REPRODUCTIVE, MORPHOMETRIC, AND ROOSTING DESCRIPTION OF THE HONDURAN WHITE BAT, *Ectophylla alba* (CHIROPTERA: PHYLLOSTOMIDAE), IN HONDURAS

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ABSTRACT. Since 1984, no morphometric data has been recorded for *Ectophylla alba* in Honduras. Records of pregnant females and description of roosts used by this species were never reported for the country. We describe herein a tent of *Heliconia* sp. used by three individuals of *E. alba*, report two records of pregnant females; with ecological data of three individuals from Rus Rus, Gracias a Dios, southeastern Honduras. We recommend monitoring *E. alba* in Rus Rus because it may be the most important region for the conservation of this threatened species in Honduras.

INTRODUCTION

The Honduran white bat (*Ectophylla alba* H. Allen, 1892) is one of the smallest members of the Stenodermatinae subfamily; endemic to the Caribbean lowlands (0-800 m asl) of Honduras, Nicaragua, Costa Rica, and eastern Panama (Rodríguez-Herrera et al. 2008; Medina-Fitoria 2014; Rodríguez & Pineda 2015). *E. alba* roosts in tents of up to 15 individuals typically made with the leaves...
of one of five species of *Heliconia* (Heliconiaceae): *H. pogonantha*, *H. imbricata*, *H. latispatha*, *H. sarpipennis*, and *H. tortuosa*; or, more rarely, with the leaves of species of the Marantaceae family (Timm & Mortimer 1976; Rodriguez-Herrera et al. 2007; 2008; 2018). The Honduran white bat may be found in wet evergreen forests and tall, secondary-growth forests (Rodriguez & Pineda 2015). *Ectophylla alba* builds its roosts in areas that have significantly fewer *Heliconia* stems than averages and a lower percentage of covering at 0-1 m above the ground, and prefers new over old leaves because the new ones are undamaged and easier to modify (Rodriguez-Herrera et al. 2008).

Globally, Rodriguez & Pineda (2015) considered *E. alba* Near Threatened (NT) based on populational decreasing (Rodriguez-Herrera et al. 2007; 2008). Overall this is a poorly studied bat in Central America and in Honduras it is considered as one of the eleven threatened species (Hernández 2015), specifically due to habitat loss and fragmentation.

Since its description by Allen (1892) in El Paraiso in eastern Honduras, Segovia region (see McCarthy et al. 1993; for further discussions about the locality in Honduras), *E. alba* has been recorded in four other localities in the country (Timm 1982; Benshoof et al. 1984; Medina-Fitoria 2008; Portillo Reyes et al. 2015): Catacamas, Olancho (eastern Honduras); Quebrada Tiro, Gracias a Dios (eastern Honduras in the Río Plátano Biosphere Reserve); Las Cuevas, Colón (northeastern Honduras in the core of the Río Plátano Biosphere Reserve); and Rus Rus, Gracias a Dios (southeastern Honduras).

This is the first report on reproduction and morphometric data for *E. alba* in Honduras since 1984. Here we describe a tent used by *E. alba*, and report data on the reproduction, and external morphology of three individuals recorded in Rus Rus, Gracias a Dios, southeastern Honduras.

**MATERIALS AND METHODS**

Since February 2017, we mist-netted bats for more than 600 hours attempting to find *E. alba* in eastern (La Mosquitia region) and northern (Río Plátano Biosphere Reserve) Honduras; both considered the most important regions for bat conservation in the country (Ávila-Palma et al. 2019; Turcios-Casco & Medina-Fitoria 2019). Finally, in August 2018, an expedition to southeastern Gracias a Dios was successful. The expedition was headed to Rus Rus (14°46’32.6" N, 84°27’50.8" W, 93 m), in a village of the municipality of Puerto Lempira, department of Gracias a Dios including lands of the native people from the region, the Miskitu. The community of Mabita includes forests of *Pinus caribaea*, and Tropical Moist Forest plant species that were identified according to Holdridge (1978). Species at which *E. alba* was recorded included *Ficus* (Moraceae), *Heliconia* (Heliconiaceae), *Persea* (Lauraceae), *Psychotria* (Rubiacae), and other plants of Apocynaceae, Anacardiaceae, Malvaceae, Poaceae, Musaceae, and Arecaceae. Annual mean temperature oscillates between 23-27°C and evapotranspiration ranges from 800 to 2000 mm (Herlihy 1997; Escuela Nacional de Ciencias Forestales 2013).

We captured bats using two mist nets of 12 x 2.5 m with a mesh of 30 mm, on August 14 and 16, 2018. The mist nets were set from 18:00 to 22:00 h and positioned based on the criteria of Kunz et al. (1996) for vegetation, topography, and bodies of water. Bat tents were searched for along riverbanks and in the forests. When tents or refuges were found, the bats were captured with a standard hand net. Bats were carefully manipulated according to guidelines for the use of mammals in wildlife research (Sikes et al. 2016). After reproductive and morphometric data were recorded, bats were released at the same site they were originally captured.

