

BUMBLE BEES (HYMENOPTERA: APIDAE) OF TEXAS: HISTORICAL DISTRIBUTIONS

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ABSTRACT—I compiled data from several museum collections to map historical distributions of species of bumble bees across Texas. *Bombus auricomus*, *B. bimaculatus*, *B. fervidus*, *B. fraternus*, *B. griseocollis*, *B. impatiens*, *B. pennsylvanicus*, *B. sonorus*, and *B. variabilis* were confirmed from the state based on vouchered specimens. As currently understood, the bumble bee fauna of Texas consists of nine documented species.

RESUMEN— Compilé datos de especímenes de varias colecciones de museos para mapear las distribuciones históricas de las especies de abejorros a través del estado de Texas. *Bombus auricomus*, *B. bimaculatus*, *B. fervidus*, *B. fraternus*, *B. griseocollis*, *B. impatiens*, *B. pennsylvanicus*, *B. sonorus* y *B. variabilis* fueron confirmados para el estado basándose en ejemplares registrados. Como se entiende actualmente, la fauna de abejorros de Texas se compone de nueve especies documentadas.

Over the past three decades, a significant body of research has identified declines in bumble bee (*Bombus*) faunas of several European nations (Williams, 1982; Sároszpataki et al., 2005; Goulson et al., 2006; Fitzpatrick et al., 2007; Kosior et al., 2007; Williams and Osborne, 2009). In the United Kingdom, three species are now extinct and another eight have undergone dramatic reductions in range (Goulson, 2003). A total of 18 species of bumble bees is considered threatened across their ranges in central and western Europe (Kosior et al., 2007). Although similar patterns of decline have yet to be as well-defined in North America, mounting evidence suggests that some species on this continent are of conservation concern.

Colla and Packer (2008) noted declines of seven species of bumble bees in southern Ontario, Canada, as well as extirpation of one species (*Bombus affinis*) from a significant portion of its range in eastern North America. Gixti et al. (2009) documented local extirpation of four species from Illinois along with contractions of ranges of four additional species within that state. On a larger geographic scale, Cameron et al. (2011) assessed occurrence of eight species across their historical ranges in the United States, identifying distributional reductions for four of the targeted species. Factors cited as potentially contributing to declines in species richness and abundance included loss of grasslands to agriculture and urbanization (Kosior et al., 2007; Goulson et al., 2008; Gixti et al., 2009), pesticides (Colla and Packer, 2008), and introduction of pathogens into wild populations of bumble bees from commercial colonies (Colla et al., 2006; Cameron et al., 2011).

Given their generalist floral preferences, large size, and

ability to buzz pollinate, bumble bees are considered effective native pollinators (Goulson, 2003) that make substantial contributions to agricultural production and maintenance of ecosystems (Kearns and Thomson, 2001). The economic and ecological value, coupled with recent evidence of decline, underscores a critical need for local and regional faunal assessments aimed at gaining a better understanding of status and potential conservation needs of bumble bees (Goulson et al., 2008).

Although distributions of bumble bees in the United States have been defined broadly (Franklin, 1913; Mitchell, 1962), most range-wide treatments are dated and rarely contain geographically discrete records of occurrence. A few states in the United States possess more detailed distributional treatments of their bumble bee faunas (Stephen, 1957, for California, Idaho, Nevada, Oregon, Utah, and Washington; Chandler and McCoy, 1965, for Arkansas; Thorp et al., 1983, for California; Golick and Ellis, 2006, for Nebraska), but these are the exceptions. Consequently, compilation of data to map distributions will be an inherent starting point for most faunal assessments. Museum collections can, with awareness of some inherent limitations (Koch and Strange, 2009), represent a valuable source of data (Suarez and Tsutsui, 2004) that can be used to map geographic range of a species, as well as to evaluate its continued persistence across a landscape (Staines, 2001; Favret and DeWalt, 2002; Gixti et al., 2009; Cameron et al., 2011).

