



Nearctic species related to *Diogmites angustipennis* Loew (Diptera: Asilidae)

JEFFREY K. BARNES

University of Arkansas, Department of Entomology, 319 Agriculture Building, Fayetteville, Arkansas 72701, USA.

E-mail: jbarnes@uark.edu

Abstract

Diogmites bilobatus **sp. nov.** is described from museum specimens collected in the south central and southwestern United States and northern Mexico. Its close resemblance to the widespread *D. angustipennis* Loew is established. *Diogmites grossus* Bromley **syn. nov.**, *D. pulcher* (Back) **syn. nov.**, and *D. symmachus* Loew **syn. nov.** are synonymized with *D. angustipennis*, and lectotypes are designated for *D. angustipennis* and *D. symmachus*. Notes on morphological variation, habitat, prey, distribution, and phenology are provided for *D. bilobatus* **sp. nov.** and *D. angustipennis*.

Key words: Brachycera, Dasypogoninae, Nearctic, new species, robber flies

Introduction

In the middle and western United States, some of the most common species of the robber fly genus *Diogmites* (Diptera: Asilidae: Dasypogoninae) can be recognized by the prominent, oblique, dark, lateral patches subtended by silver or golden pollen on abdominal tergites 2–5 (Fig. 1); the narrow and lightly infuscate wings; and usually a lack of distinct dark markings on the golden brown to dark brown scutum. When the dark abdominal patches are not connected across the surface of the tergites, the abdomen has a bright golden orange appearance. However, the patches in many specimens are connected across the tergites by diffuse brown to nearly black bands, giving the abdomen a dark disposition. *Diogmites angustipennis* Loew was the first species to be described in this group, but now there are five nominal species recognized as belonging in the *D. angustipennis* complex.

Loew (1866, 1872) named and described two species from material collected in Kansas and Texas. He first described *Diogmites angustipennis* Loew in 1866 from two relatively robust and dark colored females collected in Kansas (Loew 1866). A few years later, he described *D. symmachus* Loew from two smaller, light colored specimens collected in Texas, both a male and a female (Loew 1872). Back (1909) later described *Deromyia pulchra* Back (= *Diogmites pulcher* (Back)) from a single large, darkly pigmented, male specimen collected in Los Angeles County, California. In his revision of the genus *Diogmites* in the United States, Bromley (1936) described *D. grossus* Bromley from some large specimens with pale thoracic and abdominal “sheen”. They were collected in Arizona, California, Colorado, Idaho, and Utah.

After inspecting male genitalia and ovipositors from collections of ca. 2000 specimens I have concluded that there are only two valid species in the *D. angustipennis* complex. It appears that *D. symmachus* is merely a color variant of *D. angustipennis*. *D. pulcher* and *D. grossus* are merely size and color variants of *D. angustipennis*. *Diogmites bilobatus*, a new species described herein, has distinct ovipositor vestiture and phallus morphology. Both *D. angustipennis* and *D. bilobatus* are highly variable in size and color. Without examining ovipositors and phalli it is impossible to distinguish them morphologically.



FIGURE 1. *Diogmites angustipennis*, female preparing to oviposit in soil, showing typical abdominal color pattern. Austin, Travis County, Texas. Courtesy Eric Isley.

Material and methods

Specimens were borrowed from many insect collections. Abbreviations for depositories mentioned in this paper are AMNH: American Museum of Natural History, New York City; ASUC: Department of Biological Sciences, Arkansas State University, Jonesboro; BYU: Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah; CAS: California Academy of Sciences, Department of Entomology, San Francisco; CMNH: Carnegie Museum of Natural History, Pittsburgh; CSUC: C. P. Gillette Museum of Arthropod Diversity, Department of Bioagricultural Sciences and Pest Management, Colorado State University, Ft. Collins; CUIC: Cornell University Insect Collections, Department of Entomology, Cornell University, Ithaca, New York; EMEC: Essig Museum of Entomology, University of California, Berkeley; EMUS: Entomological Museum, Department of Biology, Utah State University, Logan; ESUW: Insect Museum, Department of Renewable Resources, University of Wyoming, Laramie; FSCA: Florida State Collection of Arthropods, Florida Department of Agriculture, Division of Plant Industry, Gainesville; INHS: Insect Collection, Illinois Natural History Survey, Champaign; ISUI: Iowa State Insect Collection, Department of Entomology, Iowa State University, Ames; KSUC: Kansas State University Museum of Entomological and Prairie Arthropod Research, Kansas State University, Manhattan; MCZ: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; MEM: Mississippi Entomological Museum, Mississippi State University, Mississippi State; NMSB: Department of Biology, New Mexico State University, Las Cruces; NMSE: Arthropod Museum, Department of Entomology, Plant Pathology, and Weed Science, New Mexico State University, Las Cruces; OSEC: K. C. Emerson Museum, Oklahoma State University, Stillwater; OSU:

Charles A. Triplehorn Insect Collection, The Ohio State University, Columbus; SEMC: Snow Entomological Collections, University of Kansas Natural History Museum, Lawrence; TAMU: Insect Collection, Department of Entomology, Texas A&M University, College Station; UAAM: Arthropod Museum, Department of Entomology, University of Arkansas at Fayetteville; UAIC: University of Arizona Department of Entomology, Tucson; UCDC: R. M. Bohart Museum of Entomology, Department of Entomology, University of California, Davis; UCR: Entomology Research Museum, University of California, Riverside; UMMZ: Insect Division, University of Michigan Museum of Zoology, Ann Arbor; UMRM: Wilbur R. Enns Entomology Museum, Department of Entomology, University of Missouri, Columbia; USNM: National Museum of Natural History, Smithsonian Institution, Washington, D.C.; WFBM: William F. Barr Entomological Museum, Entomology Division, University of Idaho, Moscow; WIRC: Insect Research Collection, Department of Entomology, University of Wisconsin, Madison; WSU: The James Entomological Collection, Department of Entomology, Washington State University, Pullman; WTAM: Department of Life, Earth, & Environmental Sciences, West Texas A&M University, Canyon, Texas.

Male genitalia were macerated in sodium hydroxide using standard techniques as described in Steyskal et al. (1986). They are stored in glycerol in microvials attached to the pins holding the source flies.

Terminology largely follows that found in the *Manual of Nearctic Diptera* (McAlpine 1981). Body length refers to the distance from the front of the face to the tip of the abdomen and excludes the length of the antennae. Wing length is measured from the anterior end of the tegula to the apex of the wing. Antennomere:scape ratios were calculated by dividing the length of each antennomere by the length of the first antennomere (scape). The numbers are listed in order from the basal antennomere to the apical antennomere. For example, the ratio 1.0:1.6:4.1 indicates that the pedicel is 1.6 times the length of the scape, and the flagellum is 4.1 times the length of the scape.

Results and Discussion

Key to Nearctic Asilidae in the *Diogmites angustipennis* complex

- 1 Phallus bilobed (Fig. 2a). Female abdominal tergites 1–6 pollinose and opaque dorsally; tergites 7–8 glabrous dorsally, opaque laterally (Fig. 2b)..... *Diogmites bilobatus* **sp. nov.**
- Phallus not bilobed (Fig. 3a). Female abdominal tergites 1–4 or 1–5 and sternites 1–5 pollinose and opaque; tergites 5–8 or 6–8 and sternites 6–8 polished (Fig. 3b) *Diogmites angustipennis* Loew

Diogmites bilobatus sp. nov.

(Fig. 2)

Diagnosis. Male 16.2–25.3 mm long (mean = 21.1 mm); female 17.0–26.5 mm long (mean = 22.5 mm). Average antennomere:scape ratios 1.0:1.6:4.1. Male wing 11.7–16.5 mm long (mean = 14.3 mm); female wing 12.2–18.4 mm long (mean = 15.6 mm). Phallus bilobed (Fig. 2a). Female abdominal tergites 1–6 pollinose and opaque dorsally; tergites 7–8 glabrous dorsally, opaque laterally (Fig. 2b).

Description. Male body, excluding antennae, 16.2–25.3 mm long (mean = 21.1 mm); female 17.0–26.5 mm long (mean = 22.5 mm); golden brown to black in ground color; golden tomentose almost throughout.

Head width 1.7 times eye height. Face golden tomentose. Mystax a dense row of long, yellowish-white setae on extreme lower margin of face; upper face lacking setae. Frons golden tomentose, with scattered thin, pale, hair-like setae. Vertex brown, with scattered, thin, pale to black, hair-like setae. Ocellar triangle tuberculate, with two long, strong, black setae and several short, thin, pale to black, hair-like setae. Postocular setae long, strong, pale. Postgena and stipes with dense vestiture of long, thin, pale, hair-like setae. Proboscis dark brown, somewhat laterally compressed, more than five times as long as deep; deepest near base, tapered to rounded apex. Palpus about as long as scape and pedicel combined, brown, bearing many long, pale, hair-like setae. Antenna brown, about 0.43 times head width; pedicel with several black setae dorsally and ventrally; flagellum with several black setae dorsally on basal half; antennomere:scape ratios 1.0:1.6:4.1.

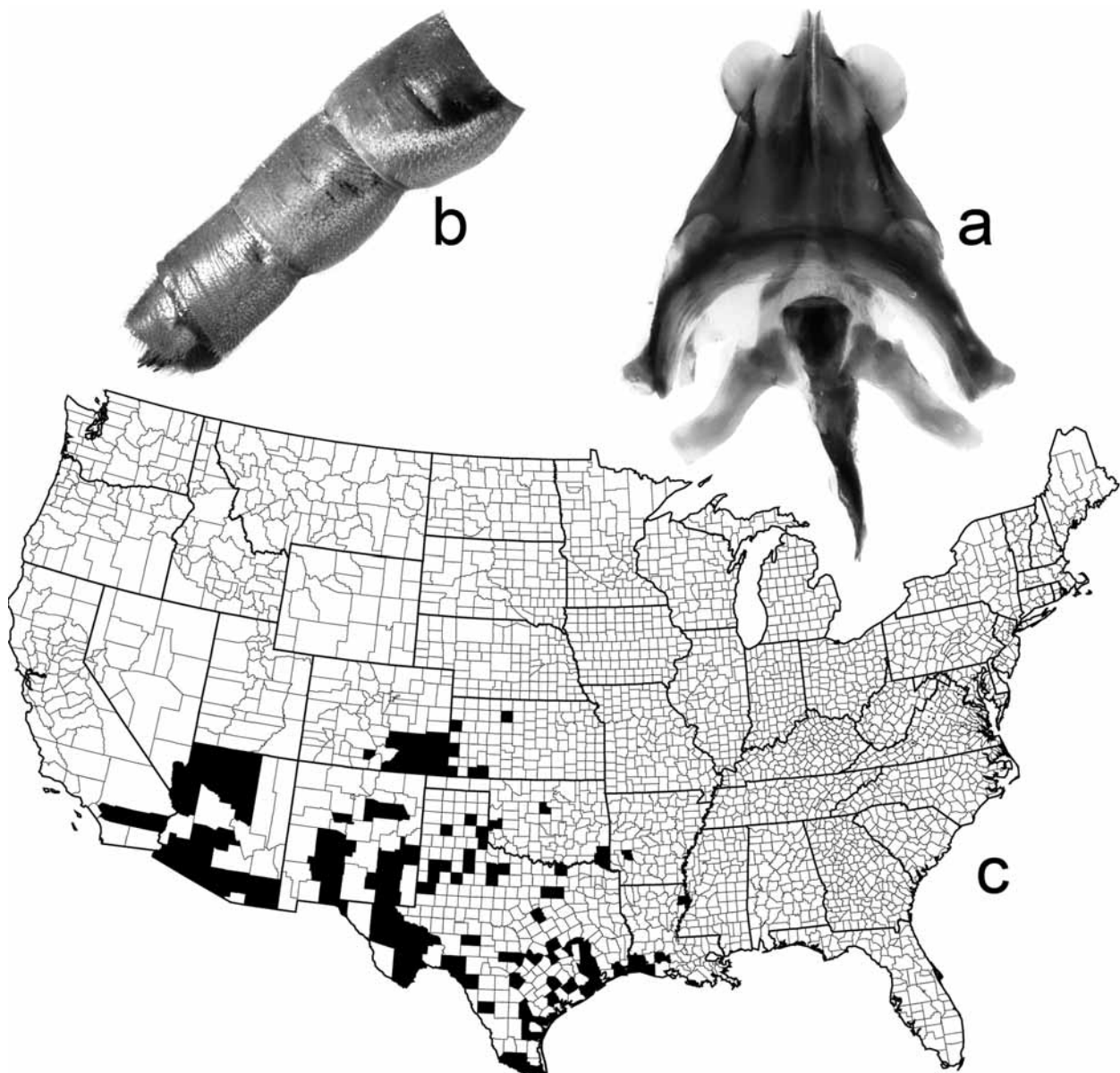


FIGURE 2. *Diognites bilobatus* sp. nov. a, phallus, dorsal view. b, ovipositor, lateral view. c, United States distribution, by county or parish.

Thorax with cervical sclerites covered with vestiture of long, pale setae. Anteprenotum with row of long, slender, pale setae along anterior margin; postpronotum bearing sparse, long, pale, hair-like setae laterally; postpronotal lobe bearing 1–2 strong, black or pale setae and several short pale, hair-like setae. Proepisternum covered with short, thin, pale, hair-like setae. Prosternum lacking setae. Scutum golden brown to dark brown in ground color, golden tomentose laterally, with three dorsal longitudinal, golden tomentose vittae, lacking distinct dark markings; mid-dorsal vittae very narrow; anterior third and golden tomentose areas covered with short, black setae; with two strong, black notopleural setae, two supraalar setae, two postalar setae, 2–4 strong dorsocentral setae, and two strong, black setae on postalar callus. Scutellum low, not convex, with two strong, black marginal setae. Mediotergite and anatergite bare; katatergite with fan of 6–7 long, slender, pale setae. Mesopleural sclerites lacking setae.

Legs yellowish brown. Coxae golden tomentose; fore and mid coxae with many long, slender, pale anterior setae; hind coxa with 1–2 strong, pale lateral setae and several thin, hair-like anterior and lateral setae. Trochanters golden tomentose; fore and mid trochanters with ventrolateral dark spots; hind trochanters with ventrolateral dark line and many, short, stout, pale, ventral setae. Femora, tibiae, and tarsi covered with many, short, thin, black setae. Fore femur with single, strong, stout, black anterior seta near basal fifth; row of 3–5

similar stout setae posteriorly; and irregular row of shorter, stout, black setae anteroventrally. Mid femur with single strong, stout, black, anterior seta near basal fifth and row of shorter black anterior setae; single strong, stout, black posterior seta near apex and row of 4–5 shorter black posterior setae; and single strong, stout, black ventral seta near base. Hind femur with row of 4–8 short, stout, black anterior setae; row of 2–5 short, stout, black anteroventral setae; and similar row of posteroventral setae. All tibiae with several long, black, preapical setae. Fore tibia with anterodorsal, posterodorsal, and posteroventral rows of 5–8 short, stout, black setae; single short, stout, black ventral seta about one third distance from base; and single long, strong, black ventral seta about one third distance from apex. Mid tibia with dorsal, anterodorsal, anteroventral, and posteroventral rows of short, stout, black setae, only posteroventral row extending from base to apex, other rows terminating about halfway from base; with two long black anterodorsal and two long, black ventral setae. Hind tibia with anterodorsal, posterodorsal, anteroventral, and posteroventral rows of long, black setae; posterodorsal and distal anteroventral setae longest; posteroventral row extending only about halfway from base of tibia. Tarsi darkened apically, with many strong, black setae; first tarsomere about equal in length to following three tarsomeres. Fore tarsus about equal in length to fore tibia; mid and hind tarsi shorter than mid and hind tibiae, respectively. Claws black; pulvilli pale yellowish-brown.

Wing 11.7–16.5 mm long in male (mean = 14.3 mm); 12.2–18.4 mm long in female (mean = 15.6 mm). Membrane lightly infuscate. Halter with stem and knob golden brown, knob somewhat darker.

Abdomen golden brown to dark brown or black in ground color. Tergites 2–5 with diffuse, diagonal, dark brown to black patches laterally, subtended posteriorly by silver or golden tomentose patches. Phallus bilobed (Fig. 2a). Female abdominal tergites 1–6 pollinose and opaque dorsally; tergites 7–8 glabrous dorsally, opaque laterally (Fig. 2b). Both sexes with all abdominal sternites pollinose and opaque.

