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Selenopidae (Arachnida: Araneae), a new host spider family for the spider wasp *Tachypompilus ferrugineus* (Say) (Hymenoptera: Pompilidae: Pompilini)

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Abstract. Four online photographs from Oaxaca, Mexico taken by N. R. Jenzen-Jones and posted on inaturalist .org reveal *Selenops* sp., probably *S. mexicanus* Keyserling (Arachnida: Araneae: Selenopidae), as a new host spider species, genus and family for the common and widespread American spider wasp *Tachypompilus ferrugineus* (Say) (rusty spider wasp). The wasp transported the immobilized spider up an exterior stucco wall of a house, dorsal side upward, walking backwards for 3 m to her nest in a gap between the wooden planking and stucco wall beneath the roof, while grasping the femur of its right pedipalp with her mandibles.

Key words. *Selenops mexicanus*, flatties or wall crab spiders, rusty spider wasp, Oaxaca, Mexico, prey transport, oligophagous, Lycosoidea.

ZooBank registration. urn:lsid:zoobank.org:pub:D9A2E4B3-EAB3-4716-A248-AA86C7AD7A10

Introduction

Tachypompilus ferrugineus (Say) is a rather large (~20 mm long), brightly colored, easily recognizable, wide-ranging American spider wasp (Hymenoptera: Pompilidae). Adult females are castaneo-ferruginous, often with a variable amount of black on the head, mesosoma and metasoma, with fuliginous wings that reflect violet in sunlight (Fig. 1; Evans 1950, 1966). This species occurs from southern Ontario and New England southward and westward through the United States, Mexico and Central America into South America, mainly east of and including the Rocky Mountains, and in Hispaniola and Puerto Rico (Evans 1950, 1966; Colomo de Correa 1985 [1987]; Kurczewski et al. 2020).

Tachypompilus ferrugineus frequently uses man-made structures for nesting sites. Nest-cells are found in rock piles, openings in stone and concrete walls and fences, exteriors of stone and wooden buildings, and beneath buildings, cemetery monuments and fallen signs in sandy, gravelly and loamy soils or artificial composite (Evans 1950, 1951; Strandtmann 1953; Evans and Yoshimoto 1962; Kurczewski 1989, 1990, 2010; Kurczewski and Edwards 2012; Kurczewski and Kiernan 2015; Kurczewski et al. 2017). The prey-deposition chamber of *T.*

Figure 1. *Tachypompilus ferrugineus* female with immobilized *Selenops* sp., probably *S. mexicanus*, adult or subadult female, San Pablo Etla (Valles Centrales region), Oaxaca, Mexico. The wasp grasped the apex of the femur of the spider's right pedipalp with her mandibles and dragged it backwards, dorsal side upward, up the exterior stucco wall of a house. Photograph: N. R. Jenzen-Jones, Churchlands, Western Australia 6018, Australia.

ferrugineus is a shallow concave depression dug by the wasp in loose soil or powdered substrate material in which a single paralyzed spider is placed and the wasp's egg laid on its abdomen (Strandtmann 1953; Kurczewski et al. in prep.). The nest-cell of *T. ferrugineus* is not excavated by the wasp until after the spider is captured and immobilized by stinging. Transport of the spider involves the wasp, usually grasping a pedipalp or chelicera with her mandibles, and dragging the comparatively heavy prey backwards, dorsal side upward, on the ground or often up a vertical man-made surface–a sometimes long and cumbersome process over and around various obstacles.

Based on 1802 predominantly North American host records *T. ferrugineus* provisions its nests mainly with Lycosidae (wolf spiders) and, secondarily, Pisauridae (fishing spiders) in the United States and northern Mexico; Trechaleidae (banana spiders) in southern Mexico and Central America; and, Ctenidae (wandering spiders) in Central America and northern South America (Table 1). Rarely, Sparassidae (huntsman or giant crab spiders), Zoropsidae (false wolf spiders), and Agelenidae (funnel-web weaving or grass spiders) are also captured by *T. ferrugineus* in North America (Kurczewski et al. 2020). The number of host records from the United States and Canada, where Lycosidae and Pisauridae are abundant, far exceeds (88.8%) those from Mexico, Central America and South America (11.2%).

Table 1. Host spider families of *Tachypompilus ferrugineus* (based on Kurczewski et al. 2020; F. E. Kurczewski, pers. obs.).

Family	Number of records	% of total records
Lycosidae	1215	67.4
Pisauridae	414	23.0
Trechaleidae	106	5.9
Ctenidae	28	1.6
Sparassidae	24	1.3
Zoropsidae	9	0.5
Agelenidae	5	0.3
Selenopidae	1	<0.1
TOTALS	1802	100