Franklin (1913) provided one of the earliest accounts of bumble bees in Texas and listed the following seven species and subgenera for the state, *B. (Bombias) auricomus*, *B. (Thoracobombus) fervidus*, *B. (Cullumanobombus) fraternus*, *B. (Cullumanobombus) griseocollis*, *B. (Thor-*

acobombus) *pensylvanicus*, *B.* (*Thoracobombus*) *sonorus*, and *B.* (*Psithyrus*) *variabilis*. Along with the seven species noted by Franklin (1913), Scholl et al. (1992) depicted *B.* (*Bombias*) *nevadensis* as ranging into in western extremes of the state. The objective of my study was to map the distribution of bumble bees in Texas based on historical records. These baseline distributions can then provide a starting point for field-based surveys to assess status of these species across the state.

MATERIALS AND METHODS—Data on collecting localities were obtained from entomological collections within Texas and extracted from electronic databases maintained by natural history museums. Collections visited were the Texas A&M University Insect Collection (TAMU) and Texas Memorial Museum (TMMC). Data also were compiled from databases maintained by the American Museum of Natural History (AMNH), Illinois Natural History Survey (INHS), Peabody Museum of Natural History (PMNH), and Snow Entomological Museum (SEMC). J. L. Neff of the Central Texas Melittological Institute provided new county records for several species; his specimens will be deposited into the collection of the Texas Memorial Museum.

Subgeneric classification of species follows Williams et al. (2008). There is some debate as to the status of *B. sonorus* as a distinct species (Franklin, 1913; Stephen, 1957; Thorp et al., 1983; Cameron et al., 2011) or if it is conspecific with *B. pensylvanicus* (Milliron, 1973; LaBougle, 1990; Poole, 1996). I follow Franklin (1913), Stephen (1957), Thorp et al. (1983), and Cameron et al. (2011) in treating *B. sonorus* as a valid species. This status could change given more directed efforts to assess genetic and morphological variability across its range.

RESULTS—I was able to obtain distributional data (Fig. 1) for all seven species attributed to Texas by Franklin (1913). Records of occurrence also were obtained for two species not listed for the state by Franklin (1913), *B.* (*Pyrobombus*) *bimaculatus* and *B.* (*Pyrobombus*) *impatiens*. I was unable locate any record for *B. nevadensis*. County-level records of occurrence, along with respective institutional repository, are as follows: *Bombus auricomus*: Aransas (SEMC), Wichita (AMNH). *Bombus bimaculatus*: Ellis (TMMC), Lamar (TMMC), Sabine (TAMU), Tyler (TMMC). *Bombus fervidus*: Val Verde (AMNH). *Bombus fraternus*: Bastrop (TMMC), Blanco (SEMC), Brazos (TMMC), Brewster (TAMU), Burleson (TAMU), Collin (TAMU), Crosby (TAMU), Dallas (TMMC), Dickens (TAMU), Floyd (TMMC), Frio (TMMC), Galveston (SEMC), Garza (TAMU), Gillespie (TAMU), Goliad (SEMC), Grayson (TAMU), Harrison (TMMC), Kerr (TMMC), Lee (SEMC), Lubbock (TAMU), Mason (TAMU), McCulloch (TAMU), Nacogdoches (SEMC), Pecos (TMMC), Presidio (TMMC), Rains (TMMC), Robertson (TAMU), San Patricio (SEMC), Sutton (TAMU), Taylor (PMNH), Travis (TMMC), Ward (TMMC), Wichita (INHS), Williamson (TAMU), Winkler (TMMC). *Bombus griseocollis*: Anderson (TMMC), Bastrop (TMMC), Brazos (TAMU), Cass (TAMU), Comal (TMMC), Franklin

