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## WESTWARD EXPANSION OF THE EASTERN PIPISTRELLE (*PIPISTRELLUS SUBFLAVUS*) IN THE UNITED STATES, INCLUDING NEW RECORDS FROM NEW MEXICO, SOUTH DAKOTA, AND TEXAS

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*Key words:* *Pipistrellus subflavus*, eastern pipistrelle, westward expansion, distribution, New Mexico, South Dakota, Texas.

The eastern pipistrelle (*Pipistrellus subflavus*) occurs in eastern North America, including parts of Canada, United States, Mexico, Guatemala, and Honduras (Hall 1981). In the United States the known distribution of *P. subflavus* in 1981 extended from the Atlantic coast west to Minnesota, Iowa, Nebraska, Kansas, Oklahoma, and Texas. Despite published records beyond western limits in the United States since 1981 (see below), recently published distribution maps of *P. subflavus* have not accounted for these records (e.g., Kunz 1999, Schwartz and Schwartz 2001, Kays and Wilson 2002). It is not clear whether omissions were oversights by the authors or assumptions that these records were accidental. This study updates the known distribution of *P. subflavus* in the United States by amassing published accounts and new records since 1981. We also attempt to determine whether western records represent accidental records, undetected populations, or recent westward expansion.

The reported distribution of *P. subflavus* changed little from 1959 to 1981 (Hall and Kelson 1959, Hall 1981). During this period the geographic range of this species expanded from southern Maine to Nova Scotia and from central Florida to the Florida Keys. Along the western edge of its range, a more modest expansion was noted from western Oklahoma to the Texas Panhandle and from central Iowa to northwestern Iowa. More recently, the known range of this bat has expanded significantly westward in the United States (Fig. 1). Records now exist beyond the distribution mapped by Hall (1981) for all states along its western edge in the United States (Minnesota, Hazard 1982;

South Dakota, this study; Nebraska, Benedict 2004; Wyoming, Bogan and Cryan 2000; Kansas, Sparks and Choate 2000; Colorado, Fitzgerald et al. 1989; New Mexico, this study; and Texas, Jones et al. 1993, Yancey et al. 1995, and this study).

Of the 16 extralimital records from 8 states reported herein, records include individuals captured in wooded, riparian habitats in summer (Yancey et al. 1995, Benedict 2004, this study), bats discovered in hibernacula in winter (Bogan and Cryan 2000, this study), and individuals captured on human-made structures in spring, late summer, and early autumn (Fitzgerald et al. 1994, Jones et al. 1993, Benedict 2004, this study). Both males and females have been reported, and lactating females were documented at 2 locations in Nebraska (Benedict 2004). None of the existing data are suggestive of animals either in poor health or roosting in locations atypical for the species.

Recent records most likely represent westward expansion of *P. subflavus* in the United States rather than accidental records or undetected populations. Evidence against records representing wandering or lost individuals includes reproductively active females that probably were summer residents, hibernating individuals that probably were winter residents, and the fact that *P. subflavus* is known to move only short distances between summer and winter roosting sites (Fujita and Kunz 1984, Schwartz and Schwartz 2001). We also suspect that most of these records do not represent undetected populations. Although some records may represent previously undetected populations, past mammalian surveys in some regions

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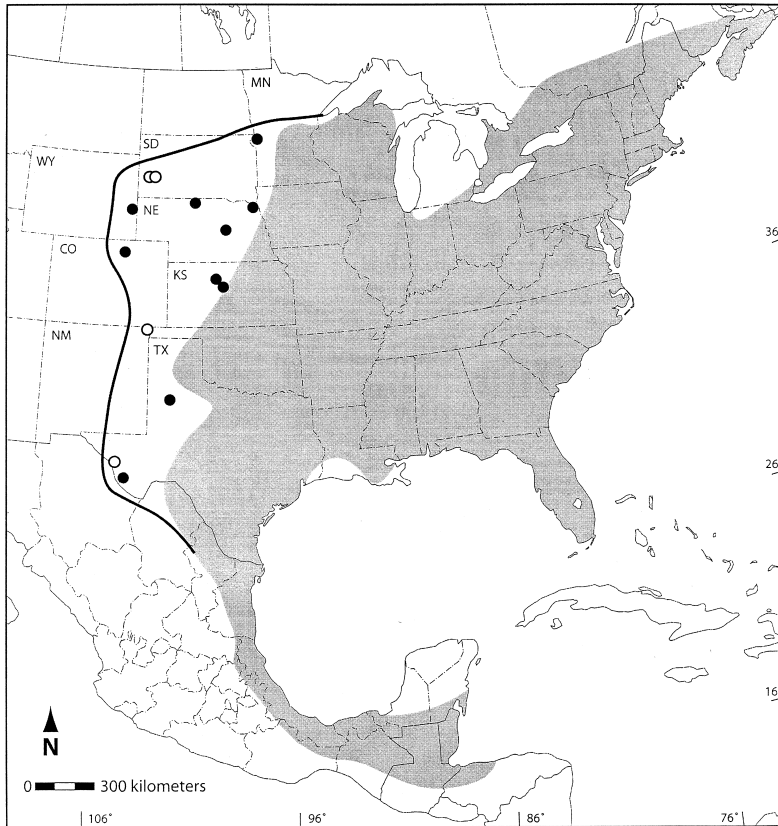


