Final report for the South Dakota Department of Game, Fish, and Parks, Wildlife Division, Small Grants Program

Reporting years 2010 and 2011

Introduction.

Spiders have always fascinated people, particularly the larger, more common and/or charismatic species often associated with grasslands and other open areas. However, most people fear spiders and do not understand their ecological role as voracious predators of insects, including insect pests. Very little has been published on the spiders of the upper Midwest grasslands, and the spiders of South Dakota are virtually unknown. Only a handful of publications noting approximately 125 total species (e.g., Peterson 1939; Okins and Johnson 2005) have been published in a state where over 600 species are expected based on other studies in other states (e.g., Ohio, Colorado, Kansas, Wisconsin).

Spiders are ubiquitous predators (Wise 1993) that have significant impacts on ecosystem diversity and function (Rypstra et al. 1999; Wise et al. 1999). Educating the general public to the ecological importance of spiders also helps educate the public to the importance of conservation and habitat preservation in general. Public support of grassland and rangeland such as the US Forest Service's Fort Pierre National Grassland (FPNG) can be further fostered by increasing public education of animals essential to the functioning of these important ecosystems. Spiders play invaluable roles in grasslands (Wise 1999), and their conservation helps conserve the grassland habitats essential to much of the economy of South Dakota (e.g., hunting, rangeland, farming).

The purpose of this grant was to sample spiders from the FPNG to determine which species are most common. The next phase of this project is to assemble a basic guide to the spiders that can be used by the US Forest Service to help people better know many of the common spiders in the native grasslands of central South Dakota. This report focuses on the collection and identification of these spiders, the primary purpose for the received funding.

Methods.

Field sites.

The field sites were four allotments (fields) of the FPNG: War Creek Northeast (Stanley Co.), Number Two Southwest (Jones Co.), Grouse Ridge North (Lyman Co.), and Little Cedar Number Four (Lyman Co.). War Creek Northeast and Number Two Southwest were sampled during summer 2010, while Grouse Ridge North and Little Cedar Number Four were sampled during summer 2011. The pitfall and ramp trap sampling locations were fixed during 2010. During 2011 sampling, pitfall traps were not used, and transects of ramp traps were changed each sampling period to provide greater sampling across these large fields.

The dominant vegetation of the field sites were Western wheatgrass (*Elymus smithii*), green needlegrass (*Stipa viridula*), buffalo grass (*Buchloe dactyloides*), silverleaf scurfpea (*Psoralea argophylla*), and prairie coneflower (*Ratibida columnifera*). The fields were not grazed at the time of sampling, but they are rotationally grazed (i.e., grazed at different times of the year) and occasionally left "to rest" without grazing, generally for a period of 1 – 3 yrs. The

fields are occasionally burned, though not in the last several years (*pers. comm.*, US Forestry Service).

Sampling methods.

I used four basic collection techniques: pitfall and ramp trapping, sweep netting, litter sifting, and hand collecting. The timing of these methods revolved around the pitfall and ramp trapping schedule. Hand collecting was done at any time in the field, while sweep netting and litter sifting were done once a month (when pitfall and ramp traps are collected starting at the end of the first week of June. Sweep netting will consist of walked transects of 10 back-and-forth sweeps approximately 15 m from and parallel to each pitfall trap transect (10 sweep transects per sweeping period, 4 sweeping periods). Litter sifting will consist of collecting plant litter to the soil surface within a 0.25 x 0.25 m quadrat, then field sifting for larger invertebrates, followed by bagging for later use in Berlese funnels. Two quadrats will be collected within 15 m of each pitfall trap transect (10 quadrat litter samples), and will be collected at the time of pitfall trap specimen collection.

In late April 2010, I established five transects of pitfall traps in each of the two fields of the FPNG sampled during 2010. Each transect consisted of five pitfall traps, with each trap separated by 3 m (50 pitfall traps total). Each trap consisted of a 10 cm (4") diameter, 20 cm (8") tall PVC sleeve into which a 710-mL (24 ounce) plastic cup was inserted and filled to approximately 4 cm with 100% propylene glycol. The PVC sleeve was capped on the bottom with a test cap, and, when not in use, the sleeve was capped also on the top to prevent accidental trapping when not in use. To deter trap raiders (e.g., microtine rodents), to prevent captured invertebrates from climbing out of the trap, and to prevent precipitation from directly flooding the trap, an 8-cm powder funnel with a base enlarged to approximately 3 cm was inserted and a 15 cm x 15 cm board was placed over each trap, leaving approximately 3 cm clearance. Pitfall trapping covered four sampling periods: May 26 to June 9, June 23 to July 7, July 21 to August 5, and September 26 to August 10.

