

Technical Report

New records for Minnesota jumping spiders (Araneae: Salticidae) including Habronattus spp., with consideration of future state Special Concern and Threatened species listings

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Overview

Jumping spiders (Araneae: Salticidae) are ubiquitous invertebrates, taxonomically diverse (Edwards and Hill, 2008), locally abundant, diurnal and relatively easy to capture, leading the State of Minnesota Department of Natural Resources (MN-DNR) to include them in field surveys of animal biodiversity. From 1996-2015, reconnaissance-level jumping spider surveys led by the first author (Ehmann and Boyd, 1997; Ehmann 2002, 2005, 2006, 2007, 2010, 2011a, 2011b, 2014; Ehmann et al., 2009) have been conducted in nearly every county across Minnesota. Records from those surveys, as combined with approximately 20 years of prior effort led by Dr. Bruce Cutler (University of Kansas) and a new compendium of literature records (Heins, 2016) together comprise perhaps the most comprehensive state inventory in the U.S. for jumping spiders. 70 salticid species are now confirmed from Minnesota, with information suggesting the presence or likelihood of 10 additional species (Heins, 2016). These efforts provide a data-driven basis for legislative decisions to list jumping spiders as Special Concern (SC), Threatened (T), or Endangered (E) as part of Minnesota's efforts to catalogue biodiversity and protect populations, natural communities and ecosystem functions across the state.

From June 16-21, 2015, field reconnaissance surveys for rare jumping spiders (Araneae: Salticidae) were conducted at natural and restored sites historically-known to support Habronattus spp. These surveys primarily sought to confirm the continued presence of Habronattus spp. at each site and secondarily to contribute to a better understanding of the distribution and abundance of other lesser-known salticid species.

Eight species of Habronattus were previously known from Minnesota, with nearly all records from the southern half of the state: H. agilis (Banks, 1893), H. americanus (Keyserling, 1884), H. calcaratus maddisoni Griswold, 1987, H. captiosus (Gertsch, 1934), H. cognatus (Peckham & Peckham, 1901), H. decorus (Blackwall, 1846), H. texanus (Chamberlin, 1924) and H. viridipes (Hentz, 1846) (Heins, pers. comm.). H. c. maddisoni, H. texanus, and H. viridipes are all state-

listed Special Concern (SC) species (Minnesota List of Endangered, Threatened, and Special Concern Species, August 19, 2013).

Survey sites included three state parks (Afton SP, Washington Co.; Blue Mounds SP, Rock Co.; and Glacial Lakes SP, Pope Co.), one county reserve (Lake Elmo, Washington Co.), four Nature Conservancy preserves (Hole in the Mountain, Lincoln Co.; Ottawa Bluffs, Le Sueur Co.; Seven Sisters, Otter Tail Co.; and Weaver Dunes, Wabasha Co.) and two State Natural Areas (Kellogg-Weaver, Wabasha Co. and Tauer Prairie, Brown Co.) that are cooperatively managed for natural resource goals with the State of Minnesota.

The Habronattus genus was revised by Griswold (1987) following G. and E. Peckham (1901), resulting in recognition of 94 species found primarily in North America. DNA sequences for this group were analyzed by Maddison and Hedin (2003) and Maddison (2015) has recently completed a broader classification of all jumping spider groups. To the lay-person, these species might be described as medium-sized jumping spiders with grey and black patterns on the dorsal abdomen, and a 'hairy' or 'shaggy' appearance (Fig. 1). Males can be colorful and often have distinctive notches and bumps on their third legs that aid in identification. Leg fringes or combs are also fairly easy to see under low magnification. Griswold (1987) summarizes that they are often found in "open, sunny places on bare ground, rocks, ground cover, or low vegetation."



Figure 1. Male Habronattus calcaratus maddisoni (photo © by Chad Heins, 2010).

Although the sampling sites were chosen to maximize the opportunity to collect Habronattus individuals, we expected to encounter other jumping spiders, and sought to add new occurrence records for six other SC species (including Marpissa formosa (Banks, 1892), Paradamoetas fontana (Levi, 1951), Pelegrina arizonensis (Peckham and Peckham, 1901), Phidippus apacheanus (Chamberlin and Gertsch, 1929), Phidippus pius Sheffer, 1905, and Sassacus papenhoei Peckham and Peckham, 1895; one T species, Tutelina formicaria (Emerton, 1891); and other lesser-known salticids.

Methods

Surveys were conducted during the day, typically under dry conditions with low wind, using canvas insect sweep nets worked on short walks through grass, shrubs, and understory vegetation. A typical sampling episode consisted of each person in a 4-5 member crew performing 300-500 sweeps over a walking distance of 150-250 m. Geographic coordinates of transect starting points were digitally recorded to an accuracy of <5 m (coordinates, habitat notes and other details are provided in Appendix 1).

Specimens of interest were captured after being emptied from nets onto ground tarps, preserved in 90% ethanol and subsequently examined with 50x binocular microscopes in the lab. Members of six species (Eris militaris (Hentz, 1845), Evarcha hoyi (Peckham & Peckham, 1883), Pelegrina flavipes (Peckham & Peckham, 1888), Pelegrina insignis (Banks, 1892), Pelegrina proterva (Walckenaer, 1837), and Phidippus clarus (Keyserling, 1885)) were captured during this study but were not retained due to their commonness and widespread distribution as well as our intention to minimize sampling impact. Non-salticid species and other invertebrates were returned to the site. Species identifications were made using characteristics of genitalia in adults. In a few cases, immature specimens presented sufficient information to lead to a highly-likely identification, although these were not used to establish county or state records. Specimens will reside in the museum collection at the University of Minnesota.

