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Use of Spotted Knapweed/Star Thistle (Asterales: Asteraceae) as the Primary Source of Nectar by Early Migrating Monarch Butterflies (Lepidoptera: Nymphalidae) from Beaver Island, Michigan

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ABSTRACT

Recent observations over the past decade suggest that the invasive star thistle (aka spotted knapweed (Asterales: Asteraceae *Centaurea stoebe* L.) provides much of the nectar that supports monarch butterflies (Lepidoptera: Nymphalidae *Danaus plexippus* L.) in their pre-migratory and early migratory flight from the Beaver Island archipelago, an isolated chain of islands located in northern Lake Michigan. With the advent and continuation of global climate change, the opportunistic evolutionary changes that may take place between migrating monarchs and their dependence on non-native nectariferous plants, prior to migration, is worth further documentation and examination.

Keywords: monarch migration, *Danaus plexippus,* star thistle, spotted knapweed, *Centaurea stoebe,* pre-migration nectar resources

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The eastern cohort of monarchs (*Danaus plexippus* L.)—residing largely east of the Rocky Mountains—exhibits an extended migratory period, somewhat variable in timing and success from year to year, but temporally wave-like in occurrence, and most pronounced between 15 August and 15 October (Brower 1995). The success of the migration is dependent upon viable nectar-bearing plants (Brower et al. 2006), as well as ambient temperatures above 10°C with enough radiant insolation, to warm the thorax to the minimal temperature required for the butterflies to conduct continuous, controlled flight (Douglas 1979).

One of the critical parameters ensuring successful migratory flight is the availability of nectar-bearing plants from which the adults feed, and from which they extract and convert sugars into fat reserves (Brower et al. 2006). Without sufficient food reserves, migratory monarchs often die in the overwintering roosts located in the state of Michoacan, Mexico. (Brower et al. 2012, Pleasants & Oberhauser 2012, Flockhart et al. 2013; Flockhart et al. 2015, personal observation February 2002). Thus, the ability to find nectar-bearing plants by sequential generations of late summer and fall butterflies migrating from southern Canada provinces and the northern tier states of the United States to Mexico is critical to their survival. The extraction of sugars from late summer and fall nectariferous plants is vital to their successful migration, survival in the overwintering roosts (located within oyamel/pine forest at 10,000 feet), and the *en masse* spring reproductive effort, which takes place prior to the spring remigration northward.

The natal origins of eastern North American migratory monarch butterflies that overwinter in Mexico have recently been identified, at least to general geographic areas. A full 38 percent migrate to Mexico from the "Midwest;" however, their origins are spread widely across a breeding range that extends across southern Canada and the northern tier states of the United States. University of Guelph scientists analyzed more than 1,000 samples from butterflies collected from the 1970's onward to determine their natal region. Approximately 17 percent originated from the north-central states, including Michigan and Ontario, which represented the greatest number of butterflies for any specific natal region (Flockhart et al. 2017).

This observational study should serve as a heuristic attempt to establish whether or not migratory monarchs from the northern tier states will ultimately switch to the invasive star thistle as a more reliable source of nectar during the early migratory season (Fig. 1).

Materials and Methods

Study Location and Period of Study. In previous years of observation, from 2010 through 2016, and especially during the late summer days of 2017, monarchs were

Figure 1: Central Michigan University Biological Station on Sandy Bay, Beaver Island. Star thistle is shown in foreground. The invasive star thistle has established extensive populations along the swales and parabolic dunes running the circumference of the island. Photo credit: Brandy Van Zalen.

observed nectaring almost exclusively on star thistle, also known vernacularly as spotted knapweed (*Centaurea stoebe* L.) that dominates the swales and parabolic dunes throughout Beaver Island, part of a small archipelago of nine islands located in Lake Michigan, about 45 km due west of Charlevoix, Michigan at latitude 45.67 N, and longitude 85.55 W. It measures 145 km^2 (about 60 square miles). Just north of Beaver Island resides Hog Island with a "natural state" flora of nearly 93 percent (Whately et al. 2005) and thus most of the flora is native and, in a few cases, endemic, leaving this isolated ecosystem of Lake Michigan islands relatively untouched by invasive species, save for the shoreline environments. This observational study has been conducted over a number of years at Sandy Bay, in front of the Central Michigan University Biological Station on Beaver Island. During mid-and late August of 2017, an unusually large population of monarch butterflies emerged and in the course of a week assumed typical migratory behavior (Fig. 2).

History of Star Thistle in Michigan. Star thistle, a Central European native with an estimated introduction in western North America in the 1890s, is an invasive plant that is currently the target of eradication in many states. In northern Michigan, however, many beekeepers are opposed to efforts directed at its eradication because a significant portion of their yearly revenue depends upon it, especially during late July and August, when it is one of the few extensively blooming plants in the northern Lower Peninsula of Michigan and along Lake Michigan lakeshore (honeytraveler.com). According to this source, star thistle honey has a light, transparent and thick viscous appearance with "an aroma of anise/almonds, slightly sharp or pungent with notes of sweet, spicy cinnamon, molasses and prune."

The star thistle first invaded the Beaver Island archipelago in the 1980's, became firmly established in the mid-1990's, and now can be found throughout the entire island, wherever there is appropriate habitat (B. Leuck personal communication 2018). There are approximately 476 populations comprising nearly 84 hectares (210 acres) of star thistle now on Beaver Island (GEI consultants 2017). Of 16 listed invasive species on Beaver Island, the invasion of star thistle is the largest, and except for Bladder Campion (*Silene vulgaris* (Moench) Garcke) at 70 hectares (175 acres), all other invasives can be measured at well under 16 hectares (40 acres), and typically fewer than 4 hectares

Figure 2: Star thistle population extending along the swales and parabolic dunes of Beaver Island. Newly emergent monarch butterflies spend over a week exclusively nectaring at the flowers, prior to the first ("early") wave of monarch migration from the island at the end of August. Monarch butterflies are now found on the island well into late October. Photo credit: Brandy Van Zalen.

(10 acres). Despite this recent and successful invasion, there has apparently not been any significant change in the *Solidago* L. (goldenrod) populations upon which migrants apparently used to rely (B. Leuck personal communication 2018).

Attractiveness of Star Thistle to Nectar-Seeking Butterflies. The star thistle is officially classified as an invasive herbaceous biennial or short-lived perennial. A highly branching species, it reaches heights during bloom between 0.3 and 1.2 meter. Star thistle is a beautiful and long-blooming plant (from June through October 2017), and a moderate nectar producer that attracts numerous butterflies during the mid- to late summer, including buckeye (*Junomia coenia* Hubner), red admiral (*Vanessa atalanta* (L.)), painted lady (*Vanessa cardui* (L.)), American lady (*Vanessa virginiensis* (Drury)), and viceroy (*Limenitis archippus* (Cramer)), which are numerous and fly in mixed species aggregations with pre-migratory monarchs. In fact, most species of butterflies on Beaver Island appear to avidly nectar at star thistle. [It is interesting to note that the buckeye, red admiral, and painted lady are also migratory species, whose orientation and flight behaviors are virtually unstudied, although they can be readily observed migrating southward down the western shore of Lake Michigan in August and September, along with migrating monarchs. (In contrast, the viceroy overwinters as first instar larvae in hibernacula created by rolling the leaves of willow that form extensive stands along the Beaver Island beaches.)]