During 2010 and starting with the first pitfall trapping date, a transect of three ramp traps was set parallel to each transect of pitfall traps. During 2010, ramp traps were only used in the War Creek Northeast field and each transect was 8 m from and parallel to the pitfall trap transect. Each ramp trap transect consisted of three traps filled to approximately 3 cm with 100% propylene glycol, with each trap of each transect separated by 3 m. Ramp traps are a novel design for capturing epigeal arthropods, and they require no soil disturbance (Bouchard et al. 2000; Pearce et al. 2005). The traps were tested during the 2010 field season, and used in place of pitfall traps during the 2011 field season.

Until sorting of the specimens, the contents of the pitfall and ramp traps and the sweep nets were transferred to Whirl-Pak bags with 100% Propylene glycol as the preservative. Spiders were then be identified to species. All mature spiders were identified to species when possible, while immature spiders were identified to family. Species names follow Platnick (2012).

Results

My sampling methods captured 3515 mature spiders in 105 species and 15 families (Table 1). The most common species were in the family Lycosidae, with *Schizocosa*

crassipalpata Roewer 1951 (724 specimens) and *Pardosa distincta* (Blackwall 1846) (541 specimens) providing the bulk of the captures. The third most common species captured was the small crab spider (family Thomisdae), *Xysticus bicuspis* Keyserling 1887 (386 specimens). Surprisingly, 149 specimens of a new species, (referred to in Table 1 as *Theridion* sp. 1, were captured. This is an unusually high number for a species unknown to science. At least two other species are new to science (*Mermessus* sp. 1 and *Ceratinops* sp. 1), and potentially others are new.

Discussion

This study discovered more than 50 species previously unknown to South Dakota, and at least 3 species that are new to science. One of the most interesting species unknown in South Dakota is the ground spider (family Gnaphosidae) *Synaphosus paludis* (Chamberlin and Gertsch 1940), known previously only as far west as southern Illinois (Platnick and Shadab, 1980). This is a range expansion of several hundred miles for this species. While not at all common in the grasslands of the FPNG (only 2 specimens were captured), this range expansion demonstrates how little is known about many spider species.

These small grants have acted as seed money for a larger project that ultimately seeks to inventory the spiders of South Dakota. The spider fauna of South Dakota is so poorly known that even a small project, such as this project, reveals a large number of species previously unreported in the state. The next phase of this project is to image the most common and unique species. These images will be used in a small guide to the common species of the FPNG.

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Table 1. List of spider families and species (Araneae) captured at the Fort Pierre National Grassland. Species for which an species-level identification could not be determined are given a numerical assignment within the genus or family.

Agelenidae
- *Agelenopsis emertoni* Chamberlin & Ivie 1935
- *Agelenopsis* sp. 1
- *Agelinopsis oklahoma* (Gertsch 1936)

Araneidae
- *Neoscona pratensis* (Hentz 1847)

Clubionidae
- *Clubiana mutata* Gertsch 1941

Corinnidae
- *Castianeira descripta* (Hentz 1847)
- *Castianeira gertschi* (Hentz 1847)
- *Phrurolithus connectus* Gertsch 1941
- *Phrurotimpus certus* Gertsch 1941
- *Scotinella pugnata* (Emerton 1890)

Dictynidae
- *Cicurina arcuata* Keyserling 1887
- *Dictyna* sp. 1
- *Dictyna* sp. 2
- *Dictyna* sp. 3
- *Dictyna terrestris* Emerton 1911