We followed Timm et al. (1999), Medellin et al. (2008), and Medina-Fitoria (2014) to identify specimens. Measurements were recorded to the nearest 0.01 mm with a digital caliper (Mitutoyo 506-675) and followed Srinivasulu et al. (2010) except for the tragus length and width that followed Dietz & Helversen (2004) and are described in Table 1: forearm length [FA]; tibia length [Tib]; ear length [E]; ear width [EW]; thumb length [Th]; tragus length [Tr]; tragus width [TrW]; length of the calcar [Ca]; tail length [T]; body height [HB]; wingspan [WS]; third metacarpal [3mt]; first phalange of third finger length [1ph]; second phalange of third finger length [2ph]; and third phalange of third finger length [3ph]. Pesola scales of 10 g and 100 g were used to measure body mass of bats. Sex and reproductive condition were determined following Kunz et al. (1996) and biological age following Brunet-Rossini & Wilkinson (2009). We recorded the temperature and relative humidity with a standard thermometer that contained a dry and humid bulb. Finally, descriptions of the tent found were made based on Timm & Mortimer (1976) and the following measurements were taken: A-total length of leaf; B-height from the base to ground; C-length of the uncut puncture; D-distance from basal cut to punctures; E-width of punctures.

**RESULTS**

During the nights of August 14 and 16 of 2018, we accumulated 16 net-hours, in which 10 individuals were captured (0.86 individuals per net-hour) of 10 phyllostomid species (Table 1), and 16 hours of searching tents, in which a tent was found near the Ibantara River at 16:38 h on August 14, 2018. There were three individuals of *E. alba* using the tent of a platanillo (*Heliconia sp.*), one male and two pregnant females. The unflowered plant had five prefoliations (Fig. 1), two mature leaves, and due to the lack of flowers and fruits, we were not able to identify the species.

In addition, we found two other tents near the active tent (fresh) as did Timm & Mortimer (1976), one was decaying, while the other was largely rotten. All the tents were found in an area of 15 km² (including
Fig. 1. Graphic representation of the tent of the platanillo (*Heliconia*; Heliconiaceae) that was used by *E. alba*. All the measurements are in centimeters. The plant had two mature leaves and five prefoliations; the Honduran white bats (*Ectophylla alba*) were in the second largest leaf, approximately 38 cm from the cut base to the middle of punctures.

cultivated crops of *Manihot esculenta* and *Zea mays* that were nearby) and the inactive tents were found at 25 m from the active tent.

Based on Timm & Mortimer (1976), measurements of the tent are the following: A = 119.6 cm; B = 183.0 cm; C = 35.0 cm; D = 59.8 cm; E = 24.8 cm (Fig. 2). At the time we found the tent, surrounding air temperature was 26.0°C and relative humidity was 74%. Temperature and humidity within the tent was 27.5°C and 81%, respectively. The measurements of the three individuals and other species captured by mist nets in the two nights are presented in Table 1.

**DISCUSSION**

The temperature of the tent reported here was higher than the value reported by Rodríguez-Herrera et al. (2008) (23.33°C), but both temperature and relative humidity within the tent were similar to those in the environment. The measurements of the tents were in the ranges mentioned by Timm & Mortimer (1976) and Rodríguez-Herrera et al. (2008). Our observations support that *E. alba* can roost in sites with temperature closer to that of the environment. Other characteristics that Miskitus have noticed related to the tents used by *E. alba* are that there was no vegetation below the tents, and that individuals of *E. alba* usually used the same tent for at least a week.
Table 1

Morphological description and biological age of 11 individuals of the 10 phyllostomid species captured during the nights of August 15 and 16 2018 and the three individuals of *E. alba* recorded in August 14 2018.