Invasive Characteristics and Control Efforts of Star Thistle. The reproductive output of star thistle is considerable. A single plant can produce 1,000 to 10,000 seeds that are dispersed by animals and birds and through the feces of birds and small rodents that consume them. The seeds can remain dormant in the soil for over 5 years (DeVries and Laureto 2013). The species spreads rapidly by reseeding itself (North Dakota State University, publications circular, crops, 2013).

Because of its r-selected characteristics, star thistle has rapidly colonized much of North America, especially disturbed areas. Unfortunately, its taproot system provides a poor anchor for soils and thus monocultures of this plant along hill sides lead to elevated erosion (Lacey et al. 1995). Because of its ability to rapidly colonize a number of habitats, it has outcompeted many native species, and has proved difficult to control biologically (i.e., "biological control") even

Figure 3: Monarch adult foraging at one of the many blooms of a single star thistle plant, late August, 2017. Photo credit: Brandy Van Zalen.

with the introduction of numerous predatory arthropods that prey on various parts of the plant, including the moth *Metzneria paucipunctella* Zeller, the knapweed gall flies, *Urophora affinis* (Frauenfeld) and *U. quadrifasciata* (Meigen), the cochylid moth *Agapeta zoegana* L., and the beetle *Sphenoptera jugoslavica*.Obenberger (Lym et al. 1992, Clark et al. 2001). However, mechanical control, biological control, or chemical control or combinations thereof have not yielded significant results anywhere in North America, and the species continues its invasion eastward (Smithsonian.com 10.21.17).

In Michigan, Star thistle has adapted quickly to sandy, disturbed soils, such as the sandy beaches and dunes along the Great Lakes shoreline. The seeds may be brought to the beaches by hikers and kayakers, especially along the edges of the islands (Great Lakes Restoration Initiative 2011). Unfortunately, star thistle is not viewed as providing much in the way of benefits for any community it invades. Star thistle is a "wicked weed" according to Joe Alper: In fact, it is a "weed" that is massively destroying the rangeland of the western states such as Montana, where it costs ranchers more than $40 million annually in herbicide use and lost productivity (Alper 2004). Star thistle has invaded pastureland and rendered huge tracts commercially useless because cattle, horses, and most other animals will not eat it (Olson et al. 1997). Star thistle produces (-) catechin, which was formerly claimed to function in part as an allelopathic compound that destroys the roots of other competing plants (Rutledge and McLendon 1998). Star thistle-infected North American soils had two to three times more (-) catechin than soils from the plant's native habitat in Europe, where star thistle grows in apparent harmony with thousands of grasses and other perennials. However, the claim that (-) catechin is allelopathic is being re-investigated.

Clearly, in North America, star thistle does not have a stellar reputation. Star thistle was documented throughout the Beaver Island archipelago as an invasive species even on smaller islands, such as Hog Island (Whately et al. 2005)(Fig. 3).

Results

During the period from 10 to 17 August 2017, star thistle was virtually the only flowering/nectar-producing plant growing along the shoreline. [Several goldenrod species, tall goldenrod (*Solidago altissima* L.) and Canada goldenrod (*Solidago canadensis* L.) were just coming into bloom, and about 10

to 20 percent of common milkweed (*Asclepias syriaca* L.) and small patches of swamp milkweed (*A. incarnata* L.) were still in bloom in shaded areas with higher moisture content.] Previous personal observations over many years in the Upper Peninsula and at Beaver Island in mid-to late-August, show that major monarch emergences occur during this period, prior to the first advance of migration.

In mid-August 2017, many thousands of monarchs emerged to find very few foraging plants save for the abundant star thistle, which they visited continuously throughout the day from sunrise to sunset—even on completely overcast days. At times, 20 or more monarchs *per minute* could be seen flying up and down Sandy Bay beach (running North/South) along a stretch of beach about 100 meters long and about 20 meters deep, before the forest interface and the bordering forest of conifers and oaks. This was a common condition across the island. These newly emergent butterflies were not exhibiting migratory behavior at this point, which in northern Michigan and the Beaver Island archipelago ultimately forces them to cross Lake Michigan, typically in a S-SW direction. Their lake crossing can vary between 30 and 300 km in length depending on the direction of the winds at the onset of migration. Star thistles in the many thermal microhabitats available on Beaver Island could be found in early stages of bloom as well as late stages of senescence, suggesting that the nectar resource was available to several generations of monarchs on the island. (Star thistle begins to bloom in June across the northern part of the Lower Peninsula of Michigan and often continues through October, thus making its nectar available to all nectar-seeking insects, and especially late migratory monarchs and other butterflies leaving the island from the end of August until late October.)

At sunset, the "pre-migratory" butterflies would begin to form small roosts of 4-10 individuals about 50 meters from the shoreline, largely within coniferous trees (*Pinus strobus* L., *Abies balsamea* (L.) Miller, *Picea mariana* (Miller) BSP, and common juniper (*Juniperus communis* L.). It is worth noting that closely related smooth-bark Mexican pine (chamite/pacingo) *Pinus pseudostrobus* Lindlay and the oyamel "sacred" fir, (*Abies religiosa* (Kunth)) create mixed groves where massive roosts of overwintering monarchs form in the southwest-facing slopes of the Trans-Mexican Volcanic Belt, Sierra Madre del Sur, State of Michoacan, Mexico (Brower 1995, personal observation Sierra Chincua roost 2002).

The same scenario of monarch migration plays out on Drummond Island (R. Haack personal communication 2018), where star thistle is also widely prevalent. As star thistle continues its unabated invasion of the Great Lakes Region, moving towards the East Coast, it is likely to create an even more reliable source of nectariferous resources for migrating monarchs. This may be especially significant in dry areas where *Solidago* either does not dominate or blooms later in the season, which may not be useful for the first and typically largest wave of monarch butterflies leaving the region.

Discussion

The origins of monarch migration throughout the species distribution is not well understood, despite many decades of research as to the evolution and proximal causes that induce migration in the several species and subspecies of monarchs. Currently the populations of monarchs in eastern North America, western north America, and South America have an extended migratory period that relies on enough nectar-bearing plants from which migrating butterflies forage, converting sugars to fats, for the lengthy migrations, which may be either altitudinal or longitudinal. Survival in the overwintering roosts depends upon reserves of fat built up from foraging during the course of migration. Without sufficient nectariferous resources, monarchs may not complete the migration, may die in the overwintering roosts, or may fail in their reproductive efforts during the spring remigration.

Invasive plants such as the star thistle often disrupt intact ecosystems and as a result change all organismal players involved. However, invasive plants may also prove useful to many insects, particularly pollinator Hymenoptera and Lepidoptera, especially if the nectar they produced is available during critical times of their life cycles. At Beaver Island, star thistle has clearly become a vital resource utilized by the early migratory monarch population in the late summer and likely for earlier and later generations as well because the plants bloom from June through October. Whether or not star thistle has displaced other nectariferous plants such as goldenrod and common milkweed, is not known, but anecdotal observations suggest that it has not diminished their range or abundance, at least on the Beaver Island archipelago (Fig. 4).

