

Noteworthy records of the Geoffroy's tailless bat and the Eastern Pipistrelle in Copán, western Honduras (Mammalia Chiroptera)

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ABSTRACT

Of the 113 bat species that occur in Honduras, the Geoffroy's tailless bat, *Anoura geoffroyi* Gray, 1838, and the Eastern Pipistrelle, *Perimyotis subflavus* (F. Cuvier, 1832), are among the least studied. Here we report the first records of *A. geoffroyi* and *P. subflavus* in a cave known as El Ermitaño in Cerro Azul Copán National Park (abbreviation in Spanish PANACAC) in the department of Copán, western Honduras, based on a survey from 30 October to 03 November 2017. We accumulated 840 m².h of sampling effort and captured 13 individuals including four of *A. geoffroyi* and two of *P. subflavus*. These records represent the first ones of *P. subflavus* in PANACAC and Copán, the westernmost records and the highest altitudinal record of the species in the country, and is the first time that *P. subflavus* has been found roosting together with *A. geoffroyi*. PANACAC might represent an important site for conservation for both species in Honduras, however, the protected area has been affected by the extension of crops and cattle. We recommend forest management and environmental education of bats to the people of Florida as a solution to keep stable bat populations.

KEY WORDS

Anoura geoffroyi; bats; conservation; new records; *Perimyotis subflavus*.

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INTRODUCTION

Goodwin (1942) mentioned that the mammalian fauna of Honduras, more or less, escaped the attention of early collectors, and there have been only scattered accounts of the mammals of Honduras. However, this is a situation that has not changed after 78 years. Chiroptera is an order in Honduras among other groups of mammals that have few studies because most of the recent distributions and

ecology comments are based on historical records (Turcios-Casco & Medina-Fitoria, 2019). Currently, 113 bat species occur in Honduras (Turcios-Casco et al., 2020), and the Geoffroy's tailless bat, *Anoura geoffroyi* Gray, 1838, and the Eastern Pipistrelle, *Perimyotis subflavus* (F. Cuvier, 1832), are among the least studied.

Here we report the first records of *P. subflavus* and *A. geoffroyi* in the municipality of Florida as part of the Cerro Azul Copán National Park (abre-

viation in Spanish is PANACAC) in the department of Copán in western Honduras. Conservational and ecological comments are also given for both species based on the information collected in the field.

METHODS

The sampling site was in the protected area known as the Cerro Azul Copán National Park (PANACAC) in Florida (15°02'45"N, 88°51'59"W–15°10'04"N, 88°51'59"W; 1203–1550 meters asl) municipality of Copán in western Honduras (Fig. 1). Based on Holdridge's (1967) life zones, we sampled in a lower montane wet forest. The land coverage of the municipality is mainly crops/pastures (48.24%), secondary wet vegetation (12.69%), and coffee plantations (11.86%) (ICF, 2015). The average temperature is between 24.9–25.6°C, and the annual precipitation is between 1312.4–1501.9 mm (UNAH & IHCT, 2012). The buffer zone of

PANACAC has an extension of 10,512.587 ha and the core zone a total of 1,570.515 ha, and despite of its high extension, it is one of the least studied protected areas in Honduras (Fig. 2).

We captured bats with two 12 x 2.5 m mist nets with denier mesh of 35 mm and were set at ground level and opened from 17:20 to 01:30. Their position at each site was selected based on the surrounding vegetation and topography, water bodies, and fruiting and flowering plants (Kunz & Kurta, 1988). Sampling effort was calculated with the area of the two mist nets times the number of hours the mist nets remained opened for the ten days (Straube & Bianconi, 2002). All the individuals were manipulated according to the guidelines of the use of mammals in wildlife research (Sikes et al., 2019), and were identified based on Timm et al. (1999); Medellín et al. (2008), Reid (2009), and Mora (2016).

A 100 g spring scale was used to obtain body mass, and the following external measurements