Results

22 species including four Habronattus spp. (H. cognatus, H. cuspidatus, H. decorus, H. viridipes) four SC species (H. viridipes, P. fontana, P. pius, and S. papenhoei) and two new state records (H. cuspidatus and Pelegrina exigua Banks, 1892) were among 160 specimens collected and retained (Table 1). 30 new county records were set. Seven species were “reconfirmed” at specific sites where they were collected previously, for the first time in as much as 30 years. One U.S. range record was extended (A. youngi) by what may be the only existing Minnesota record (two Lake County specimens cited in Stratton et al., 1979 are not cited as examined by

Edwards, 1999) that increased the known northwestern distribution by 500 km from a site in Kansas.

With our limited, reconnaissance-level sampling, we did not find H. agilis (listed in Minnesota by Cutler, 1977 but not cited by Griswold, 1987); H. americanus (reported from Minnesota by Griswold, 1987 but no specific location); H. c. maddisoni (still known only from St. Louis County, originally collected by Gerda Nordquist at the future site of Lake Vermillion State Park and subsequently within the same area by Heins; see Ehmann, 2011a, b); H. captiosus (we checked two historically-known sites at Afton SP and Blue Mounds SP); or H. texanus (SC) (we checked two historically-known sites at Hole-in-the-Mountain TNC and Ottawa Bluffs TNC).

Table 1. Species list by preserve name and specimen count (includes six identifiable immature specimens as indicated). SC = Special Concern, SNA = State Natural Area, SP = State Park, TNC = The Nature Conservancy.

Site/species	Count	Notes
Afton SP (Washington County)	2	
<u>Tutelina similis</u> (Banks, 1895)	2	County record
Blue Mounds SP (Rock County)	25	
<u>Attidops youngi</u> (Peckham and Peckham, 1888)	1	Possible State record, is a County record, northwestern-most range record for U.S.
<u>Maevia inclemens</u> (Walckenaer 1837)	1	County record
<u>Marpissa pikei</u> (Peckham & Peckham, 1888)	2	County record
<u>Naphrys pulex</u> (Hentz, 1846)	13	13 specimens include 1 immature
<u>Pelegrina exigua</u> Banks, 1892	2	County record, second and third specimens for the state
<u>Phidippus audax</u> (Hentz, 1845)	1	
<u>Synemosyna formica</u> Hentz, 1846	3	County record
<u>Tutelina similis</u> (Banks, 1895)	2	Previously collected here by Ehmann in 2001
Glacial Lakes SP (Pope County)	33	
<u>Pelegrina exigua</u> Banks, 1892	1	County record
<u>Phidippus whitmani</u> Peckham & Peckham, 1909	1	County record
<u>Tutelina elegans</u> (Hentz, 1846)	11	County record
<u>Tutelina harti</u> (Emerton, 1891)	1	County record
<u>Tutelina similis</u> (Banks, 1895)	19	Previously collected here by Ehmann in 2001
Hole In The Mountain TNC (Lincoln County)	3	
<u>Pelegrina exigua</u> Banks, 1892	2	State record, County record
<u>Tutelina elegans</u> (Hentz, 1846)	1	County record
Kellogg-Weaver SNA (Wabasha County)	2	
<u>Habronattus viridipes</u> (Hentz, 1846)	2	Previously collected here by Ehmann in 1996
Lake Elmo County Nature Reserve (Washington County)	1	
<u>Tutelina similis</u> (Banks, 1895)	1	County record

Ottawa Bluffs TNC (Le Sueur County)	25	
<u>Habronattus decorus</u> (Blackwall, 1846)	1	Immature
<u>Hentzia mitrata</u> (Hentz, 1846)	1	County record
<u>Hentzia palmarum</u> (Hentz, 1832)	1	Cutler as previously reported in Richman, 1989
<u>Maevia inclemens</u> (Walckenaer 1837)	2	County record
<u>Synageles occidentalis</u> Cutler, 1988 [1987]	6	Previously collected by Cutler in 1987
<u>Tutelina elegans</u> (Hentz, 1846)	9	County record
<u>Tutelina harti</u> (Emerton, 1891)	1	County record
<u>Tutelina similis</u> (Banks, 1895)	4	Previously collected here by Ehmann in 1996
Seven Sisters TNC (Otter Tail County)	17	
<u>Habronattus cognatus</u> (Peckham & Peckham, 1901)	4	Previously collected here by Ehmann in 2004
<u>Habronattus cuspidatus</u> Griswold, 1987	2	State record, County record
<u>Habronattus decorus</u> (Blackwall, 1846)	1	Immature
<u>Marpissa pikei</u> (Peckham & Peckham, 1888)	1	County record
<u>Paradamoetas fontana</u> (Levi, 1951)	1	SC, County record
<u>Pelegrina exigua</u> Banks, 1892	1	County record
<u>Synageles occidentalis</u> Cutler, 1988 [1987]	1	
<u>Synemosyna formica</u> Hentz, 1846	1	County record
<u>Tutelina elegans</u> (Hentz, 1846)	1	County record
<u>Tutelina similis</u> (Banks, 1895)	4	
Tauer Prairie SNA (Brown County)	28	
<u>Marpissa grata</u> (Gertsch, 1936)	1	County record
<u>Marpissa pikei</u> (Peckham & Peckham, 1888)	1	County record
<u>Phidippus pius</u> Scheffer, 1905	1	SC, County record
<u>Synageles occidentalis</u> Cutler, 1988 [1987]	2	
<u>Tutelina similis</u> (Banks, 1895)	23	
Weaver Dunes TNC (Wabasha County)	24	
<u>Habronattus cognatus</u> (Peckham & Peckham, 1901)	5	County record
<u>Habronattus decorus</u> (Blackwall, 1846)	1	County record
<u>Habronattus viridipes</u> (Hentz, 1846)	2	SC, Previously collected here by Ehmann in 1988
<u>Maevia inclemens</u> (Walckenaer 1837)	1	Previously collected here by Ehmann in 1988
<u>Marpissa pikei</u> (Peckham & Peckham, 1888)	1	
<u>Sassacus papenhoei</u> Peckham & Peckham, 1895	11	SC, Previously collected here by Cutler in 1988, 11 specimens include 4 immatures
<u>Tutelina elegans</u> (Hentz, 1846)	2	County record
<u>Tutelina similis</u> (Banks, 1895)	1	County record
Grand Total	160	