In effect, star thistle has become an essential nectariferous plant of great value to the emerging early migratory populations on Beaver Island, and likely throughout the archipelago. What change and value this has for the monarchs under extensive pressure

Figure 4: Common milkweed *(Aesclepias syriaca)* forms dense monocultural stands along many areas of the Lake Michigan lakeshore on Beaver Island. Note the two newly emergent monarchs nectaring on the milkweed blooms in the front (second milkweed from the left) of the picture. Photo credit: Brandy Van Zalen.

during the migratory period from northern Michigan is not known, but it is likely that eradication efforts will demand a great deal of time and money, and the ultimate goal of eradication will prove extremely difficult if not impossible.

Future areas of investigation may involve the effects of star thistle success and the possible co-evolution of star thistle and monarchs during their migratory periods. With the advent and continuation of global climate change, the opportunistic evolutionary changes that may take place between migration of monarchs and their non-native nectariferous plants prior to migration would be worth examining.

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New state records for some Pentatomomorpha (Heteroptera) of the United States

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Abstract

Forty-two new state records, distributed among the Alydidae, Coreidae, Largidae, Pyrrhocoridae, and Rhopalidae, are reported for 25 species of Pentatomomorpha found in the United States.

Keywords: True bugs, faunistics, distribution, Nearctic

My studies of the heteropteran groups of Michigan have afforded ample opportunity to examine material from all over the United States. As a retroactive companion piece to my Michigan Coreoidea synopsis (i.e., Swanson 2011), I have re-examined and identified Coreoidea and Pyrrhocoroidea in the two major collections in southern Michigan in order to bring to light unreported state records among that material. As a result, 42 new extra-Michigan state records for species from five pentatomomorphan families, comprising material from the Michigan State University Albert J. Cook Arthropod Research Collection in East Lansing, the University of Michigan Museum of Zoology Insect Collection in Ann Arbor, and the author's personal collection, are herein reported.

Materials and Methods

After examining the determined coreoid and pyrrhocoroid holdings and identifying most of the undetermined U.S. material in two Michigan university collections, the locality data of these specimens was compared with the most recent catalog for Heteroptera found north of Mexico (Henry and Froeschner 1988). Further records were culled after comparing with various post-1988 regional faunistic studies, as well as some pre-1988 references overlooked by the authors of the catalog (see annotations). The remaining specimen data are the subject of this treatment.

The identification of each specimen included in this study was rendered or confirmed by me, using my own keys (Swanson, unpublished) to the United States taxa synthesized from various sources (e.g., Torre-Bueno 1941, Packauskas 1994, Schaefer 2004). All new records pertain to specimens vouchered in one of the collections listed below.

Label data were not copied verbatim, although complete locality information is included. Any additions, changes, or interpretive elements I provide are shown in brackets. Multiple localities are included, where possible, to fortify new records. Distributional or taxonomic notes are offered where deemed necessary or useful.

As mentioned, the initial authority on which a state having a published record is based belongs to Froeschner (Alydidae: 1988a; Coreidae: 1988b) and Henry (Largidae: 1988a; Pyrrhocoridae: 1988b; Rhopalidae: 1988c). An updated distribution within the United States and Canada is included for each species treated herein. Records overlooked or reported subsequently are annotated in the distribution north of Mexico given at the end of each species account, whereas new records herein reported are presented in bold type; thus, this treatment also may be used as a partial compilation of references overlooked in Henry and Froeschner's (1988) catalog. The abbreviations used for each U.S. state and Canadian province or territory follow the United States Postal Service and the Canada Post Corporation, respectively.

Collections are designated as follows: Daniel R. Swanson, personal collection (DRS); Albert J. Cook Arthropod Research Collection, Michigan State University, East Lansing, Michigan (MSUC); and University of Michigan Museum of Zoology Insect Collection, Ann Arbor, Michigan (UMMZ).

Results

As a result of this investigation, 42 new state records for 25 species in 22 genera in 5 families have been compiled. The following 22 states have new records: AL, AZ, CT, FL, GA, IL, KS, KY, LA, MD, MN, MT, ND, NE, NM, NY, OK, OR, TN, TX, WV, WY.

Superfamily COREOIDEA

Family ALYDIDAE

Eleven new state records are reported for 8 species in 6 genera.

Alydus conspersus Montandon, 1893. – **CONNECTICUT**: [Litchfield Co.], Lakeville, 2 September 1934 [add. date: 29 June 1935], R. F. Hussey, det. R. F. Hussey 1936 [2 ♀] (UMMZ); Litchfield Co., Salisbury – Twin Lakes, 10 September 1982, M. & A. O'Brien, det. D. R. Swanson 2012 [1 ♂] (UMMZ); **MINNESOTA**: [Hennepin Co.], Minneapolis, 5 October 1918, R. F. Hussey, det. D. R. Swanson 2012 [1 ♀] (UMMZ).

Notes: Froeschner (1988a) listed this species from "Dakota"; see Rider (2012) for a discussion about the probable localities of these records. Hussey (1922a) and Weber (1935) reported this species (the former as *Coriscus conspersus*) from North Dakota, and Clem and Ray (2016) listed a specimen from South Dakota in the appendix. I have examined the following corroborative material: **SOUTH DAKOTA**: Lawrence Co., Cheyenne Crossing, Black Hills National Forest, 13–14 July 1974, Richard A. Arnold, det. D. R. Swanson 2012 [1 ♀] (MSUC); idem. Thomas A. Bowling [1 ♂] (MSUC).

Distribution: USA: AZ, CO, **CT**, IA, IL, IN, MA, ME, MI, **MN**, ND (Hussey 1922a), NH (Parshley 1917), NJ, NY, OH, PA, SD, UT, WI, WY (Dennis et al. 2010); Canada: AB, BC, MB (Maw et al. 2000), NB (Maw et al. 2000), ON, QC, SK (Maw et al. 2000).

Alydus eurinus (Say, 1825). – **MINNESOTA**: Otter Tail Co., Fergus Falls, Swan Lake Road, roadside weeds, 19 July 2013, 46.2315°N 96.0315°W, #29, 1290 ft., D. R. Swanson, det. D. R. Swanson 2013 [1 ♂] (DRS); Wadena Co., 10 July 1952, George W. Byer, det. D. R. Swanson 2012 [1 ♂] (UMMZ); **WEST VIRGINIA**: [Fayette Co.], Page, goldenrod, 10 September 1960, B. A. Wilson, det. D. R. Swanson 2012 [1 ♂, 2 ♀] (MSUC); [Mercer Co.], Bluefield, 12 June 1954, R. L. Fischer, det. D. R. Swanson 2012 [1 ♂] (MSUC); Pendleton Co., Brandywine, Brandywine Rec. Area, 20 June 2016, 38.6016°N 79.2027°W, 1890 ft., D. R. Swanson, #30, det. D. R. Swanson 2017 [1 ♂] (DRS).