Fig. 1. Distribution of the eastern pipistrelle (*Pipistrellus subflavus*) in North America. Shading represents the distribution of *P. subflavus* published in Hall (1981). The solid black line represents the revised western limits of its range based on the present study. Closed circles represent published records of eastern pipistrelles since 1981 (see text), and open circles represent additional records reported in this study. The westernmost open circle in South Dakota represents 3 records of *P. subflavus*.

now containing *P. subflavus* also suggest recent colonization (e.g., Turner 1974, Schmidly 1977, Dalquest et al. 1990). We concur with Sparks and Choate (2000) that increases in wooded corridors along waterways, such as those documented in the Great Plains (Tomelleri 1984, Johnson 1994), and construction of mines and other human-made structures in the region have led to the expansion in distribution of eastern pipistrelles. The combination of these factors probably has enabled *P. subflavus* to inhabit riverine corridors in summer and to hibernate in nearby areas in winter. Additional surveys of bats along wooded riparian corridors with nearby hibernacula likely will show *P. subflavus* more widespread in western parts of its range.

Below we report 6 additional records of *P. subflavus* in the United States, which represent the 1st record in New Mexico, the 1st four records in South Dakota, and the westernmost record in Texas.

On 30 September 2003, KG discovered a male *P. subflavus* roosting under a cement bridge in Union County, New Mexico. The solitary individual was first observed about 3 m from the west wall in the northern section of the bridge (36°54.096'N, 103°00.125'W; NAD83 datum). In KG's presence, it flew to the west wall and was captured by hand (36°54.096'N, 103°00.131'W). The west end of the bridge is in New Mexico, but most of the bridge lies in Oklahoma (the Cimarron Meridian at 103°00.117'W divides the states). State

highway markers on the ground also confirm that locations of *P. subflavus* were in New Mexico. The bridge spans Carrizozo Creek, which flows into the Dry Cimarron River 2 km downstream. Both waterways contain open water and are bordered in areas by cottonwoods (*Populus*), saltcedar (*Tamarix*), and other trees. The surrounding area consists of rocky mesas containing woodlands of Colorado piñon (*Pinus edulis*) and one-seeded juniper (*Juniperus monosperma*).

Eastern pipistrelles enter hibernacula in autumn, and some studies report them at hibernacula as early as August and September (Fujita and Kunz 1984, Sandel et al. 2001). Because our individual was captured in September and contained large amounts of subcutaneous fat on its back, sides, and lower abdominal region, this male probably was in the vicinity of a hibernaculum.

Our capture represents the 1st record of *P. subflavus* in New Mexico (Findley et al. 1975, Dalquest et al. 1990). The individual was kept as a voucher and deposited in the U.S. Geological Survey, Biological Survey Collection at the Museum of Southwestern Biology (MSB), University of New Mexico, Albuquerque (MSB #124271). Nearest published records are 260 km to the southeast in the Panhandle of Texas (Yancey and Jones 1996) and 360 km to the east in northwestern Oklahoma (Hall 1981, Caire et al. 1989). We suspect that eastern pipistrelles inhabit other wooded riverine corridors in eastern New Mexico, and surveys along the Dry Cimarron, Canadian, and Pecos Rivers may yield additional records for the state.

On 7 January 2003, JMT discovered a torpid *P. subflavus* roosting on a wall in an abandoned mine 6.5 km east-northeast of Hill City, Pennington County, South Dakota (T1S, R5E, Section 23). The solitary individual was observed 1.5 m above the floor in a short passageway off the main horizontal passageway of the mine. Other species of bats reported hibernating in the mine the same day included *Myotis septentrionalis*, *M. thysanodes*, *M. ciliolabrum*, *M. lucifugus*, *M. volans*, and *Corynorhinus townsendii*. The mine has a single opening and approximately 1 km of passageways, all of which are at the same level. Relative humidity was approximately 90% throughout the mine due to presence of water, and temperatures ranged from 2°C near the opening to 7°C in deeper reaches.

