limits that can be used in statistical inference (Chao et al. 2006).

As predicted by Colwell (2005), all of the estimates derived with the adjustment for missing species produce higher similarity values. The results from the Chao-Jaccard and Chao-Sorensen similarity indices are somewhat similar to the traditional indices in that comparisons between the old field sites yield higher similarity values (Chao-Jaccard 0.97, Chao-Sorensen 0.98) than comparisons between the 2 prairie remnant sites (Chao-Jaccard 0.86, Chao-Sorensen 0.92). As with the traditional indices, comparisons of the old fields to prairie remnants yield intermediate similarity values (Chao-Jaccard range from 0.97 to 0.74, Chao-Sorensen range from 0.99 to 0.81). Comparisons of the MCP to the old field sites also yield intermediate similarity values (Chao-Jaccard 0.82, 0.88; Chao-Sorensen 0.90, 0.97). Comparisons between the MCP and the prairie remnants also yield comparable similarity estimates (Chao-Jaccard 0.78, 0.93; Chao-Sorensen 0.87, 0.97), as was the case with the traditional indices. All of these apparent differences are not actually distinguishable statistically because variability in the estimates generates broadly overlapping confidence limits. In summary, using the adjusted similarity indices provides some support for the idea that the MCP supports a spider assemblage more like an old field, but this conclusion must be tempered by the statistical reality that the revealed differences may be the result of sampling error.

A review of published and unpublished lists of spider species, from these habitat types in northeastern North America, helped examine the basic similarity of spider assemblages in prairies and old fields. Nine lists from prairies and 11 lists from old fields and meadows were found in the literature (Lowrie 1948; Muma and Muma 1949; Cannon 1963; Peck 1966; Riechert and Reeder 1972; MacMahon and Trigg 1972; Penniman 1975; Bruggeman 1981; Bultman et al. 1982; Weaver 1987; Abraham 1996; Stirnaman et al. 1998; Bradley and Hickman 2009) as well as the Ohio Spider Survey database. These data demonstrate broad spider-species community similarity. Of the 400 spider species present on at least 1 list: 226 (57%) are rarely-encountered species that appear on only 1 or 2 of the original 20 lists, 160 (40%) species appear on both the combined prairie and combined old field lists, and only 18 (<5%) species appear on several lists that are either prairie only (11 species) or old field only (7 species). Thus, there is no evidence that great differences exists between the spider-species assemblages in these 2 habitats.

Four species, often present on prairie lists but usually absent from old field lists, may represent prairie specialists: *Eridantes erigonoides* (Emerton, 1882); *Marpissa lineata* (C. L. Koch, 1846); *Xysticus triguttatus* Keyserling, 1880; and *Euryopis funebris* (Hentz, 1850). Only 1 species, *Eris militaris* (Hentz, 1845), was present on most old field lists but not found on any prairie list. Three of these 4 prairie specialists were found among the MCP specimens collected during the current study. The fourth species (*Euryopis funebris*) has been found at the MCP, but not as part of this sampling effort. The common old field spider, *Eris militaris*, has also been found on the MCP—but not during the current project.

Five spider species collected by William Barrows from central Ohio prairies during 1913 to 1924 (Barrows 1918, 1924, 1943) (*Araneus pratensis* (Emerton, 1884); *Goneatara nasutus* (Barrows, 1943); *Micaria longipes* Emerton, 1890; *Sassacus papenhoei* Peckham & Peckham, 1895; *Xysticus pellax* O. Pickard-Cambridge, 1894) were not collected during this study. Two other species that Barrows found in Ohio prairies were collected: *Hypselistes florens* (O. Pickard-Cambridge, 1875) at MCP and *Rabidosa rabida* (Walckenaer, 1837) at CRP, DPSSNP, BIWA, and DWA. It is not clear whether the fact that only 2 out of 7 species were collected during the current study is because they are not present or because of the relatively low sampling intensity. At least 1 of these species, *Araneus pratensis*, has been found in more extensive sampling that was not part of the current study at MCP.

DISCUSSION

Most of the active restoration efforts have concentrated on prairie plants (Larsen and Work 2003). The few animal species that have been actively managed as part of prairie restoration efforts have been vertebrates (Oldemeyer et al. 1993; Davidson et al. 1999; Smeeton and Weagle 2000). In contrast, invertebrates have not received active restoration (Opler 1981; Larsen and Work 2003). Notable exceptions are work on populations of butterflies (Swengel 1996; Debinski and Babbit 1997): in particular the Karner blue Butterfly (*Plebejus melissa samuelis*) (Andow et al. 1994) and the Regal Fritillary (*Speyeria idalia* (Drury, 1773)) (Debinski and Kelly 1998; Kopper et al. 2000).