Discussion

Sites

The sampling at Blue Mounds SP and Glacial Lakes SP was sufficient to demonstrate that these parks host significant jumping spider species richness. Recent research showing that bison grazing can increase invertebrate populations (Moran, 2014) suggests Blue Mounds SP, where bison are present, may be particularly interesting from spider research and conservation perspectives. Blue Mounds SP protects P. exigua collected both from the base of the ledge below the Visitor's Center and from oak and nettle understory at the top of the Burr Oak Trail near the old quarry. Three congeners (T. elegans, T. harti, and T. similis) were sympatric on hill prairie at both Glacial Lakes SP and Ottawa Bluffs TNC, suggesting potential for behavioral and genetics research.

Even with limited sampling, Kellogg-Weaver SNA and adjacent Weaver Dunes TNC are shown to currently protect three Habronattus spp. and two SC species, and Seven Sisters SNA protects three Habronattus spp. including the only known location in the state for H. cuspidatus, and one SC species. These are clearly valuable properties for spider biodiversity.

Tauer Prairie SNA was found to host P. pius, an SC species, and the number of new county records established in a short sampling period suggests this area may also be a valuable habitat for jumping spiders.

Species

A. youngi – As noted above, two specimens that are believed to be valid (Stratton et al., 1979) may be the original state records, however since Edward's (1999) comprehensive review of the genus does not cite these records, the specimen we acquired in 2015 may be regarded as confirmation of presence in the state. Members of this genus are very small (2.1 to 3.1 mm in length), previously reported from underneath bark of deciduous and coniferous trees, and have a flattened carapace when viewed from the side (Edwards, 1999). Our single specimen was an adult male collected from oak understory including nettle, in the North Central Glaciated Plains (CGP) ecological section (Inner Coteau subsection). ***We are unaware of any systematic efforts in MN to collect jumping spiders from bark, however given that only 1 to 3 specimens maximum have ever been reported from Minnesota, this species could be a candidate for future SC or T status within the state.***

H. cognatus – With records from Otter Tail, Rock, Wabasha, and Washington Counties (counting those in this report), this species appears to be the most widely distributed Habronattus in Minnesota. This range spans CGP, Paleozoic Plateau (PPL) and Minnesota and NE Iowa Morainal (MIM) ecological sections. With this report, we confirm earlier data that this species uses Seven Sisters TNC, but we do not have sufficient data to show a continuous presence.

Regular, seasonal sampling can help establish whether a population is persisting at Seven Sisters TNC. ***No state listing at this time.***

H. cuspidatus – State and county records were set with a new, single adult female specimen, acquired from sweep netting low vegetation adjacent to a gravel quarry including grass, sumac, willow, and spiderwort. Whereas this species is restricted to Canada and the U.S., and known from about a dozen sites from the high plains from the Dakotas to Texas, this specimen taken from the MIM/Hardwood Hills ecological sections is the only one known east of the Red River. ***Given that only 1 specimen has ever been reported from Minnesota, and that no specimens are known nationally east of this location, this species might be a candidate for future SC or T status within the state.***

H. decorus – Three specimens (including two late instar immatures) were collected, with the only adult establishing a Wabasha County record in the PPL/Blufflands ecological sections, from a dune area populated by wild rose, poison ivy, spiderwort, yarrow, porcupine grass, and hawksbeard. Cutler (1990) found this species in New York in human-disturbed habitats including vacant lots and railroad yards and under cans, wood, and cardboard. Jennings and Graham (2007) found this species in pitfall traps in Maine. H. decorus has a wide distribution similar to H. cognatus. ***No state listing at this time.***

H. viridipes – This SC species has a range from Otter Tail Co. to Wabasha Co., but is only known from four locations: Cedar Creek Ecosystems Science Reserve in Anoka Co. (Cutler as cited in Griswold, 1987 from the MIM ecological section), and three sites resampled in this study (Glacial Lakes SP, Kellogg-Weaver Dunes SNA, and Seven Sisters TNC (immature only). Edgcumbe (2014) describes this species as a habitat generalist of forests and prairies and also cites records from cranberry communities and blueberry fields. We confirmed presence of H. viridipes at Kellogg-Weaver Dunes SNA and the adjacent Weaver Dunes TNC property, in PPL/Blufflands ecological sections, but these records are the first in 20-30 years. ***SC status appears justified and should be maintained.***

H. palmarum – This elongate species is at the northern-most part of its North American range in Minnesota, though common across the Midwest, South, and East Coast. Richman (1989) cites Cutler's specimens from shrubs and small trees in Le Sueur and Wabasha Counties, as well as a sympatric association with the more common H. mitrata. We confirm the sympatry by noting that our new H. mitrata county record came from the same set of sweeps as our H. palmarum specimen (Ottawa Bluffs TNC, Le Sueur County). The adult female H. palmarum came from shaded streamside vegetation below an oak savannah restoration area, in the MIM/Big Woods ecological section. There are a few, older, unverified University of Minnesota museum records from other counties that need checking to assist in the assessment of this species presence. Based on national range, the most likely new localities are in the southern-most tier of counties from Rock to Houston Counties (west to east). ***Because there are only three documented and verified collections of H. palmarum in Minnesota, and because these come from only two***

southeastern counties in MIM and PPL ecological sections, this species may need to be considered for state SC status if some older museum records are not confirmed or if new records are not found.