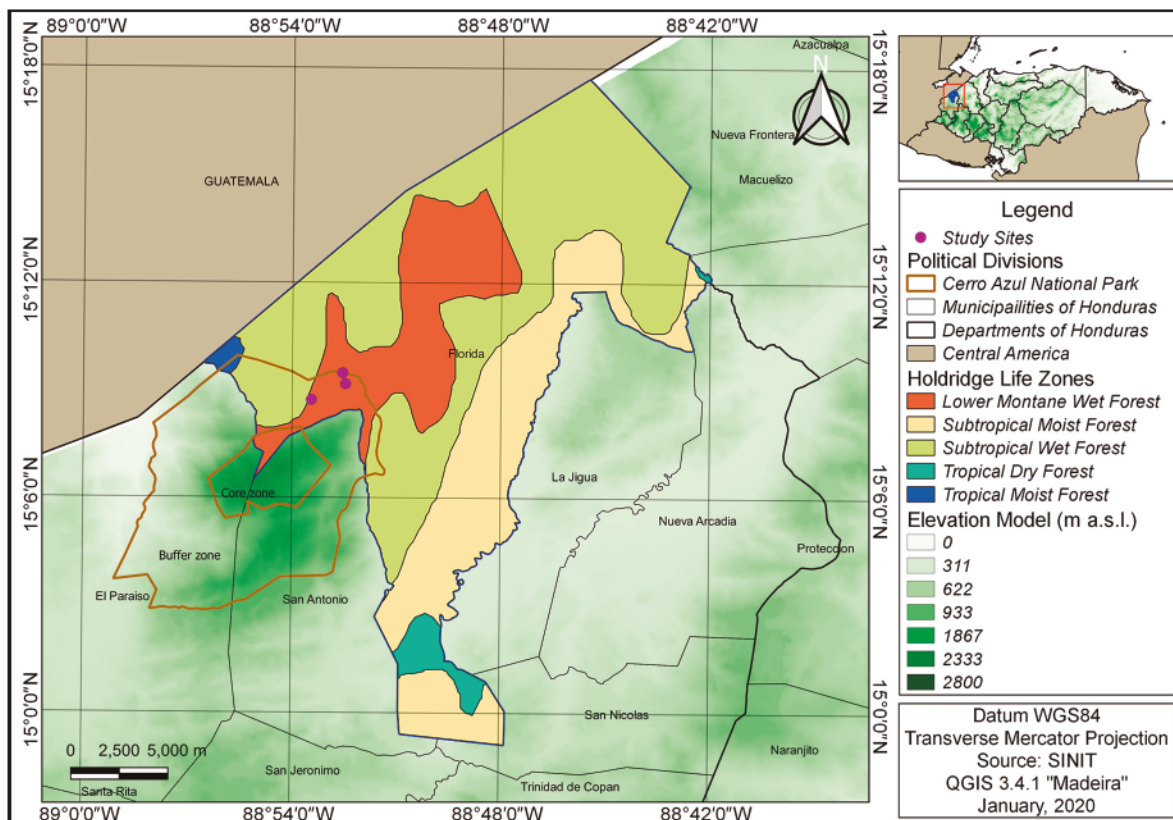


Figure 1. Studied sites at Cerro Azul National Park in western Honduras in Copán. Note that all the localities are in a lower montane wet forest and are part of the buffer zone of the protected area.



Figure 2. The entrance of the cave of El Ermitaño in PANACAC in which *A. geoffroyi* and *P. subflavus* were roosting.

were recorded to the nearest 0.01 mm with a digital caliper, following Srinivasulu et al. (2010), except for the tragus length and width, in which case Dietz & von Helversen (2004) were followed: forearm length (FA); tibia length (Tib); ear length (E); ear width (EW); thumb length (Th); noseleaf length (LN); tragus length (Tr); tragus width (TrW); calcaneus length (Ca); tail length (T); body length (BH); hindfoot length (HF); wingspan (WS); third metacarpal length (3mt); length of the first phalanx of digit III (1ph); length of the second phalanx of digit III (2ph); and length of the third phalanx of digit III (3ph).

RESULTS

From 30 October to 3 November 2017 we accumulated 840 m².h and captured 13 individuals (0.015 individuals per m².h) of seven species (0.008 species per m².h) from Phyllostomidae (76.9% of the captures), Mormoopidae (7.7%), and Vespertil-

ionidae (15.4%). The following species (relative abundance in parentheses) were recorded: *Anoura geoffroyi* (0.31), *Desmodus rotundus* (E. Geoffroy, 1810) (0.15), *Diphylla ecaudata* Spix, 1823 (0.15), *Perimyotis subflavus* (0.15), *Artibeus jamaicensis* Leach, 1821 (0.08), *Dermanura azteca* K. Andersen, 1906 (0.08), and *Pteronotus mesoamericanus* Smith, 1972 (0.08).

Anoura geoffroyi Gray, 1838

MATERIAL EXAMINED. Honduras, Copán, El Ermitaño (15°08'44"N, 88°52'30"W; 1520 m asl). Manfredo Alejandro Turcios-Casco, Claudio Josué Mejía-Suazo, Danny Josué Ordoñez Bautista; 31 October 2017 (4 adult males, Figs. 3, 4).

All the non-reproductive males were captured between 18:00-20:25 (16°C and 100% relative humidity, for both captures), while the moon phase was first quarter with illumination between 76 and 81% of moonlight. Ectoparasites were found in three individuals. One individual vocalized distress

calls while it was being taken out from the mist net and attracted other bats that tried to help it escape by distracting or frightening the predator (Eckeweber & Knörnschild, 2016; Ávila-Palma et al., 2019).