Discussion. *Diogmites bilobatus* **sp. nov.** is much more consistent in size than is *D. angustipennis*, and on average it is slightly shorter in length, but its range of color variation is more extreme. Some specimens, especially those from southern Texas, have nearly black abdominal tergites. Specimens collected at more northerly sites tend to be lighter in color. Abdominal tergites of specimens collected in Doña Ana County in southwestern New Mexico range across the entire spectrum, from golden orange to nearly black.

The known range of *D. bilobatus* **sp. nov.** extends from northern Kansas south through Oklahoma and Texas to northeastern Mexico, and from Louisiana and southeastern Arkansas west to Arizona and southern California (Fig. 2c). Labels on museum specimens indicate that adults are active from late May to mid October, but most museum specimens bear labels dated July, August, or September. The earliest and latest records refer to specimens collected in far southern reaches of the species' range.

G. S. Forbes (in litt.) collected many specimens in New Mexico and made the following observations:

The new species probably originally inhabited the Rio Grande floodplain before they channeled the river and tore out the bosques. At the river it now seems to occur in flat sandy areas between the levee roads and the river edge. Although the sites are periodically mown and otherwise "managed" by the International Boundary and Water Commission, they often get quite weedy, with *Astragalus*, small tamarisks, *Salsola*, Bermuda grass, and rabbit brush, with *Salix exigua* along the bank. The *Diogmites* is a rather low flier, perching on weeds, grass stems, and often on the *Salix*. It is somewhat wary and doesn't perch for long at any one spot. Other perching sites I noted were *Chrysothamnus* and mesquite. The species has also extended into agricultural situations and was frequently found in alfalfa fields, where there were doubtless many prey items. The fly is also present in residential areas. It often perched on Bermuda grass.

The only record I have from outside the Mesilla Valley was a male from the south end of the USDA Jornada Experimental Range, on the HQ road 6.6 mi. NW of Rt. 70, 19 vii 1982. This is an area of mixed creosotebush-snakeweed-yucca scrub with saltbush and mesquite along the washes. Along the road is a grassy area with tobosa grass and *Scleropogon brevifolia*. The species was locally common at times but I see it wasn't recorded at several of the riparian sites I collected, nor every time during the flight season. The most abundant I

found it was on 2 Aug. 1982 on the E levee rd. 2 mi. (NW) of Picaho Ave, where I recorded 12 in about 1 1/4 hours. The only prey record I have is a female *Efferia albibarbis*.

Triorla interrupta, a *Machimus* nr. *erythrocnemius*, *Megaphorus pulchrus*, and *Efferia albibarbis* were found with it in weedy areas, and *Proctacanthella cacopiloga*, *Efferia luna*, *Scleropogon duncani*, *Proctacanthus nearno*, and *Promachus giganteus* occurred in some of the same sites at the proper time, although I didn't necessarily record them with the *Diogmites*.

Some museum specimens examined during the course of this study have the following prey items pinned beneath them:

Araneae: Lycosidae, *Pirata* sp., Texas, Hidalgo County, Weslaco, 12.VIII.1933 (USNM).

Orthoptera: Acrididae, *Syrbula admirabilis* (Uhler), Texas, Live Oak County, Choke Canyon State Park, 4.X.1997 (BYU). Tettigoniidae (nymph), Texas, Brazos County, College Station, 12.VIII.1932 (USNM).

Hemiptera: Coreidae, *Anasa andresii* (Gurin-Mneville), Texas, Hidalgo County, 8.IX.1933 (USNM). Coreidae, *Chariesterus antennator* Fabricius, Texas, Brazos County, College Station, 20.VIII.1933 (TAMU).

Coleoptera: Scarabaeidae, *Onthophagus* sp., Texas, Hidalgo County, Weslaco, 12.VIII.1933 (USNM). Histeridae, Texas, Brazos County, College Station, 10.VIII.1932 (USNM).

Diptera: Asilidae, *Efferia* sp., Texas, Brazos County, College Station, 8.VIII.1932 (USNM). Asilidae, *Proctacanthella cacopiloga* (Hine), Texas, Brazos County, College Station, 19.VIII.1932 (USNM). Syrphidae, *Vollucella mexicana* Macquart, Texas, Cameron County, 8.VIII.1933 (USNM). Syrphidae, *Eristalis* sp., Texas, Hidalgo County, Weslaco, 7.VIII.1933 (USNM). Calliphoridae, *Lucilia illustris* (Meigen), Texas, Hidalgo County, Weslaco, 12.VIII.1933. Tachinidae, Texas, Madison County, 22.VIII.1932 (USNM).

Hymenoptera: Anthophoridae, *Melissodes* sp., Texas, Brazos County, College Station, 3.VIII.1932 (USNM). Hymenoptera, Anthophoridae, *Melissodes* sp., Texas, Hidalgo County, Donna, 8.X.1933 (USNM). Apidae, *Apis mellifera* Linnaeus, Texas, Bexar County, 2.X.1946 (USNM). Apidae, *Apis mellifera* Linnaeus, Texas, Bexar County, 6.VI.1934 (TAMU). Apidae, *Apis mellifera* Linnaeus, Texas, Bexar County, 28.X.1946 (USNM). Apidae, *Apis mellifera* Linnaeus, Texas, Brazos County, College Station, 14.X.1945 (USNM). Apidae, *Apis mellifera* Linnaeus, Texas, Hidalgo County, Weslaco, 12.VIII.1933 (USNM). Halictidae, *Halictus* sp., Texas, Hidalgo County, Weslaco, 12.VIII.1933 (USNM). Ichneumonidae, Texas, Hidalgo County, Weslaco, 12.VIII.1933 (USNM). Ichneumonidae, Texas, Live Oak County, Choke Canyon State Park, 4.X.1997 (BYU). Nyssonidae, Gorytinae, Texas, Hidalgo County, Weslaco, 7.VIII.1933 (USNM). Pompilidae, Texas, Brazos County, College Station, 30.VII.1932 (USNM). Sphecidae, *Podium* sp., Texas, Hidalgo County, Weslaco, 12.VIII.1933 (USNM). Sphecidae, *Tachytes* sp., Texas, Brazos County, College Station, 15.VII.1932 (USNM). Tiphidae, Texas, Brazos County, College Station, 17.VIII.1932 (USNM). Scoliidae, *Campsomeris tolteca* Saussure, Texas, Hidalgo County, 12.VII.1933 (USNM). Vespidae, *Polistes*, Texas, Brazos County, College Station, 8.VIII.1932 (USNM).

Lepidoptera: Libytheidae, *Libytheana carinenta* (Cramer), Texas, Cameron County, 8.VIII.1933 (USNM).

One Blythe, California, specimen in the Charles H. Martin collection at the Florida State Collection of Arthropods bears a label stating, "This species common Blythe area. They kill thousands of honey bees. It was captured in a cotton field on 22 July 1949.

Type material. Holotype: The male holotype is deposited in the CAS collection. It is labeled 'San Antonio, Tex', VI-25-42', E S Ross'; 'Diogmites, symmachus, Lw - '76, det. J. Wilcox', 'HOLOTYPE', 'DIPTERA: ASILIDAE', 'Diogmites bilobatus', 'Barnes'. It measures 20.4 mm long and wings are 13.1 mm long. The antennomere:scape ratios are 1.0:1.7:3.8.

Paratypes: UNITED STATES. ARIZONA: Cochise County, 8 mi. NE of Douglas, 4.VIII.1940, ♂ (UCR); 8 mi. E of Douglas, 8.VIII.1958, ♂ (UCDC); 27 mi. E of Douglas, 9.VIII.1966, ♂ (UCR); Miller Canyon, Huachuca Mountains, 5000', 9.VII.1974, 2 ♀ (CUIC); 26.VII.1974, ♀ (CUIC); San Bernardino Ranch, 3750', August, ♀ (CAS). Coconino County, Flagstaff, 25.VII.1950, 2 ♀ (AMNH). Maricopa County, Mesa, VI.1931, ♂, ♀ (BYU); 17.VII.1950, ♀ (EMUS). Mohave County, Mohave Valley, 1.VI.1980, ♂, ♀

(UAIC); 15.VII.1980, 2 ♂ (UAIC); 25.VII.1980, ♂ (UAIC). Pima County, 20.IX.1925, ♀ (CAS); Tucson, 20.X.1927, ♀ (CAS); X.1931, ♀ (CAS); 21.IX.1938, ♀ (CAS); 4.VIII.1953, ♂ (UAIC); 13.VIII.1954, ♀ (UCDC); 29.VIII.1954, ♀ (UAIC); 16.VIII.1955, ♀ (UAIC); laying eggs on soil, 31.VII.1966, ♀ (UAIC). Yuma County, Roll, 19.VII.1954, ♀ (UAIC).

ARKANSAS: Pike County, Daisy, 4.VII.1974, ♂ (WTAM).

CALIFORNIA: Riverside County, Blythe, cotton field, killing honey bees, 22.VII.1949, ♂ (FSCA).

COLORADO: county unknown, Walker Hill, 6.VIII.1933, 2 ♂ (CSUC, WSU). Alamosa County, Alamosa, Summer 1964, ♂ (FSCA). Baca County, S of Lamport, 2.VIII.1933, ♂, ♀ (CSUC). Bent County, Las Animas, 2.VIII.1921, ♀ (CSUC); 12.IX.1933, ♀ (WSU); 3887', 6.IX.1938, ♀ (SEMC); Rd CC, SW of Caddoa, 17.VIII.1995, ♀ (CSUC); Rd 26, along Caddoa Cr., 17.VIII.1995, ♂ (CSUC). Crowley County, Ordway, 19.VII, ♀ (CSUC); 6.VIII.1933, 2 ♀ (CSUC); 11.VIII.1934, ♀ (CSUC); 12.VIII.1934, ♀ (CSUC); 23.VIII.1936, ♂ (CSUC); 6.VIII.1937, ♂ (WSU). Las Animas County, Purgatoire River, Bent Canyon, 2.VII.1989, ♂ (CSUC). Otero County, CO Rt. 109, Purgatoire R., 11.VIII.1990, 2 ♂, ♀ (CSUC). Prowers County, Hartman, 23.VIII.1961, ♂, ♀ (KSUC); Lamar, 25.VIII.1925, 2 ♂, 3 ♀ (UMMZ); Lamar, Arkansas River, 15.IX.1992, ♀ (CSUC); Lamar, Willow Creek Park, 15–16.VIII.1998, ♀ (CSUC). Pueblo County, Boone, 5000', 17.VIII, ♀ (KSUC).

KANSAS: Hamilton County, 4000', 6.VIII.1928, ♂ (KSUC); 8 km WNW of Syracuse, 25.VII.1991, ♀ (CMNH). Meade County, 14.VIII.1945, 2 ♂, ♀ (SEMC). Morton County, 2800', 5.VIII.1911, ♀ (OSEC). Rooks County, 1775 ft., 9.VIII.1912, ♂ (OSU). Seward County, 2600', 18.VIII.1911, 6 ♂, 3 ♀ (OSU). Wallace County, 19.VIII, ♂ (KSUC).

LOUISIANA: Acadia Parish, Crowley, 22.IX.1911, ♀ (USNM). Calcasieu Parish, Sulphur, 23.VIII.1992, ♀ (BYU); 14 mi. S Vinton, 8.IX.1916 (USNM). Cameron Parish, Cameron, 2.VII.1905, ♂ (OSU); 10.VII.1905, 3 ♀ (OSU); Martin Beach off Hwy 82, 13.VIII.2003, ♀ (CSUC). Lafayette Parish, Lafayette, ♀ (USNM); 11.X.1932, ♀ (USNM); Southwestern Lafayette, 8.X.1938, ♂ (USNM); 5.XII.1938, ♂ (USNM). Madison Parish, Tallulah, ♀ (OSEC).

NEW MEXICO: county unknown, northern New Mexico, ♂ (USNM). Bernalillo County, Albuquerque, VIII.1894, ♂, ♀ (OSU). Chaves County, 8.VII.1927, ♂ (SEMC); Chaves, 6.VIII, ♂ (OSU). Doña Ana County, alfalfa, 3.VIII.1956, ♀ (NMSE); alfalfa, 16.VIII.1956, ♀ (NMSE); swept from alfalfa, 9.VIII.1956, ♂ (NMSE); 5 mi. N of Anthony, 16.VII.1958, ♂ (WFBM); Las Cruces, 23.VIII, ♂ (USNM); 28.VIII.1937, ♀ (USNM); 31.VII.1961, ♀ (NMSE); Las Cruces, Mesquite Drive, 6.X.1975, ♀ (NMSB); Las Cruces, Rio Grande, E levee road, 2 mi. N of Picacho, 25.VII.1982, ♀ (NMSB); 29.VII.1982, 8 ♂, 3 ♀ (BYU, NMSB); 2.VIII.1982, 9 ♂, ♀ (EMUS, NMSB); 23.VIII.1982, 2 ♀ (EMUS, NMSB); Las Cruces, Rio Grande, W levee road, 1.5 mi. of Picacho Ave, 6.IX.1982, ♀ (NMSB); Rio Grande, 1 mi. E of San Miguel, 3900', 18.VIII.1993, ♀ (NMSB); Las Cruces, yard, 2 mi. N of NMSU, 12–14.VII.1982, 2 ♀ (NMSB); 13.VII.1982, ♂ (NMSB); 18.VII.1982, ♂ (NMSB); 2 mi. N of NMSU campus, 22.VII.1982, ♂ (BYU); 2 mi. N of NMSU campus, 3900', 25.VII.1982, ♂ (NMSB); 2 mi. N NMSU campus, 24.VII.1983, ♂ (NMSB); 10 mi. S NMSU Exp. Farm, 6.VIII.1982, ♂, 4 ♀ (NMSB); 10 mi. S NMSU Exp. Farm, 3900', 7.VIII.1982, ♀ (NMSB); playa 6.6 mi. N Rt. 70/82, 0.5 mi. E Joranda Rd., 4200', 19.VII.1982, ♂ (NMSB); Masilla Dam, 3800', 9.VIII.1979, ♀ (NMSB); 16.VII.1982, ♀ (NMSB); 31.VIII.1982, ♂ (NMSB); Mesilla Park, alfalfa, 17.VIII.1962, ♀ (NMSB); White Sands, 7.VIII.1931, ♂ (KSUC). Eddy County, Carlsbad, 5.VIII.1931, ♂ (KSUC); 2.IX.1967, ♂, 2 ♀ (UCR); Loving, 19.VI.1963, ♂ (NMSE); Malaga, 11.VII.1936, ♂ (CAS). Roosevelt County, 2.VII.1968, ♂ (UCR); Dora, 7.VIII.1965, ♀ (CAS). San Miguel County, Pecos, 16.VIII.1938, ♀ (AMNH). Sierra County, Percha Dam State Park, Rio Grande River, 17.VII.1989, ♂ (CSUC). Socorro County, La Joya Wilderness, 31.VII.1993, ♂ (CSUC).

OKLAHOMA: Beckham County, US 66 (I-40) 10 Mi. E of Erick, 10.VIII.1969, ♀ (CUIC). Logan County, near Coyle, banks of the Cimarron R., 18.VIII.1959, 3 ♂, 4 ♀ (OSEC). McCurtain County, Sherwood, 27.VI.1937, ♀ (OSEC).

