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# "Conservation Biology of Special Concern Jumping Spiders (Araneae: Salticidae) of Minnesota"

A Conservation Biology Research Award Project

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Abstract

Using spot sampling and a sweep net, I surveyed the jumping spider fauna of vegetation from 117 sites in 20 Minnesota counties in the summers of 1999 and 2001 to assess the distribution and status of eight Special Concern (SC) species. Commonly, sample sites were protected natural areas including SNAs and TNC properties with remnant or restored prairie communities, although some forest understory was also sampled. In total, 572 jumping spiders from 15 species were collected. Three SC species were encountered: Marpissa grata (Gertsch, 1936), Pelegrina arizonensis (Peckham & Peckham, 1901), and Tutelina formicaria (Emerton, 1891). M. grata, represented by an unusual male specimen, was found for the first time at Sherburne NWR (Sherburne Co.) and is now known from nine MN counties. P. arizonensis was found at three locations, one for the first time (Sherburne NWR) at the known NE range limit, and confirmed from historic locations at Allison Savanna TNC/SNA and Uncas Dunes SF. My first collection of T. formicaria (1 female) confirms continued presence at Allison Savanna TNC/SNA (Anoka Co.), the only known MN locality. Overall, 31 new county records were found, 13 historical occurrences were reconfirmed, and three new U.S. range records were established. Consistent with my 1996 season, two species were very common and widespread, comprising 69% of the total identified catch: Phidippus clarus Keyserling, 1884 (299 specimens) and Pelegrina insignis (Banks, 1892) (97 specimens). Future collection of the three other SC species (Habronattus texanus (Gertsch & Muliak, 1936); Phidippus apacheanus Chamberlain & Gertsch, 1929; and Phidippus pius Scheffer, 1906) might be enhanced with hand searches. Six high diversity locations (Sherburne NWR, St. Croix SP, Uncas Dunes SF, and Yellow Bank Hills) and several unsampled northeastern counties appear worthy of additional surveys.

## Introduction

Recent estimates of earth's biodiversity have been found to differ by more than an order of magnitude (Wilson, 1992), rekindling interest in field surveys and taxonomic studies. Within these estimates, there is recognition of the primacy of invertebrate biodiversity (New, 1995), and Wilson (1987) asserts that they are essential to ecosystem function. In the case of spiders, arguments for consideration in conservation efforts include their inherent scientific value, their ecological roles as generalist and possibly keystone predators, and their possible use as indicator species. Majer (1983, as cited by New) lists seven attributes of ants that make them useful indicator species, and spiders meet them as well: they are abundant, have high species richness, there are specialist species, they occupy high trophic levels, are easily sampled, are usually easily identified (once local keys are derived), and they respond to changing environmental conditions.

The State of Minnesota has included eight jumping spider species (Araneae: Salticidae) mainly known from prairie sites on its list of "Endangered, Threatened, and Special Concern Species". Over the past 6 years, I have been interested in resampling some known locations for special concern (SC) jumping spiders and in extending field surveys into other areas. An important feature of this work has been establishment of relocatable sampling sites through use of geopositioning system (GPS) technology with 15 m map accuracy. Also, as I have gained field experience in MN, I am increasingly able to recognize plants and describe habitat characteristics that may be associated with spider presence.

## Materials and Methods

I conducted field surveys from 27-June to 4-July 1999 (several weeks later than my surveys in 1996) and from 04-August to 12-August 2001 at 30 different locations across Minnesota (Table 1). Approximate boundaries of target areas were located on 1:24000 USGS topographic maps or an atlas compilation (Delorme, Inc.) by Robert Dana and Rich Baker (MN-DNR, Conservation Division, St. Paul, MN), supplemented with descriptions given in "A Guide to Minnesota's Scientific and Natural Areas, 2/e"(1999).

Each "location" contains one or more sample "sites" (N = 171), and each site is an area registered by GPS and sampled by 200 sweeps of a net while walking through vegetation. In a few areas of small extent, 100 sweeps were used (and one spider was collected directly from a vehicle). No grids, as described in Ehmann & Boyd (1997, unpubl.), were established, because a field assistant was not available. Especially in 2001, strong southerly winds reduced the efficacy of sweep netting. The effect of record heat during that time on spider activity/capture is unknown.