P. fontana – A single adult male specimen from Seven Sisters TNC established a new record for this SC species in Otter Tail County, adding range to the northwest of previously known habitat in Minnesota. P. fontana is an iridescent ant mimic (Cutler, 1982) and is endemic to the Great Lakes area of the United States and Canada. In Minnesota, has been found at fewer than 10 sites including mesic prairie, bogs, and marsh edge habitats (all but one site in MIM ecological section). Our specimen was found at the edge of MIM and CGP sections, in a gravel prairie suggesting that searches of drier habitats may also be productive. ***SC status should be maintained, especially given the extremely restricted global range.***

P. exigua – A Minnesota record provided by Cutler (1977) was not mapped by Maddison (1996) or supported by Richman et al. (2012), suggesting that our specimens post new state records. We recorded this species from four locations in one season, suggesting that this species may have been overlooked in the past among more common, very similar-appearing members of the genus. Three localities are in CGP and one is in CGP adjacent to MIM ecological sections, and all localities were dry restored prairie or hill prairies. It is hoped that this report will lead to other investigators considering this identification as they collect Pelegrina spp. from Minnesota. Museum collections could also be checked for misidentified individuals. ***P. exigua may indeed be rare in the state, as suggested by field work and national range maps, but SC status is not recommended at this time.***

P. pius – This SC species is only reported from the southern one-third of Minnesota, and our single adult male specimen from Tauer Prairie SNA in Brown Co. established a new county record, in the middle part of the known state range within CGP/Minnesota River Prairie ecological sections. Adult males have bright red bands against black areas on their abdomens and the back portion of the cephalothorax (head) and females have similar patterns but appear more orange and grey. This species is known from a region where few natural and restored prairies exist within a larger agricultural landscape. P. pius has a spotty distribution across the desert southwest, the southeastern U.S., and into Mexico and Central America, but the records from Minnesota establish the known northern geographic range. ***Given the continued rarity of P. pius relative to sampling effort and the pressures on remaining natural prairie habitat, state SC status should continue.***

S. papenhoei – Seven adults and four late-instar immatures of this beetle-mimic were collected from Weaver Dunes TNC, one of only two historically-known sites for this species. S. papenhoei is widespread across North America, from the Pacific NW through deserts and across Mexico, and northeast up the Atlantic coast to New York, but it is rare in the Dakota and Great Lakes regions (Richman, 2008). Specimens from this field season come from relatively restricted

PPL/Blufflands ecoregions and are the first collected from Minnesota in almost 30 years. **SC status should continue.**

S. formica – This species is a North American endemic and an ant-mimic, but not much else is known about it (records from Ontario, Illinois, and West Virginia are the only locations in the online *Encyclopedia of Life*, accessed 16-MAY-2016). The first collection from Minnesota dates to 1877 from Hennepin Co. and Heins (2016) documents reports from eight other counties. Our three adult females from Blue Mounds SP (Rock Co.) come from trailside vegetation including Burr oak saplings and nettle, in the CGP/Inner Coteau ecological sections and our one adult female from Seven Sisters TNC (Otter Tail Co.) was taken from a gravel quarry, in the MIM/Hardwood Hills ecological sections. **No state listing at this time.**

Finally, although the SC listed species M. formosa was not encountered in this survey, Heins (2016) now documents specimens or photographs from Minnesota spanning Sherburne, Steele, Fairbault, and Cass Counties. This species' affinity for wetter habitats may have led to fewer encounters from ground surveys to date. **Additional surveys are recommended to discern whether the current SC status is appropriate.**

Conclusion

Despite the significant work over 40 years inventorying Minnesota's jumping spider diversity, much remains to be done. Certainly species are present in the state that have not yet been recorded and it is possible that species not yet known to science are present in relatively unsampled areas such as peat bogs, ground and litter layers, emergent aquatic vegetation, tree canopies, and agricultural lands. Spiders are often collected as by-catch in pitfall traps and bee traps that could be further documented when invertebrate biologists collaborate.

On the other hand, now that we know where certain apparently rare species have been found, we can initiate site-specific monitoring and try to establish which populations are persisting over time. Periodic surveys across spring, summer, and fall for a given preserve might only take 20-25 hours of effort for one person over a year, whether they be performed by a staff member or volunteer. Attractive, easily found, non-threatening to humans and behaviorally interesting, jumping spiders are good candidates for citizen science projects. The chief limitation is often accurate species identification. Jumping spider abdomens have quite variable markings and colorations even within the same species and thus characteristics of male and female genitalia are more determinative. A microscope and considerable patience is required, although this skill can be self-taught and experts are often willing to look at problematic specimens. Additionally, new user-friendly field guides (in print, such as Richard A. Brady's "Common Spiders of North America" (2012) and online, such as [Spiders of North America](#)), the advent of digital photography, and community sharing sites such as [BugGuide](#) can assist interested amateurs.

Citizen scientists, in partnership with arachnologists and entomologists, can further extend our understanding of the spatial distribution, phenology, and habitat associations for jumping spiders as part of documenting and protecting biodiversity in Minnesota. We do not yet know enough to develop spider-specific conservation plans (New, 1999), however, we can continue to add salticids to comprehensive site inventories and initiate site monitoring projects that help managers prioritize protection of areas with high or unique biodiversity.