Even if restoration efforts focused on invertebrates have been rare, some work has been done to document the composition of the arthropod faunas. In a study comparing the ground beetles (Coleoptera: Carabidae) of original prairie remnants and reconstructed prairies in northeastern Iowa, significant differences in species composition were found between these habitats (Larsen and Work 2003). The statistical differences that these authors detected were primarily driven by the abundance of 5 common species, 4 generalists and 1 prairie specialist. In the current study, no clear patterns of species abundance differences were detected among the common spider species collected.

It has been shown that the prevalence of fire as a management tool for prairie restoration has a substantial influence on the arthropod fauna (Nagel 1973; Warren et al. 1987; Reed 1997; Panzer 2002). Reed (1997) reported that while fire depresses arthropods in the short term, areas of regenerated prairie are re-colonized within a decade or two. Thus, if suitable source populations exist, it can be expected that arthropods will also colonize restored prairies. Spider community composition was strongly, but temporarily, influenced by fire management in a mixed prairie restoration area (Riechert and Reeder 1972). These authors also showed that the spider-species composition remained relatively constant on an established prairie remnant (Riechert and Reeder 1972). Weaver (1987) demonstrated an initial increase in spider numbers and biomass immediately following burns, but this effect disappeared within 4 years.

Disturbance is an important aspect of tall grass prairie ecosystems, and the prairie remnants studied here were subject to different disturbance regimes. The Claridon Railroad Prairie was managed by selective removal or herbicide use to control invasive weedy species. Daughmer Prairie Savannah State Nature Preserve was subject to occasional grazing. The restored Marion Campus Prairie was managed primarily by springtime fires at approximately 2-year intervals. The old fields (Big Island Wildlife Area and Delaware Wildlife Area) were managed primarily by mowing. These management differences may well contribute to the differences detected in spider assemblage composition. Because the different management methods have an important influence on the vegetation composition, it is difficult to separate the direct effects of fire on the spider assemblage from the indirect effects acting through the alteration of vegetation at the sites. The vegetation differences between the current study sites were documented by Klips (2003, 2004). Weaver (1987) tested this with an experimental manipulation intended to simulate the influence of fire on prairie vegetation. Frequent fires tend to reduce forb (dicot) dominance and favor grasses (monocots). Manipulations included removal of dicots, monocots, or litter. The result of this experiment demonstrated that the vegetation manipulations did simulate some of the effects of fire on spiders, but not all.

The Marion Campus Prairie is 7.3 km from the nearest prairie remnant, Claridon Railroad Prairie. The Claridon prairie is also quite small and it seems unlikely to be a major source population at that distance, particularly in light of the fact that prevailing southwestern winds would carry spiders directly away from the MCP. Most colonization of the MCP would likely have been from distant sources (via ballooning) or from local heterogeneous habitats, including old fields. Alternately, some spiders or their eggs may have been directly imported to the MCP with plant materials in the process of restoration. In particular, the transport of clumps of vegetation with soil are a potential source of founding individuals for some spider species. The sources for such plant materials are local Sandusky Plains remnants, primarily the CRP. It is interesting to speculate about one uncommon species, *Zodarion rubidum* Simon, 1914, which has been found in central Ohio only at the CRP and the MCP. These small spiders live at the soil interface and build small retreats either under rocks or other debris. It seems possible that the population detected at the MCP may have been established by accidental transportation from the CRP with plant materials during restoration efforts. This species has also been found in abandoned properties in Cleveland, Ohio, most abundantly in planted prairies (Burkman and Gardiner 2015).

All of the localities in the current study represent small patches in a larger landscape of agricultural fields and small woodlots. Lower density and diversity of spiders (Braschler and Baur 2016) would be expected in this fragmented habitat. This may explain why the spider diversity and abundance, detected in the current study, were both relatively low in comparison to other tall grass prairie spider studies (MacMahon and Trig 1972; Stirnaman et al. 1998; Bradley and Hickman 2009). Dahms et al. (2010) studied arthropods in German grasslands which were judged to have high or low agronomic potential. They demonstrated that the low agronomic-potential grasslands supported a relatively high diversity of spiders and may be of significant value for preservation of invertebrate biodiversity. The current study detected a somewhat diverse assemblage of spiders, including a few species that appear to be prairie specialists. Thus, even the small patches of open habitat studied here may provide an important refuge for grassland spider diversity in central Ohio.