**Table 1.** Historic and new areas in Minnesota sampled for jumping spiders by W.J. Ehmann during 1999 and 2001.

| Area | County |
|---|---|
| *Historic (9)* | |
| Agassiz Dunes TNC | Polk |
| Allison Savanna TNC/SNA | Anoka |
| Clinton Prairie SNA | Big Stone |
| Hole In The Mountain TNC | Pipestone |
| Itasca SP | Clearwater |
| Prairie Smoke Dunes SNA | Norman |
| Sherburne NWR | Sherburne |
| St. Croix Savannah SNA | Washington |
| Uncas Dunes SF | Sherburne |
| *New (21)* | |
| Blue Mound SP | Rock |
| Cottonwood River Prairie SNA (Prairie Sky Unit) | Big Stone |
| Crookston Prairie SNA | Polk |
| Glacial Lakes SP | Pope |
| Grey Cloud Dunes SNA | Washington |
| Marks WPA | Becker |
| Ordway Prairie TNC | Pope |
| Pankratz Memorial Prairie TNC | Polk |
| Pembina Trail Preserve SNA | Polk |
| Pomme de Terre City Park | Stevens |
| Red Lake Peatland, Red Lake WMA | Beltrami |
| Roseau Peatland, Lost River SF | Roseau |
| Sioux Nation WMA | Yellow Medicine |
| St. Croix SP | Pine |
| Strandness Prairie TNC | Pope |
| Twin Lakes WMA | Roseau |
| Two Rivers Aspen Prairie Parkland | Roseau |
| Western Prairie SNA | Wilkin |
| WPA near Morris Airport | Stevens |
| Yellow Bank Hills SNA | Lac Qui Parle |
| Zippel Bay SP | Lake of the Woods |

Jumping spider species (including species of special concern) were sometimes recognized in the field, but final determinations were made in the laboratory using a Leica 10-40x stereo-zoom microscope. A general key by Kaston (1978) was supplemented with primary literature sources, including original descriptions dating to the early 1900s. Bruce Cutler (Department of Entomology, University of Kansas, Lawrence, KS) provided assistance identifying several specimens. Age and sex of each specimen was identified by genitalia as female (F), male (M), immature male (IMM M), and immature (I, sex unknown). Species names follow latest taxonomic revisions known.

Specimens from each site were placed together in a single vial containing 70% propanol and an archival, pre-numbered tag bearing four digits and, on the reverse, the collector's name (WJ EHMANN). Vial numbers are linked to locations in the database and in original field notebooks. Voucher specimens for each new county occurrence are being prepared for deposit (The Field Museum of Natural History, Chicago, IL).

## Results

A total of 40,900 sweeps were made during the project, at a comparable rate to the 1996 surveys. 572 jumping spiders representing 15 species were collected (Table 2), with 89% of the spiders successfully identified to species level. Three SC species were collected (Marpissa grata (Gertsch, 1936); Pelegrina arizonensis (Peckham & Peckham, 1901); and Tutelina formicaria (Emerton, 1891)). As shown in Table 3, based on literature reviews and information from all but one of B. Cutler's collections, 31 new county records were established. This work also confirms spider persistence at 13 historically-known locations and marks three new U.S. range records (Habronattus viridipes (Hentz, 1846); Maevia inclemens (Walckenaer, 1837); and Tutelina similis (Banks, 1895) (Table 4).

Consistent with the 1996 collections (Ehmann & Boyd, 1997, unpublished), two species were very common, comprising 69% of the total identified catch: Phidippus clarus Keyserling, 1884 (299 specimens) and Pelegrina insignis (Banks, 1892) (97 specimens). Both common species appear to be habitat generalists. Species encountered with intermediate frequency were: Eris militaris (Walckenaer, 1837), Evarcha hoyi (Peckham & Peckham, 1883), Habronattus cognatus (Peckham & Peckham, 1901) , M. inclemens, Pelegrina proterva (Walckenaer, 1837), and T. similis. A total of 54 specimens (9% of catch) were identifiable only to genus level and 9 specimens were unidentified.

Complete listings of spiders collected with geographic coordinates, age and sex information, and notes on site characteristics are presented as appendices. Appendix 1 is sorted by location, date, and species name. Appendix 2 is sorted by county, date, and species name. Appendix 3 is sorted by species name, location, and date. The dataset has also been provided to Rich Baker (MN-DNR) on a 100MB zip disk, saved in four different formats, including Excel, to facilitate transfer to digital databases.

**Table 2.** Numbers of jumping spiders collected during this study.

| Species | Count |
|---|---|
| Eris militaris (Walckenaer, 1837) | 13 |
| Evarcha hoyi (Peckham & Peckham, 1883) | 28 |
| Habronattus cognatus (Peckham & Peckham, 1901) | 17 |
| Habronattus viridipes (Hentz, 1846) | 2 |
| Habronattus sp. | 52 |
| Maevia inclemens (Walckenaer, 1837) | 6 |
| Marpissa formosa (Banks, 1892) | 1 |
| Marpissa grata (Gertsch, 1936) | 1 |
| Marpissa pikei (Peckham & Peckham, 1888) | 1 |
| Pelegrina arizonensis (Peckham & Peckham, 1901) | 12 |
| Pelegrina insignis (Banks, 1892) | 97 |
| Pelegrina proterva (Walckenaer, 1837) | 17 |
| Phidippus clarus Keyserling, 1884 | 299 |
| Sitticus palustris (Peckham & Peckham, 1883) | 1 |
| Tutelina formicaria (Emerton, 1891) | 1 |
| Tutelina similis (Banks, 1895) | 13 |
| Tutelina sp. | 2 |
| Unidentified, damaged, lost | 9 |
| **Total** | **572** |