IDENTIFICATION. All the individuals were identified as *A. geoffroyi* because is the only Glossophaginae in Honduras with reduced and heavily furred uropatagium (Mora, 2016).

External measurements (in mm) are as follows: FA = 40.92–41.23; Tib = 13.41–15.02; E = 9.74–12.83; EW = 5.75–7.70; Th = 4.85–5.07; LN = 4.63–5.17; Tr = 3.44–4.98; TrW = 2.71–2.84; Ca = 2.14–3.40; BH = 37.88–45.10; HF = 8.63–11.22; WS = 321.87–336.24; 3 mt = 38.29–42.77; 1ph = 13.22–14.70; 2ph = 21.50–23.04; 3ph = 13.30–15.12; body mass = 14.0–18.0 g.

DISTRIBUTION AND BIOLOGY. *Anoura geoffroyi* is distributed from Sinaloa and Tamaulipas, México, through Central America (excluding Yucatán Peninsula) to Perú, Bolivia, and southeast Brazil to northwestern Argentina (Baumgarten & Viera, 1994; Reid, 2009), from elevations from 400 to 3600 m asl (Solari, 2016). Even though *A. geoffroyi* is generally tolerant of human disturbance (Handley, 1976), it is considered a bat with a wide distribution (Ortega & Alarcón, 2008).

Anoura geoffroyi is considered insectivorous and facultative nectarivorous (Gardner, 1977). It roosts in a variety of refuges including caves and tunnels (Reid, 2009) and may be captured near streams, croplands, evergreen pine forests, deciduous *Quercus* forests, and cloud forests (Handley, 1976; Ceballos González & Galindo Leal, 1984; Ortega & Alarcón, 2008).

STATUS AND CONSERVATION. Currently, this species is considered as LC (Least Concern) by the International Union for the Conservation of Nature (IUCN) (Solari, 2016).

Perimyotis subflavus (F. Cuvier, 1832)

MATERIAL EXAMINED. Honduras, Copán, El Ermitaño (15°08'44"N, 88°52'30"W; 1520 m asl). Manfredo Alejandro Turcios-Casco, Claudio Josué Mejía-Suazo, Danny Josué Ordoñez Bautista; 31 October 2017 (2 adult males, Figs. 5, 6).

Individuals were captured between 17:15–17:17 (16°C and 100% relative humidity for both captures),

while the moon phase was first quarter with illumination between 76 and 81% of moonlight. Both individuals were in a non-reproductive state, ectoparasites were found in both of them, and one individual vocalized distress calls as described before.

IDENTIFICATION. Both individuals were identified as *P. subflavus* because we observed two premolars on each of them, the tragus was curved with a rounded tip, and the tail membrane sparsely covered with yellowish hair from base to below level of knee (Timm et al., 1999; Reid, 2009).

External measurements (in mm) are as follows: FA = 34.56–35.00; Tib = 14.3–14.8; E = 7.00–9.65; EW = 3.55–4.99; Th = 3.42–3.37; Tr = 5.11–5.97; TrW = 1.55–2.84; Ca = 8.46–9.34; T = 28.4–29.71; HF = 6.41 (second individual escaped after taking this measurement); WS = 231.113–24.121; 3mt = 31.23–31.61; 1ph = 9.76–9.62; 2ph = 8.44–9.71; 3ph = 6.62–7.61; body mass = 4.0–5.0 g.

DISTRIBUTION AND BIOLOGY. *Perimyotis subflavus* is a vespertilionid bat known to occur from southeast Canada and eastern United States (Fujita & Kunz, 1984) to Guatemala, Honduras (McCarthy et al., 1993) and Nicaragua (Medina-Fitoria et al., 2015) from lowlands (Reid, 2009) to 2097 m asl (Solari, 2018). Even though is considered locally common in the United States and Canada (Reid, 2009), is rare in Central America (Fujita & Kunz, 1984).

Their hibernacula are seasonally different (Fujita & Kunz, 1984) and they can roost in small groups in caves, mines, and other man buildings (Davis 1964; Reid, 2009), but in spring they have maternity colonies frequently found in barns, trees, caves and rock crevices (Lane, 1946; Humphrey et al., 1976; Fujita & Kunz, 1984). Their forage behavior indicates that is frequent over waterways and forest edges (Fujita & Kunz, 1984; Reid, 2009).

STATUS AND CONSERVATION. Populations of *P. subflavus* in eastern North American are threatened because they are highly susceptible to the white-nose syndrome (WNS) (Bernard & McCracken, 2017; Leivers et al., 2019) and this is one of the reasons that is considered as VU (Vulnerable) by the IUCN (Solari, 2018).