CONCLUSION

Some differences were found between the spider assemblages at prairie remnants, old fields, and a reconstructed prairie—all in central Ohio. ***It appears that the reconstructed prairie supports a fauna with similar spider diversity to the remnant prairies, and shares a few species found primarily on the prairie remnant sites.*** Comparisons of species overlap indices indicate a slightly greater similarity between the reconstructed prairie site and local old fields. Nevertheless, it was not possible to detect statistically significant differences between the spider assemblages found on the reconstructed Marion Campus Prairie and either local remnant prairies or local old fields. There are 2 reasons for this lack of statistical power: 1) the relatively small sample sizes generated in this study, and 2) the lack of clear differences between old field spider assemblages and those of prairies. There is some evidence from the species present that the MCP is inhabited by a "prairie assemblage" of spiders. This is based on the presence of several of the spider species identified at MCP that have been previously identified as prairie specialists by virtue of a review of published prairie and old field spider lists.

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Table
Spider species (n = 94) collected across all 5 sites
For data analytic purposes, a supplemental spreadsheet titled "Spider Species Supplemental Table" is available at http://hdl.handle.net/1811/90876

Family	Genus	Species	Collection sites				
			CRP [a]	DPSSNP [b]	MCP [c]	BIWA [d]	DWA [e]
Araneidae	*Argiope*	*aurantia*		1			
Araneidae	*Argiope*	*trifasciata*	11	12	1		
Araneidae	*Larinia*	*directa*			1		
Araneidae	*Neoscona*	*arabesca*	1		2	1	
Clubionidae	*Clubiona*	*johnsoni*	1		1		
Clubionidae	*Clubiona*	*kastoni*	1				
Corinnidae	*Castianeira*	*gertschi*	1	1	9		
Corinnidae	*Castianeira*	*longipalpa*	3	1	2		1
Corinnidae	*Castianeira*	*variata*	3	3	11	3	
Corinnidae	*Meriola*	*decepta*	1		4		
Corinnidae	*Trachelas*	*tranquillus*		1			
Dictynidae	*Argenna*	*obesa*	1			1	
Dictynidae	*Dictyna*	*foliacea*	10		5		13
Dictynidae	*Dictyna*	*volucripes*				3	
Dysderidae	*Dysdera*	*crocata*	5				
Gnaphosidae	*Drassyllus*	*creolus*	2	1			
Gnaphosidae	*Drassyllus*	*depressus*	8	7	21	5	4
Gnaphosidae	*Drassyllus*	*novus*	1				
Gnaphosidae	*Drassyllus*	*rufulus*	1				
Gnaphosidae	*Gnaphosa*	*parvula*		2			4
Gnaphosidae	*Micaria*	*elizabethae*		1		3	4
Gnaphosidae	*Micaria*	*gertschi*		1		4	1
Gnaphosidae	*Micaria*	*pulicaria*	1	6		4	
Gnaphosidae	*Sergiolus*	*decoratus*		1			
Gnaphosidae	*Zelotes*	*fratris*	16	1			
Gnaphosidae	*Zelotes*	*laccus*			1	1	9
Hahniidae	*Neoantistea*	*agilis*	4	12	1	1	
Linyphiidae	*Bathyphantes*	*pallidus*	3	61	6	1	6
Linyphiidae	*Ceraticelus*	*emertoni*	1	4	1		
Linyphiidae	*Ceraticelus*	*laticeps*	3				
Linyphiidae	*Ceratinella*	*brunnea*	3			1	
Linyphiidae	*Ceratinopsis*	*laticeps*	1	2			
Linyphiidae	*Diplostyla*	*concolor*		2			

[a] Claridon Railroad Prairie.
[b] Daughmer Prairie Savannah State Nature Preserve.
[c] Marion Campus Prairie.
[d] Big Island Wildlife Area.
[e] Delaware Wildlife Area.