**Table 3.** New county records of jumping spider species from this study, compared to Ehmann and Boyd's 1996 records, literature reviews, and correspondence with B. Cutler.

| SPECIES | STATUS | NEW COUNTIES FOUND IN |
|---|---|---|
| E. militaris | | No new counties |
| E. hoyi | | Beltrami, Lac Qui Parle, Lake of the Woods, Pope |
| H. cognatus | | Lac Qui Parle |
| H. viridipes | | Pope |
| M. inclemens | | Pine |
| M. formosa | | Sherburne |
| M. grata | SC | Sherburne (9th MN county ever, 3rd new county for Ehmann) |
| M. pikei | | Lac Qui Parle |
| P. arizonensis | SC | None, but new site at Sherburne NWR |
| P. insignis | | Becker, Pine, Pope, Sherburne, Stevens, Wilkin |
| P. proterva | | Lake of the Woods, Pope, Sherburne |
| P. clarus | | Anoka, Becker, LQ Parle, L. Woods, Lincoln, Pine, Pope, Rock, Roseau, Stevens |
| S. palustris | | Sherburne |
| T. formicaria | SC | No new counties |
| T. similis | | Becker, Polk, Pope, Rock, Roseau |

**Table 4.** Reconfirmed (persisting) jumping spider populations at protected, historically-known locations, with distributional records.

| SPECIES | STATUS | RECONFIRMED LOCATIONS | RANGE RECORDS |
|---|---|---|---|
| E. militaris | | None | Throughout US and Canada |
| E. hoyi | | Agassiz Dunes TNC, Uncas Dunes SF | MT to ME, IA to VA |
| H. cognatus | | Prairie Smoke Dunes SNA, Uncas Dunes SF | Central US, also NY |
| H. viridipes | | None | *NW range record for US* |
| M. inclemens | | None | *N range record for US* |
| M. formosa | | None | Near northern US range limit |
| M. grata | SC | None | IA, MI, and MN endemic |
| M. pikei | | None | Widespread E, also SW |
| P. arizonensis | SC | Allison Savanna, Uncas Dunes SF | At NE range limit |
| P. insignis | | Agassiz Dunes, Clinton Prairie, Hole In the Mountain | Widespread, N tier and Canada |
| P. proterva | | Itasca SP | US and Canada except SW |
| P. clarus | | Agassiz Dunes, Prairie Smoke Dunes | US and Canada except SW |
| S. palustris | | | Spotty distribution US and Canada |
| T. formicaria | SC | Alllison Savanna | Only MN location, 6 other states |
| T. similis | | | *NW range records for US* |

## Discussion

The most significant result of this study is the evidence for a persistent population of T. formicaria at Allison Savanna TNC (Anoka Co.), an SC species known in Minnesota only from this location. A single female adult was collected from mixed grass along the roadside. Cutler (1995) associated it specifically with Adropogon, Aristida, and Penstemon, and it will be worthwhile to re-visit the locality for more sampling and better habitat analysis. It is important to note that T. formicaria is known only from six other states.

In terms of other SC species, a single adult male M. grata collected proved interesting as it matched Barnes' (1958) description of Marpissa wallacei, described as endemic to Florida. Cutler (pers. comm.) reports that this separation has been removed by later work, and that his own inspection of the new specimen appears to validate the consolidation into M. grata. A consistency in habitat is noted with 1996, in that the specimen was associated with cattails near a lake. Any collection of this SC species is important, as it is endemic to IA, MI, and MN. Twelve immature P. arizonensis collected in this study were primarily associated with big bluestem, including one occurrence in an oak savanna. Two locations previously known to support this species, Allison Savanna and Uncas Dunes SF, continue to do so, based on this survey.

Non-SC jumping spiders represented by only a single specimen include: Marpissa formosa (Banks, 1892), a female from Uncas Dunes SF (Sherburne Co.); Marpissa pikei (Peckham & Peckham, 1901), an immature male from a new county (Lac Qui Parle) within known range; and Sitticus palustris (Peckham & Peckham, 1883), a female, also from Uncas Dunes SF.

