Short Note

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New tent architecture roost by *Dermanura phaeotis* (Miller, 1902) (Chiroptera: Phyllostomidae) in southeastern Mexico

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Abstract: Some phyllostomid bats modify leaves of certain plant species in order to build tents as daytime roosts. Most tent-roosting members of the *Artibeus* and *Dermanura* genus have a widespread geographic distribution; nevertheless, there are few reports regarding roost architecture. This is the first report in Mexico of boat/apical tents built by the pygmy fruit-eating bat *Dermanura phaeotis*.

Keywords: banana leaves; boat/apical tents; daytime roost; Oaxaca; Stenodermatinae.

The bats of the Neotropical family Phyllostomidae make use of a great variety of roost structures, such as caves, hollow trees, logs, foliage, leaves and modified leaves known as “tents” (Kunz et al. 1994, Kunz and Lumsden 2003, Rodríguez-Herrera et al. 2007, Voss et al. 2016). This family includes 166 species (following Simmons 2005), of which 23 use modified leaves as daytime roosts (Barbour 1932, Kunz and Lumsden 2003, Chaverri and Kunz 2006, Rodríguez-Herrera et al. 2007, Garbino and Tavares 2017). The tent-roosting bats modify leaves of plant species from 18 families by cutting the midrib, veins or blade (Timm 1987, Kunz et al. 1994, Kunz and Lumsden 2003, Rodríguez-Herrera et al. 2007). Although it is well known

which members of the *Artibeus* Leach, 1821 and *Dermanura* Gervais, 1856 genera (subfamily Stenodermatinae) build tents, in Mexico few publications describe the architecture used by these species (e.g. Evelyn and Stiles 2003, Ortiz-Ramírez et al. 2006, Hernández-Mijangos and Medellín 2013, García-García and Santos-Moreno 2014).

Dermanura phaeotis (Miller 1902) exhibits a widespread geographic distribution, and occurs from Mexico through Central America to northwestern South America (Miller et al. 2015). In Mexico, it is found in the Pacific slopes, from Sonora to Chiapas, and in the Gulf of Mexico from Veracruz to the Yucatán Peninsula (Timm 1985, Simmons 2005) (Figure 1). It is a fruit-eating bat that roosts in caves, unmodified leaves and tents (Bonaccorso 1979, Timm 1985, Rodríguez-Herrera et al. 2007), known to modify banana (*Musa paradisiaca*) and false bird-of-paradise (*Heliconia imbricata*) leaves in order to construct boat-type roosts (Timm 1985, Kunz et al. 1994, Rodríguez-Herrera et al. 2007, Rodríguez-Herrera et al. 2018), *Sterculia apetala* leaves for umbrella-type roosts (Artavia-Durán 2014), *Philodendron mediocostatum* leaves for apical roosts and a non-identified species of the family Arecaceae for bifid roosts (Rodríguez-Herrera et al. 2007).

During field expeditions in 2017–2018 in Pluma Hidalgo, Oaxaca, southeastern Mexico, we observed individuals of *Dermanura phaeotis* (Miller, 1902) using tents close to the end of the rainy season (November and December 2017, and November 2018). Specifically, the observations occurred inside a 0.5-ha plot in an agroforestry system of a shaded coffee plantation associated with banana plants (with a canopy of 25–30 m high trees) in the locality known as Santa María Magdalena (15.903527°, –96.376488°, 423 m of elevation, Figure 1). This zone presents a humid-warm climate, with an annual precipitation of 2500 mm, and predominance of medium semi-deciduous forest and coffee plantations (Trejo 2004).