Table (continued)
Spider species (n = 94) collected across all 5 sites

Family	Genus	Species	Collection sites				
			CRP [a]	DPSSNP [b]	MCP [c]	BIWA [d]	DWA [e]
Linyphiidae	*Eperigone*	*trilobata*		6			1
Linyphiidae	*Eridantes*	*erigonoides*	28	1	7	3	2
Linyphiidae	*Erigone*	*autumnalis*	2		2	3	9
Linyphiidae	*Frontinella*	*pyramitela*		1			
Linyphiidae	*Grammonota*	*inornata*	1				
Linyphiidae	*Hypselistes*	*florens*			1		
Linyphiidae	*Islandiana*	*flaveola*		7	3	3	5
Linyphiidae	*Lepthyphantes*	*zebra*		1			
Linyphiidae	*Meioneta*	*barrowsi*		2	3		
Linyphiidae	*Meioneta*	*fabra*	1	2	2		1
Linyphiidae	*Meioneta*	*unimaculata*	20	28	22	38	15
Linyphiidae	*Microlinyphia*	*pusilla*					1
Linyphiidae	*Neriene*	*clathrata*		1			
Linyphiidae	*Pocadicnemis*	*americana*	1				
Linyphiidae	*Walckenaeria*	*spiralis*	4		1	2	4
Liocranidae	*Agroeca*	*pratensis*	2				
Liocranidae	*Scotinella*	*brittoni*			1		
Liocranidae	*Scotinella*	*fratrella*	26	5	56	91	68
Liocranidae	*Scotinella*	*madisonia*	14		2		2
Liocranidae	*Scotinella*	*pugnata*	11	1	17	3	1
Lycosidae	*Allocosa*	*funerea*	26	21	7	4	5
Lycosidae	*Gladicosa*	*bellamyi*	1			1	
Lycosidae	*Gladicosa*	*gulosa*			1		
Lycosidae	*Hogna*	*helluo*	8	2	5	1	3
Lycosidae	*Pardosa*	*milvina*	1				1
Lycosidae	*Pardosa*	*modica*			2		
Lycosidae	*Pardosa*	*moesta*		1			
Lycosidae	*Pardosa*	*saxatilis*	7	5	37	6	1
Lycosidae	*Pirata*	*alachuus*					2
Lycosidae	*Pirata*	*aspirans*			1	3	2
Lycosidae	*Pirata*	*minutus*	90	96	31	22	25
Lycosidae	*Rabidosa*	*punctulata*					1
Lycosidae	*Rabidosa*	*rabida*	2	1		1	5

[a] Claridon Railroad Prairie.
[b] Daughmer Prairie Savannah State Nature Preserve.
[c] Marion Campus Prairie.
[d] Big Island Wildlife Area.
[e] Delaware Wildlife Area.

Table (continued)
Spider species (n = 94) collected across all 5 sites

Family	Genus	Species	Collection sites				
			CRP [a]	DPSSNP [b]	MCP [c]	BIWA [d]	DWA [e]
Lycosidae	*Schizocosa*	*avida*			2		
Lycosidae	*Schizocosa*	*bilineata*	12	12	7	14	2
Lycosidae	*Schizocosa*	*ocreata*			1		
Lycosidae	*Trochosa*	*sp?*		1			
Lycosidae	*Varacosa*	*avara*	2			1	
Oxyopidae	*Oxyopes*	*salticus*	6	1			1
Salticidae	*Eris*	*aurantia*		1			
Salticidae	*Hentzia*	*palmarum*					1
Salticidae	*Marpissa*	*lineata*	13		6	2	1
Salticidae	*Marpissa*	*pikei*			2	1	1
Salticidae	*Neon*	*nellii*	1			1	1
Salticidae	*Pelegrina*	*proterva*			10	2	7
Salticidae	*Phidippus*	*clarus*		1		1	1
Salticidae	*Sarinda*	*hentzi*					1
Salticidae	*Sitticus*	*cursor*	3		1	4	2
Salticidae	*Talavera*	*minuta*	4		1	3	3
Salticidae	*Zygoballus*	*rufipes*		1			
Tetragnathidae	*Tetragnatha*	*caudata*				1	
Tetragnathidae	*Tetragnatha*	*pallescens*			1		
Theridiidae	*Euryopis*	*funebris*					1
Theridiidae	*Theridion*	*differens*					1
Theridiidae	*Theridula*	*emertoni*		1	1		
Thomisidae	*Misumenops*	*sp?*			18		
Thomisidae	*Ozyptila*	*georgiana*		1			
Thomisidae	*Tibellus*	*oblongus*	2		1		
Thomisidae	*Xysticus*	*ferox*	3		3		1
Thomisidae	*Xysticus*	*triguttatus*			1		
Zodariidae	*Zodarion*	*rubidum*	69		4		
Totals							
Number of specimens			436	320	326	239	220
Number of species			49	47	48	37	42

[a] Claridon Railroad Prairie.
[b] Daughmer Prairie Savannah State Nature Preserve.
[c] Marion Campus Prairie.
[d] Big Island Wildlife Area.
[e] Delaware Wildlife Area.

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