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Appendix 1. 2015 MN Salticids (Ehmann, Heins, Jacobsmeyer, Moravec, Sandrich)
Specimens Deposited at University of Minnesota Insect Collection

SITE #	VIAL # (grey is base vial)	LOCATION	COUNTY	DATE	TIME	LAT (North)	LONG (West)	SWEEPS	DUP SWEEPS	SALTICID SPECIES	SPECIES NUMBER	COUNT	SEX/ AGE	NOTES	DATA ROW NUMBER	REPORT
2015001	2340	Weaver Dunes TNC	Wabasha	16-Jun-2015	11:26	44.25571	91.94093	1200	1200	Tutelina similis		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	1	CR
2015002	2402	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44.25401	91.93835	250	250	Sassacus papenhoei		2	F	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	2	SC; Confirms Cutler 1988 specimen
2015002	2413	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44.25401	91.93835	200	200	Sassacus papenhoei		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	3	SC; Confirms Cutler 1988 specimen
2015002	2413	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44.25401	91.93835	a	200	Sassacus papenhoei		2	imm.	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	4	SC; immature
2015002	2428	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44.25401	91.93835	300	300	Habronattus viridipes		2	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	5	SC; Confirms Ehmann 1996 specimen
2015002	2478	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44.25401	91.93835	a	200	Habronattus cognatus		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	6	CRA
2015002	2478	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44.25401	91.93835	a	250	Habronattus cognatus		3	F	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	7	CR
2015002	2482	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44.25401	91.93835	a	300	Sassacus papenhoei		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	8	SC; Confirms Cutler 1988 specimen
2015002	2482	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44.25401	91.93835	a	300	Sassacus papenhoei		1	imm.	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	9	SC; immature
2015004	2365	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.269	091 56.336	a	250	Sassacus papenhoei		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	10	SC; Confirms Cutler 1988 specimen
2015004	2409	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.269	091 56.336	a	200	Sassacus papenhoei		1	F	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	11	SC; Confirms Cutler 1988 specimen
2015004	2409	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.269	091 56.336	a	200	Sassacus papenhoei		1	imm.	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	12	SC; immature
2015004	2448	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.269	091 56.336	a	200	Habronattus decorus		1	F	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	13	CR
2015004	2456	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.269	091 56.336	200	200	Tutelina elegans		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	14	CR
2015004	2460	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.269	091 56.336	a	250	Tutelina elegans		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	15	CRA
2015004	2463	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.269	091 56.336	250	250	Habronattus cognatus		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	16	CRA
2015007	2331	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.288	091 56.314	300	300	Sassacus papenhoei		1	F	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	17	SC; Confirms Cutler 1988 specimen
2015007	2459	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.288	091 56.314	a	300	Marpissa pikei		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	18	Confirms Cutler report and also van der Linden photo from 2010 (BugGuide online)
2015009	2385	Weaver Dunes TNC	Wabasha	16-Jun-2015	?	44 15.377	091 56.637	?	?	Maevia inclemens		1	M	PPL/Blufflands; dune area, wild rose, poison ivy, spiderwort, yarrow, porcupine grass, hawksbeard	19	Confirms Ehmann 1996 specimen
2015010	2338	Kellogg-Weaver SNA	Wabasha	16-Jun-2015	14:49	44.27411	91.9401	300	300	Habronattus viridipes		1	M	PPL/Blufflands; sumac, milkweed, larkspur	20	Confirms Ehmann 1996 specimen
2015010	2345	Kellogg-Weaver SNA	Wabasha	16-Jun-2015	14:49	44 16.468	091 56.419	300	300	Habronattus viridipes		1	F	PPL/Blufflands; sumac, milkweed, larkspur	21	Confirms Ehmann 1996 specimen