We registered six tents made of modified *Musa paradisiaca* leaves. Five of them were occupied by *Dermanura phaeotis* individuals as daytime roosts. The

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Figure 1: Geographic distribution of *Dermanura phaeotis* in Mexico and Central America, study area in Oaxaca, Mexico, and observation point in Santa María Magdalena, Pluma Hidalgo.

number of individuals per tent varied between one and four. During November 2017, we observed two occupied tents in separate plants: the first plant with a group of four individuals (Figure 2A), and the second plant with one individual. In December 2017, we also observed two occupied tents in separate plants: the first plant with a group of three individuals (Figure 2B), and the second plant with one individual. Lastly, in November 2018, we observed a bat roosting in a different plant from the previous year (Figure 2C). According to our observations and information provided by the landowner of the plantation who saw bats using banana leaves as daytime roosts since August 2017, individuals of *D. phaeotis* remained in the same tents during 4 months; they used leaves from a different plant as a roost in the next rainy season.

Dermanura phaeotis used only leaves that were always under the shade at an average height of 1.80 m from the ground and in all cases, the leaves used as tents were located toward the northwest. The minimum distance among roosts was 3 m, while the maximum was 10 m. The leaves presented parallel cuts along the

midrib, from the base to a third part of the blades, in such a way that both sides of the blades fold downward; also, deep cuts on the midrib were present provoking the leaves' tips to hang perpendicular to the ground (Figure 2D). All shelters presented the same patterns, with bites made parallel along the central vein of the leaf and deep cuts on the midrib. Both cut types produced a boat/apical tent architecture (Figure 2E). A distinct trait of boat-type tents are the "v" and "j" cuts parallel to the leaf midrib, mainly on long banana and false bird-of-paradise leaves. Deep cuts on the leaf midrib, which cause leaf tip breakdown, are typical of apical tents, architecture mainly observed in epiphytic species of Araceae (Kunz et al. 1994, Rodríguez-Herrera et al. 2007). The boat/apical tent architecture combines the latter distinctive traits: parallel cuts to the midrib and deep cuts on the midrib (Rodríguez-Herrera et al. 2007). We observed this type of tent architecture in Santa María Magdalena. There are no previous records of *Dermanura phaeotis* using this tent architecture, only known for *Artibeus jamaicensis* Leach, 1821, *Dermanura watsoni* (Thomas, 1901), *Vampyressa pusilla* (Wagner, 1843) and

Figure 2: Boat/apical tents by *Dermanura phaeotis* in *Musa paradisiaca* leaves, registered in Oaxaca, Mexico. Tents observed in (A) November (A. García-Méndez); (B) December 2017 (© L. Tlapaya Romero, with permission); (C) November 2018 (© E. López Ososrio, with permission); (D) leaf of *Musa paradisiaca* with parallel cuts along the midrib from the leaf base, and deep cuts on the midrib (white arrows) (A. García-Méndez); (E) The resulting boat/apical tent architecture (A. García-Méndez).

Vampyressa thuyne Thomas, 1909 (Rodríguez-Herrera et al. 2018). Even though the banana plant is a non-native species of the Neotropics, it is very common in the region and provides roost sites for certain bat species (Timm 1987, Rodríguez-Herrera et al. 2007). When *Heliconia*, *Calathea* and palm species are not present, *D. phaeotis* recurs to banana leaves (Timm 1987).

Information regarding tent architecture and roosting requirements of tent-roosting bats has been largely

compiled in Central and South America (Barbour 1932, Timm 1987, Kunz et al. 1994, Kunz and Lumsden 2003, Chaverri and Kunz 2006, Rodríguez-Herrera et al. 2007, Voss et al. 2016, Garbino and Tavares 2017, Rodríguez-Herrera et al. 2018). In Mexico, these observations are limited to conserved environments in the states of Campeche, Chiapas and Oaxaca (see Evelyn and Stiles 2003, Ortiz-Ramírez et al. 2006, Hernández-Mijangos and Medellín 2013, García-García and Santos-Moreno

2014). In the region *Musa paradisiaca* is very abundant, being a common plantation among agroforestry systems which offer an important source for food and shelter for bats. Therefore, we consider it an important task to gather more information in order to establish the respective importance of native and introduced plants as bat tent-roosts, mainly because these may represent limiting resources in this environment.

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