Gnaphosidae
- *Cesonia bilineata* (Hentz 1847)
- *Drassodes auriculoides* Barrows 1919
- *Drassyllus depressus* (Emerton 1890)
- *Drassyllus nannellus* Chamberlin & Gertsch 1940
- *Gnaphosa fontinalis* Keyserling 1887
- *Gnaphosa parvula* Banks 1896
- *Haplodrassus bicornis* (Emerton 1909)
- *Haplodrassus chamberlini* Platnick & Shadab 1975
- *Micaria alpina* L. Koch 1872
- *Micaria gertschi* Barrows & Ivie 1942
- *Sergiolus decoratus* Kaston 1945
- *Synaphosus paludis* (Chamberlin & Gerstch 1940)
- *Zelotes hentzi* Barrows 1945
- *Zelotes laccus* (Barrows 1919)
- *Zelotes puritanus* Chamberlin 1922

Linyphiidae
- *Agyneta* sp. 1
- *Bathyphantes pallidus* (Banks 1892)
- *Ceraticelus emertoni* (O. Pickard-Cambridge 1847)
- *Ceraticelus laticeps* (Emerton 1894)
- *Ceratinella buna* Chamberlin 1949
- *Ceratinops latus* (Emerton 1882)

Linyphiidae (continued)
- *Ceratinops littoralis* (Emerton 1913)
- *Ceratinops* sp. 1
- *Coloncus siou* Chamberlin 1949
- *Eridantes erigonoides* (Emerton 1882)
- *Grammonota vitata* Barrows 1919
- *Islandiana flaveola* (Banks 1892)
- Linyphiidae sp. 1
- Linyphiidae sp. 2
- Linyphiidae sp. 3
- Linyphiidae sp. 4
- Linyphiidae sp. 5
- *Meioneta serrata* (Emerton 1909)
- *Meioneta unimaculata* (Banks 1892)
- *Mermessus index* (Emerton 1914)
- *Mermessus* sp. 1
- *Mermessus trilobatus* (Emerton 1882)
- *Pocadicnemis pumila* (Blackwall 1841)
- *Walckenaeria digitata* (Emerton 1913)
- *Walkenaeria spiralis* (Emerton 1882)

Lycosidae
- *Arctosa rubicunda* (Keyserling 1887)
- *Hogna frondicola* (Emerton 1885)
- *Hogna helluo* (Walckenaer 1837)
- *Pardosa distincta* (Blackwall 1846)
- *Pardosa modica* (Blackwall 1846)
- *Pardosa saxatilis* (Hentz 1844)
- *Pirata aspirans* Chamberlin 1904
- *Pirata piraticus* (Clerck 1757)
- *Piratula insularis* (Emerton 1885)
- *Piratula minuta* (Emerton 1885)
- *Schizocosa crassipalpata* Roewer 1951
- *Schizocosa mccooki* (Montgomery 1904)

Oxyopidae
- *Oxyopes salticus* Hentz 1845

Philodromidae
- *Ebo* sp. 1
- *Thanatus coloradensis* Keyserling 1880
- *Thanatus formicinus* (Clerck 1757)
- *Thanatus rubicellus* Mello-Leitão 1929
- *Thanatus striatus* C. L. Koch 1845
- *Tibellus chamberlini* Gertsch 1933
- *Tibellus duttoni* (Hentz 1847)

Table 1 (continued).

Salticidae
Habronattus decorus (Blackwall 1846)
Habronattus sp. 1
Habronattus viridipes (Hentz 1846)
Marpissa sp. 1
Neon nelli Peckham & Peckham 1888
Phidippus clarus Keyserling 1885
Phidippus pius Scheffer 1905
Phidippus sp. 1
Salticidae sp. 1
Sitticus sp. 1
Talavera minuta (Banks 1895)
Tetragnathidae
Tetragnatha sp. 1
Theridiidae
Asagena americana Emerton 1882
Crustulina stricta (O. Pickard-Cambridge 1861)
Dipoena nigra (Emerton 1882)
Euryopsis pepini Levi 1954
Euryopsis saukea Levi 1951
Theridion petraeum L. Koch 1872
Theridion sp. 1
Thomisidae
Mecaphesa carletonica (Dondale & Redner 1976)
Ozyptila conspurcata Thorell 1887
Ozyptila georgiana Keyserling 1880
Xysticus acquiescens Emerton 1919
Xysticus bicuspis Keyserling 1887
Xysticus ferrox (Hentz 1847)
Xysticus gulosus Keyserling 1880
Xysticus luctans (C. L. Koch 1845)
Xysticus pellax O. Pickard-Cambridge 1894
Xysticus sp. 1
Titanoecidae
Titaneoca americana Emerton 1888