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2015011	2401	Afton State Park	Washington	16-Jun-2015	17:15	44.84679	92.79074	350	350	Tutelina similis			1 M	MIM/St. Paul-Baldwin Plains & Moraines; center island of overgrown grass before entrance gate	22	CR
2015013	2411	Afton State Park	Washington	16-Jun-2015	18:15	44.85285	92.77714	800	800	Tutelina similis			1 M	MIM/St. Paul-Baldwin Plains & Moraines; grass at intersection of main road and trailer/bus parking area inside park	23	CRA
2015014	2317	Lake Elmo County Nature Reserve	Washington	16-Jun-2015	19:10	44.98952	92.90009	850	850	Tutelina similis			1 M	MIM/St. Paul-Baldwin Plains & Moraines; low grade prairie restoration behind campsite 13 in group/equestrian area	24	CR
2015015	2304	Ottawa Bluffs TNC	Le Sueur	17-Jun-2015	14:13	44.36641	93.93191	180	180	Maevia inclemens			1 M	MIM; patches of grass along forest and cornfield edge	25	CR
2015016	2441	Ottawa Bluffs TNC	Le Sueur	17-Jun-2015	?	44.36386	93.93163	0	0	Tutelina elegans			1 M	MIM; limb beating oak branches from hill prairie facing previous WJE sample site #31 from 4-Jun-1996	26	CR
2015016	2449	Ottawa Bluffs TNC	Le Sueur	17-Jun-2015	?	44.36386	93.93163	0	0	Maevia inclemens			1 M	MIM; limb beating oak branches from hill prairie facing previous WJE sample site #31 from 4-Jun-1996	27	CRA
2015018	2406	Ottawa Bluffs TNC	Le Sueur	17-Jun-2015	16:00	44.36352	93.93574	150	150	Tutelina elegans			1 M	MIM; roadside vegetation	28	CRA
2015019	2325	Tauer Prairie SNA	Brown	18-Jun-2015	10:52	44.19656	94.53237	200	200	Tutelina similis			1 F	CGP/MN River Prairie; wetter area with northern bedstraw	29	
2015019	2325	Tauer Prairie SNA	Brown	18-Jun-2015	10:52	44.19656	94.53237	a	200	Tutelina similis			1 M	CGP/MN River Prairie; wetter area with northern bedstraw	30	
2015019	2369	Tauer Prairie SNA	Brown	18-Jun-2015	10:52	44.19656	94.53237	1050	1050	Tutelina similis			2 M	CGP/MN River Prairie; central area, south side of preserve	31	
2015019	2392	Tauer Prairie SNA	Brown	18-Jun-2015	10:52	44.19656	94.53237	250	250	Synageles occidentalis			1 F	CGP/MN River Prairie; mesic prairie with rattlesnake master, milkweed, lead plant	32	
2015019	2310	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.19656	94.53237	270	270	Tutelina similis			2 M	CGP/MN River Prairie; east edge of preserve	33	Confirms Ehmann 2013 specimen
2015019	2310	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.19656	94.53237	a	270	Tutelina similis			2 F	CGP/MN River Prairie; east edge of preserve	34	Confirms Ehmann 2013 specimen
2015020	2302	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	200	200	Marpissa grata			1 M	CGP/MN River Prairie; river rush, canary reed, cattail	35	CR (Heins reported visual, no photo)
2015020	2328	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	990	990	Phidippus pius			1 M	CGP/MN River Prairie; yarrow, clover, horsetail, milkweed, bluestem, brome, wild strawberry	36	SC; CR
2015020	2381	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	?	?	Marpissa pikei			1 M	CGP/MN River Prairie; tussocks, horseweed, horsetail	37	CR (Heins reported visual, no photo)
2015020	2432	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	?	?	Synageles occidentalis			1 F	CGP/MN River Prairie; burned willow shrubs	38	Confirms Ehmann 2013 specimen
2015020	2455	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	a	990	Tutelina similis			7 F	CGP/MN River Prairie; yarrow, clover, horsetail, milkweed, bluestem, brome, wild strawberry	39	Confirms Ehmann 2013 specimen
2015020	2455	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	a	990	Tutelina similis			3 M	CGP/MN River Prairie; yarrow, clover, horsetail, milkweed, bluestem, brome, wild strawberry	40	Confirms Ehmann 2013 specimen
2015020	2476	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	?	?	Tutelina similis			1 M	CGP/MN River Prairie; burned willow shrubs	41	Confirms Ehmann 2013 specimen
2015020	2476	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	?	?	Tutelina similis			1 F	CGP/MN River Prairie; burned willow shrubs	42	Confirms Ehmann 2013 specimen
2015020	2477	Tauer Prairie SNA	Brown	18-Jun-2015	?	44.20057	94.5281	a	990	Tutelina similis			3 M	CGP/MN River Prairie; yarrow, clover, horsetail, milkweed, bluestem, brome, wild strawberry	43	Confirms Ehmann 2013 specimen
2015021	2320	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	15:37	44.36432	93.93597	350	350	Tutelina elegans			1 M	MIM; sumac forest	44	CRA

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2015021	2335	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	15:37	44.36432	93.93597		35	35	Tutelina elegans		1	M	MIM; grass patch	45	CRA
2015021	2465	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	15:37	44.36432	93.93597		350	350	Tutelina similis		1	F	MIM; sumac forest	46	Confirms Ehmann 1996 specimen
2015022	2332	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.36432	93.93597		280	280	Habronattus decorus		1	imm.	MIM; hillside vegetation including sumac	47	immature
2015022	2361	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.36432	93.93597		?	?	Tutelina elegans		1	M	MIM; from oak branches	48	CRA
2015022	2419	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.36348	93.93401		475	475	Hentzia palmarum		1	F	MIM; trailhead near stream below oak restoration area, partially shaded	49	Confirms Cutler specimen in Richman 1989; first WJE
2015022	2467	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.36348	93.93401	a		475	Hentzia mitrata		1	F	MIM; trailhead near stream below oak restoration area, partially shaded	50	CR; first WJE
2015022	2475	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.36432	93.93597	a		280	Synageles occidentalis		1	F	MIM; hillside vegetation including sumac	51	Confirms Cutler 1987 specimen
2015023	2414	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.4	93.9		750	750	Tutelina similis		2	M	MIM; grass at top of burial mound	52	Confirms Ehmann 1996 specimen
2015023	2414	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.4	93.9		750	750	Tutelina similis		1	F	MIM; grass at top of burial mound	53	Confirms Ehmann 1996 specimen
2015023	2464	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.4	93.9	a		750	Synageles occidentalis		2	F	MIM; grass at top of burial mound	54	Confirms Cutler 1987 specimen
2015023	2464	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.4	93.9	a		750	Synageles occidentalis		3	M	MIM; grass at top of burial mound	55	Confirms Cutler 1987 specimen
2015023	2491	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.4	93.9	a		750	Tutelina elegans		1	F	MIM; grass at top of burial mound	56	CRA
2015023	2491	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.4	93.9	a		750	Tutelina elegans		3	M	MIM; grass at top of burial mound	57	CRA
2015023	2497	Ottawa Bluffs TNC	Le Sueur	18-Jun-2015	?	44.4	93.9	a		750	Tutelina harti		1	M	MIM; grass at top of burial mound	58	CR
2015025	2352	Hole In The Mountain TNC	Lincoln	19-Jun-2015	11:05	44.23849	96.30221		450	450	Tutelina elegans		1	F	CGP/Coteau Moraines; same location as historical WJE site 48 in 2001, top of hill prairie	59	CR
2015025	2468	Hole In The Mountain TNC	Lincoln	19-Jun-2015	11:05	44.23849	96.30221	a		450	Pelegrina exigua		1	M	CGP/Coteau Moraines; same location as historical WJE site 48 in 2001, top of hill prairie	60	SR, CR based on Richman et al., 2012
2015026	2342	Blue Mounds State Park	Rock	19-Jun-2015	16:18	43.68938	96.20482		1230	1230	Pelegrina exigua		1	M	CGP/Inner Coteau; base of ledge below visitor center, bluestem, brome, clover, east of visitor center road with more brome	61	CR (second from MN)
2015026	2351	Blue Mounds State Park	Rock	19-Jun-2015	16:18	43.68938	96.20482		1200	1200	Tutelina similis		1	M	CGP/Inner Coteau; base of ledge below visitor center, bluestem, brome, clover, west of visitor center road	62	Confirms Ehmann 2001 specimen
2015026	2469	Blue Mounds State Park	Rock	19-Jun-2015	16:18	43.68938	96.20482	a		1230	Maevia inclemens		1	M	CGP/Inner Coteau; base of ledge below visitor center, bluestem, brome, clover, east of visitor center road with more brome	63	CR
2015026	2474	Blue Mounds State Park	Rock	19-Jun-2015	16:18	43.68938	96.20482	a		1200	Marpissa pikei		1	M	CGP/Inner Coteau; base of ledge below visitor center, bluestem, brome, clover, west of visitor center road	64	CR
2015026	2474	Blue Mounds State Park	Rock	19-Jun-2015	16:18	43.68938	96.20482	a		1200	Marpissa pikei		1	F	CGP/Inner Coteau; base of ledge below visitor center, bluestem, brome, clover, west of visitor center road	65	CRA
2015027	2396	Blue Mounds State Park	Rock	19-Jun-2015	17:34	43.69519	96.1871		0	0	Naphrys pulex		7	M	CGP/Inner Coteau; handsearch on quartzite boulders	66	Confirms Cutler (pers. comm.)
2015027	2396	Blue Mounds State Park	Rock	19-Jun-2015	17:34	43.69519	96.1871		0	0	Naphrys pulex		1	imm.	CGP/Inner Coteau; handsearch on quartzite boulders	67	immature