Notes: Froeschner (1988a) listed this species from "Dakota"; see Rider (2012) for a discussion about the probable localities of these records. Hussey (1922a) reported this species (as *Coriscus eurinus*) from North Dakota, and I have examined the following corroborative material: **NORTH DAKOTA**: Richland Co., Wahpeton, jct. Hwy. 210 & Westmore Ave., 19 July 2013, 46.2727°N 96.6258°W, #31, 1010 ft., D. R. Swanson, det. D. R. Swanson 2013 [2 ♂] (DRS); **SOUTH DAKOTA**: Codington Co., Watertown, Pelican Lake Rec. Area, 19 July 2013, 44.8656°N 97.2082°W, #34, 1770 ft., D. R. Swanson, det. D. R. Swanson 2013 [1 ♀] (DRS); Badlands, 16 June 1955, R. L. Fischer, det. D. R. Swanson 2012 [1 ♂] (MSUC). Evans et al. (1978) recorded *Alydus pluto* Uhler, 1872 from the Yukon Territories, which record was later referred to this species by Scudder (1997).

Distribution: USA: AK (Scudder 1997), AL (Clem and Ray 2016), AR, AZ, CA, CO, CT, DC, FL, GA, IA, IL, IN, KS, KY, LA (Masner 1983), MA, MD (Brown and Bahr 2008), ME, MI (Townsend 1890, Hussey 1922b, Swanson 2011), **MN**, MO, MS (Lago and Testa 2000), MT, NC, ND (Hussey 1922a), NE, NH, NJ, NM, NY, OH, OK (Drew and Schaefer 1963, Smith et al. 1996), PA, RI (Parshley 1917), SC, SD, TN (Clem and Ray 2016), TX, UT, VA, VT (Parshley 1917), WI, **WV**; Canada: AB, BC, MB (Maw et al. 2000), NB (Maw et al. 2000), NS (Maw et al. 2000), NT (Maw et al. 2000), ON, PE (Maw et al. 2000), QC, SK (Maw et al. 2000), YT (Evans et al. 1978, Scudder 1997).

Alydus scutellatus Van Duzee, 1903. – **WYOMING**: Albany Co., Medicine Bow National Forest, Curtis Gulch Campground, T28N – R73W – Sec. 8, 8–10 July 1974, Daniel K. Young, det. D. R. Swanson 2012 [1 ♀] (MSUC); [Albany Co.], Centennial, Snowy Ranch, 10000 ft., 9 August 1950, R. R. D[reisbach] & R. K. Schwab, det. R. F. Hussey 1951, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Distribution: USA: CA (Van Duzee 1917a), CO, IA, MT, NM, **WY**; Canada: AB, BC.

Darmistus subvittatus Stål, 1859. – **OREGON**: Curry Co., Humbug State Park, 25 August 1962, R. L. Fischer, det. D. R. Swanson 2012 [1 ♀] (MSUC).

Distribution: AZ, CA, CO, NE (Schaefer 2003), NM (Schaefer 2003), **OR**, SD (Harris 1937), TX, UT (Schaefer 2003), WA (Schaefer 2003), WY (Schaefer 2003).

Megalotomus quinquespinosus (Say, 1825). – **TENNESSEE**: Shelby Co., Shelby Forest State Park, 7 June 1971, Bruce Wildie, det. D. R. Swanson 2012 [1 ♂]

(MSUC); Stewart Co., Land Between the Lakes, nr. Model, 9–10 June 1971, R. L. Fischer, det. D. R. Swanson 2012 [3 ♂, 4 ♀] (MSUC); idem. D. K. Young [3 ♀] (MSUC); **WEST VIRGINIA**: [Greenbrier Co.], Alderson, 11 September 1960, B. A. Wilson, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Distribution: USA: AL (Clem and Ray 2016), AR (Tugwell et al. 1973, Chordas et al. 2005), AZ, CA, CO, CT (Parshley 1917, 1923), DC, DE, FL, GA (Clem and Ray 2016), IA, IL, IN, KS, KY, MA, MD (Brown and Bahr 2008), ME, MI, MO, NC, ND (Hussey 1922a), NH (Parshley 1917), NJ, NY (Van Duzee 1917b), OH, OK (Drew and Schaefer 1963), PA, SC, SD (Harris 1937), **TN**, UT, VA (Hoffman 1975), VT (Parshley 1917), WA, WI, **WV**; Canada: AB, BC, MB (Maw et al. 2000), ON, QC.

Stachyocnemus apicalis (Dallas, 1852). – **GEORGIA**: [Haralson Co.], Bremen, 19 June 1954, R. L. Fischer, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Notes: Froeschner (1988a) listed this species from "Dakota"; see Rider (2012) for a discussion about the probable localities of these records.

Distribution: USA: AL (Clem and Ray 2016), AZ, CA, CO, CT (Schaefer and Schaffner 1997), "Dak.", DC, FL, **GA**, IL (Hart 1907), IN, MT, NC, NJ, NM, NY, OK (Drew and Schaefer 1963), SC, SD (Harris 1937, Clem and Ray 2016), TX, VA (Hoffman 1975), WY (Lavigne et al. 1976); Canada: AB.

Stenocoris (*Stenocoris*) *tipuloides* (DeGeer, 1773). – **LOUISIANA**: St. Helena Par., 10 mi. SW. Fluker, Hiways 1047 at 1048, 13 April 1972, E. H. Metzler, det. D. R. Swanson 2012 [3 ♂] (MSUC); Orleans Par., N. O. City Park, 28 January 1972, E. H. Metzler, det. D. R. Swanson 2012 [1 ♀] (MSUC).

Notes: Van Duzee (1917b) and Ahmad (1965) reported this species from Florida and Texas, the latter author having studied two females from the United States. However, Froeschner (1988a) stated "The nominate subgenus *Stenocoris* does not occur in our region." Hoffman (1994) added records for Georgia, South Carolina, and Virginia but mentioned "inconsistencies" associated with this name's usage. Jansen and Halbert (2016) included *S. tipuloides*, as well as two species in the subgenus *Oryzocoris* Ahmad, 1965, as present in Florida. The material I have examined and here referred to *S.* (*S.*) *tipuloides* agrees with the characterization of Ahmad (1965), and should this be the incorrect name for this species, as suggested by Hoffman (1994), then the material may easily be referred to the appropriate taxon following the new characterizations. Besides the new state record reported above, I also have studied corroborative material for Florida, Mississippi, and Texas: **FLORIDA**: [Manatee Co.], nr. Whitfield[?], George Ames[?], Collection C. V. Riley, det. D. R. Swanson 2012 [1 ind., abdomen missing] (MSUC); Everglades National Park, 3 April 1960, W. T. Van Velzen, det. D. R. Swanson 2012 [1 ♂, 2 ♀] (MSUC); **MISSISSIPPI**: [no further locality data], "576", det. D. R. Swanson 2012 [1 ♂, 1 ♀] (MSUC); **TEXAS**: Cameron Co., Brownsville, ex. USDA light trap, 15 March 1972, H. M. Graham, det. D. R. Swanson 2012 [1 ♂] (MSUC); Cameron Co., Los Fresnos, ex. USDA light trap, 16 March 1972, H. M. Graham, det. D. R. Swanson 2012 [1 ♂] (MSUC); Starr Co., Benston [sic]-Rio Grande Valley State Park, 16 March 1972, T. A. Bowling, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Distribution: AL (Clem and Ray 2016), FL, GA (Hoffman 1994), **LA**, MS (Blatchley 1926), SC (Hoffman 1994), TX, VA (Hoffman 1994).