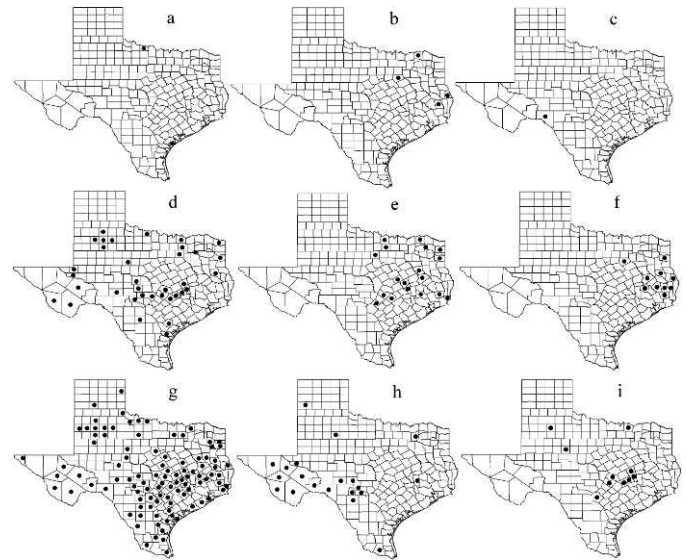


FIG. 1—Distribution of bumble bees in Texas: a) *Bombus auricomus*; b) *B. bimaculatus*; c) *B. fervidus*; d) *B. fraternus*; e) *B. griseocollis*; f) *B. impatiens*; g) *B. pensylvanicus*; h) *B. sonorus*; and i) *B. variabilis*.

(TMMC), Hardin (PMNH), Fall (TMMC), Harrison (TMMC), Houston (TAMU), Lamar (TMMC), Montague (TMMC), Montgomery (TAMU), Orange (TMMC), Palo Pinto (TMMC), Robertson (TAMU), Travis (TMMC), Wise (TMMC). *Bombus impatiens*: Ellis (TMMC), Hardin (TMMC, PMNH), Harrison (TMMC), Houston (TAMU), Jasper (TMMC), Nacogdoches (TMMC), Polk (TAMU), Sabine (TAMU), Tyler (TMMC), Walker (TAMU). *Bombus pensylvanicus*: Anderson (TAMU), Angelina (TAMU), Aransas (INHS, SEMC, TMMC), Atascosa (TAMU), Bandera (TAMU), Bastrop (SEMC, TAMU, TMMC), Bexar (TAMU, TMMC), Bosque (TAMU), Brazoria (TAMU), Brazos (TAMU), Brewster (INHS, SEMC, TAMU), Brooks (TAMU), Burleson (SEMC, TAMU), Burnet (TMMC), Cameron (INHC, SEMC, TAMU), Cherokee (TMMC), Childress (TAMU), Cochran (TAMU), Collin (TAMU), Colorado (SEMC), Coryell (TMMC), Crockett (INHS), Crosby (TAMU), Dawson (TAMU), Denton (SEMC, PMNH), DeWitt (TAMU), Dickens (TAMU), Dimmit (TAMU), El Paso (TAMU), Erath (TAMU), Fannin (TAMU), Fayette (SEMC), Foard (TAMU), Frio (TAMU), Galveston (SEMC, TAMU), Garza (TAMU), Gillespie (SEMC, TAMU), Goliad (SEMC), Gonzales (SEMC), Guadalupe (TAMU), Hale (TAMU), Hardin (PMNH), Harris (SEMC), Harrison (TAMU), Hays (TAMU), Hemphill (SEMC), Hidalgo (SEMC, TAMU), Hockley (TAMU), Houston (TAMU), Jackson (SEMC), Jeff Davis (INHS, SEMC), Jefferson (TMMC), Jim Wells (TAMU), Kendall (TAMU), Kenedy (SEMC, TAMU), Kerr (INHS, SEMC, TAMU), Kimble (TAMU), Kleberg (SEMC, TAMU), LaSalle (INHS), Lee (INHS, SEMC, TAMU), Limestone (INHS), Live Oak (SEMC), Lubbock (TAMU), Lynn (TAMU), McLennan (TAMU),