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2015027	2396	Blue Mounds State Park	Rock	19-Jun-2015	17:34	43.69519	96.1871	0	0	Naphrys pulex			3	F	CGP/Inner Coteau; handsearch on quartzite boulders	68	Confirms Cutler (pers. comm.)
2015027	2398	Blue Mounds State Park	Rock	19-Jun-2015	17:34	43.69519	96.1871	0	0	Phidippus audax			1	F	CGP/Inner Coteau; handsearch on quartzite boulders	69	Confirms Cutler (pers. comm.)
2015027	2471	Blue Mounds State Park	Rock	19-Jun-2015	17:34	43.69519	96.1871	0	0	Tutelina similis			1	M	CGP/Inner Coteau; handsearch on quartzite boulders	70	Confirms Ehmann 2001 specimen
2015027	2326	Blue Mounds State Park	Rock	19-Jun-2015	?	43.69519	96.1871	150	150	Synemosyna formica			3	F	CGP/Inner Coteau; understory including oak and nettle, Burr Oak Trail near quarry	71	CR
2015027	2362	Blue Mounds State Park	Rock	19-Jun-2015	?	43.69519	96.1871	0	0	Naphrys pulex			1	M	CGP/Inner Coteau; handsearch on quartzite boulders	72	Confirms Cutler (pers. comm.)
2015027	2473	Blue Mounds State Park	Rock	19-Jun-2015	?	43.69519	96.1871	a	150	Naphrys pulex			1	M	CGP/Inner Coteau; understory including oak and nettle, Burr Oak Trail near quarry	73	Confirms Cutler (pers. comm.)
2015027	2479	Blue Mounds State Park	Rock	19-Jun-2015	?	43.69519	96.1871	a	150	Pelegrina exigua			1	M	CGP/Inner Coteau; understory including oak and nettle, Burr Oak Trail near quarry	74	CRA (third from MN)
2015027	2495	Blue Mounds State Park	Rock	19-Jun-2015	?	43.69519	96.1871	a	150	Attidops youngi			1	M	CGP/Inner Coteau; understory including oak and nettle, Burr Oak Trail near quarry	75	cited in Stratton and Uetz 1979 but those two specimens (believed to be valid) from Lake Co. were not reported as examined
2015030	2305	Hole In The Mountain TNC	Lincoln	20-Jun-2015	13:00	44.22744	96.3042	150	150	Pelegrina exigua			1	M	CGP/Coteau Moraines; dry slope containing Canada anemone, nodding thistle, alfalfa, sweet clover, porcupine grass	76	CRA
2015033	2364	Glacial Lakes State Park	Pope	20-Jun-2015	17:16	45.53463	95.52125	1250	1250	Tutelina elegans			8	F	CGP/MN River Prairie; horse camp loop, hill prairie/kames	77	CR
2015033	2462	Glacial Lakes State Park	Pope	20-Jun-2015	17:16	45.53463	95.52125	a	1250	Phidippus whitmanii			1	M	CGP/MN River Prairie; horse camp loop, hill prairie/kames	78	CR, new western range record for MN, extending by 200 km from Hennepin Co., first WJE
2015033	2496	Glacial Lakes State Park	Pope	20-Jun-2015	17:16	45.53463	95.52125	a	1250	Tutelina similis			9	M	CGP/MN River Prairie; horse camp loop, hill prairie/kames	79	Confirms Ehmann 2001 specimen
2015033	2496	Glacial Lakes State Park	Pope	20-Jun-2015	17:16	45.53463	95.52125	a	1250	Tutelina similis			6	F	CGP/MN River Prairie; horse camp loop, hill prairie/kames	80	Confirms Ehmann 2001 specimen
2015033	2498	Glacial Lakes State Park	Pope	20-Jun-2015	17:16	45.53463	95.52125	a	1250	Pelegrina exigua			1	M	CGP/MN River Prairie; horse camp loop, hill prairie/kames	81	CR
2015033	2367	Glacial Lakes State Park	Pope	20-Jun-2015	?	45.53463	95.52125	1150	1150	Tutelina elegans			3	F	CGP/MN River Prairie; horse camp loop, hill prairie/kames	82	CRA
2015033	2489	Glacial Lakes State Park	Pope	20-Jun-2015	?	45.53463	95.52125	a	1150	Tutelina similis			2	M	CGP/MN River Prairie; horse camp loop, hill prairie/kames	83	Confirms Ehmann 2001 specimen
2015033	2489	Glacial Lakes State Park	Pope	20-Jun-2015	?	45.53463	95.52125	a	1150	Tutelina similis			2	F	CGP/MN River Prairie; horse camp loop, hill prairie/kames	84	Confirms Ehmann 2001 specimen
2015033	2494	Glacial Lakes State Park	Pope	20-Jun-2015	?	45.53463	95.52125	a	1150	Tutelina harti			1	F	CGP/MN River Prairie; horse camp loop, hill prairie/kames	85	CR
2015036	2329	Seven Sisters TNC	Otter Tail	21-Jun-2015	13:44	46.11161	95.74966	a	1080	Tutelina similis			2	F	gravel prairie, bluestem, spurge, sweet yellow clover, NW corner of preserve	86	Confirms Ehmann 2001 specimen
2015036	2329	Seven Sisters TNC	Otter Tail	21-Jun-2015	13:44	46.11161	95.74966	a	1080	Tutelina similis			2	M	gravel prairie, bluestem, spurge, sweet yellow clover, NW corner of preserve	87	Confirms Ehmann 2001 specimen
2015036	2341	Seven Sisters TNC	Otter Tail	21-Jun-2015	13:44	46.11161	95.74966	a	1080	Tutelina elegans			1	M	gravel prairie, bluestem, spurge, sweet yellow clover, NW corner of preserve; palp is in this vial	88	CR
2015036	2346	Seven Sisters TNC	Otter Tail	21-Jun-2015	13:44	46.11161	95.74966	1080	1080	Pelegrina exigua			1	F	MIM Hardwood Hills; gravel prairie, bluestem, spurge, sweet yellow clover, NW corner of preserve	89	CR
2015036	2349	Seven Sisters TNC	Otter Tail	21-Jun-2015	13:44	46.11161	95.74966	a	1080	Synageles occidentalis			1	F	gravel prairie, bluestem, spurge, sweet yellow clover, NW corner of preserve	90	Confirms Ehmann 2004 specimen