TEXAS: county unknown, Buff Lake, 23.VIII.1968, ♀ (ESUW). Aransas County, 6.VIII.1928, 3 ♂, 2 ♀ (SEMC, UAAM); 6.VIII.1928, 2 ♂ (UAAM); Goose Island State Park, 11.VIII.1985, ♂, ♀ (TAMU). Baylor County, Lake Kemp, below Dam, 20.VIII.1969, ♂ (ESUW). Bexar County, ♂, ♀ (CAS); 2.X.1932, ♂, ♀

(CAS, FSCA); 2–8.X.1932, 3 ♀ (CAS); 6.VI.1934, ♂ (TAMU); 2.X.1946, ♀ (USNM); 28.X.1946, ♀ (USNM); 1.VII.1952, ♂ (EMEC); San Antonio, 22–31.VIII, ♀ (CMNH); 25.VI.1938, 2 ♀ (SEMC, UAAM); 25.VI.1942, ♂ (CAS); 20 mi. N of San Antonio, 22.VI.1942, ♀ (CAS). Blanco County, Blanco, 22.VII.1962, ♀ (TAMU); Pedernales Falls State Park, 28.IX.1991, ♀ (BYU). Bosque County, Valley Mills, 24.VII.1932, ♀ (USNM). Brazoria County, Alvin, 9.XI.1904, ♂ (AMNH). Brazos County, College Station, 13.VIII.1921, ♀ (EMEC); 5.VII.1932, ♀ (USNM); 15.VII.1932, ♂ (USNM); 21–22.VII.1932, ♂, 2 ♀ (USNM); 28.VII.1932, ♂, 2 ♀ (USNM); 30.VII.1932, ♂ (USNM); 3.VIII.1932, ♂ (USNM); 8.VIII.1932, 4 ♂ (USNM); 11.VIII.1932, ♂, 2 ♀ (USNM); 12.VIII.1932, 2 ♂ (USNM); 15.VIII.1932, ♀ (USNM); 17.VIII.1932, 2 ♂, 2 ♀ (USNM); 2–18.VIII.1932, 8 ♀ (USNM); 18.VIII.1932, ♂ (TAMU); 18–19.VIII.1932, 3 ♂, 2 ♀ (USNM); 21.VIII.1932, ♂ (USNM); 20.VIII.1933, 2 ♂ (CAS, TAMU); 26.VII.1933, ♀ (USNM); 14.X.1945, ♀ (USNM). Brewster County, Big Bend National Park, Rio Grande Village, trailer camp, 14.VIII.1970, ♀ (FSCA). Cameron County, 3.VII.1933, 2 ♂, ♀ (USNM); 8.VIII.1933, 5 ♂ (USNM); 18.VIII.1933, ♂ (USNM); Brownsville, June, ♀ (SEMC); 23.X.1960, ♂ (FSCA); 10.VII.1970, ♀ (TAMU); 27.V.1989, ♂ (UCR); 8 mi. E of Brownsville, 18.VII.1962, ♀ (KSUC); 20 mi. E of Brownsville, alkaline flats, 30.VI.1968, ♀ (FSCA); Harlingen, 4.IX.1945, ♂, 2 ♀ (ISUI); 3.X.1945, ♀ (ISUD); 8.X.1945, 2 ♂ (ISUI); Laguna Madre, 25 mi. SE Harlingen, 26.IX.1945, 5 ♂, 3 ♀ (ISUI); 9.X.1945, 2 ♂, 2 ♀ (ISUI). Childress County, Lake Childress, 24.VIII.1948, ♂, ♀ (AMNH). Collingsworth County, Salt Fork, Red River, Hwy 83, 11.VIII.2003, ♂, 2 ♀ (CSUC). Culberson County, 5 mi. E of Van Horn, 12.IX.1970, ♀ (UCDC). Dallas County, 13.VII.1940, ♀ (WIRC); Dallas, 22.VIII.1905, ♀ (USNM); 14.IX.1918, ♀ (UMMZ); 20.IX.1918, 2 ♀ (UMMZ). Dickens County, N of Wichita River, 6 mi. SW Dumont, 9 July, ♀ (ESUW); Spur, 11.IX.1931, ♀ (USNM). Dimmit County, Carrizo Springs, 19.VIII.1994, ♀ (BYU). El Paso County, El Paso, 29.VII.1934, 2 ♂, 2 ♀ (CAS); Tornillo, mesquite area, 15.VII.1948, ♀ (UCDC); Ysleta, 4.IX.1927, ♀ (CUIC); 20.VII.1955, ♂ (WSU); 3.5 mi. S Ysleta, 3800', 19.VIII.1952, ♀ (EMEC). Gaines County, Seminole, 4.IX.1990, ♀ (ESUW). Galveston County, Dickinson, VI.1929, ♀ (KSUC); Galveston Island, 21.VII.1962, 3 ♂ (KSUC); Port Bolivar, 22.VII.1962, ♂ (KSUC). Garza County, Justiceburg, Double Mt. Fork, Brazos R. & Hwy 84, 6.VIII.1993, ♀ (BYU). Gillespie County, Fredericksburg, 1962, ♀ (ISUI). Gray County, 20.IX.1969, ♂ (ESUW); 3.X.1969, ♂ (ESUW). Grayson County, 2.VIII.1969, ♀ (UCR). Harris County, Bellaire, 11.VIII.1957, ♂ (EMEC); Houston, 1.IX.1945, ♀ (EMEC); 6.X.1990, ♀ (BYU); Lake Houston, 13.VII.1978, ♀ (FSCA). Haskell County, Lake Stamford, 29.VIII.1968, ♂ (ESUW). Hidalgo County, 9.VII.1932, ♂ (USNM); 26–29.VI.1933, 2 ♂ (USNM); 12.VII.1933, ♀ (USNM); 1.VIII.1933, ♀ (USNM); 23.VIII.1933, ♀ (USNM); 8.IX.1933, ♀ (USNM); Bentsen, Rio Grande Pk., 9.VI.1981, ♂, ♀ (CSUC); Donna, 8.X.1932, ♂ (USNM); 22.VIII.1933, ♂ (USNM); 24.IX.1933, ♂ (TAMU); 31.IX.1933, ♂ (OSU); Edinburg, FM 2812 & Doolittle Rd., 12.X.1991, ♂ (BYU); McAllen, 11.IX.1965, ♂ (ISUD); 19.IX.1969, ♀ (ISUI); 14.X.1969, ♂ (ISUD); McAllen, valley bot. garden, 27.VIII–8.IX.1973, ♀ (FSCA); Pharr, 20.IX.1947, ♂, ♀ (ISUD); Weslaco, 2.VII.1933, ♀ (USNM); 4.VII.1933, ♂, ♀ (USNM); 27.VII.1933, 2 ♂ (USNM); 3.VIII.1933, ♂ (USNM); 3–7.VIII.1933, 2 ♀ (USNM); 7.VIII.1933, 5 ♂, 2 ♀ (USNM); 12.VIII.1933, 5 ♂, 6 ♀ (USNM); 14.VIII.1933, 2 ♂ (USNM). Hockley County, Levelland, 7.IX.1969, ♀ (ESUW). Jeff Davis County, Ft. Davis, Limpia Creek Campground, 28.VII.1967, ♂, ♀ (CUIC). Jefferson County, Beaumont, 10.VIII.1917, ♀ (CUIC). Jim Wells County, Nueces River at Texas 359, 17.VI.1966, ♀ (FSCA). Kleberg County, Kingsville, 6.VII.1921, ♀ (KSUC); 11.VII.1950, ♂ (CAS); Buffin Bay, Riviera Beach, 17.VI.1948, ♀ (INHS). Knox County, 9.VIII.1969, ♂ (ESUW). Lavaca County, Hallettsville, 28.IX.1953, ♀ (CAS). Lee County, Old Dime Box, 19.VI.1956, ♂ (CUIC). Live Oak County, Choke Canyon State Park, Frio River spillway, 4.X.1997, 4 ♀ (BYU); Choke Canyon State Park, 4 mi. W of Three Rivers, South Shore Campground, 19.X.1991, ♀ (BYU). Lubbock County, 16.IX.1969, ♀ (ESUW); 28.IX.1969, 2 ♀ (ESUW); Lubbock, 2.VIII.1962, ♂ (ESUW); 15.IX.1967, ♂ (ESUW); 17.IX.1967, ♂ (ESUW); 27.IX.1967, ♂ (ESUW); 4.IX.1969, ♀ (ESUW); 7.IX.1969, ♀ (ESUW); 16.X.1969, ♀ (ESUW). Madison County, 2.VIII.1930, ♂ (TAMU); 22.VIII.1932, 4 ♂, 2 ♀ (OSU, USNM); X.1932, 2 ♂, 2 ♀ (CAS, TAMU, USNM); 14.VIII.1933, ♀ (USNM). Milam County, Thorndale, 2.X.1950, ♀ (AMNH). Montgomery County, Montgomery, 18–21.VIII.1975, ♀ (UCDC). Motley County, 12.VIII.1969, 2 ♂ (ESUW, MEMU). Pecos County, Girvin, 8 mi. NW of Hwy 11, 28–30.VIII.1992, ♀ (BYU); Hwy 10 & Pecos River, 21.IX.1984, ♀ (TAMU). Randall County, Canyon, 13.VIII.1969, ♂ (KSUC); Palo Duro Canyon State Park, 22.VIII.1990,

6 ♂, 2 ♀ (BYU); Palo Duro Canyon State Park, Hackberry Campground, 20.IX.1999, ♀ (BYU). Reeves County, Balmorhea, 16.VIII.1982, ♂ (TAMU). San Patricio County, Mathis, 22.VIII.1932, ♀ (CAS); R. & B. Welder Refuge, 26.VIII.1979, ♀ (BYU). Schleicher County, 17.1 mi. W of Eldorado on I90, 14.VIII.1982, ♀ (TAMU). Starr County, 13.VIII.1937, ♀ (USNM). Tarrant County, 14.VII.1968, ♀ (ESUW). Terry County, 27.IX.1969, ♀ (ESUW). Travis County, Austin, 6.X.1901, ♀ (USNM); 25.IX.1965, ♀ (UCDC). Val Verde County, 14.VI.1929, ♀ (OSEC); 14.VI.1949, ♂ (OSU). Victoria County, Victoria, 1.VIII.1902, ♂ (USNM); 15.VII.1903, ♀ (USNM); 12–15.VII.1946, ♂ (KSUC). Walker County, 8 mi. W of Huntsville, 2.IX.1960, 2 ♂ (EMEC, UCDC). Wharton County, 7 mi. E Wharton, 9.VIII.1921, ♀ (EMEC).

MEXICO. CHIHUAHUA: Colonia Dublan, July 1931, ♂ (BYU); Delicias, 13.VII.1947, 4 ♀ (FSCA); Delicias, 4150', 11.VII.1947, 3 ♂, 2 ♀ (FSCA).

COAHUILA: 10 mi. S of Ciudad Acuña, 13.IX.1977, ♂ (EMEC); 10 mi. S of Sabinas, 11.IX.1976, ♀ (EMEC); Muzquiz, Las Ruscias, 3.VIII.1938, ♂ (TAMU); Zaragoza, 11.IX.1976, ♀ (EMEC).

NUEVO LEÓN: Monterrey, Chipinque, V.1957, ♂ (FSCA); 6 mi. S of Monterey, 12.VIII.1959, ♀ (FSCA).

SAN LUIS POTOS: Valles, 1.VII.1959, ♀ (FSCA).

Diogmites angustipennis Loew

(FIGS 1, 3, 4)

Diogmites angustipennis Loew 1866: 23.

Diogmites symmachus Loew 1872: 66. **New synonymy.**

Deromyia pulchra Back 1909: 361 (= *Diogmites pulcher*). **New synonymy.**

Diogmites grossus Bromley 1936: 236. **New synonymy.**

Diagnosis. Male 16.5–28.9 mm long (mean = 23.4 mm); female 15.2–29.9 mm long (mean = 24.2 mm). Average antennomere:scape ratios 1.0:1.5:3.6. Male wing 13.8–20.6 mm long (mean = 16.8 mm); female wing 10.0–20.1 mm long (mean = 16.9 mm). Phallus not bilobed (Fig. 3a). Female abdominal tergites 1–4 or 1–5 and sternites 1–5 pollinose and opaque; tergites 5–8 or 6–8 and sternites 6–8 polished (Fig. 3b).

Discussion. *Diogmites angustipennis* varies widely in size and color, but few specimens display the darkest pigmentation found among specimens of *D. bilobatus* **sp. nov.** There is a general tendency for specimens from more southern areas to be darker, but regional populations often display a wide range of coloration. Most specimens collected at College Station, Texas, have medium brown abdominal tergites, but a few have yellowish orange tergites. On the other hand, most specimens collected in Sedgwick County, Kansas, and Woodbury County, Iowa, have yellowish orange abdominal tergites, but a few have medium brown tergites. Specimens from Rooks County, Kansas, all collected 9 August 1912 at 1775 feet elevation, range from yellowish orange to nearly black. Of the 83 males collected in Garden Grove, Orange County, California in August and September, 1941, 41 specimens have black dorsal longitudinal thoracic stripes. Most females also have black thoracic stripes, but a few show the more typical pattern and lack dark thoracic markings.

There is also a wide size range, even within the same population. The Sedgwick County females range from 20 mm long to 28 mm long. The Rooks County females range in length from 22 to 29 mm. Garden Grove males range from 20 to 28 mm long, and females from the same locality range from 26 to 32 mm long.

Females usually have tergites 6–8 and the corresponding sternites completely glabrous. In some individuals, especially those that fit the descriptions of *Diogmites grossus* or *D. pulcher*, tergite 5 also is largely glabrous, except for the lateral edges, but sternite 5 is always pollinose and dull. Both ovipositor types can often be found in the same population. At Lamar, Prowers County, Colorado, the type locality of *Diogmites grossus*, some females have dull and pollinose tergite 5 while others have a largely glabrous tergite 5. Most of the seven specimens that I have seen from Masters, Weld County, Colorado have a glabrous tergite 5, but in one specimen this tergite is clearly pollinose dorsally. Most females from Utah that I have seen have a largely glabrous tergite 5, but most specimens from California have a pollinose tergite 5. Many of the

specimens from the large series collected at Garden Grove, Orange County, California in August and September, 1941, have dark mesonotal stripes and wings yellowed around the veins, and they key to *D. pulcher* in Bromley's (1936) key. Three-quarters of the females have the fifth tergite pollinose, but one quarter have the fifth tergite glabrous. Glabrous fifth tergites are found in some specimens from the following states: Arizona, California, Colorado, Idaho, Kansas, Nebraska, New Mexico, Oklahoma, Oregon, Texas, Utah, and Wyoming.

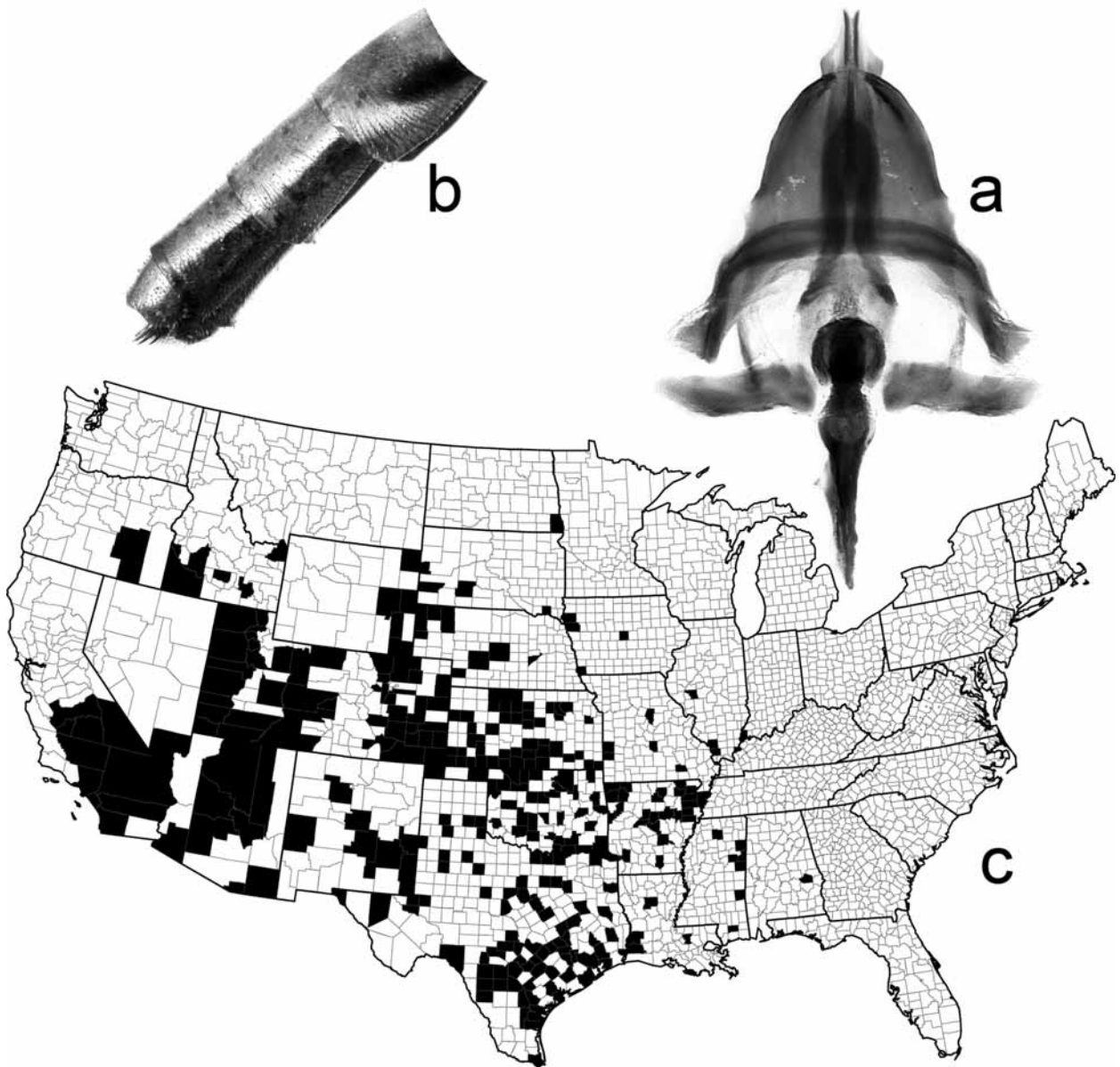


FIGURE 3. *Diogmites angustipennis*. a, phallus, dorsal view. b, ovipositor, lateral view. c, United States distribution, by county or parish.

