

Solifuges

Dave Leatherman

What looks so scary you would never just pick one up, lives in the arid West amid rocks and grass, can run like lightning, appears to have 10 legs, and almost nothing is known about its consumption by birds? Answer: the solifuge. So, what's a solifuge? They go by many other names. In 2004 during the Iraq War and the formative stages of the sensationalism we have come to expect from many quarters on the Internet, they became widely known as “camel spiders.” The photoshopped image of a soldier carrying two clinging head-to-tail that stretched from the infantryman's belt to the ground got sent around the globe faster than you can say “arachnophobia.” Why is it that sort of story goes viral, and the calm scientist's video debunking the fabrication is only watched by his mother?

Other names for solifuges include solifugids, solpugids, sun scorpions, false spiders, sun spiders, haarskeeders, jagspinne kippe, jerymanders (presumably after the social activist, not to be mistaken for political line-drawing shenanigans starting with a “g”), roman spiders, walzenspinnen, wind scorpions, and my favorite, matevanados (Spanish translation: “deer killers”) (Savery 2016). Despite their looks and ominous displays when harassed, my buddies at Colorado State University tell me that our Colorado species are harmless to humans. These guys are always right, but one site says “gives a painful bite” and I will admit to not yet having the courage to pick one up. The assignment of the word “pain” to these creatures may pertain to South American or African species, which can be bigger than those in North America. Whatever the truth regarding the pain of their bite, solifuges do NOT possess venom and, speaking from imaginary experience, the bite of Colorado species should be no more painful than that of a gnaw-happy puppy or paper edge. However, if their arthropod and vertebrate prey have nightmares, solifuges are in them, perhaps in color.

Worldwide the Order Solifugae (Class Arachnida) has 12 families, 141 genera, and well over 1,000 species (Savery 2016). Because they and their habitats are poorly studied, experts on this group think the true number of species could be twice the number formally described (Savery 2016). They have eight legs and one pair of pedipalps that usually project out front as they move. The pedipalps aid their predaceous lifestyle in two important ways—initial detection and capture, and then manipulation. Capture is facilitated by special suctional organs at the pedipalp tips (Cushing et al 2005). Solifuges are

more closely related to pseudoscorpions in the Order Pseudoscorpiones than they are spiders in the order Araneae (Kraus 1976). Their strongholds are South Africa and the American Southwest. North America has two families (Ammotrechidae and Eremobatidae), only one of which, the latter, occurs in Colorado, where we have 4 genera and 15 species, as follows (Brookhart and Cushing):

Colorado Solifuges	
<u>Scientific name</u>	<u>Colorado distribution</u>
<i>Eremochilus bilobatus</i>	Statewide
<i>Hemerotrecha fruitana</i>	Statewide
<i>H. cornuta</i>	Southeastern
<i>H. parva</i>	Northwestern
<i>H. denticula</i>	Southwestern
<i>Eremorhax puebloensis</i>	Southeastern
<i>E. mumai</i>	Northwestern
<i>Eremobates docolora</i>	Northwestern
<i>E. pallipes</i>	Front Range from WY to NM
<i>E. bantai</i>	Southeastern Front Range
<i>E. palpisetulosus</i>	Front Range from WY to NM
<i>E. ctenidiellus</i>	Colorado Plateau
<i>E. clarus</i>	Northwestern
<i>E. mormonus</i>	Southwestern
<i>E. similis</i>	San Luis Valley

These intriguing beasts range in size from a few millimeters to 10 centimeters, with most of our full-grown Colorado species being in the 20–30mm range. They typically live in arid habitats with sparse vegetation. Such areas are characterized by high daytime temperatures, low nighttime temperatures, and low humidity. Solifuges can run in bursts as fast as 53 centimeters/second (i.e., almost two feet in the time it takes to say, “one-thousand-one”) (Punzo 1998b). Their lifespan is about one year. They have very high metabolic rates, typical of active predators. They obtain their prey mostly at night either alive or scavenged, and promptly macerate it with a pair of chelicerae resembling the action end of a clamshell loader. Animals suffering this fate include arthropods like spiders and insects (especially termites), other solifuges, and small reptiles (Muma 1966, Punzo 1993). Predators include spiders, solifuges, small mammals, reptiles, and amphibians (Muma 1967, Punzo 1998a). Oh yes, and birds.

Most of the anecdotes involving bird predation on solifuges come from Africa. The only mention of the term “solifuge” (or synonyms) in the huge *Birds of North America* database from Cornell University is in the account for Northern Shrike. The section on how fledglings learn to hunt describes their pecking at a variety of animate and inanimate objects including “solifuges” (Cade and Atkinson 2002). This is interesting but also confusing since the entire, decidedly northerly, breeding range of Northern Shrike and known ranges of the North American solifuges do not come close to overlapping! I am not sure what to make of this. Northern Shrikes certainly seem to be among the bird types that would enjoy a good solifugid entrée. However, by the time this shrike moves southward to areas inhabited by solifuges (late autumn/winter), the temperatures are such that most, if not all, solifuges would be in hiding in burrows or under objects like rocks, wood, or cowpies.