Materials and Methods

The first author, in his daily perusal of online sites with Pompilidae photos, immediately recognized on inaturalist.org a highly atypical host spider for *Tachypompilus ferrugineus*, a species he has been studying since 1973 (Kurczewski 1981, 1989, 1990, 2010; Kurczewski and Edwards 2012; Kurczewski et al. 2017). N. R. Jenzen-Jones, Churchlands, Australia had taken four photographs of the female wasp transporting an immobilized spider up the exterior stucco wall of a house in San Pablo Etla, Oaxaca, Mexico. When contacted about use of his photographs, Jenzen-Jones sent us high resolution images for publication. The first author sent the photographs to six arachnologists and two of them, Rick West, Sooke, BC, Canada and Sarah Crews, California Academy of Sciences, San Francisco, CA replied with the correct family and genus identification—Selenopidae and *Selenops* sp. Sarah Crews, an authority on the family Selenopidae, further indicated the species was likely *Selenops mexicanus* Keyserling, a common species in the region in the *S. mexicanus* group (Crews 2011). She sent the first author via emails extensive information and references on this species. The second author, an authority on spiders belonging to the suborder Mygalomorphae, formulated Table 1 in Excel and configured Figure 1. The second and third authors re-configured Figure 2 from a photograph sent by the fourth author. The first author, using the literature at his disposal and information from his three co-authors, wrote the text. Images of specimens of the largest females of *Selenops mexicanus* from the American Museum of Natural History, New York, NY and Museum of Comparative Zoology, Harvard University, Cambridge, MA were measured for body length with a scale bar using FiJi software at the California Academy of Sciences by Sarah Crews.

Results

A new host family, Selenopidae, and *Selenops* sp., probably *mexicanus* Keyserling, is introduced for *T. ferrugineus* based on four online photographs taken at San Pablo Etla (Valles Centrales region), Oaxaca, Mexico, 6 August 2020, by N. R. Jenzen-Jones (Fig. 1). *Selenops mexicanus* is quite common and one of the most widespread species of selenopids occurring naturally from northern Mexico to Colombia, Ecuador and the Galapagos Islands (Crews 2011). This species lives underneath rocks, bark, concrete blocks and other debris, on fence posts, in and on houses, and on trees and banana plants during the day and night (Crews 2011). *Selenops mexicanus* females can attain a body length of ~15 mm (Crews 2011). Nine of the largest females in the American Museum of Natural History and Museum of Comparative Zoology insect collections averaged 15.64 mm (14.14–16.41) in body length (S. C. Crews, pers. obs.).

Selenops Latreille species are frequently found on vertical surfaces, especially on or beneath the bark of upright tree trunks on which they are highly camouflaged. These spiders are exceedingly rapid in their predatory and escape movements and difficult to capture, the probable reason for the scarcity of Selenopidae host records. There is a South American record of a *Tachypompilus* sp., either *T. erubescens* (Taschenberg) or *T. xanthopterus* (Rohwer), two species that typically capture Sparassidae, a look-alike but unrelated spider family (Wheeler et al. 2017), preying on *Selenops* sp. and nesting in a wall crevice (Kurczewski et al. in prep.). The spider captured by *T. ferrugineus* in Oaxaca, Mexico may have been flushed from its retreat on the outside of the house where the wasp nested, knocked or dropped to the ground when attacked by the wasp, chased, captured and stung. The wasp, with spider in tow, traveled a distance of 3 m from the ground where she probably captured and stung her prey to her nest in a gap between the wooden planking and stucco wall beneath the house roof (Fig. 2).

Carriage of the spider by the wasp was typical *T. ferrugineus* prey transport (Kurczewski and Edwards 2012; Kurczewski et al. 2017). The wasp grasped the immobilized spider's right pedipalp at the apex of the femur with her mandibles and pulled it backwards, dorsal side upward, up the exterior stucco wall of the house (Fig. 1, 2). The body length of the wasp was 1.08 times longer than that of the spider, supporting the 1:1 body length ratio of many large-size spider wasps and their large-size cursorial host spiders (Kurczewski and Kiernan 2015). In that study *T. ferrugineus* females averaged 197.5 mg in (wet) body weight and their host spiders, 492.5 mg or ~2.5 times as much (Kurczewski and Kiernan 2015). To haul a spider weighing perhaps three times as much a distance of 3 m, mostly up a vertical wall, was a monumental task for the wasp!

Discussion

Selenopidae is the eighth host spider family associated with *T. ferrugineus*. Four of the host spider families of *T. ferrugineus*, Zoropsidae, Agelenidae, Sparassidae and, now, Selenopidae, are probably incidental prey captures, as indicated by their low numbers (Table 1)—apparently, these spiders were simply in the wrong place at the wrong time. The four other host spider families of *T. ferrugineus*, Lycosidae, Pisauridae, Trechaleidae and Ctenidae, are typical prey captures based on geography (Table 1; Kurczewski et al. 2020). These four families of cursorial-hunting spiders are in the superfamily Lycosoidea (Griswold 1993; Polotow et al. 2015; Piacentini and Ramirez 2019) and, combined, represent 1763/1802 prey captures (97.8%) of the known total host records for *T. ferrugineus* (Table 1). *Tachypompilus ferrugineus* could, therefore, be labeled as being oligophagous on species of Lycosoidea.

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Figure 2. Route traveled (black line with arrow) by *Tachypompilus ferrugineus* female with immobilized *Selenops* sp., probably *S. mexicanus*, adult or subadult female, up the exterior stucco wall of a house to her nest in a gap between the wooden planking and stucco wall beneath the house roof. Photograph: N. R. Jenzen-Jones, Churchlands, Western Australia 6018, Australia.

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