However, there is a tendency toward regional consistency in both size and color. Specimens collected from agricultural lands, mostly cotton and soybean fields, in Conway County, Arkansas, in the late 1950s and early 1960s are shorter (19.1 ± 3.0 mm; $n = 27$) than the average 23.8 mm length. They tend to be lightly pigmented, and their abdomens appear bright golden orange. Specimens collected from vineyards in northwest Arkansas in 2003 are much larger (25.9 ± 2.6 mm; $n = 31$), and their abdomens are a fairly dark brown. It is tempting to speculate that prey availability and edaphic factors to which the soil-dwelling larvae are exposed, such as frequency of disturbance and insecticide concentrations, might account at least in part for the observed variation.

The known range of *D. angustipennis* in North America north of Mexico extends from southeastern North Dakota to southeastern Alabama in the east, and from southeastern Oregon to southern California in the west (Fig. 3c). This species also occurs in northern Mexico. Labels on museum specimens indicate that adults are active from April and May to late November in the southern part of the species' range. However, most museum specimens bear labels dated July, August, or September. Specimens have been collected at College Station, Brazos County, Texas, from early April to late October. In Colorado, they have been collected from mid July to late September.

In Platte County, southeastern Wyoming, Lavigne and Holland (1969) found that *Diogmites angustipennis* is a common denizen of the open plains, often found in rank and shrubby vegetation along intermittent stream beds. It is a strong flier, making flights up to 50 to 100 yards, often landing on tall vegetation. It tends to forage from the ground in the morning before the soil becomes too warm. Later in the day it forages from horizontal branches of various shrubs. These asilids usually take their prey in the air, although they will sometimes capture prey crawling on the ground or on vegetation. They take many kinds of prey in at least seven insect orders, 29 families, and 51 genera. However, they seem to have a clear preference for relatively large Hymenoptera. Out of 97 prey species recorded by Lavigne and Holland (1969), 63% were Hymenoptera and 25% were Diptera.

Nearby, in Weld County, Colorado, O'Neill and Bjostad (1987) found that *Diogmites angustipennis* preys on males of the bee *Nomia nevadensis bakeri* Cockerell (Hymenoptera: Halictidae). The male bees congregate in large numbers and compete heavily for emerging virgin females. In their zeal to find and guard mates they become conspicuous targets for predation by *D. angustipennis*.

Captured prey is enclosed within the fly's spiny legs. The asilid carries it to a suitable perch, from which it hangs by one or both front tarsi (Fig. 4), earning it the nickname "hanging thief. Once the prey is manipulated into a suitable position, the predator impales it with its proboscis, usually through the membranous cervix. Prey is usually held from above and behind, oriented facing the same direction as the fly. This helps the asilids to avoid the stings of aculeate Hymenoptera (Lavigne and Holland 1969).

In the Wyoming study, most mating activity occurred during the middle of the day. On warm days, large numbers of males held their front tarsi high and out in front while flying slowly from shrub to shrub with their wings producing a loud buzz. When a male found another individual feeding or foraging, he began a courtship hover about one foot from his potential mate, with front legs held above the thorax. When the other individual was a receptive female, the couple mated in an end-to-end position for a period of several hours.

Females oviposited in the morning. They dragged their ovipositors over the soil and thrust them from side to side, evidently sensing the soil texture. At appropriate sites, they pushed their ovipositors into the soil and jerked the terminal spines upward from time to time, displacing the soil as the abdomen sank down to the first segment. Eggs were deposited side by side in the soil in clutches of 5–14 eggs each.

Bromley (1934) discussed the biology of *D. angustipennis* and *D. symmachus* in Texas. It is possible that some of the observations he relates were actually made on *D. bilobatus*, which occurs widely in Texas. He found the flies to be common in cotton fields, pastures, and waste lands, especially in areas of alluvial and sandy soils. They flew with a high-pitched buzz, darting among plants and preying on honey bees, wasps, and other insects. They could be pests around bee hives. They were also cannibalistic, the females often killing and devouring approaching males. Out of 113 prey items recorded in eight orders, 60% were Hymenoptera and 24% were Diptera, mostly Asilidae. These prey data are nearly identical to those recorded in the Wyoming study.

Some museum specimens that I examined have the following prey items pinned beneath them:

Orthoptera: Acrididae, Texas, Zavala County, Nueces River, 4 mi. E La Pryor, 9.IX.1972 (SEMC).

Hemiptera: Coreidae, Texas, McLennan County, 9.VII.1945 (TAMU). Coreidae, *Leptoglossus* sp., Texas, Montague County, Forestburg, 26.IX.1941 (USNM). Reduviidae, Texas, McLennan County, 17.VI.1934 (CAS). Reduviidae, *Sinea* sp., Wyoming, Crook County, Devils Tower National Monument, 16–18.VIII.1983 (ESUW).

Coleoptera: Carabidae, *Cicindela*, Texas, McLennan County, 9.VII.1933 (TAMU). Chrysomelidae, Texas, Montague County, Forestburg, 25.IX.1941 (USNM). Scarabaeidae, Texas, McLennan County, 20.VI.1934 (FSCA). Scarabaeidae, Texas, Victoria County, 15 mi. N Victoria, 28IX.1965 (UCDC).

Diptera: Asilidae, *Efferia* sp., Wyoming, Platte County, Wheatland, 24.VIII.1964 (ESUW). Asilidae, *Machimus* sp., Colorado, Douglas County, 28.VIII.1969 (CSUC). Asilidae, *Proleptis tristis* (Walker), Texas, Brazos County, College Station, 30.IX.1932 (USNM). Asilidae, *Proleptis tristis* (Walker), Texas, Brazos County, College Station, 23.IX.1933 (USNM). Asilidae, *Promachus bastardii* (Macquart), Texas, Brazos County, College Station, 21.VI.1932 (USNM). Asilidae, *Stichopogon trifasciatus* (Say), Texas, Dickens County, Spur, 11.IX.1932 (USNM). Bombyliidae, Texas, Montague County, Forestburg, 26.IX.1941 (USNM). Muscidae, Wyoming, Platte County, Wheatland, 16.IX.1973 (ESUW). Stratiomyidae, *Hoplitimyia* sp., Texas, Brazos County, College Station, 27.VIII.1933 (TAMU). Stratiomyidae, *Stratiomys meigenii* (Wiedemann), McLennan County, Texas, Valley Mills, 24.VII.1932 (USNM).



FIGURE 4. *Diogenes angustipennis*, the “hanging thief” hanging with prey. Camp Robinson Wildlife Development Area, Faulkner County, Arkansas. Courtesy Herschel Raney.

Lepidoptera: Texas, Brazos County, College Station, 23.IX.1933 (CAS).

Hymenoptera: Andrenidae, California, Fresno County, Kingsburg, 6.VIII.1952 (UCDC). Andrenidae, Utah, Millard County, Delta, 30.VII.1949 (EMUS). Apidae, *Apis mellifera* Linnaeus, Colorado, Boulder County, Boulder, 25.VII (AMNH). Apidae, *Apis mellifera* Linnaeus, Kansas, Cherokee County, 5 km E Crestline, 2.VIII.1985 (SEMC). Apidae, *Apis mellifera* Linnaeus, Kansas, Riley County, Manhattan, September (KSUC). Apidae, *Apis mellifera* Linnaeus, Texas, Bexar County, 2.X.1931 (CAS). Apidae, *Apis mellifera* Linnaeus, Texas, Bexar County, 11.IX.1931 (TAMU). Apidae, *Apis mellifera* Linnaeus, Texas, Bexar County, 8.X.1931 (CAS). Apidae, *Apis mellifera* Linnaeus, Texas, Lavaca County, 10 mi. N

Hallettsville, 28.IX.1965 (UCDC). Apidae, *Apis mellifera* Linnaeus, Texas, Uvalde County, Nueces River, Highway 55, S of Campwood, 13.VI.1992 (CSUC). Apidae, *Apis mellifera* Linnaeus, Wyoming, Crook County, Devils Tower National Monument, 16–18 August 1983 (ESUW). Apidae, *Bombus* sp. Texas, Bexar County, 2.X.1931 (CAS). Pompilidae, Oklahoma, Comanche Co., Punch Bowl Road, 2 mil. E Letra, 1.VII.2003 (CSUC). Pompilidae, Texas, Brazos County, College Station, 4.VI.1933 (TAMU). Pompilidae, Texas, McLennan County, 16.VII.1933 (TAMU). Pompilidae, Wyoming, Platte County, Glendo Road, 13 mi. W Glendo, 26.VII.1998 (CSUC). Scoliididae, *Scolia* sp., Colorado, Las Animas County, Iron Canyon, Steinman's Ranch., Purgatoire River, 14.VII.1991. Sphecidae, *Ammophila* sp., Colorado, Las Animas County, Iron Canyon, Steinman's Ranch., Purgatoire River, 14.VII.1991 (CSUC). Sphecidae, *Ammophila* sp., Utah, Pine Valley, VIII.1950 (USNM). Sphecidae, *Sceliphron caementaria* (Drury), Kansas, Riley County, Manhattan, 26.VII.1955 (KSUC). Sphecidae, *Sceliphron caementaria* (Drury), Texas, Brazos County, College Station, 23.VIII.1932 (USNM). Sphecidae, *Tachytes* sp., Oklahoma, Comanche County, Fort Sill, Quanah Range, 0.5 mi. E Falcon Gate, 19.IX.2003. Sphecidae, Arizona, Yavapai County, Oak Creek Canyon, 15.VIII.1938 (USNM). Sphecidae, Texas, McLennan County, 8.VII.1934 (FSCA). Sphecidae, Utah, Westside Lake, 20.VIII.1950 (USNM). Tiphidae, *Myzinum* sp., Louisiana, Beauregard Parish, 16.VIII.1928 (SEMC). Tiphidae, *Myzinum* sp., Oklahoma, Comanche County, Fort Sill, West Range, short grass, 13–14 September 2002. Tiphidae, Texas, Brazos County, College Station, 19.VI.1932 (USNM). Tiphidae, Texas, Lavaca County, 15 mi. S Hallettsville, 28.IX.1965 (UCDC). Vespidae, *Eumenes* sp., Kansas, Riley County, Manhattan, 5.IX.1931 (KSUC). Vespidae, California, Tulare County, Visalia, 23.VIII.1950 (UCDC). Vespidae, Kansas, Cherokee County, 5 km. E Crestline, 2.VIII.1985 (SEMC). Vespidae, Oklahoma, Comanche County, Fort Sill, East Range, 10.VIII.2002. Vespidae, Texas, Bexar County, 2.X.1931 (CAS). Vespidae, Texas, Brazos County, College Station, 5.VI.1932 (TAMU). Vespidae, Texas, Brazos County, College Station, 24.X.1945 (TAMU).

Type material examined. *Diogmites angustipennis* was originally described from two female specimens collected in Kansas. I have examined both specimens, which are in the MCZ collection, and I hereby designate one of them as lectotype for clarification and to ensure stabilization in nomenclature. That specimen bears the following labels: 'Kansas'; 'Loew coll.'; 'Type 12820'; '*angustipennis*'; 'Jan.–July 2003 MCZ image database'; 'Lectotype, *Diogmites angustipennis* Loew, 1866, designated by J. K. Barnes 2004'. The paralectotype (MCZ) bears the following labels: 'Mat'; 'Loew coll.'; 'Type 12820'. 'Mat probably refers to the collector, Matamoras, cited in the original description.

Diogmites symmachus was originally described from a male and a female specimen, both collected in Texas. I have examined both specimens, which are in the MCZ collection, and I hereby designate the male specimen as lectotype for clarification and to ensure stabilization in nomenclature. That specimen bears the following labels: 'Texas Lafr.'; 'Loew coll.'; 'Type 12826'; '*symmachus* Lw. Cent. X'; 'Jan.–July 2003 MCZ image database'; 'Lectotype *Diogmites symmachus* Loew, 1872, designated by J. K. Barnes 2004'. The female paralectotype (MCZ) bears the following labels: 'Texas Lafr.'; 'Loew coll.'; 'Type 12826'. 'Lafr. might be a flawed reference to the collector of the specimens, Gustaf Wilhelm Belfrage, who was cited in the original description. Belfrage was a Swedish nobleman who spent the last 16 years of his life, 1867–1882, collecting insects in Texas, mostly in Bosque and McLennan Counties and surrounding areas of central Texas. He sold collections to many museums in the United States and Europe (Geiser 1948).

The *D. angustipennis* female lectotype is 21.6 mm long, and its wing is 16.4 mm long. The *D. symmachus* male lectotype is 19.3 mm long, and its wing is 13.5 mm long. The *D. angustipennis* lectotype has a brown mesonotum and brown abdominal tergites, whereas the *D. symmachus* lectotype has a more orange or ochreous mesonotum and abdomen. In both the *D. angustipennis* lectotype and the *D. symmachus* female paralectotype, abdominal tergites 1–5 and the corresponding sternites are dull and pollinose, whereas tergites 6–8 and the corresponding sternites are glabrous except for the lightly pollinose extreme lateral edges of tergite 6.

Diogmites pulcher was originally described from a single male collected in Los Angeles County, California. This holotype (USNM) bears the following labels: 'Type No. 11027 U. S. N. M.'; 'Type *D. pulchra*'; '*Deromyia pulchra* Back.'

Diogmites grossus was originally described from a male holotype, three male paratypes, 12 female paratypes, and 19 paratypes of unspecified sex. I have examined the holotype and eight paratypes. The holotype (USNM) bears the following labels: 'COLO. Prower Co., Lamar, 279, Aug. 25, 1925, F. M. Gaige'; 'Deromyia bigoti Bellardi, Det. C. T. Greene 1928'; 'Holotype ♂, Diogmites grossus Bromley'; 'SWBromley Collection 1955'.

The *D. pulcher* holotype is 26.3 mm long, and its wing is 17.6 mm long. It is a darkly pigmented specimen. The mesonotum bears three dark brown vittae. The middle vitta is divided longitudinally and reaches to the pronotum. The abdominal tergites are dark brown dorsally, and the otherwise hyaline wings are distinctly yellowed around the veins. The lateral flanges of the ventral aedeagal channel are not well developed. The *D. grossus* holotype is 29.8 mm long, and its wing is 19.0 mm long. The mesonotum lacks distinct vittae and the abdominal tergites are brown, about the same color as in the *D. angustipennis* lectotype. The lateral flanges of the ventral aedeagal channel are not well developed. The hyaline wings have some light yellowing around the veins. There is no pale bloom or sheen that distinctly sets this specimen apart from the *D. angustipennis* lectotype. *Diogmites grossus* paratypes in the USNM collection from Lamar, Prowers County, Colorado; Parma, Canyon County, Idaho; and Moab, Grand County, Utah have the typical *D. angustipennis* abdominal vestiture, with tergites 1–5 and the corresponding sternites dull and pollinose and tergites 6–8 and the corresponding sternites glabrous. One paratype from near Midvale, Salt Lake County, Utah, has abdominal tergites 1–4 dull and pollinose. Tergite 5 is glabrous dorsally and pollinose laterally. Sternite 5 is pollinose. Tergites and sternites 6–8 are glabrous.

Other material examined. UNITED STATES. ALABAMA: Macon County, Tuskegee, 22.VII.1930, ♀ (SEMC).