Tollius curtulus (Stål, 1859). – **WYOMING**: Albany Co., Medicine Bow National Forest, Curtis Gulch Campground, T28N – R73W – Sec. 8, 8–10 July 1974, F. William Ravlin, det. D. R. Swanson 2012 [1 ♀] (MSUC).

Distribution: USA: CA, CO, IL, NY, OR, UT, **WY**; Canada: AB, BC, SK (Maw et al. 2000).

Family COREIDAE

Sixteen new state records are reported for 9 species in 9 genera.

Acanthocephala terminalis (Dallas, 1852). – **WEST VIRGINIA**: [Webster Co.], Cowen, July 1934, [no collector], det. D. R. Swanson 2012 [1 ♀] (MSUC); [Wood Co.], Rockport, 11 June 1954, D. L. Haynes, det. D. R. Swanson 2012 [2 ♀] (MSUC).

Notes: McPherson et al. (2011) synonymized *Acanthocephala confraterna* (Uhler, 1871) with this species; many of the annotations refer to this or another junior synonym, and the record for Texas reported by Froeschner (1988b) is referred here.

Distribution: USA: AL (Blatchley 1926, McPherson et al. 2011), AR (Chordas et al 2005), CO, CT, DE (McPherson et al. 2011), FL, GA (Scott and Fiske 1902, Palmer and Bennett 1988, McPherson et al. 2011), IA (Osborn 1892, McPherson et al. 2011), IL, IN, KS (Tucker 1907a, b; McPherson et al. 2011), KY (McPherson et al. 2011), LA, MA, MD, MI (Hussey 1922b, Swanson 2011), MN, MO, MS (McPherson et al. 2011), NC, NE

(McPherson et al. 2011), NJ, NY, OH (Adkins 1917), OK, PA, RI (Parshley 1917), SC, SD (Harris 1937, McDaniel 1989), TN, TX, VA (Hoffman 1975, McPherson et al. 2011), WI, **WV**; Canada: ON (Maw et al. 2000).

Catorhintha apicalis (Dallas, 1852). – **NEW MEXICO**: Sierra Co., 3 mi. W. Kingston, 30 July 1989, R. L. Fischer, det. D. R. Swanson 2012 [2 ♂] (MSUC); Socorro Co., T45 R6W Sec. 5, 27 July 1989, Manda Kasture, det. D. R. Swanson 2012 [1 ♀] (MSUC); Socorro Co., T25 R2W Sec. 31, 28 July 1989, Manda Kasture, det. D. R. Swanson 2012 [1 ♂] (MSUC); Socorro Co., T25 R7W Sec. 29, 29 July 1989, Manda Kasture, det. D. R. Swanson 2012 [1 ♂] (MSUC); Socorro Co., Water Canyon, T35 R3W Sec. 26, 29 July 1989, Manda Kasture, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Notes: Brailovsky and Garcia (1987) synonymized *Ficana* Stål, 1862 with *Catorhintha* Stål, 1859.

Distribution: AZ, CA, CO, **NM**.

Chariesterus antennator (Fabricius, 1803). – **LOUISIANA**: [East Baton Rouge Par.], Baton Rouge, 24 May 1934, F. E. Lyman, det. D. R. Swanson 2012 [3 ♂, 2 ♀] (UMMZ); **NEW MEXICO**: McKinley Co., Gallup, 10 July 1960, J. E. Bath, det. D. R. Swanson 2012 [1 ♂] (MSUC); **TENNESSEE**: Fentress Co., Allardt, 15 August 1922, T. H. Hubbell, det. R. F. Hussey 1924 [1 ♂] (UMMZ); Knox Co., Knoxville, 28 September 1919, H. C. Fortner, det. R. F. Hussey [1 ♂] (UMMZ); [Sevier Co.], Headquarters, Great Smoky Mountains National Park, 15 August 1947, 1600 ft., Bullock-Dreisbach, det. R. I. Sailer [1 ♀] (MSUC).

Distribution: USA: AR (Tugwell et al. 1973, Chordas et al. 2005), CO, FL, GA, IA (Osborn 1898, 1899), IL, IN, KS, **LA**, MD (Blöte 1935, Brown and Bahr 2008), MI, MS, NC, NE (McDaniel 1989), NJ, **NM**, NY, OH (Osborn 1900, 1904), OK, PA, SC, SD (Parshley 1922, Harris 1937, McDaniel 1989), **TN**, TX, VA, WI (Williams 2004); Canada: ON (Paiero et al. 2003).

Cimolus obscurus Stål, 1870. – **FLORIDA**: Alachua Co., Gainesville, 12 January 1924, H. S. Holl, det. R. F. Hussey 1950 [1 ♂] (UMMZ); Alachua Co., Gainesville, 5 March 1922, [no collector], det. R. F. Hussey 1950 [1 ♂] (UMMZ); Alachua Co., 11 March 1923, Alexander-Walker, det. R. F. Hussey 1925 [1 ♀] (UMMZ); **OKLAHOMA**: Cleveland Co., Norman, Cimarron Trails apartment complex, 10 October 2007, 35.2453°N 97.4885°W, #204, 1170 ft., D. R. Swanson, det. D. R. Swanson 2008 [1 ♀] (DRS).

Distribution: **FL**, LA, **OK**, SC, TX.

Euthochtha galeator (Fabricius, 1803). – **ALABAMA**: Calhoun Co., Camp MacClellan, Choccolocco Mountain, 13 July 1925, H. D. Smith, det. D. R. Swanson 2012 [1 ♂] (UMMZ); **KENTUCKY**: Laurel Co., Bald Rock, 11 June 1978, R. L. Fischer, det. D. R. Swanson 2012 [5 ♂, 3 ♀] (MSUC); Lee Co., 2.9 rd. mi. SW. on Virgil Todd Rd., nr. rock face, 28 July 2010, 37.5109°N 83.8240°W, #31, 720 ft., D. R. Swanson, det. D. R. Swanson 2010 [1 ♂] (DRS); **MINNESOTA**: Houston Co., [no additional data], 20 May 1938 [add. dates: 21 May 1938, 28 May 1939], H. E. Milliron, det. D. R. Swanson 2012 [1 ♂, 3 ♀] (MSUC); **WEST VIRGINIA**: [Wood Co.], Rockport, 11 June 1954, D. L. Haynes, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Distribution: USA: **AL**, AR (Tugwell et al. 1973, Chordas et al. 2005), CT, FL, GA (Scott and Fiske 1902), IA (Osborn 1892, Hendrickson 1930), IL, IN, KS, **KY**, MA, MD (Brown and Bahr 2008), MI, **MN**, MO, NC, NE, NH (Parshley 1917), NJ, NY, OH, OK (Drew and Schaefer 1963, Smith et al. 1996), PA, RI (Parshley 1917), SC, SD (Parshley 1922, Harris 1937, McDaniel 1989), TN (Lambdin et al. 2003), TX, VA, WI, **WV**; Canada: ON.