Three new records extend known U.S. salticid distributions. These are important not only because each population is new for MN, but also because they raise expectations for finding additional populations in the intervening landscape. An immature M. inclemens collected from a roadside at St. Croix SP (Pine Co.), extends the known U.S. range 160 km north from the previous record in the Thousand Islands area of NY State. Five immatures were also collected from bracken ferns in oak-aspen woodland at Sherburne NWR that also exceeded the previous range. Buddle & Shorthouse (2002) list Canadian records for M. inclemens from Quebec and Manitoba. A male and female H. viridipes (Hentz, 1846) were collected from Strandness Prairie (Pope Co.) representing a 320 km U.S. range extension. Specimens were from a grassy kame, contrasting somewhat with a 1996 record from aspen saplings. Buddle & Shorthouse (2002) list Canadian records from Ontario and Quebec. A 360 km U.S. extension of the NW range of T. similis was established from an adult female specimen from Twin Lakes WMA (Roseau Co.), however it is widespread across Canada (Buddle & Shorthouse, 2002).

The 31 new county records reported here are significant to the extent they provide potential management options, should jumping spiders become part of conservation

planning. Salticid and other invertebrate biodiversity may help managers gauge the relative importance of certain similar parcels to conservation or may add a distinctive character to protected locations.

Additional notes for other species collected:

Eris militaris

Clearwater and Lake of the Woods locations match northernmost records from MN, but both are well within the wide range across the U.S. and Canada. Spiders were taken from sedge and cattail marshes, fern understory in a red pine forest, and from patches of leafy spurge. Previous collections have included grass, oak and aspen saplings, cattails, and ferns.

Evarcha hoyi

Found in 21 samples, from a total of 10 locations (two historic), and in seven new counties. Habitats included big bluestem hill prairie, little bluestem, oak savanna, oak saplings, bergamot, and leafy spurge.

Habronattus cognatus

Found in 9 samples, from four locations (two historic), and in one new county. Associations with hill prairies, dunes, and prairie grass that included lead plant were noted.

Pelegrina proterva

Found in 8 samples, from 4 locations (one historic), and in three new counties. Especially likely in samples from bracken ferns and ostrich ferns, though many other plant associations exist (grass, meadow rue, bluestem, lead plant, bergamot, goldenrod, cattail, leafy spurge, wild strawberry).

Sitticus palustris

A single new record (adult female) is the first collection I have from a protected natural area and comes from a new county (Sherburne). Both my 1996 and 2001 records come from grass and cattail near lakes.

Suggestions for Future Work

Given that three SC species (Habronattus texanus (Gertsch & Muliak, 1936); Phidippus apacheanus Chamberlain & Gertsch, 1929; Phidippus pius Scheffer, 1906) have not been collected by sweep net in 1996, 1999, and 2001, future field work might also employ hand searches, leaf litter collection, and other techniques. Note, however, that the earliest known mature date for P. apacheanus is 06-August, and the latest survey I have performed to date is 12-August. Six high diversity (> 6 spp.) locations (Sherburne NWR, St. Croix SP, Uncas Dunes SF, and Yellow Bank Hills) appear worthy of additional effort. Whitewater WMA remains the only location I have taken Sassacus papenhoei Peckham & Peckham 1895, but has not been revisited. The northeastern counties remain largely unsampled.

Literature Cited

Barnes, R.D. 1958. North American jumping spiders of the subfamily Marpissinae (Araneae, Salticidae). American Museum Novitates No. 1867, p. 1-50.

Buddle, C.M. and D.P. Shorthouse. 2002. Jumping spiders of Canada. <http://www.ualberta.ca/~dps1/salticidae.html> accessed 03-NOV-2002.

Cutler, B., R. Dana, R. Huber, R. Bright, L. Pfannmuller. 1988. Final report to the Invertebrate Group Committee, In: Minnesota's Endangered Flora and Fauna (B. Coffin and L. Pfannmuller, eds.). Minnesota Department of Natural Resources, University of Minnesota Press, p. 423-431.

Cutler, B. 1995. Jumping spiders. Proposed Amendment of Minnesota Rules, Chapter 6134: Endangered and Threatened Species Statement of Need and Reasonableness, December 4, 1995, p. 108-116.

Ehmann, W.J. and B.E. Boyd. 1997. Surveys for proposed special concern jumping spiders of Minnesota. Contractor Report, Minnesota Department of Natural Resources, Conservation Division, St. Paul, MN.

Kaston, B.J. 1978. How to know the spiders. W.C. Brown. 272 p.

Majer, J.D. 1983. Ants: bio-indicators of minesite rehabilitation, land-use and land conservation. Environmental Management 7:375-383.

Minnesota Department of Natural Resources, Section of Ecological Services. 1999. A guide to Minnesota's scientific and natural areas, 2/e. St. Paul, MN.

New, T.R. 1995. An introduction to invertebrate conservation biology. Oxford University Press.

Wilson, E.O. 1987. The little things that run the world. Conservation Biology 1:344-346.

Wilson, E.O. 1992. The diversity of life. Harvard University Press.