At this point you might be asking, why are solifuges a subject of this column? Because of the African anecdotes, a personal one from Colorado, and an Iranian snake’s tail. These seem to indicate the literature, particularly here in North America, is lacking more than the fact that these creatures do not get eaten by birds.

African anecdotes first. Remains have been found in bustard (family Otididae) droppings (Wharton 1987). New World shrikes have captured them (Clark et al 1982). There is mention of predation by Old World larks and wagtails (Distant 1892). The Pearl-spotted Owllet (looks a lot like our Northern Pygmy-Owl) and Marsh Owl eat solifuges on occasion (Dixon 1981, Braine 1989).

As for close to home, on 6 July 2015 I was driving slowly along Larimer County Road 5 north of Fort Collins, Colorado, between Buckeye Road and Larimer CR92, photographing birds on the west-side barbed wire fence. Of particular interest were adult birds with mouths full of food items destined for gaping nestlings. One of these parents was a Western Meadowlark (*Sturnella neglecta*). Upon computer examination of photographs that night, I noticed a solifuge among the other items, mostly grasshoppers, in that meadowlark’s beak (Fig. 1). Identification to species is not possible from the photograph, but it appears to be in the genus *Eremobates*.

Surely this observation is not unique but it appears to be one of the few documented cases of feeding by a North American bird on a solifuge.

On 20 July 2016 while hiking along the Pronghorn Loop Trail in the City of Fort Collins’s Soapstone Prairie Natural Area about 11 miles northwest of the CR5 spot where the aforementioned meadowlark had captured a solifuge, at about 8 A.M., Georgia Doyle spot-

ted a solifuge underfoot. This individual was collected by me (specimen deposited with Colorado State University's Gillette Museum of Arthropod Biodiversity) and later determined to be *Eremobates pallipes* (Figs. 2 and 3). This finding perhaps supports the identification of the meadowlark prey as being in this genus. Besides *E. pallipes*, the other possibilities for this northern Front Range area would be *E. palpisetulosus*, *Eremochelis bilobatus*, and *Hermotreacha fruitana*. Its being active in early morning on a sunny day is also of interest. If occasional solifuge diurnal activity occurs routinely, perhaps the likelihood of predation by diurnal birds on these organisms thought to be mostly nocturnal is, likewise, routine, just difficult to witness and document.

Now about that Middle Eastern snake. In 1968 a collecting expedition targeting, but not limited to, mammals visited western Iran. A viper thought to be a deformed individual of a known species was discovered which had a strangely frayed tail. It was deposited in the famous Chicago Field Museum. In 2001 a second individual that matched the appearance of the 1968 specimen was found. This triggered a re-examination of these two snakes, which determined they were anything but deformed. In 2006 they were described as a new species, the spider-tailed horned viper, *Pseudocerastes unarachnoides* (Serpentes: Viperidae) (Bostanchi et al. 2006).

The amazing thing about this viper is its tail, how it uses it, and for what purpose. It has taken a while to prove, but it is now apparent this snake uses a tail resembling a solifuge to lure birds into range of the snake's fatal strike. Certain of its caudal scales are elongated to resemble "appendages." At the extreme tail tip is a pale knob flanked by the adjacent leglike scales. The snake positions itself motionless in gypsum rocks that match the pattern of its primary body scales, then gently wiggles its tail in an almost perfect match of a moving solifuge. To see this, do an Internet search for "spider-tailed horned viper video." Truly amazing. Birds are attracted to this lure and die for their hungry curiosity (Fathinia et al. 2009, Fathinia et al. 2015). Among the birds proven to be captured in this way are warblers in the genus *Acrocephalus* and the Crested Lark (*Galerida cristata*) (Fathinia et al. 2009, James 2016).

This snake with the remarkable tail is a twist on the theme of birds eating solifuges but in an evolutionary sense seems to prove birds have been eating them for a long time. What other North American birds besides the Western Meadowlark and perhaps the Northern Shrike eat solifuges? With the heart of solifuge ranges being the arid West, I will speculate likely eaters of them are birds like American Kestrel, our pygmy and screech-owls, Greater Roadrunner,

various thrashers, Canyon Wren, towhees, and desert sparrows like Sagebrush, Rufous-winged and Black-throated. Probably other bird species eat them, too, and probably none of these utilize solifuges as a major component of their diets. But then again, maybe they do.

So much to learn in this study area of bird food habits.

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Fig. 1. Western Meadowlark delivering solifuge (possibly in genus *Eremobates*) and grasshoppers to nestlings along Larimer County Road 5 on 6 July 2015. Photo by Dave Leatherman



Figs. 2 and 3. *Eremobates pallipes* (both photos of same individual) found at Soapstone Prairie Natural Area north of Fort Collins on 20 July 2016. Note pair of dark, two-part chelicerae involving movable (upper) and fixed (lower) fingers best visible in left photo. Both dark upper fingers can be seen in front of the cephalothorax (head area) in the right photo. The long tan appendages protruding farthest out in right photo are the pedipalps. Length of this individual as shown in right photo is about 4cm. Photos by Dave Leatherman