ARIZONA: Apache County, Horseshoe Cienega, 12 mi. E McNairy on Rt. 73, 30.VII.1962, ♂ (UAIC). Cochise County, Willcox, 1.VIII.1909, ♂ (USNM); 14.VIII.1958, 12♂ (UCDC, UCR); 30.VIII.1958, ♂ (UCDC); 27.VIII.1959, 14♂ (EMEC); 31.VIII.1959, 20♂ (EMEC); 1 mi. S Willcox, 23.VIII.1961, 2♂ (UAIC); 3 mi. SE Willcox, 31.VIII.1959, ♂ (AMNH). Coconino County, 27 mi. N Cameron, 30.VIII.1967, ♀ (UCR); Flagstaff, 5.VIII.1973, ♂ (UCR); Grand Canyon, 11.IX.1932, ♂ (EMUS); "General Springs", 6200', 28.VIII.1935, ♀ (USNM); Oak Creek Canyon, 15.VIII.1938, ♂ (USNM); 13.VIII.1958, ♂ (EMEC); 1.VIII.1962, ♂ (BYU); 4.VIII.1982, ♀ (UCR); 10.VIII.1991, ♂ (UCDC); 6000', August, 3♂ (AMNH, OSU); Oak Creek Canyon, Pine Flat Campground, 22.VIII.1967, ♂ (UCR); West Fork of Oak Creek, 30.VIII.1985, 2♂ (BYU). Gila County, Carrizo, 1.IX.1986, ♂, ♀ (EMUS); 5 mi. N Payson, East Verde Park, 12.IX.1969, ♂ (UCR); Sierra Ancha Mountains, August, ♀ (USNM); Sierra Ancha Mountains, 4.IX.1932, ♂ (CAS). Maricopa County, Granite Reef, 12.IX.1936, ♂, ♀ (AMNH); Granite Reef Dam, 29.VIII.1964, ♂ (EMEC); Granite Reef Dam, 16.IX.1968, ♂, ♀ (CAS); Phoenix, August, ♂, ♀ (USNM); Phoenix, 1929, ♂ (WSU); Tempe, 17.VII.1962, ♀ (EMEC); ASU, Tempe, 12.IX.1973, ♀ (CAS). Navajo County, Shumway, 1.IX.1959, 2♀ (CAS); White Mountains, September, 2♂ (AMNH, CAS). Santa Cruz County, Sonoita, 4000', 10.X.1930, ♀ (USNM). Yavapai County, near Del Rio Verde River, 18.IX.1929, ♂ (CAS); Oak Creek, Red Rock Crossing, 30.VIII.1985, ♀ (BYU). Yuma County, Yuma, VIII.1936 (AMNH); Yuma, alfalfa, 6.VII.1925, ♂ (CAS); 4.IX.1925, ♀ (CAS); 3.IX.1926, ♂, ♀ (CAS).

ARKANSAS: Benton County, Lowell, Bishop Vineyard, Malaise trap, 29.VII.2003, ♂ (UAAM); 14.VIII.2003, 8♂ (UAAM). Bradley County, cotton, 8.VII.1959, ♂, ♀ (UAAM). Carroll County, Roberts Farm, 29.VII.2003, ♀ (UAAM). Columbia County, pond, 1989, ♀ (UAAM). Conway County, 10.VIII.1961, ♂ (CAS); 28.VIII.1961, ♀ (CAS); 8.IX.1961, ♀ (CAS); 15.VII.1964, ♀ (UAAM); alfalfa, 10.VIII.1961, 3♀ (UAAM); 9.IX.1961, ♂, ♀ (UAAM); corn, 12.VII.1959, ♀ (UAAM); 9.IX.1961, ♂, 2♀ (UAAM); 27.VII.1964, ♀ (UAAM); cotton, 14.VII.1959, 2♀ (UAAM); 24–25.VIII.1959, ♂, 2♀ (UAAM); 2.IX.1959, 2♂, 13♀ (UAAM, USNM); 6.VI.1960, ♀ (UAAM); 14–19.VII.1960, ♂, 4♀ (UAAM); 26.VIII.1960, 6♀ (UAAM); 6.IX.1960, 2♂, 2♀ (UAAM); 25.VIII.1961, ♀ (UAAM); 11.IX.1961, ♀ (UAAM); 5.VII.1963, ♂ (UAAM); sorghum, 12.VII.1959, ♂ (UAAM); soybeans, 18.VII.1960, 3♂ (UAAM); 6.VII.1961, ♂ (UAAM); 10.VII.1961, ♂, 3♀ (UAAM); 25.VII.1961, 3♂, 6♀ (UAAM); 26.VII.1961, ♀ (UAAM); 1.VIII.1961, ♂, 3♀ (UAAM); 10.VIII.1961, 4♀ (UAAM); 16.VIII.1961, ♂, ♀ (UAAM); 20.VIII.1961, 3♂ (UAAM); 24–31.VIII.1961, 5♂, 17♀ (UAAM); 5–11.IX.1961, 2♂, 9♀ (UAAM); 20.X.1961, ♂ (UAAM); 10.VIII.2003, ♂

(UAAM); weeds, 17.VII.1959, ♂ (UAAM); 14.VII.1960, ♂ (UAAM); 26.VIII.1960, ♂ (UAAM); 6.IX.1960, ♂ (UAAM); 24.VII.1961, 2 ♀ (UAAM); 30.VIII.1961, ♀ (UAAM); 11.IX.1961, ♂ (UAAM). Craighead County, 10.VIII.1967, ♀ (UAAM); 25.VIII.1984, 2 ♀ (ASUC); 13.IX.1993, ♀ (ASUC); Bono Bog, 11–21.VII.2003, 3 ♂ (UAAM); Hatchie Coon, 24.VIII.2003, ♀ (UAAM); Jonesboro, bypass, abandoned field, 8.VII.1979, ♂ (UAAM); 7–9.VIII.1979, 2 ♂, ♀ (UAAM); Lester Levee, 23.VII.2003, ♂ (UAAM). Cross County, 14.X.1995, ♀ (ASUC); Village Creek State Park, 9.IX.2003, ♀ (UAAM). Faulkner County, Camp Robinson Wildlife Development Area, 12–17.VII.2003, 2 ♂, 2 ♀ (UAAM); 26.VIII.2003, ♀ (UAAM). Franklin County, 4.VII.2003, ♂ (UAAM). Greene County, Crowley's Ridge State Park, 10.VII.2003, 2 ♂ (UAAM). Hempstead County, cotton, 19–29.VIII.1959, 2 ♂, 8 ♀ (UAAM); 15.IX.1959, ♀ (UAAM); 5–6.IX.1960, ♂, 35 ♀ (UAAM); field peas, 29.VIII.1959, ♀ (UAAM); Hope, 22.IX, ♀ (UCDC). IZARD COUNTY, 15.X.1986, ♀ (ASUC). Jefferson County, cotton, 14.VII.1959, ♀ (UAAM). Lawrence County, 20.IX.1983, 3 ♀ (ASUC); 4.IX.1988, ♀ (ASUC); Imboden, ♂, 4 ♀ (CSUC, OSEC). Little River County, weeds, 4.VII.1961, ♂ (UAAM). Madison County, Hindsville, Gay Vineyard, Malaise trap, 26–29.VII.2003, 10 ♂, ♀ (UAAM); 14.VIII.2003, 10 ♂, 6 ♀ (UAAM). Mississippi County, Johnson grass, 12.VII.1967, ♂ (UAAM); willow, 29.VII.1966, ♂ (UAAM); Mississippi River, near Armorel, 30.VIII.2003, ♂, 3 ♀ (UAAM). Perry County, Toad Suck beach, 16–19.VIII.2003, ♂, 3 ♀ (UAAM). Poinsett County, 21.X.1992, ♀ (ASUC). Pulaski County, grass, 15.XI.1999, ♀ (UAAM). Randolph County, 26.IX.1986, ♀ (ASUC); Hwy 63 & Eleven Point River, 5.IX.2003, 2 ♂, 2 ♀ (UAAM). Sebastian County, 15.IX.1926, 3 ♀ (OSEC, UAAM). St. Francis County, 5.IX.1926, 2 ♀ (OSEC, UAAM). Stone County, above Gunner Pool, 5.VIII.2003, ♀ (UAAM). Washington County, 9.IX.1953, ♀ (USNM); IX.1955, ♀ (UAAM); 3.IX.1959, ♀ (UAAM); X.1959, ♀ (UAAM); IX.1960, ♂ (UAAM); 2.IX.1960, ♀ (UAAM); 12.IX.1960, ♀ (UAAM); 8.X.1960, ♀ (UAAM); 7.IX.1965, ♂ (CAS); 26.VII.1969, ♀ (UAAM); light trap, 25.VII.1965, ♂ (UAAM); crimson clover, 22.VIII, 2 ♀ (UAAM); crimson clover, 24.VIII, ♂ (UAAM); crimson clover, 28.VIII.1959, ♀ (UAAM); eggplant, 17.VIII.1959, ♀ (UAAM); weeds, X.1959, ♂ (UAAM); C. Creek, grass and weed swamp, 20.VIII.1932, 2 ♀ (UAAM); Clear Creek, 4.IX.1954, ♀ (UAAM); Cove Creek, meadow, 8.IX.1962, ♀ (UAAM); Fayetteville, University of Arkansas farm, 18.IX.2002, ♂ (UAAM); 5.VII.2003, ♂ (UAAM); 8.VIII.2003, ♂ (UAAM). White County, Bald Knob, abandoned vineyard, Malaise trap, 12.VIII.2003, ♀ (UAAM); Bald Knob NWR, 23.VIII.2003, ♀ (UAAM); Judsonia, Gillam Vineyard, Malaise trap, 12.VIII.2003, ♀ (UAAM); Searcy, Smith Vineyard, Malaise trap, 15.VII.2003, ♂ (UAAM); 31.VII.2003, ♂ (UAAM); 12.VIII.2003, ♂ (UAAM). Woodruff County, 12.IX.1983, ♀ (ASUC).

CALIFORNIA: Fresno County, Clovis, 7.X.1951, ♀ (CAS); Fresno, IX.1929, 2 male, ♀ (EMEC); 4.IX.1935, ♂ (AMNH); 23.X.1954, ♀ (CAS); 30.IX.1955, ♂ (CAS); 1.X.1955, ♂ (CAS); 20.IX.1958, ♂ (CAS); 8 mi. NW Kerman, 10.VIII.1961, ♂ (CAS); Kerman, 10.VIII.1973, ♀ (EMEC); Kingsburg, 6–7.VIII.1952, ♂ (UCDC); Reedley, 20.VIII.1950, ♂ (UCDC); Reedley, 11.IX.1952, ♀ (UCDC). Inyo County, Lone Pine, 7.IX.1935, 2 ♂, 2 ♀ (USNM). Kern County, 28.VIII.1958, ♀ (UCDC); button willow, 6.VIII.1955, ♀ (EMEC); near Hwy 99, 1.7 mi. S of Hwy 223, 8.IX.1990, ♀ (UCR); 29.IX.1990, ♂ (UCR); 22.IX.1998, ♂, ♀ (UCR); 3.5 mi. S of Hwy 223, 0.5 mi. E Wible Rd., 15.IX.1998, ♀ (UCR); Bakersfield, 24.IX.1965, ♀ (EMEC); Shafter, 14.IX.1952, ♂, 2 ♀ (CAS). Kings County, Lemoore, 6.VIII.1932, 2 ♂, 4 ♀ (CAS, EMEC). Los Angeles County, Bellflower, 1.X.1956, ♀ (CAS); Huntington Park, 1.IX.1937, ♂ (CAS); Los Angeles, VII.1961, ♂ (UCR); Norwalk, on flowers, 8.VIII.1949, ♀ (EMEC); Pasadena, 5.IX.1963, ♀ (UCR). Orange County, Anaheim, 26.VIII.1958, ♂ (BYU); Garden Grove, 6–22.VIII.1941, 18 ♂, 8 ♀ (CAS); 2–3.IX.1941, 54 ♂, 9 ♀ (CAS, EMUS); 22–23.IX.1941, 11 ♂, ♀ (CAS); 9.VIII.1949, ♀ (UCR). Riverside County, Banning, 26.VIII.1909, ♂ (USNM); Blythe, 22.VIII.1966, ♀ (NMSB); Ripley, sweeping alfalfa, 12.VIII.1946, 2 ♀ (EMEC); Riverside, 17.IX.1933, ♀ (UCR); 14.X.1933, ♀ (CAS); 20.IX.1962, ♂ (UCR). San Bernadino County, 3 mi. S Highland, 5.VIII.1957, ♂ (EMEC); Needles, 22.IX.1909, ♀ (USNM); Redlands, 1913, ♂, ♀ (EMEC); San Bernadino, [no date], 2 ♂ (CAS). San Diego County, San Ysidro, 1.IX.1948, ♂ (UCR). Tulare County, Lindsay, 6.IX.1932, ♂, ♀ (UCR); Visalia, 9.IX.1945, ♀ (CAS); 23.VIII.1950, ♀ (UCDC).

COLORADO: Alamosa County, Box Canyon, near Alamosa, 2.IX.1921, ♀ (CAS). Arapahoe County, Roxborough State Park, VI.1993, ♂, 2 ♀ (CSUC). Baca County, Rd. 18, 0.8 mi. N of Rd G, 12.VII.1991, ♀ (CSUC); S Lampart, 2.VIII.1933, 2 ♀ (USNM); Picture Canyon picnic area, 16.VII.1992, ♂, 4 ♀ (CSUC);

Sand Canyon, 13.VII.1991, ♀ (CSUC). Bent County, Rd CC, 24.VIII.1996, ♀ (CSUC); 2.5 mi. S Caddoa, sand dunes along Caddoa Ck., 11.VII.1991, ♂, 4♀ (CSUC); Hasty, 17.VII.1974, 2♂ (CSUC); John Marin Reservoir, GG Road (Caddoa Cr.), 26.VIII.2001, ♂ (CSUC). Boulder County, 12.IX.1926, ♀ (CSUC); 7.VIII.1934, 2♂ (USNM); Boulder, 25.VII, ♂ (AMNH); 9.VIII, ♂ (USNM); 13.VIII, ♂ (USNM); 7.VIII.1906, ♀ (AMNH); 28.VIII.1907, ♀ (WSU); 2.VIII.1932, ♂, ♀ (CSUC); 5.VIII.1932, ♂ (WSU); 20.VII.1933, ♂, 2♀ (CAS, CUIC); 30.VIII.1933, ♂ (CUIC); 27.VII.1934, 4♂, 2♀ (CSUC, WSU); 3.VIII.1934, ♂ (CSUC); Boulder, Gregroy Canyon, about 5600', 12.VIII.1922, ♂ (USNM); Marshall, 13.VIII.1964, ♀ (UAIC); White Rocks, 13.VIII, ♀ (CSUC); White Rock, near Boulder, about 4003'N, 10508'W, about 5100 ft., 13.VIII.1919, ♂ (AMNH). Clear Creek County, 3.VIII.1898, ♂, ♀ (OSU). Crowley County, Crowley, 1.IX.1932, ♀ (CAS); Ordway, 6.VIII.1937, 3♀ (CSUC, WSU). Douglas County, Kinny Creek, 3.VIII.1994, ♀ (CSUC); mouth Varic Cyu, 28.VIII.1969, ♂ (CSUC). El Paso County, Colorado Springs, on ground, 31.VII.1964, ♂ (WFBM). Fremont County, 6.5 km NE Canon City, 1740 m, 28.VII.1992, 3♀ (CMNH). Huerfano County, 6000', 14.VIII, ♂, ♀ (KSUC); La Veta, 5.VIII.1933, ♂ (CSUC); Walsenburg, 3–6.VIII.1925, 2♂, 3♀ (UMMZ). Jefferson County, 24.VII.1961, ♂ (KSUC); Golden, 9.VIII.1898, ♂ (OSU); 18.VIII.1938, ♀ (CAS); Morrison, 13.VIII.1898, ♂, 2♀ (OSU). Kiowa County, N Eads, 20.VII.1933, ♂ (CSUC). Kit Carson County, S Burlington, 27.VII.1933, ♂ (CSUC). Larimer County, Bellvue Fishery, 27.VIII.2001, ♀ (CSUC); Dixon Res., 2.VIII.1993, ♀ (CSUC). Fort Collins, 14.VII.1900, ♀ (CAS); 23.IX.1915, ♂ (CSUC); 31.VII.1936, ♀ (CSUC); 7.VIII.1936, ♂ (CSUC); 15.VII.1959, ♂ (UCR); 30.IX.1967, ♂ (CSUC); 19.VIII.1977, ♀ (CSUC); mixed grass prairie, 31.VII.1993, ♂ (ESUW); Horsetooth, 30.VIII.1991, ♀ (CSUC); Lory State Park, 29.VII.1994, 2♂ (CSUC); Masonville, 5.IX.1933, ♂, ♀ (CSUC); Pineridge Open Space, 30.VIII.1995, ♀ (CSUC). Las Animas County, Iron Canyon, Steinman's Ranch (Rourke Ranch), Purgatoire R., 14.VII.1991, 13♂, 15♀ (BYU, CSUC). Lincoln County, Genoa, 15.VIII.1940, ♀ (KSUC). Mesa County, 2 mi NE Gateway, 9.VIII.1981, ♂ (CSUC). Moffat County, Brown's Park, 3.VIII.1983, ♂ (ESUW). Montezuma County, McElmo Canyon, Anazasi SRMA, G Road, 25.VIII.1992, ♀ (CSUC). Montrose County, 18 mi. SE Gateway, 19.VIII.1963, ♀ (KSUC). Morgan County, Fort Morgan, 5.VIII.1960, 2♂ (FSCA); Muir Springs, 3.IX.1990, ♀ (CSUC). Otero County, Co. Rt. 109, MP 37, 11.VIII.1990, 7♀ (CSUC); Co. Rt. 109, MP 42, 11.VIII.1990, ♂ (CSUC); La Junta, about 3759'N, 10331'W, about 4100 ft. alt., 12.VIII.1920, 2♂ (AMNH); Vogel Canyon Picnic Area, 3 mi. off Rt. 109, 17.VII.1992, ♀ (CSUC); Vogel Canyon, 14.VII.1993, ♂, ♀ (CSUC); 13.VIII.1993, ♀ (CSUC); Vogel Canyon, 18 mi. S La Junta, 1200 m, 27.VII.1994, ♂ (CSUC). Prowers County, Lamar, 25–27.VIII.1925, ♂, 6♀ (USNM); Pueblo, 4.VIII.1938, ♂ (CSUC). Weld County, Co. Rd. 122, 5 mi. E of SR 85, 7.IX.1992, ♀ (CSUC); Deerfield, 29.VIII.1940, 2♂ (KSUC); Greeley, 24.VIII.1930, ♂ (KSUC); Masters, 4300', 3.IX.1939, ♂, 7♀ (USNM); Roggen, 31.VIII.1938, 2♂ (USNM, WIRC); Co. Rd. 386, 3 mi. N Roggen, 21.VIII.1990, ♂ (CSUC); Co. Rd. 386, N Roggen, sand dunes, 26.VIII.1990, 3♂, 2♀ (CSUC). Yuma County, Wray, 3700', 17–19.VIII.1919, ♂, ♀ (AMNH, USNM).