Mamurius mopsus Stål, 1862. – **TEXAS**: Hidalgo Co., Mission, 16 March 1972, J. Zimmerman, det. D. R. Swanson 2012 [1 ♂] (MSUC); Maverick Co., 23.7 mi. S. Del Rio jct. Rt. 90 on Rt. 277, 14 October 2007, 29.0829°N 100.6430°W, #231, 920 ft., D. R. Swanson, det. D. R. Swanson 2008 [1 ♀] (DRS); Starr Co., Falcon State Park, 20 March 1972, Roland F. Fischer, det. D. R. Swanson 2012 [1 ♀] (MSUC).

Distribution: AZ, **TX**.

Merocoris distinctus Dallas, 1852. – **MONTANA**: Carter Co., 11 mi. N. Ekalaka, sandy soils, grassland, ponderosa pine, UV, 5 August 1994, 3400', J. H. Wilterding, det. D. R. Swanson 2017 [1 ♂] (MSUC); **WEST VIRGINIA**: Greenbrier Co., Alvon, 18 June 1957, R. L. Fischer, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Notes: The species of this genus are often confounded and some of the records referred to other species actually refer to *M. distinctus*. The Floridian record (i.e., Uhler 1876) is referred to *Merocoris typhaeus* (Fabricius, 1798), following the interpretation of Baranowski and Slater (1986). Records from the western states (i.e., Van Duzee 1914, 1917b; Froeschner 1988b) might refer to *Merocoris curtatus* McAtee, 1919 and currently remain suspect. Identifications

also were compared with Brailovsky and Barrera's (2009) key. Uhler (1876), Wirtner (1904), Van Duzee (1917b), and Froeschner (1988b) reported this species as *M. typhaeus* or *var. distinctus* from Pennsylvania, and I have examined the following corroborative material: **PENNSYLVANIA**: [Pike Co.], Milford, 7 September 1955, R. Angle, det. D. R. Swanson 2012 [1 ♀] (MSUC). The record of *M. typhaeus* reported for Tennessee by Lambdin et al. (2003) almost certainly refers to this species, and I have examined the following corroborative material: **TENNESSEE**: Fentress Co., Allardt, 16 August 1922 [add. date: 13 August 1924], elev. ca. 1600 ft., T. H. Hubbell, det. D. R. Swanson 2012 [2 ♂] (UMMZ); Stewart Co., Land Between the Lakes, nr. Model, 9–10 June 1971, D. K. Young, det. D. R. Swanson 2012 [1 ♂] (MSUC); Van Buren Co., Fall Creek Falls State Park, 11 August 1951, T. J. Cohn, det. D. R. Swanson 2012 [1 ♂, 1 ♀] (UMMZ). Van Duzee (1917b), Froeschner (1988b), and Williams (2004) reported this species as *M. typhaeus* or *var. distinctus* from Wisconsin, and I have examined the following corroborative material: **WISCONSIN**: Shawano Co., [no further locality data], 26 August 1950 [add. date: 31 August 1950], [no collector], det. D. R. Swanson 2012 [2 ♀] (MSUC); [Oconto Co.], Lakewood, 1 August 1950 [add. date: 26 August 1950], [no collector], det. D. R. Swanson 2012 [1 ♂, 1 ♀] (MSUC).

Distribution: AL, AR, AZ(?), CA(?), CO, CT (Parshley 1917, 1923), GA (Scott and Fiske 1902), IA, IL, IN (Blatchley 1926), KS, MA, MD, ME (Parshley 1917), MI (Swanson 2011), MO, **MT**, NC (Torre-Bueno and Engelhardt 1910, Van Duzee 1917b, Brimley 1938), NH (Parshley 1917), NJ, NM(?), NY, OH, OK, PA (Uhler 1876, Wirtner 1904, Van Duzee 1917b), RI (Parshley 1917), SC, SD (Parshley 1922, Harris 1937, McDaniel 1989), **TN**, TX (Uhler 1876), VA, VT (Parshley 1917), WI (Van Duzee 1917b, Williams 2004), **WV**; Canada: AB, MB (Maw et al. 2000), ON (Gibson 1910, 1912, 1917; Maw et al. 2000), QC (Maw et al. 2000), SK (Maw et al. 2000).

Narnia snowi Van Duzee, 1906. – **OKLAHOMA**: Cimarron Co., Kenton, 3 July 1926 [add. date: 4 July 1926], T. H. Hubbell, det. R. Packauskas 1995 [1 ♂, 2 ♀] (UMMZ).

Distribution: AZ, CA, CO, NM, **OK**, TX.

Nisoscolopocerus apiculatus Barber, 1928. – **NORTH DAKOTA**: Slope Co., Amidon, 24 August 1920, T. H. Hubbell, det. R. F. Hussey 1950 [1 ♀] (UMMZ).

Notes: Barber (1928) described this species from specimens previously referred to *Coriomeris humilis* (Uhler, 1872) (Pseudophloeinae), based on morphological similarities with the genus *Scolopocerus* Uhler, 1875 (Coreinae). It is worth noting that a single male of *C. humilis* residing in the UMMZ shares the exact same locality data as the above specimen of *N. apiculatus*; the former was reported by Hussey (1922a). Barber (1928) stated that Uhler's (1875) specimen from Gila River was not *Dasycoris humilis* Uhler, 1872 but rather belonged to his new species; thus, Uhler's (1875) record is treated as the first for Arizona.

Distribution: USA: AZ (Uhler 1875), CO, **ND**, NE, NM; Canada: AB, MB (Maw et al. 2000), SK (Maw et al. 2000).

Family RHOPALIDAE

Ten new state records are reported for 5 species in 5 genera.

Arhyssus nigristernum (Signoret, 1859). – **ALABAMA**: Cleburne Co., Shoal Creek Ford, 6 mi. NNW. Edwardsville, 25 July 1965, J. & L. Donahue, det. D. R. Swanson 2012 [1 ♂, 1 ♀] (MSUC).

Notes: Snow (1904), Hambleton (1908), and Van Duzee (1917b) included records for Arizona and California, but these records were excluded by Chopra (1968) and Henry (1988c), the latter treatments followed here.

Distribution: USA: **AL**, AR, CO (Gillette and Baker 1895), CT, DC, FL, IA (Osborn 1892, Hendrickson 1930), IL (Swanson et al. 2017), IN, KS, KY, LA, MA, MD, ME, MI, MO, MS, NC, NH (Parshley 1917), NJ, NY, OH, PA, RI, TN, TX, VA, WV; Canada: BC (Parshley 1919, Downes 1927), ON, QC.

Harmostes fraterculus (Say, 1831). – **NEW YORK**: Nassau Co., Lynbrook, 31 August 1959, George Eickwort, det. D. R. Swanson 2012 [1 ♀] (MSUC).

Distribution: AR (Chordas et al. 2011), AZ, CA, DC, FL, GA, IL, IN, KS (Tucker 1907a, b), MD, MN, MO, MT (Göllner-Scheiding 1978), NC, NJ, **NY**, OK, PA, TN (Lambdin et al. 2003), TX, VA, WA (Göllner-Scheiding 1978).