The area surrounding the mine consists of a forest dominated by ponderosa pine (*Pinus ponderosa*). On 11 January 2004, JMT discovered another torpid *P. subflavus* roosting in this same mine. This individual was observed 1.5 m above the floor on a wall in another passageway. Both individuals were not disturbed; thus none was taken as a voucher specimen. Other bats reported hibernating in the mine on the same day included *M. septentrionalis*, *M. thysanodes*, *M. ciliolabrum*, *M. lucifugus*, and *M. volans*.

On 12 January 2004, JMT discovered a torpid *P. subflavus* roosting on a wall in an abandoned mine approximately 16 km east-northeast of Hill City, Pennington County (T1S, R6E, Section 15). This solitary individual was observed 1.5 m from the floor in the main passageway and was not disturbed. Other species of bats hibernating in the mine on the same day included *Eptesicus fuscus*, *M. septentrionalis*, *M. thysanodes*, and *M. ciliolabrum*. The mine has a single opening and approximately 75 m of underground passageways. The temperature profile was similar to the mine described above, while relative humidities were noticeably lower than at the other mine (JMT personal observation). This mine is situated adjacent to a creek in a ponderosa pine forest.

On 14 April 2004, JMT discovered another torpid *P. subflavus* roosting in a shallow dome in an abandoned mine approximately 9 km east of Hill City, Pennington County (T1S, R5E, Section 25). The solitary individual was observed approximately 6 m from the mine opening. The bat was not disturbed, but voucher photographs were taken (MSB #124461). Ambient temperature outside the mine on this day was -1°C, whereas temperature at the height of the ceiling <1 m from the bat was 5°C. This individual was not observed during an earlier visit to this mine in January 2004. Other bats in the mine on 14 April included *E. fuscus* and *C. townsendii*. The area surrounding the mine consists of a ponderosa pine forest.

These observations represent the 1st records of *P. subflavus* in South Dakota (Turner 1974, Higgins et al. 2002). Nearest published records are approximately 190 km to the southwest in eastern Wyoming (Bogan and Cryan 2000) and 275 km to the southeast in north central Nebraska (Benedict 2004). All 4 sightings were from mines located within the Black Hills

region of the state. We suspect that eastern pipistrelles occur along riverine corridors throughout South Dakota, especially in those areas with nearby hibernacula.

On 30 April 2003, TRM and MAB captured an adult male *P. subflavus* in ZH Canyon, ca. 9 miles (14.5 km) west of Valentine, Sierra Vieja, Presidio County, Texas (UTM coordinates 130531885E 3379571N, 1408 m elev.; NAD27 datum). The individual was netted over a small stream at 2225 hours. ZH canyon is located in the Sierra Vieja, one of a series of small mountain ranges east of the Rio Grande in western Texas. This steep-walled canyon drains north and then eastward. The capture site is located in the east–west part of the canyon, upstream and past an abandoned U.S. Army facility (Camp Holland, which was built in the early 1900s). Pools of water occur over a 50-m stretch from the head of a pipeline to where water emerges from dense riparian vegetation. Water also exists up-canyon, but pools are intermittent and small. Other species of bats captured the same evening were *M. velifer*, *M. volans*, *M. californicus*, *P. hesperus*, *E. fuscus*, *Lasiurus cinereus*, *Antrozous pallidus*, and *Tadarida brasiliensis*. An additional 8 species also have been captured in ZH Canyon in the past (Schmidly 1991): *Mormoops megalophylla*, *M. yumanensis*, *M. thysanodes*, *M. ciliolabrum*, *Lasionycteris noctivagans*, *L. blossevillii*, *Corynorhinus townsendii*, and *Nyctinomops macrotis*. With a total of 17 species, this site has one of the most diverse faunas of bats in Texas, as well as in the United States.

This capture represents the westernmost record of *P. subflavus* in Texas (Schmidly 1991, Yancey et al. 1995). The individual was kept as a voucher and deposited in the Museum of Texas Tech University (TTU #100,001; tissues, TK #112,773). The nearest published record is 87 km to the south-southeast in Presidio County, Texas (Yancey et al. 1995). Eastern pipistrelles captured east of the Pecos River in Texas are presently referred to *P. s. subflavus*; however, individuals taken west of the Pecos River and in neighboring Coahuila, Mexico, are referred to as *P. s. clarus* (Schmidly 1991, Yancey et al. 1995). Based on geographic grounds, we tentatively assign our individual to *P. s. clarus*.

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