| Species          | Sex   | Age     | Body mass | FA       | TIB      | E        | EW       | Th       | Tr        | TrW     | Ca       | T        | HB       | WS       | 3mt | 1ph | 2ph | 3ph |
|------------------|-------|---------|-----------|----------|----------|----------|----------|----------|----------|----------|---------|---------|----------|----------|------|-----|-----|-----|
| *Artibeus jamaicensis* | ♂     | Adult   | 47.0      | 60.91    | 15.00    | 9.81     | 9.82     | 6.56     | 1.67     | 8.16     | –       | 12.85   | 21.40   | 14.63   | 17.75 | 15.00 | 17.56 | 15.00 |
| *Carollia perspicillata* | ♂     | Adult   | 16.0      | 39.25    | 17.83    | 14.71    | 9.58     | 6.58     | 5.53     | 2.83     | –       | 14.67   | 21.40   | 14.63   | 17.75 | 15.00 | 17.56 | 15.00 |
| *Dermanura phaeotis* | ♀     | Adult   | 17.0      | 37.71    | 15.21    | 13.09    | 8.19     | 8.01     | 5.20     | 2.80     | 3.55    | –       | 12.85   | 21.40   | 14.63 | 17.75 | 15.00 | 17.56 | 15.00 |
| *Dermanura watsoni* | ♀     | Adult   | 12.0      | 36.41    | 14.57    | 11.26    | 7.86     | 6.61     | 5.01     | 2.90     | 4.49    | –       | 12.85   | 21.40   | 14.63 | 17.75 | 15.00 | 17.56 | 15.00 |
| *Desmodus rotundus* | ♂     | Adult   | 39.0      | 53.26    | 23.94    | 15.98    | 10.02    | 15.09    | 5.06     | 2.92     | 1.70    | –       | 12.85   | 21.40   | 14.63 | 17.75 | 15.00 | 17.56 | 15.00 |
| *Glossophaga soricina* | R♀   | Adult   | 4.5       | 27.70    | 9.82     | 9.82     | 6.55     | 4.84     | 3.21     | 1.50     | 3.29    | –       | 12.85   | 21.40   | 14.63 | 17.75 | 15.00 | 17.56 | 15.00 |
| *Ectophylla alba* | ♀     | Adult   | 6.5       | 29.41    | 10.89    | 9.62     | 6.49     | 5.95     | 3.45     | 1.70     | 4.72    | –       | 12.85   | 21.40   | 14.63 | 17.75 | 15.00 | 17.56 | 15.00 |
| *Ectophylla alba* | ♀     | Adult   | 7.5       | 29.60    | 11.35    | 11.49    | 7.94     | 5.24     | 4.61     | 2.72     | 4.63    | –       | 12.85   | 21.40   | 14.63 | 17.75 | 15.00 | 17.56 | 15.00 |
| *Lophostoma silvicolum* | ♂     | Adult   | 26.5      | 52.54    | 29.28    | 30.00    | 16.47    | 16.62    | 12.85    | 3.20     | 29.62   | 16.25   | 81.86   | 66.00   | 80.70 | 27.81 | 40.76 | 23.30 | 20.05 |
| *Micronycteris microtis* | ♀   | Adult   | 6.0       | 33.30    | 14.05    | 16.46    | 11.32    | 3.28     | 5.20     | 2.45     | 11.47   | 11.35   | 36.17   | 252.43  | 28.31 | 9.70  | 14.49 | 14.57 | 23.25 |
| *Phyllostomus hastatus* | ♀   | Adult   | 93.0      | 83.22    | 37.57    | 25.90    | 15.86    | 12.85    | 12.92    | 3.20     | 29.62   | 19.60   | 103.86  | 660.10  | 80.70 | 27.81 | 40.76 | 23.30 | 20.05 |
| *Phyllostomus hastatus* | L♀ | Adult   | 103.0     | 89.34    | 36.24    | 25.88    | 13.28    | 12.98    | 10.48    | 3.40     | 27.78   | 18.22   | 107.30  | 674.28  | 88.02 | 26.31 | 43.32 | 23.25 | 20.05 |
| *Uroderma convexum* |  confidential | Juvenile | 27.0      | 40.82    | 17.35    | 12.71    | 8.30     | 7.96     | 4.40     | 1.92     | 6.40    | –       | 12.85   | 21.40   | 14.63 | 17.75 | 15.00 | 17.56 | 15.00 |

*Ectophylla alba* in Costa Rica. Similar to Brooke (1990), the females reported here are larger (FA mean: 29.50; FA range: 29.41-29.60) than the male (FA: 27.70).

Rodriguez-Herrera et al. (2008) mentioned that *Ectophylla alba* prefers habitats with a relatively narrow time window of succession; for example, a young forest is not suitable because it lacks high canopy coverage, and a very mature forest will lack sufficient abundance of *Heliconia* plants. We considered the Ibantara River in the community of Mabita an important area for the conservation of *E. alba* in Honduras because this region has areas of advanced succession stages, with canopy coverage and open understory. However, it has a constant advance of livestock and crops that is affecting and disturbing its habitat (Portillo Reyes et al. 2015). Therefore, the protection of an adequate habitat is a conservation priority, and if there is any reduction in the species distribution range, the extinction risk increases (Rodriguez-Herrera et al. 2008). Other facts that support the conservation of *E. alba* are the specialization in figs of *Ficus colubrinae* (Brooke 1990; Villalobos-Chaves et al. 2017), the small geographic distribution area that is restricted by the age of the forest (Rodriguez-Herrera et al. 2008), and the dependence of *E. alba* on Zingiberales for tent construction (Rodriguez-Herrera et al. 2018).

A fact that may be related to the conclusion of Hernández (2015) that there is a decrease in the distribution range of *E. alba* due to deforestation, is that some people in the Miskitu community (Ibantara region) cut *Calathea* and *Heliconia* because they believe that those plants may be detrimental to their crops. We suggest that showing to the Miskitu community how to identify *Heliconia* species is essential for the conservation of *E. alba*.

In conclusion, *Ectophylla alba*, and its suitable habitats in Honduras must be identified and protected, and conservation programs should include local conservation activities of Miskitu in the community of Mabita, and also national policies, keeping in mind that the age range of the forest needed by *E. alba* for roots is specific.
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