Jadera haematoloma (Herrich-Schäffer, 1847). – **LOUISIANA**: [East Baton Rouge Par.], Baton Rouge, 27 April 1934, F. E. Lyman, det. D. R. Swanson 2012 [1 ♂] (UMMZ); **NEBRASKA**: Cuming Co., West Point, Karl Timmerman Mem. Bridge, 20 July 2013, 41.8395°N 96.7276°W, 1350 ft., D. R. Swanson, #38, det. D. R. Swanson 2013 [1 ♀] (DRS).

Distribution: AL, AR (Chordas et al. 2011), AZ, CA, CO, FL, IA (Hoebeke and Wheeler 1982), IL, IN (Deay and Gould 1935), KS, **LA**, MI (Barber 1912), MO, NC, **NE**, OK (Ortenburger 1926, Drew and Schaefer 1963, Smith et al. 1996, Chordas and McAllister 2012), SD (Harris 1937), TX.

Liorhysus hyalinus (Fabricius, 1794). – **ILLINOIS**: Champaign Co., Urbana, Meadowbrook Park on S. Race St., 12 May 2012, 40.0805°N 88.2085°W, 730 ft., D. R. Swanson, #25, det. D. R. Swanson 2012 [1 ♂, 1 ♀] (DRS); Champaign Co., Urbana, Student Sustainable Farm, 12 Sept. 2013, 40.0800°N 88.2169°W, 710 ft., D. R. Swanson, #88, det. D. R. Swanson 2016 [2 ♂] (DRS); Champaign Co., Champaign, UIUC campus, NRSA, 16 August 2016, 40.0916°N 88.2427°W, 750 ft., D. R. Swanson, #57, det. D. R. Swanson 2017 [1 ♂] (DRS); Johnson Co., Goreville, 13 June 1958, J. G. Brady, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Distribution: USA: AR, AZ, CA, CO, CT, FL, IA, ID (Harris and Shull 1944, Hampton 2005), **IL**, IN, KS, LA, MA, MD, MI (Swanson 2011), MO, MS, NC, NE, NM, NV, OH, OK (Drew and Schaefer 1963, Stoner et al. 1962), OR (Wheeler 2016), SC, SD, TN (Lambdin et al. 2003), TX, UT, VA, WI (Williams 2004), WY; Canada: BC, MB, ON, QC (Scudder 2008).

Stictopleurus punctiventris (Dallas, 1852). – **CONNECTICUT**: [Litchfield Co.], Lakeville, 2 September 1934, R. F. Hussey, det. R. F. Hussey 1948 [1 ♂] (UMMZ); **ILLINOIS**: Lake Co., Fort Sheridan, 25 June 1924, E. Liljeblad, coll., det. D. R. Swanson 2012 [1 ♀] (UMMZ); **MARYLAND**: Montgomery Co., Seneca Creek Park, 5 May 1973, Collector: Barry M. O'Connor, det. D. R. Swanson 2012 [1 ♀] (UMMZ); **OKLAHOMA**: [Comanche Co.], Lawton, 4 May 1956, Robt. Angle, det. D. R. Swanson 2012 [1 ♂] (MSUC); **WEST VIRGINIA**: [Fayette Co.], Page, goldenrod, 10 September 1960, B. A. Wilson, det. D. R. Swanson 2012 [1 ♀] (MSUC); Greenbrier Co., Alvon, 18 June 1957, R. L. Fischer, det. D. R. Swanson 2012 [1 ♂] (MSUC).

Notes: Hambleton (1908) and Van Duzee (1917b) reported this species (as *Corizus crassicornis* [Linnaeus, 1758]) from Wyoming, although these records probably were confounded with other species. Nevertheless, I have examined the following corroborative material for the state: **WYOMING**: Albany Co., Medicine Bow National Forest, Curtis Gulch Campground, T28N – R73W – Sec. 8, 8–10 July 1974, Daniel K. Young, det. D. R. Swanson 2012 [1 ♀] (MSUC); Lincoln Co., Salt River Range, 8 July 1934, Edna Brodkorp, det. D. R. Swanson 2012 [1 ♂] (UMMZ).

Distribution: USA: AK (Scudder 1997; Maw et al. 2000), AZ, CA, CO, **CT**, GA (Scott and Fiske 1902), ID, **IL**, IN, MA, **MD**, ME, MI, MN, MT, ND (Uhler 1878, Hussey 1922a), NE, NH, NJ, NM, NY, OH, **OK**, OR, PA, SD, TN (Lambdin et al. 2003, Vlach et al. 2010), TX, UT, VA (Hoffman 1975), VT (Parshley 1917, 1923), WA, **WV**, WY (Hambleton 1908, Van Duzee 1917b); Canada: AB, BC, MB (Maw et al. 2000), NB (Maw et al. 2000), NF (Maw et al. 2000), NS, NT (Uhler 1876; Maw et al. 2000), ON (Van Duzee 1889, 1917b; Gibson 1913; Torre-Bueno 1918; Brown 1934; Maw et al. 2000), PE (Maw et al. 2000), QC, SK, YT.

Superfamily PYRRHOCOROIDEA

Family LARGIDAE

Four new state records are reported for 2 species in 1 genus.

Largus convivus Stål, 1861. – **ARIZONA**: Cochise Co., Rustlers Park, 18 June 1956, 8000 ft., R. & K. Dreisbach, det. D. Flynn [1 ♂] (MSUC); Navajo Co., White Mountains, Fools Hollow, Show low, 3 August 1989, Manda Kasture, det. D. R. Swanson 2012 [1 ♀] (MSUC); Pima Co., Santa Catalina Mts., Gen. Hitchcock tree, 2 September 1951, T. J. Cohn, det. D. R. Swanson 2012 [1 ♀] (UMMZ); **NEW MEXICO**: Otero Co., Sacramento Mountains, 2.3 mi. NW. Mayhill, James Canyon Forest Camp, 17 July 1956, elev. 6900 ft., T. J. Cohn & E. G. Matthews, #120A, det. J. C. Lutz [2 ♀] (UMMZ).

Notes: There is much confusion regarding the alpha taxonomy of this group, and the identifications were rendered using Halstead's (1972) key. Halstead (1972) treated *Wupatkius semo* Bliven, 1956, described from Arizona, as a junior synonym of *L. convivus*. Bliven (1973) disputed this treatment, and Henry (1988b) retained Bliven's genus and species.

Distribution: **AZ**, CA, CO, **NM**, TX.

Largus succinctus (Linnaeus, 1763). – **ALABAMA**: Monroe Co., 1 mi. N. Midway, 10 August 1992, B. M. OConnor, det. D. R. Swanson 2012 [2 ♂, 2 ♀] (UMMZ); **TENNESSEE**: Henderson Co., Natchez Trace State Forest, 12 May 1968, Norman T. Baker, det. D. R. Swanson 2012 [1 ♀] (MSUC).