IDAHO: Canyon County, Parma, 12.VIII.1934, ♂ (USNM); 4.VIII.1939, ♂ (UCDC). Elmore County, Dietrich Butte, 31.VII.1968, ♂ (ESUW); 2 mi. NE Glens Ferry, 9.IX.1967, 4♀ (ESUW); Mt. Home, 27.VIII.1967, ♀ (ESUW). Fremont County, St. Anthony, sand dunes, 9.IX.1967, ♀ (ESUW). Lincoln County, 5 mi. E Dietrich, 6.VIII.1065, 4♂ (WFBM); 7 mi. W Shoshone, 1.VIII.1961, ♂ (WFBM). Owyhee County, Bruneau Dunes State Park, 28.VII.1989, 2♂ (BYU); Sand Dunes Lake, 10.VIII.1966, 2♂ (CAS, WFBM).

ILLINOIS: Hardin County, Elizabethtown, 5.IX.1924, ♀ (INHS). Jackson County, Grand Tower, 10.VII.1909, ♀ (INHS). Morgan County, Meredosia, sand, 17.VIII.1913, 4♀ (INHS); Meredosia, 19–22.VIII.1917, 3♂ (INHS). Union County, Anna, 9.VII.1883, 2♂ (INHS).

INDIANA: Posey County, New Harmony, 16.VIII.1918, 2♂, 2♀ (USNM).

IOWA: Fremont County, Waubonsie State Park, loess–hill prairie, 5.VIII.1969, ♂ (ISUI). Plymouth County, 0.3 mi. N Sioux City, 7.VIII.1971, ♂ (ISUI). Story County, Ames, 16.VII.1948, 2♂, ♀ (ISUI). Woodbury County, 3 mi. SE Holly Springs, 4214'N, 962'W, 30.VII.1967, 5♂, 3♀ (ISUI); Sioux City, 17.VIII.1953, ♂ (ISUI).

KANSAS: Barber County, 1468', 1916, 9♂, 7♀ (SEMC, USNM). Butler County, 1285', 1916, 3♂, 4♀ (SEMC, UAAM). Cherokee County, 888', 1915, ♀ (SEMC); 5 km E Crestline, 2.VIII.1985, ♂, 5♀ (SEMC); Lawton, 15.VIII.1930, ♂ (KSUC). Clark County, 1950', 26.VIII.1911, ♂, 4♀ (OSEC, OSU). Clay County,

Clay Center, 15.VIII.1979, ♀ (UCR); Morganville, 31.VII.1962, ♀ (UCR). Comanche County, 15.VII, ♂ (KSUC); 2089', 1916, 7♂, 4♀ (SEMC). Douglas County, 20.VII.1956, ♂ (SEMC); Lawrence, 10.IX.1954, ♀ (EMUS). Elk County, 1008', 1916, ♂, ♀ (SEMC, USNM). Ellis County, 2000 ft., 19.VII.1912, ♂ (OSU). Ellsworth County, 17.VII.1923, ♂ (SEMC). Finney County, 15.VIII.1939, ♀ (KSUC); Garden City, VIII.1895, 2♂ (OSU); Garden City, VIII.1956, ♀ (SEMC); 1 mi. SW Garden City, 5.VIII.1963, ♀ (KSUC). Geary County, Fort Riley, 20.VII.1913, ♀ (USNM). Graham County, 2130', 16.VIII.1912, 4♂, 2♀ (FSCA, OSEC, OSU). Grant County, 2800', 27.VII.1911, ♀ (OSEC). Gray County, 9–15.VII.1917, 2♀ (SEMC). Harper County, 3.VIII.1937, 2♂ (KSUC); 1417', 1916, 10♂, 9♀ (SEMC, USNM). Harvey County, 21–27.VIII.1917, 9♂, 7♀ (SEMC). Kingman County, 1516', 1916, 7♂, 8♀ (SEMC). Kiowa County, 2250', 5.VII.1911, 2♀, 2♂ (FSCA, OSEC, OSU). Labette County, 899', 2♂ (SEMC). Lincoln County, Shady Bend, 25.VIII.1962, ♀ (FSCA). Logan County, ♂ (SEMC). Meade County, 14.VIII.1945, 2♂ (SEMC). Mitchell County, 25.VIII, ♀ (KSUC). Morton County, 2800', 5.VIII.1911, ♂, 2♀ (OSEC, OSU). Ness County, 2260', 7.VII.1912, ♂ (OSU). Norton County, 2270', 23–27.VIII.1912, ♂, ♀ (OSEC, OSU); Norton, 8.IX.1966, ♀ (ESUW). Osborne County, 1557', 3.VIII.1912, 3♂, 7♀ (FSCA, OSEC, OSU). Phillips County, 1940', 30.VIII.1912, ♀ (OSEC); 8.VII.1925, ♀ (SEMC); 7.VIII.1925, ♂ (SEMC). Pottawatomie County, VIII.1931, ♂ (KSUC); 24.VII.1956, 2♂ (KSUC); 22.VII.1977, ♀ (KSUC). Pratt County, 1900', 25–27.VI.1911, 2♂, 7♀ (OSEC, OSU). Reno County, 22.IX, ♂, ♀ (KSUC); 13–20.VIII.1917, ♂, 5♀ (SEMC, UAAM); 7.IX.1919, ♀ (SEMC). Riley County, 17–28.VII, 8♂, 2♀ (FSCA, KSUC, OSU, WFBM); 1–26.VIII, 18♂, 16♀ (KSUC, OSU); 2.IX, ♀ (KSUC); 26.VII.1956, ♀ (CSUC); 17.IX.1961, ♀ (CAS); 12–24.VII.1962, 3♂, ♀ (KSUC); 3–5.VIII.1962, ♂, 4♀ (CAS, KSUC); 11.X.1964, ♀ (TAMU); swept *Solidago*, 16.IX, ♀ (KSUC); Malaise trap, 21.VII–5.VIII.1962, 6♂, ♀ (KSUC); Little Gobi, near Manhattan, 19.VIII.1939, ♂ (USNM); Manhattan, July, 3♂, ♀ (FSCA, KSUC); September, 5♀ (KSUC); 8–19.VIII, 2♂, 2♀ (KSUC); 25.VII.1917, ♀ (KSUC); 6.VII.1920, ♀ (KSUC); 29.VII–9.VIII.1921, ♀ (KSUC); 15–16.IX.1928, ♂, ♀ (KSUC); 4–30.VIII.1929, ♂, 2♀ (KSUC); 5.IX.1931, ♀ (KSUC); 6.X.1931, ♀ (KSUC); 9.VIII.1936, ♂ (KSUC); 7.X.1936, ♀ (KSUC); 2.IX.1953, ♀ (KSUC); 1.VIII.1959, ♀ (KSUC); 25.VII.1965, ♂ (KSUC); 27.VII.1966, ♀ (FSCA); alfalfa, 2.VIII.1932, ♂ (KSUC). Rooks County, 1775', 9.VIII.1912, 7♂, 8♀ (OSEC, OSU). Russell County, 1830', 26.VIII.1912, 2♂, 8♀ (FSCA, OSEC, OSU). Saline County, Brookville, 23.VIII.1937, ♀ (USNM). Scott County, Arcola, 21.VII.1929, 4♂, 2♀ (FSCA, KSUC). Sedgwick County, 1291', 1916, 7♂, ♀ (SEMC, USNM, UAAM); IX.1961, ♂ (WFBM). Seward County, 2600', 17–18.VIII.1911, ♂, 2♀ (OSEC, OSU). Smith County, 1800', 4.IX.1912, ♀ (OSEC). Stanton County, 3000', 30.VII.1911, ♂, ♀ (OSEC, OSU). Stevens County, 2700', 14.VIII.1911, ♂, 2♀ (OSEC, OSU). Sumner County, 1189', 1916, 5♂, 8♀ (SEMC, UAAM); Bella Plaine, 2.VII.1933, 2♀ (KSUC). Wallace County, 19.VIII, 3♂ (KSUC, OSU); 3000', ♂ (SEMC). Wilson County, 866', 1916, 4♀ (SEMC).

LOUISIANA: Beauregard Parish, 16.VIII.1928, 2♀ (SEMC). Calcasieu Parish, Sulphur, 19.VI.1956, ♀ (INHS). East Baton Rouge Parish, Baton Rouge, 14.VII.1930, ♀ (LSAM); 27.IX.1931, ♀ (LSAM); 27.X.1934, 3♂, 5♀ (LSAM); 9.X.1940, 2♀ (LSAM). Winn Parish, Winfield, 27.VI.1918, ♂ (OSU).

MISSISSIPPI: Clarke County, Stonewall, 15.IX, ♀ (OSEC). Lafayette County, 2♀ (MEM). Lowndes County, Luxapallila Creek, T18S, R18W, sec. 14, 25.VI.1990, ♂ (MEM); Tombigbee River, T19S, R18W, sec. 10, 31.VII.1990, ♂ (MEM). Monroe County, Amory, ♀ (MEM); Hamilton, 15.VII.1930, ♂ (SEMC); Tombigbee River, T13S, R19W, sec. 4, 17.VII.1990, ♂ (MEM). Noxubee County, Shuqualak, 16.VII.1930, ♂, 2♀ (SEMC). Oktibbeha County, Ag. Col., XI.1915, ♂ (MEM); 30.IX.1917, ♂ (MEM). Stone County, forestlands, VII.1991, ♂ (BYU).

MISSOURI: Barton County, Liberal, 29.VII.1938, ♂ (UMRM). Boone County, Helland Res, 4 mi. W Ashland, 1.VIII.1999, 2♀ (LSAM). Carter County, Big Springs State Park, 1.VIII.1981, ♂ (MEM). Pulaski County, Richland, 3 mi. N Hwy 7, 27.VII.1985, 2♀ (UAAM). Vernon County, grassland, sweepnet, 18.VIII.1958, ♂, ♀ (FSCA).

NEBRASKA: Dawes County, Chadron, 25.VII.1952, ♀ (UCDC); 20–24.VII.1961, 2♂, ♀ (WSU); 5.VIII.1961, 2♀ (WSU); 29.VII–2.VIII.1963, 4♂, 5♀ (WSU); 9 mi. W Crawford, 4.IX.1962, ♂, 2♀ (USNM); Fort Robinson, 6.IX.1962, ♂, ♀ (EMUS). Lincoln County, Hershey, 2.VII.1926, ♂ (UMRM); 20 mi. SE N. Platte, taken on alfalfa, 13.VIII.1955, ♂ (SEMC). Merrick County, Clarks, 15.VIII.1935, ♀ (WIRC). Scotts

Bluff County, 8 mi. S Gering, 11.VIII.1955, ♀ (FSCA). Sheridan County, Hay Spring, 22.VII.1963, ♂ (WSU). Sioux County, Ft. Robinson, 5.IX.1962, ♂, 2♀ (UNSM); Monroe Canyon, Pine Ridge, 4200', 13–16.VIII.1983, ♀ (ESUW); Wood Reserve, Ft. Robinson, 27.VIII.1959, ♂ (UNSM); Wood Reserve, 5 mi. NW Ft. Robinson, 18.VIII.1963, ♀ (UNSM).

NEVADA: Clark County, St. Thomas Gap, T17S R71E Sec 31, 2200', 26.IX.1984, ♀ (EMUS).

NEW MEXICO: Chaves County, 9.5 mi. W Caprock, 27.VII.1989, ♀ (TAMU); Dexter National Fish Hatchery, 22.VIII.1985, ♂ (BYU); Elkins, 12.IX.1962, ♂ (KSUC); 1 mi. W Pecos R., Hwy 380, salt flat, 16.VIII.2003, ♂, ♀ (CSUC); Roswell, 16.VII.1936, ♂ (CAS); 5.VIII.1969, 3♀ (WFBM); 5 mi. E Roswell, 11.IX.1961, ♂, 2♀ (EMEC); 35 mi. E Roswell, 5.VIII.1969, 4♂ (WFBM). Lea County, Caprock, 8.VIII.1965, ♂ (TAMU); 6 mi. S Jal, Hwy 18, 29.VIII.1992, 2♂, ♀ (BYU); Maljamar, 1.IX.1962, ♂, ♀ (FSCA); 31.VII.1966, ♂ (TAMU); Tatum, 25.VIII.1938, ♂ (AMNH). Lincoln County, 18 mi. N Carrizozo, 15.IX.1964, ♀ (WFBM). Roosevelt County, Kenna, 16.VII.1936, ♀ (CAS); 6 mi. E Portales, ENMU Natural History Preserve, white light, 25.VIII.1970, ♀ (WFBM); 8 mi. NE Portales, ENMU Nat. Hist. Pres., 2.IX.1970, ♀ (UCR). Sandoval County, Frijoles Canyon, 30.VII.1942, ♂ (USNM). Torrance County, Gran Quivera, 10.VIII.1931, ♀ (KSUC).

NORTH DAKOTA: Richland County, 8 mi. N McLeod, 31.VII.1984, ♀ (EMEC).