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2015036	2356	Seven Sisters TNC	Otter Tail	21-Jun-2015	13:44	46.11161	95.74966	a	1080	Paradamoetas fontana		1	M	gravel prairie, bluestem, spurge, sweet yellow clover, NW corner of preserve	91	CR
2015037	2323	Seven Sisters TNC	Otter Tail	21-Jun-2015	?	46.10648	95.74554	a	850	Habronattus decorus		1	imm.	MIM Hardwood Hills; old gravel quarry facing Lake Christina, grass, sumac, willow, spiderwort	92	immature
2015037	2334	Seven Sisters TNC	Otter Tail	21-Jun-2015	?	46.10648	95.74554		850	Synemosyna formica		1	F	MIM Hardwood Hills; old gravel quarry facing Lake Christina, grass, sumac, willow, spiderwort	93	CR
2015037	2357	Seven Sisters TNC	Otter Tail	21-Jun-2015	?	46.10648	95.74554	a	850	Habronattus cuspidatus		1	F	MIM Hardwood Hills; old gravel quarry facing Lake Christina, grass, sumac, willow, spiderwort	94	SR, CR
2015037	2378	Seven Sisters TNC	Otter Tail	21-Jun-2015	?	46.10648	95.74554	a	850	Habronattus cognatus		2	M	MIM Hardwood Hills; old gravel quarry facing Lake Christina, grass, sumac, willow, spiderwort	95	Confirms Ehmann 2004 specimen
2015037	2378	Seven Sisters TNC	Otter Tail	21-Jun-2015	?	46.10648	95.74554	a	850	Habronattus cognatus		1	F	MIM Hardwood Hills; old gravel quarry facing Lake Christina, grass, sumac, willow, spiderwort	96	Confirms Ehmann 2004 specimen
2015037	2408	Seven Sisters TNC	Otter Tail	21-Jun-2015	?	46.10648	95.74554	a	850	Marpissa pikei		1	F	MIM Hardwood Hills; old gravel quarry facing Lake Christina, grass, sumac, willow, spiderwort	97	CR
2015038	2388	Seven Sisters TNC	Otter Tail	21-Jun-2015	14:30	46.10703	95.74243		1010	Habronattus cognatus		1	F	MIM Hardwood Hills; top of gravel prairie along crest trail	98	Confirms Ehmann 2004 specimen
2015038	2407	Seven Sisters TNC	Otter Tail	21-Jun-2015	14:30	46.10703	95.74243	a	1010	Habronattus cuspidatus		1	F	MIM Hardwood Hills; top of gravel prairie along crest trail	99	SRA, CRA
TOTAL												160				