Notes: See note in previous species account. Scott and Fiske (1902) and Van Duzee (1917b) reported this species from Georgia, and I have examined the following corroborative material: **GEORGIA**: Mitchell Co., Baconton, 8 April 1953, George W. Byers, det. D. R. Swanson 2012 [1 ♀] (UMMZ);

Decatur Co., Low hammock, Mosquito Cr. on GA. Hwy. 97, 15 June 1953, T. H. Hubell, #78, det. D. R. Swanson 2012 [1 nymph] (UMMZ); [Gordon Co.], Calhous [sic], 26 August 1949 [add. date: 28 August 1949], [no collector], det. D. R. Swanson 2012 [3 ♀] (MSUC). Townsend (1886) reported this species from Louisiana, and I have examined the following corroborative material: **LOUISIANA**: [Caddo Par.], Shreveport, 23 November 1921, [no collector], det. D. R. Swanson 2012 [1 ♀] (MSUC). Froeschner (1944) reported this species from Missouri, and I have examined the following corroborative material: **MISSOURI**: Franklin Co., Sullivan, 8 June 1960, W. T. Van Velzen, det. D. R. Swanson 2012 [3 ♂, 3 ♀] (MSUC); Franklin Co., Meramec State Park, 26 July 1988, D. J. Biddinger, det. D. R. Swanson 2012 [2 ♀] (MSUC). Henry (1988b) considered records from Arizona (e.g., Snow 1904, 1906, 1907) and California (e.g., Van Duzee 1909, Blöte 1931, Torre-Bueno 1931, Masner 1983) to be suspect, suggesting that these records apply to *Largus cinctus* Herrich-Schäffer, 1842. Blöte (1931) reported this species (as *Euryophthalmus succinctus* [Linnaeus, 1763]) from "Eastern Branch, near Bannings, D.C.", although I am unable to confidently elucidate this locality.

Distribution: **AL**, AR (Chordas and Kremers 2009), AZ(?), CA(?), CO, FL, GA (Scott and Fiske 1902, Van Duzee 1917b), LA (Townsend 1886), MD, MN, MO (Froeschner 1944), MS, NC, NJ, NM(?), NY, OK, PA, **TN**, TX, VA.

Family PYRRHOCORIDAE

One new state record is reported for 1 species in 1 genus.

Dysdercus bimaculatus (Stål, 1854). – **KANSAS**: [Finney Co.], Mansfield, 13 June 1961, Green, det. D. R. Swanson 2012 [1 ♀] (MSUC).

Distribution: AZ, **KS**.

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State Record for *Stenamma foveolocephalum* (Hymenoptera: Formicidae) in Missouri

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Abstract

We report the first known collection of *Stenamma foveolocephalum* Smith (Hymenoptera: Formicidae) from Missouri. Two specimens were collected in pitfall traps during a field study at Sand Prairie Conservation Area, Scott County, Missouri.

The genus *Stenamma* Westwood (Hymenoptera: Formicidae) contains 84 extant species (Bolton 2018), and is found within the Nearctic, Palearctic and Neotropical Regions (Branstetter 2012). *Stenamma foveolocephalum* Smith is the only Nearctic species with a reported distribution limited to the southeastern United States (Fig. 1) (Smith 1930, 1951; Dubois and Davis 1998). The species' known ecology is limited (DuBois and Davis 1998). Based on the literature, it appears that *S. foveolocephalum* nesting sites are found in sparsely vegetated, sandy soils (Smith 1930, 1951; DuBois and Davis 1998). This species appears to be active earlier in the year (e.g., Alabama in February—Dubois and Davis 1998; Florida in January and February—Dubois and Davis 1998; Mississippi in February—Smith 1930, Dubois and Davis 1998, and MacGown et al. 2008; North Carolina in February—Smith 1951).

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During a study conducted from March to October 2014 at Sand Prairie Conservation Area (SPCA), Scott County, Missouri, two *S. foveolocephalum* workers (Fig. 2) were collected from pitfall traps in the grassland portion of the SPCA. These sand prairies only occur in the southeastern region of the state and are a result of sand deposition during flooding events by the Mississippi and Ohio rivers (Nelson 2005). Of the two individuals collected, one was collected on 31 March when the maximum air temperature was 22°C and a second individual was collected on 27 October when the maximum air temperature was 28°C. The soil type and timing of the worker's foraging activity fits the expected ecological pattern of previous collections of *S. foveolocephalum*. The specimens will be housed in the Enns Entomological Collection, University of Missouri–Columbia.

This is the first known recorded collection of *S. foveolocephalum* from Missouri

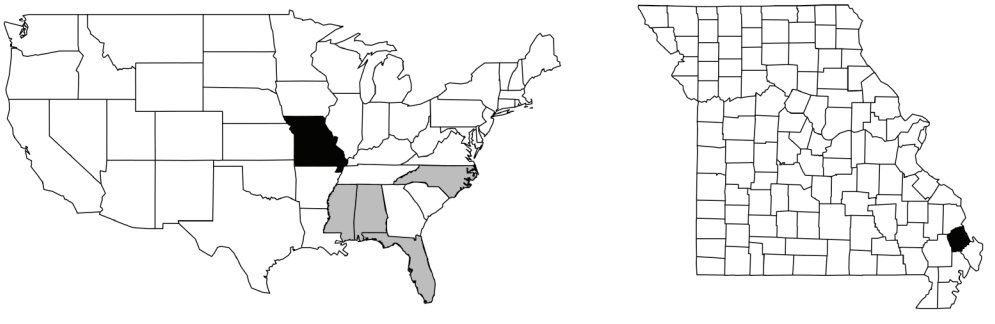

Figure 1. Known distribution of *Stenamma foveolocephalum* Smith within the U.S.A. with former state records (grey) and new state record (black) (left) and county where specimens were collected in Missouri (right).

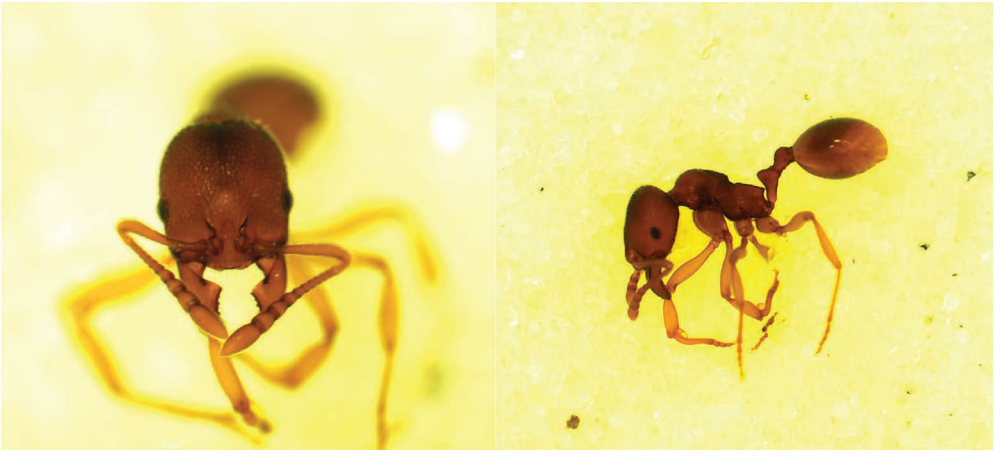

Figure 2. Digital images, Frontal view of head (left) Lateral view (right), of *Stenamma foveolocephalum* Smith individual collected from the grassland area at Sand Prairie Conservation Area, Scott County, Missouri.

and extends its known range significantly (Fig. 1). Based on this range extension, it is not unreasonable to assume that this species might occur in the intervening states between Missouri and the other states recorded to have *S. foveolocephalum*.

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Table of Contents

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