OKLAHOMA: Alfalfa County, 13.VIII.1932, ♀ (OSEC); Byron, 13.VIII.1932, ♂ (OSEC). Atoka County, Range 12E T3S S12, 5.VIII.1991, ♂ (CSUC). Beaver County, Beaver, 19.IX.1989, ♀ (OSEC). Bryan County, 3 mi. S Bennington, 11.VII–5.IX.1983, 2♂, 4♀ (OSEC). Caddo County, Red Rock Canyon State Park, 13.VIII.1959, 4♂, 2♀ (OSEC); 27.VII.1972, ♂ (CUIC). Cherokee County, 9.IX.1983, ♀ (UNSM). Choctaw County, Hugo, 2.VIII.1945, ♀ (AMNH). Cimarron County, Hwy 287 & Beaver R., 11 mi. SE Boise City, 5.VIII.1993, 4♂, 4♀ (BYU); Cimarron River at Rd 45, 15.VII.1992, ♀ (CSUC). Cleveland County, Norman, 14.VII.1926, ♂ (UMMZ); 15.X.1929, ♂ (AMNH). Comanche County, 2–9.IX.1983, 4♀ (UNSM); 28.IX.1985, ♂ (UNSM); Fort Sill, 24.VI.1974, ♀ (FSCA); Fort Sill, East Range, 10.VIII.2002, ♂ (CSUC); 17.VIII.2003, 2♂ (CSUC); mix grass, 13–14.IX.2002, 2♀ (CSUC); tall grass, 13–14.IX.2002, ♂, 6♀ (CSUC); pig farm, E. Cache Cr., S Bound Rd, 13–14.IX.2002, 2♀ (CSUC); E. Cache Cr., S. Bound. Rd, 11.VIII.2003, ♀ (CSUC); Medicine Creek, 19.IX.2003, ♂ (CSUC); Fort Sill, Quanah Range, 0.5 mi. E Falcon Gate, 1.VII.2003, 2♀ (CSUC); 19–29.IX.2003, 4♂, 5♀ (CSUC); Pottawatomie Pond, 12.VIII.2003, ♂, ♀ (CSUC); 20.IX.2003, ♂ (CSUC); West Cache Cr., 12.VIII.2003, ♂, ♀ (CSUC); Fort Sill, West Range, 24.V.2003, ♂ (CSUC); 17.VI.2003, ♀ (CSUC); 11.VIII.2002, ♂ (CSUC); grass, 13–14.IX.2002, ♂, 2♀ (CSUC); Blue Beaver Cr., 1.VII.2003, 2♂, 2♀ (CSUC); 20.IX.2003, ♀ (CSUC); Blue Beaver Cr., McKenzie Hill Rd., 13–14.IX.2002, ♂ (CSUC); Engineer Pond, 13–14.IX.2002, ♂, ♀ (CSUC); 11.X.2002, ♂ (CSUC); 19.IX.2003, ♀ (CSUC); Lake Elmer Thomas, 2.VII.2003, 2♀ (CSUC); 11.X.2002, ♂ (CSUC); 13–29.IX.2002, 7♀ (CSUC); Pottawatomie Pond, 20.IX.2003, ♀ (CSUC); Pratt Hill, 10.VII.2002, ♂ (CSUC); Punch Bowl Rd., 2 mi. E Lake Elmer Thomas Recreation Area, 1.VII.2003, ♀, 3♂ (CSUC); Wichita Mts., 28.VII.1983, 2♂, ♀ (OSEC); Wichita Wildlife Refuge, Boulder Camp, 17.VIII.1960, ♀ (FSCA). Craig County, Centralia, 29.VI.1931, ♂ (OSEC). Custer County, 24.IX.1970, ♀ (LSAM); Custer City, 1.VIII.1974, ♂ (OSEC). Ellis County, 22.VIII.1932, ♀ (OSEC). Grady County, Malaise trap, 17.VI.2004, 3♂ (UAAM); Chickasha, Little Washita River, 6.X.1958, ♀ (OSEC); Tuttle, 23–29.VI.2004, ♂, ♀ (UAAM); 12.VII.2004, 5♂ (UAAM); 1–6.VIII.2004, 17♂ (UAAM); Malaise trap, 29.VI–12.VII.2004, 3♀ (UAAM); at lights, 11.VII.2004, ♀ (UAAM); Minco, 12.VII.1931, ♀ (KSUC). Grant County, 7.IX.1919, ♀ (SEMC). Greer County, Lake Altus, 25.VIII.1948, ♂ (AMNH). Hughes County, 6 mi. ENE Horntown, 26.VII.1984, ♀ (OSEC). Johnston County, 16.VII.2003, ♀ (UAAM); Mannsville, 15.IX.1906, ♀ (USNM). Kingfisher County, Blackwell, 13.VIII.1931, ♂ (OSEC). Latimer County, 5 mi. W Red Oak, 2.VII.1977, ♀ (FSCA). Logan County, near Coyle, banks of Cimarron R., 18.VIII.1959, ♂, 7♀ (NMSB, OSEC); 3 mi. S Orlando, 15.VII.1962, 2♀ (KSUC). Major County, 9.IX.1983, ♂ (UNSM). Marshall County, Lake Texoma, 2 mi. E Willis, VII.1965, 4♂, ♀ (CAS, UCDC). McCurtain County, Beaver Bend State Park, 4.VIII.1983, ♀ (OSEC); Wright City, 14–21.VII.1983, 2♂ (OSEC); 3.IX.1983, ♂ (OSEC). McIntosh County, Checotah, 30.VIII.1939, ♀ (CAS); Eufaula, 26.VIII.1935, ♂ (USNM). Murray County, Turner Falls, 12.VII.1934, ♀ (CUIC). Osage County, Barnsdall, 12.VIII.1959, ♂, 2♀ (OSEC); 13 mi. SE Fairfax, 22–23.VIII.1937, 3♂, ♀ (UMMZ); Osage Hills State Park,

11.VIII.1959, ♂ (OSEC); Pawhuska, 22.VI–11.VIII.1983, 5♂, ♀ (OSEC); West Bartlesville, 27.VI.1981, ♂ (BYU). Pawnee County, Pawnee, 30.VI.1934, ♂ (CUIC). Payne County, Lake Carl Blackwell, 2–13.VIII.1960, ♂, 2♀ (OSEC); 29–31.VII.1972, 2♀ (OSEC); N Lake Carl Blackwell, 9.VIII.1979, ♀ (OSEC); near Lake Carl Blackwell, 8.VII.1981, ♂ (OSEC); Perry, 2 mi. S CCC Lake, on *Tribulus* and *Amaranthus*, 3.IX.1981, 2♂, ♀ (UCR); Stillwater, 23.X.1934, ♀ (OSEC); 31.VIII.1935, ♂ (USNM); 9.IX.1935, ♂ (OSEC); 28.VII.1935, 2♂, ♀ (OSEC); 20.X.1940, ♀ (OSEC); 2.VII.1959, 2♂, 2♀ (OSEC); 24.VII.1960, ♀ (OSEC); 23.IX.1989, ♀ (OSEC); 26.VIII.1990, ♂ (OSEC); 1 mi. W Stillwater, Malaise trap, 17.IX.1977, ♀ (OSEC); W of Lake Carl Blackwell, 1–23.VIII.1979, 4♂, ♀ (OSEC). Seminole County, Sportsman Lake, 2.VIII.1983, ♂, ♀ (OSEC). Sequoyah County, Muldrow, 19.X.1950, ♀ (TAMU). Stephens County, 10 mi. E Duncan, on the L. S. Ranch, 9.VIII.1983, ♀ (OSEC). Tulsa County, Bixby, blacklight, 7.VI.1983, ♂ (OSEC); 25.VII.1983, ♂ (OSEC); Tulsa, 21.VIII.1937, 3♂, ♀ (UMMZ); 14.IX.1966, ♂, ♀ (EMEC). Woods County, 2.VII.1930, ♂ (USNM); Alva, 20.VII.1935, ♂ (OSEC); 4.VIII.1933, ♂ (OSEC). Woodward County, Boiling Springs State Park, 13.VII.1983, ♀ (OSEC); 22.VII.1988, ♂ (OSEC); Fort Supply, 11.VII.1960, 7♂, 1♀ (OSEC); Woodward, VII.1925, ♀ (OSEC).

OREGON: Harney County, 20 mi. N Fields, 6.VIII.1981, ♂ (UCDC).

SOUTH DAKOTA: Custer County, Wind Cave National Park, Lookout Point, 16.VII.1988, ♂, 2♀ (CSUC). Jackson County, Interior, 7.VIII.1924, 2♂ (SDSU). Lawrence County, Mirror Lakes, near McNenny Fish Hatchery, 26.VIII.1996, ♂ (BYU). Yankton County, Yankton, 8.VIII.1973, ♂ (SDSU).

TEXAS: Anderson County, Palestine, 10.VII.1962, ♂ (NMSE). Atascosa County, 1.XI.1953, ♂ (CAS); 15–16.IX.1972, ♀ (CAS); 7–10 mi. E Devine, 28.VIII.1994, ♂, ♀ (BYU); 12 mi. N Poteet, 14.X.1994, 3♀ (BYU); 6 mi. W Roseville, 8.X.1995, ♂, 2♀ (BYU). Austin County, Austin State Park, near Sealy, 14–16.VI.1956, ♂ (CUIC). Bailey County, Muleshoe, 24.VIII.1921, ♂ (EMEC). Bastrop County, Bastrop State Park, Malaise trap, 16–30.VII.1990, ♂ (TAMU); Camp Swift, 24.VII–12.VIII.1944, 2♀ (CUIC, UMRM); Colorado River, McKinney Roughs Preserve, Wilbarger Bend, 25.IX.1998, ♀ (BYU); Lost Pines Scout Camp, 6 mi. W Bastrop off Hwy 21, 27.X.1990, ♀ (BYU); Lake Bastrop, Lost Pines Boy Scout Reservation, 24.X.1992, ♂, 3♀ (BYU); Lost Pines Scout Reservation, 14.X.1995, ♀ (BYU); Lost Pines Field Station, near Buescher State Park, Stengl Ranch, 3.IX.1993, 2♂, ♀ (BYU); Sayersville, 14.IX.1991, ♂ (BYU); Stengl Biological Station, near Buescher State Park, 3.X.1992, ♀ (BYU); Stengl Ranch, 15.IX.1992, ♀ (BYU). Bee County, Beeville, 28.X, ♀ (USNM). Bexar County, 13.VI.1916, ♂ (USNM); 24.VI.1930, ♀ (TAMU); 11–16.IX.1931, ♀ (TAMU); 16.IX.1931, ♀ (TAMU); 27.IX–16.X.1932, 5♂, 6♀ (CAS); 7.VI.1933, ♂ (TAMU); 6–9.VI.1934, 3♂ (TAMU); Sayers, 14.IX.1991, ♀ (BYU). Blanco County, Pedernales Falls State Park, 27.VI.1990, 2♂, 2♀ (BYU); 5.VIII.1990, ♀ (BYU); 19.VI.1991, 2♂, 2♀ (BYU); 31.VIII.1991, 2♂ (BYU); 26–28.IX.1991, 4♀ (BYU); 10.VI.1992, ♂, ♀ (BYU); 11.VII.1992, ♀ (BYU); 15.VIII.1993, ♂, ♀ (BYU); 11.IX.1993, ♂ (BYU); 1.VI.1994, ♀ (BYU); 11–21.IX.1994, 2♂, 3♀ (BYU); along river below falls, 22.VI.1991, ♂ (BYU); falls area, 27.V.1999, ♂, ♀ (BYU); 22.VI.1991, 2♀ (BYU); 26–31.VIII.1991, 5♂, 2♀ (BYU); 11.X.1991, 3♀ (BYU); 15.VI.1993, ♀ (BYU); falls parking area, 22.VI.1991, 5♀ (BYU); group area and by river, 22–23.IX.1995, 3♂, 3♀ (BYU); river trail, 21.IX.1991, ♀ (BYU); river trail and campground, 18–19.IX.1992, ♂ (BYU); trammel crossing, 6.IX.1997, ♂, ♀ (BYU); Sandy, Rd. 1323 & Hickory Creek, 11.VI.1994, ♂ (BYU). Bosque County, Brazos Point, 14.VI.1948, ♂, 2♀ (INHS); Valley Mills, 24.VII.1932, 2♂, 2♀ (USNM). Brazoria County, Alvin, 27.XI.1905, ♂ (AMNH). Brazos County, 1.X.1978, ♂ (TAMU); 27.VIII.1933, ♂ (CAS); College Station, 19.IX.1903, 2♂ (OSU); 13.IX.1913, ♂, ♀ (TAMU); 3–4 .IX.1916, 3♂, 2♀ (EMEC, OSEC, OSU); 3.VII.1917, ♀ (EMEC); 23.V.1928, ♀ (TAMU); 10.IV.1929, ♂ (TAMU); 4.VI.1929, ♂ (TAMU); 23.VI.1929, ♂ (TAMU); 6.V.1930, ♀ (TAMU); 10.VII.1930, ♂ (TAMU); 9.VIII.1930, ♂ (TAMU); 31.VIII.1930, ♀ (CAS); 5.X.1930, ♂, ♀ (OSEC, OSU); 5–18.V.1931, 2♀ (TAMU); 2.VI.1931, ♀ (TAMU); 1–26.VI.1932, 4#, 10♀ (CAS, OSEC, OSU, TAMU, USNM); 4–28.VII.1932, ♂, 5♀ (TAMU, USNM); 7–18.VIII.1932, 2♂, ♀ (TAMU, USNM); 27.IX–3X..1932, 3♀ (TAMU, USNM); 3–18.VI.1933, 6♂, 7♀ (CAS, CUIC, TAMU, WSU); 2–23.IX.1933, ♂, 4♀ (CAS, TAMU, USNM); 27.VIII.1933, 3♂, ♀ (CAS, CUIC, TAMU); 24.X.1945, ♀ (TAMU); 24.IX.1947, ♀ (TAMU); 2.VII.1956, ♀ (CUIC); 19.X.1963, ♀ (TAMU); 13.X.1964, ♀ (ISUI); 2.IX.1971, ♂ (FSCA); 1.IX.1976, ♂ (TAMU); 15.VII.1990, ♀ (BYU); College Station, Lick Creek Park, 30.VII.1991, ♂, ♀ (BYU); Koppe Bridge, 27.X.1968, ♀ (TAMU); 5 mi. E