DISCUSSION

Rinker (1948) checked three unidentified spec-

imens preserved in alcohol in the collection of the Division of Mammals, University of Michigan Museum of Zoology (catalogue numbers as follows: 55863, 55864, 55865) that were collected on 23 May 1924 on the Jilamo Farm, Dakota Division, Tela District, of the United Fruit Company in Atlántida, northern Honduras. The three bats were pregnant females and represented at that time, the first

record of *Perimyotis subflavus* in Honduras and the southernmost record of the species. After these records, there was no further information about the species in Honduras. McCarthy et al. (1993) described a new record of a male of *P. subflavus* at 16.5 km (by road) SSW Dulce Nombre de Culmí in Olancho, eastern Honduras. The record mentioned by them was done by W.J. Bleier on 22 July 1971



Figure 3. Frontal view of a male of *Anoura geoffroyi* captured in PANACAC during the night of 31 October 31, 2017. Figure 4. Note the reduced and heavily furred uropatagium.



Figure 5. Frontal view of a male of *Perimyotis subflavus* captured in PANACAC in western Honduras during the same night with *A. geoffroyi*. Figure 6. Lateral view of the same specimen, note that the tragus was curved with a rounded tip.



Figure 7. Teaching the importance of the conservation of bats to children in the municipality of Florida, Copán, western Honduras.

and extended the range of this species approximately 186 km ESE from Jilamo, Atlántida. Considering the records presented here, there are only four records of *P. subflavus* in Honduras and the last record of the species was 46 years ago. Currently, the advance of white-nose syndrome is affecting a large part of its eastern distribution in North America, and the population may decrease up to 45% over the next 15 years (Solari, 2018). Additionally, Leivers et al. (2019) mentioned that *P. subflavus* is currently under review for listing under the Endangered Species Act of the United States Fish and Wildlife Service. The records of *P. subflavus* in the cave El Ermitaño represent the only known record of the species in Copán, the westernmost record and the highest altitudinal record of the species in the country, and considering Ortega & Alarcón (2008) it is the first time that *P. subflavus* has been found roosting together with *A. geoffroyi*. In Central America, the southernmost record of the species is in Somoto Canyon in Madriz in northern Nicaragua, approximately 160 km from Dulce Nombre de Culmí in Olancho (Medina-Fitoria et al., 2015).

The two individuals of *P. subflavus* captured in PANACAC are slightly larger than those recorded in Atlántida (Rinker, 1948) and the individual of Olancho (McCarthy et al., 1993). This first report of *P. subflavus* roosting in the cave El Ermitaño is in agreement with Whitaker (1998) because we did not find any females roosting together with males

(generally they roost alone). Even though *P. subflavus* enter the hibernaculum in late July-October and leaves their roosts at the beginning of April (Fujita & Kunz, 1984), it is unknown how torpor varies in the neotropical species (Morrison & McNab, 1967).

McCarthy et al. (1993) also presented the first records of *A. geoffroyi* in Honduras: Yuscarán in El Paraíso, southeastern Honduras; Talanga in Francisco Morazán, central Honduras; La Esperanza in Intibucá and Nueva Ocotepeque in Ocotepeque, western Honduras; and Catcamas, Juticalpa, and Dulce Nombre de Culmí in Olancho, eastern Honduras. Additionally, in the GBIF.org (2019) database there are 30 more records in the country, and the last record of the species was in 2004. Moreover, Mora et al. (2018) reported *A. geoffroyi* as a common species and considered its occurrence in Honduras with no further information of the species. Our records are in accordance with Reid (2009) in which the species roosts in caves but its ecology is still unknown in Honduras.

The records *P. subflavus* and *A. geoffroyi* in PANACAC are the first ones in the protected areas, also are the first ones in the department of Copán in western Honduras. Even though PANACAC might represent an interesting site to study the biodiversity of the highlands of western Honduras, it has been affected by the extension of crops and cattle. Considering the conservation activities mentioned by Solari (2018), a good forest management, including the protection of the core zone of the protected area, could help to keep stable populations by increasing areas for roosting and foraging for *P. subflavus* (and indirectly to the conservation of *A. geoffroyi* because they shared the same roosting site). In Nicaragua, *P. subflavus* is only known from one record and is considered very rare with a restricted distribution, and *A. geoffroyi* is considered a rare species which is known only in highlands (Medina-Fitoria et al., 2015). Another species that shares the same roosting site with both species is *Diphylla ecaudata* and has a conservational interest because Mora et al. (2018) considered it widely distributed in Honduras excluding the western region of Honduras.

As well as in Santa Bárbara (Turcios-Casco et al., 2019), people set fire to caves trying to get rid of the bats because they considered that all of them are “vampiros” (Spanish name to vampire), and

they think that all bat species are hematophagous (these problems are known as human-vampires and are affecting populations of many species in western Honduras). Medina-Fitoria et al. (2017) mentioned that 10.7% of the bat species in Honduras were considered threatened in 2012, and due to the previous reasons, we strongly recommend educational activities (Fig. 7) to avoid such practices not only in PANACAC but in all the country.

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