Madison (TAMU), Marion (SEMC, TAMU), Mason (TAMU), Matagorda (SEMC), Medina (SEMC), Milam (SEMC, TAMU), Montgomery (SEMC, TAMU), Nacogdoches (SEMC), Nueces (SEMC), Orange (TMMC), Pecos (INHS, SEMC, TAMU), Polk (TAMU), Presidio (INHS), Randall (TAMU), Reeves (TAMU), Refugio (SEMC), Robertson (TAMU), Runnels (TAMU), Sabine (TAMU), San Jacinto (TAMU), San Patricio (SEMC, TAMU), Schleicher (SEMC), Starr (TAMU), Sutton (INHS), Taylor (TAMU), Throckmorton (SEMC), Tom Green (SEMC), Travis (SEMC, TAMU, TMMC), Tyler (TAMU), Uvalde (SEMC, TAMU), Val Verde (SEMC, TAMU), Walker (TAMU), Washington (INHS), Webb (PMNH), Wichita (INHS), Willbarger (SEMC), Williamson (SEMC, TAMU), Wilson (SEMC, TAMU). *Bombus sonorus*: Bandera (TAMU), Brewster (TAMU), Culberson (TAMU), Grimes (TMMC), Hidalgo (TAMU), Hunt (TAMU), Jeff Davis (TAMU), Kent (TAMU), Kerr (TAMU), Kimble (TAMU), Pecos (TAMU), Presidio (TAMU), Real (TAMU), Reeves (TAMU), Sutton (TAMU), Terrell (SEMC), Uvalde (SEMC, TAMU), Val Verde (SEMC), Ward (TMMC). *Bombus variabilis*: Bexar (TAMU), Brazos (TAMU), Burleson (TAMU), Crosby (TAMU), Grayson (TAMU), Lee (INHS), Nolan (PMNH), Robertson (TAMU), Travis (TAMU), Williamson (TAMU).

DISCUSSION—*Bombus pensylvanicus* was the most frequently represented bumble bee in the accessed museum collections. Individuals of that species have been taken from >100 counties across the state. Based on these data, *B. pensylvanicus* has the widest historical distribution of any bumble bee in Texas. *Bombus pensylvanicus* is currently of some conservation interest given evidence of a significant reduction of range in Illinois (Grixti et al., 2009). On a larger geographic scale, Cameron et al. (2011) recently found *B. pensylvanicus* to be absent from most of its historical eastern and northern range in North America, remaining abundant only in the southern Gulf Coast states and a portion of the Great Plains.

Following *B. pensylvanicus*, *B. fraternus* and *B. sonorus* possessed the next largest number of locality records. The distribution of *B. fraternus* is comprised of records scattered across the state. Occurrences of *B. sonorus* primarily are confined to the southwestern region of the state. Most species of bumble bees that range into Texas, including *B. fraternus*, are typified by distributions that encompass significant portions of the eastern and northern United States. Conversely, the distribution of *B. sonorus* is centered in Mexico with southerly regions of California, Arizona, New Mexico, and Texas comprising the northern terminus of the range in the United States.

Records of *B. bimaculatus*, *B. griseocollis*, and *B. impatiens* are limited to eastern portions of the state. Franklin (1913) did not list either *B. bimaculatus* or *B. impatiens* for Texas, but intimated that both had the potential to occur

there. County records cited herein represent new state records for *B. bimaculatus* and *B. impatiens*.

Like all members of the subgenus *Psythirus*, *B. variabilis* is an obligate social parasite of eusocial species of *Bombus*. Species in this subgenus are marked by lack of a worker class and a complete dependency upon host-colonies for reproduction (Plath, 1922; Fisher, 1987). *Bombus variabilis* is a species noted by Grixti et al. (2009) as being extirpated from Illinois. The preferred host of *B. variabilis* is *B. pensylvanicus* (Frison, 1916) whose distribution it likely mirrors. Historical records of this species in Texas are mostly aggregated in central portions of the state, with a few widely scattered occurrences.

Franklin (1913) listed only one record for *B. auricomus* from Greenville, Hunt County, Texas. The author provided no information as to disposition of any specimen(s) collected from that locality. I was unable to locate vouchered specimens to confirm that record. The only data I was able to compile for *B. auricomus* were from specimens collected from Aransas County along the Gulf Coast and Wichita County near the Red River in northern Texas. For *B. fervidus*, Franklin (1913) provided no occurrence data and noted that the species was absent from the greater part of Texas. The American Museum of Natural History contains a specimen of *B. fervidus* from Val Verde County along the United States–Mexico border. Both *B. auricomus* and *B. fervidus* may occur in additional locales across Texas and merit targeted surveying effort to better define their occurrence in the state.

Examination of distribution maps herein makes clear the need for more work to define distributions of species across Texas. Efforts also should be made to revisit known localities to evaluate persistence of species; especially, for those species noted to be in decline elsewhere in North America. Baseline distributions presented herein can provide a starting point for field-based surveys to assess the status of species of bumble bees across Texas.

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