Kurten, 18.VII.1972, ♀ (TAMU). Brown County, Brownwood, 13–15.IX.1920, ♂, ♀ (KSUC); 28.VII.1931, ♀ (KSUC); Brownwood Lake, 31.X.1970, ♀ (ESUW). Burtleson County, 1.X.1932, ♀ (USNM). Caldwell County, Luling, ♀ (USNM). Calhoun County, Port Lavaca, 21.VI.1925, ♀ (KSUC). Chambers County, Bolivar Flats, 14.VIII.2003, ♀ (CSUC). Childress County, Lake Childress, 24.VIII.1948, 2♂ (AMNH). Collingsworth County, Salt River Red River Hwy 83, 11.VIII.2003, ♀ (CSUC). Comal County, Cypress Bend Park, New Braunfels, 19.VI.1978, ♀ (INHS); Guadalupe River State Park, 15 mi. E Boeme, off Hwy 46, 10–11.VI.1992, ♂ (BYU); New Braunfels, 16.X.1977, ♀ (FSCA). Cooke County, Gainesville, 6.IX.1912, ♂ (USNM). Culberson County, 16 mi. E Van Horn, 24.IX.1965, ♂, ♀ (CAS, UCDC). Dallas County, dead at entrance of hive, 23.IX.1932, ♀ (TAMU); Dallas, 20–30.IX.1918, 3♂, 3♀ (OSEC, OSU, UMMZ); 20.VI.1936, 2♂, ♀ (TAMU); 28.IX.1937, ♀ (WIRC); 30.VII.1939, ♀ (KSUC). Dickens County, Spur, 11.IX.1932, ♀ (USNM). Dimmit County, 2.X.1934, ♀ (CUIC). Donley County, Clarendon, 11.VIII.1905, ♂ (USNM). Eastland County, 25.VIII.1920, ♂ (SEMC); Ranger, 18.VIII, 2♂ (KSUC). Ector County, Metz, 12.VIII.1930, 2♀ (KSUC). El Paso County, Canutillo, 23.VIII.1985, 2♂, ♀ (BYU). Erath County, Stephenville, 3.VIII.1982, ♀ (TAMU); Stephenville, Tex. Agri. Expt. Sta., Malaise trap, 24.VI–1.VII.1976, ♂ (TAMU); Morgan Mill, 4.VII.1956, 2♀ (CUIC). Frio County, Pearsall, 10.X.1934, 2♀ (CUIC, FSCA); 30.IX.1936, ♂, ♀ (TAMU). Gillespie County, 14.VI.1934, ♂, ♀ (OSEC, OSU); VII.1967, ♀ (ESUW); Fredericksburg, 12.VII.1962, ♂ (ISUI); Pedernales River, Hwy 290 SE Fredericksburg, 11.VI.1992, ♀ (CSUC). Gonzales County, Gonzales, 27.IX.1965, ♂, ♀ (EMUS); Palmetto State Park, 20.VI.1956, 2♀ (CUIC). Grayson County, Sherman, 6.VII.1936, ♂ (TAMU). Guadalupe County, Sequin, 26.VI.1938, ♀ (SEMC). Harris County, 13.VIII.1928, ♂ (UAAM). Harrison County, 2 mi. S Waskom, 4.IX.1967, 3♀ (CAS, UCR); Marshall, 18.VII.1935, ♂, ♀ (UMMZ). Hayes County, Wimberly, 30.IX.1989, ♀ (BYU). Jim Wells County, 14.VII.1969, ♀ (ESUW); 23 mi. N Alice (oil tanks), 5.X.1986, ♀ (TAMU). Karnes County, Gillette, 26.VI.1917, ♀ (CUIC). Kaufman County, 3.VII.1938, ♂ (INHS); Terrell, 11.VII.1950, ♀ (AMNH). Kerr County, 8 mi. S Center Point, 8.VI.1962, ♀ (ISUI); Kerrville, VIII.1961, ♂ (TAMU). Klegberg County, Kingsville, 6.VI.1921, ♀ (KSUC). Lavaca County, 10 mi. N Hallettsville, 28.IX.1965, 2♀ (UCDC); 5 mi. S Hallettsville, 8–28.IX.1965, ♂, ♀ (CAS, UCDC). Lee County, Fedor, 7.VII.1946, ♀ (KSUC); Giddings, 6.VII.1946, 2♀ (KSUC); Lincoln, 28.VIII.1953, ♀ (AMNH); 19.VI.1956, ♂ (CUIC). Leon County, Peeler, 22.VI.1938, ♂ (SEMC). Liberty County, IX.1933, ♀ (TAMU); Liberty, 17–24.VI.1934, 2♂ (TAMU); Trinity River, HWY 105, 13.VIII.2003, ♀ (CSUC). Live Oak County, Choke Canyon State Park, 4.X.1997, ♂ (BYU). Llano County, Castell, 21.IX.1993, ♀ (TAMU); Llano, 1000 ft., 1.X.1950, ♀ (AMNH). Lubbock County, 13–19.IX.1969, ♀ (ESUW); Lubbock, 7.X.1964, ♂ (ESUW). Lynn County, Wilson, 16.IX.1970, ♀ (ESUW). McLennan County, 2.VII–2.VIII.1933, 3♂, ♀ (TAMU); 12.VI–8.VII.1934, 8♀ (CAS, FSCA); Waco, ♂, ♀ (USNM). Medina County, Medina, 5.X.1952, ♂ (CAS). Montague County, Forestburg, 20.VI–7.XI.1941, 4♂, 6♀ (USNM). Nacagdoches County, 22.VI.1949, ♀ (KSUC). Nueces County, Corpus Cristi, 28.VI.1942, 2♂ (CAS); Padre Island ocean beach, 3.IX.1994, ♂, 4♀ (BYU). Orange County, 14.VIII.1926, ♀ (SEMC). Palo Pinto County, VII–VIII.1931, ♀ (UMMZ); Palo Pinto, 20.VII.1935, ♂ (UMMZ). Randall County, Palo Duro Canyon State Park, 22.VIII.1990, 5♂, ♀ (BYU); Palo Duro Canyon State Park, Hackberry Campground, 20.IX.1999, ♀ (BYU). Real County, HEB Foundation Camp, 30–31.VIII.1975, ♂ (FSCA). Red River County, Detroit, 16.IX.1959, ♀ (CUIC). Robertson County, FM 46, 2.4 mi. N Franklin, 24.VII.1976, ♂ (TAMU). San Jacinto County, 19 km W Cleveland, 16.VIII.1987, ♂ (TAMU); 2 mi. E Oakhurst, 3000 ft., 3.X.1950, ♀ (AMNH). San Patricio County, Welder Wildlife Refuge, 28.VI.1969, ♀ (TAMU); 27.VIII.1970, ♀ (ESUW); Welder Wildlife Refuge, 8 mi. NE Sinton, 29–30.VII.1975, ♂ (CUIC). Somervell County, Brazos River at Route 405, 3.VII.1998, ♂ (EMEC). Stonewall County, Aspermont, 13.VIII.1972, ♀ (AMNH). Swisher County, Kress, 3.VI.1968, ♀ (ESUW). Tarrant County, Bedford Rd., Ft. Worth, vicinity Trinity R., 4.X.1970, ♂, ♀ (CUIC); Handley, 3.VIII.1905, ♀ (USNM); Fort Worth, 16.VII.1935, ♂ (TAMU); 1.IX.1949, ♀ (EMUS). Taylor County, Abilene, 2.X.1942, ♀ (USNM); 18.IX.1943, ♀ (USNM). Travis County, Austin, 1–7.X.1899, 3♀ (AMNH); 6–27.X.1901, 2♂, ♀ (USNM); VIII.1903, ♀ (USNM); 3.VI.1921, ♂, ♀ (KSUC); 20.X.1921, ♀ (USNM); 23–24.VI.1930, ♂, ♀ (UMMZ); VII–VIII.1945, ♀ (ISUI); 27.IX.1958, ♀ (UAAM); 15.VIII.1968, ♀ (UCR); 29.VI.1976, ♂ (UMMZ); 3.VIII.1976, ♀ (UMMZ); 15.IX.1979, ♀ (BYU); 1.X.1988, ♂ (AMNH); 7.VII.1997, ♂ (BYU); Austin, in cotton field, 6.VIII.1903, ♀ (USNM); Austin, Brackenridge Field Laboratory, 140 m, 17.VI.1983, ♀ (CMNH); 27.VI.1987, ♂ (BYU); 6–26.IX.1989, 5♂, 9♀ (BYU); 1–

25.VI.1990, 4♂, 4♀ (BYU); 20–31.VII.1990, 2♂ (BYU); 14.IX.1990, ♀ (BYU); 10.IX–1.X.1990, 3♂, 6♀ (BYU); 14–23.VI.1991, 3♂, ♀ (BYU); 5–31.VII.1991, ♂, 3♀ (BYU); 1–28.VIII.1991, ♂, 2♀ (BYU); 4–27.IX.1991, 2♂, 9♀ (BYU); 6.VIII.1992, ♂ (BYU); 21.IX.1992, ♂ (BYU); 3–22.VI.1993, ♂, ♀ (BYU); 27.VIII–17.IX.1993, 6♂ (BYU); 8.IX.1995, ♂, ♀ (BYU); 7.VII.1997, ♂ (BYU); 7.IX.1997, ♀ (BYU); 18.VI.1998, ♂, 2♀ (BYU); 2.VII.1998, ♂ (BYU); 24.IX.1998, ♂ (BYU); 17.VI.1999, ♂, ♀ (BYU). Tyler County, Woodville, 4.VIII.1938, ♂ (TAMU). Uvalde County, Nueces R, Hwy 55, S Camp Wood, 13.VI.1992, 3♂, 4♀ (CSUC); Concan, 6.VII.1936, ♂ (CAS); Uvalde, 13.X.1935, ♀ (FSCA). Val Verde County, Devil's River at Dolan Falls, 16.X.1993, ♀ (BYU); Devil's River at Dolan Falls Preserve, 24–25.IX.1994, ♀ (BYU); Devil's River, Dollan Falls Ranch, 17–19.VI.1993, ♂ (BYU). Victoria County, 9.VIII.1928, ♀ (SEMC); Victoria, 4.VIII, ♀ (USNM); 22.VIII.1902, ♂ (USNM); 6.VII.1912, ♂ (USNM); 28.IX.1965, ♀ (UCDC). Waller County, Prairie View, 18.VI.1933, ♀ (CAS). Ward County, 10 mi. NE Monihans, 29.VIII.1986, ♂ (SEMC); Monahans Sandhills State Park, 2.VIII.1987, ♂ (LSAM); 18.VIII.1990, 3♂, 2♀ (BYU); 28–30.VIII.1992, 2♂, 4♀ (BYU); 29.VII.1995, 9♂, ♀ (BYU); 1–2.VII.1999, 3♂ (BYU). Washington County, Washington State Park, 17.VI.1956, ♂ (CUIC). Wharton County, 3.X.1983, ♀ (WFBM). Winkler County, 1.2 mi. W junction Hwy 115 on 874, on peanuts, 28.VII.1989, ♀ (TAMU); County Road 404, 1 mi. E Hwy 18, 29.VIII.1992, 4♂ (BYU); County Road 404, 8 mi. E Hwy 18, 10.IX.1989, ♀ (BYU); Kermit, 5.8 mi. N, 3156N, 10306W, 29.VIII.1992, ♀ (BYU); Kermit, 6 mi. W Hwy 18, 29.VIII.1992, ♀ (BYU). Zavala County, Nueces River, 4 mi. E La Pryor, 9.IX.1972, ♀ (SEMC).

UTAH: Box Elder County, Curlew Valley, W base of Wildcat Hills, 21.VII.1983, 2♂, 2♀ (EMUS); Promontory, 8.VIII.1929, ♂ (EMUS); Salt Springs, base of Pilot Range, 21.VIII.1979, ♂ (BYU); Wildcat Hills near Kelton, 11.VIII.1983, 2♂ (BYU). Cache County, Cornish, 6.VIII.1959, ♂ (EMUS); Logan, 20.VIII, ♂ (EMUS). Duchesne County, Bluebell, 6.IX.1935, ♂ (EMUS). Emery County, Green River, 29.VIII.1974, ♂ (UCDC); Swinging Bridge, San Rafael Swell, 13.IX.1991, ♂ (BYU). Garfield County, Boulder Mail Trail between Sand Creek and Death Hollow, 11.VII.2000, ♂ (BYU); Boulder Mail Trail to Sand Creek off Hwy 12, 10.VII.2000, ♂ (BYU); Grand Staircase-Escalante National Monument, Boulder Mail Trail, 1.VIII.2001, ♂ (BYU); 14.VII.2003, ♂ (BYU); 18.VIII.2003, ♂ (BYU); Grand Staircase-Escalante National Monument, Upper Calf Cr. Falls, 37.85586°N 111.45245°W, 5922', 15.VIII.2003, ♂ (BYU); Upper Calf Creek Trailhead, 3751'35"N 11126'15"W, 19.VII.2000, ♂ (BYU). Grand County, Arches National Park, Delicate Arch Trail, 24.VIII.1983, ♂ (BYU); Castle Valley, 29.VIII, ♂ (KSUC); Moab, 11.VIII.1955, ♂ (EMUS); 12 mi. S Moab, 22–23.VIII.1979, ♂ (EMUS). Juab County, Little Sahara Sand Dunes, 21.IX.1995, ♂ (BYU). Kane County, 14 mi. NW Kanab, 13.VIII.1969, ♂ (WFBM); Coral Pink Sand Dunes, Ponderosa Grove Campground, 4.IX.1992, ♀ (ESUW); 20.VIII.1998, 2♂ (BYU); 26–27.VII.2002, 6♂ (BYU). East Fork of Virgin River, 29.VII.2002, ♂ (BYU); 11.VII.2003, 3♂ (BYU); Glandale, 6000', 24.VIII.1957, ♂ (KSUC); Grand Staircase-Escalante National Monument, Seamans Wash at Hwy 89, 13.VII–13.VIII.2000, 2♂ (BYU); Seaman Spring off Hwy 89, 8–21.VIII.2001, 2♂ (BYU); Paria River from Paria Town site to Snake Creek, off Hwy 89, 12.VIII.2000, ♂ (BYU); Snake Creek above jct. Paria River, 37 20'44"N, 11200'29"W, 3–4.VIII.2000, 3♂ (BYU). Millard County, Delta, 6.VIII.1947, 3♂ (EMUS, UCDC); 31.VII.1948, ♂, ♀ (EMUS); 30.VII.1949, ♂ (EMUS); 6.VIII.1953, ♂ (UCDC); Flowell, 16.VIII.1972, ♂ (EMUS); dunes 11 mi. N Flowell, 5.IX.1983, ♂ (EMUS); Garrison, VII.1949, ♂ (BYU). Salt Lake County, Point of the Mountain, Traverse Mountains, S of Draper, 18–19.VII.2000, 11♂ (BYU); 31.VII.2001, ♂ (BYU). Tooele County, Dugway Proving Ground, SW end Cedar Mts., 15.VIII.1953, 2♂ (UCDC); Skull Creek, 1.VIII.1966, ♂ (BYU). Uintah County, SW Bonanza, 5000–5600', 3.VIII–5.IX.1981, 4♂ (EMUS). Utah County, 5 mi. S Bluffdale, 13.VIII.1963, ♂ (EMUS); Elberta, 17.VII.1991, ♂ (BYU); Hwy 68, Elberta Dunes, 30.VII.2001, 4♂ (BYU); Sand Dunes N of Elberta, 19.VII.2000, ♂ (BYU); Goshen, 3.VIII.1965, ♂ (EMUS); 2.VIII.1991, 2♂ (BYU); Goshen Valley, 21.VII.1992, 6♂ (BYU); Hobble Creek, no date, ♂ (BYU); north of Mountain View High School, 22.VII.1997, ♂ (BYU); Provo, Lincoln Beach, 18.VIII.1969, ♂ (EMUS); Spanish Fork, 17.VII.1992, ♂ (BYU); 12 mi. E Thistle, Hwy 6, 14.VIII.1984, 3♂ (BYU, NMSB); Wheeler Sawmill, 12 mi. E Thistle, Hwy 6, 15.VII.2000, ♂ (BYU); 4–11.VIII.2001, 11♂ (BYU). Washington County, Crystal Creek, 5–19.VIII.1981, 3♂, ♀ (EMUS); Leeds Canyon, 20–23.VII.1981, 4♂, 3♀ (EMUS); 9–11.VIII.1983, ♂ (EMUS); Pine Valley, VIII.1950, ♂ (USNM); Pine Valley, Juniper Park Campground, 21.VII.1989, 2♂ (BYU); Upper Deep Creek, 20–31.VIII.1981, ♂ (EMUS); 18–31.VIII.1982, 3♂, 2♀ (BYU, EMUS); Zion National Park, 24–29.VIII.1964,

2♂ (EMUS); VIII.1974, ♂ (UCR); 16.VII–11.VIII.1981, 3♂ (EMUS); Zion National Park, Birch Creek, Malaise trap, 30.VII.1965, ♂ (EMUS); Zion National Park, Court of the Patriarchs, 11–12.VIII.1981, 2♂ (EMUS); 11–19.VIII.1982, 5♂, ♀ (EMUS); Weber County, Ogden, 19.VII.1940, ♂ (EMUS).

WYOMING: Crook County, Devils Tower National Monument, 16–18.VIII.1983, ♂, ♀ (ESUW); 18.VIII.1984, ♂ (ESUW); 12 mi. S Sundance, 2.IX.1962, 4♂, 3♀ (UNSM). Laramie County, 3 mi. S Meriden, US 85, 30.VIII.1998, ♀ (CSUC). Niobrara County, 20 mi. NE Lusk, 13.VIII.1982, ♀ (ESUW). Platte County, Glendo, 6.VIII.1964, ♂ (ESUW); Glendo Road, 13 mi. W Glendo, 26.VII.1998, ♀ (CSUC); Guernsey, 22.VII–4.VIII.1960, ♂, ♀ (ESUW); 5 mi. S Guernsey, barrow pit, 18.VII.1945, ♂ (ESUW); Warm Springs, Camp Guernsey, 4500', 28–29.VII.2000, ♂, 2♀ (CSUC); 20.VII.2001, ♂ (CSUC); Wheatland, 5–25.VIII.1964, 5♀ (ESUW); 20.VII.1966, ♀ (ESUW); 21.VIII.1972, ♀ (ESUW); 16.IX.1973, ♀ (ESUW); 20–29.VII.1974, 2♂, 2♀ (ESUW); 10 mi. W Wheatland, 31.VIII.1965, ♂ (USNM); 23 mi. N Wheatland, 22.VIII.1967, ♂ (ESUW).

MEXICO. CHIHUAHUA: Camargo, IX.1917, ♀ (USNM).

SONORA: Rio Magdalena, Hwy 15 S Imuris, 18.VIII.1986, ♂ (BYU).

Acknowledgments

I am grateful to the following individuals for loans of specimens: Tam Nguyen (AMNH), Shawn Clark (BYU), Victor Smith (CAS), Chen Young (CMNH), Boris Kondratieff (CSUC), Richard Hoebeke (CUIC), Cheryl Barr (EMEC), Carol von Dohlen (EMUS), Scott Shaw (ESUW), Gary Steck (FSCA), Paul Tinerella (INHS), Gregory Courtney (ISU), Gregory Zolnerowich (KSUC), Philip Perkins (MCZ), Daniel Howard (NMSB), David Richman (NMSE), Donald Arnold (OSEC), Creighton Freeman (OSU), Zachary Falin (SEMC), Edward Riley (TAMU), Carl Olson (UAIC), Steven Heydon (UCDC), Douglas Yanega (UCR), Mark O'Brien (UMMZ), F. Christian Thompson (USNM), Frank Merickel (WFBM), Stephen Krauth (WIRC), Richard Zack (WSU), and W. David Sissom (WTAM).

Dr. Gregory Forbes, New Mexico State University, provided information about the natural history of *D. bilobatus*.

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