



First records of *Mimon cozumelae* Goldman, 1914 (Chiroptera, Phyllostomidae) in the Río Plátano Biosphere Reserve in northeastern Honduras

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Abstract

Mimon cozumelae Goldman, 1914 is a poorly studied phyllostomid bat with occurrence records in Honduras dating from 17 years ago. During a survey from 13–22 September 2018 in the core of the Río Plátano Biosphere Reserve, northeastern Honduras, we captured two *M. cozumelae* in a sample of 43 individuals recognized in 11 bat species. These records represent the fifth and sixth localities of *M. cozumelae* in the country and the first record since 2001. We recommend that *M. cozumelae* be included in the conservation and management plan of the Río Plátano Biosphere Reserve and in the conservation lists of bats in Honduras.

Keywords

Bats, Colón, Cozumelan Golden Bat, Phyllostominae, spear-nosed bats.

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Introduction

Mimon is a genus of Phyllostomidae with two recognized species: *M. bennettii* Gray, 1838 and *M. cozumelae* Goldman, 1914 (Hurtado and Pacheco 2014). While *M. bennettii* is endemic to South America, with two apparently disjunct populations (one in Colombia, Venezuela, northern Brazil, and the Guianas, and other in central and eastern Brazil; Hoppe and Ditchfield 2015), *M. cozumelae* is recorded from southern Mexico to northeastern Colombia (Hurtado and Pacheco 2014). Although there

seems to be a consensus that *M. cozumelae* is a valid species (Simmons and Voss 1998; Williams and Genoways 2008; Hurtado and Pacheco 2014), it was previously treated as either a subspecies or a junior synonym of *M. bennettii* (Ortega and Arita 1997) due to some difficulty in separating them morphologically (Gregorin et al. 2008).

Mimon cozumelae is a poorly studied and locally rare member of Phyllostominae (Reid 2009), a subfamily composed by predominantly animalivorous bats

(Giannini and Kalko 2004). In Mexico this species has been recorded in dry forests (Winkelman 1962), but in Central America it is restricted to humid ecosystems on the Caribbean versant (Hurtado et al. 2014). Although categorized as Least Concern by the International Union for the Conservation of Nature (IUCN), in Mexico *M. cozumelae* is listed as threatened [cited as *M. bennettii* by Ceballos (2014)], and the need of further research on its biology has been emphasized (Arroyo-Cabrales et al. 2015). Its diet is known to include scarab beetles, birds (Whitaker and Findley 1980), lizards, katydids (Reid 2009), and fruits of *Citrus* spp. (Lobova et al. 2009). Colonies are composed of approximately 10 individuals, and roosts, mainly in caves, can be shared with other species such as *Carollia perspicillata* Linnaeus, 1758, *Desmodus rotundus* É. Geoffroy, 1810, *Diphylla ecaudata* Spix, 1823, and *Pteronotus mesoamericanus* Smith, 1972 (Ortega and Arita 1997).

Honduras harbors a diverse bat fauna, with at least 111 confirmed species (Medina-Fitoria and Turcios-Casco 2019). *Mimon cozumelae* has been known in the country since the early 1970s (Valdez and LaVal 1971), but only three additional localities have been subsequently found (McCarthy et al. 1993), and the last sampled individual was obtained in 2001 (Dick 2013). Herein, we revise these previous records and provide two new occurrences of *M. cozumelae* in the core of the Río Plátano Biosphere Reserve (RPBR) in northeastern Honduras.

Methods

RPBR is situated in northeastern Honduras, including areas in the departments of Gracias a Dios, Olancho, and Colón (14°57'54"N–16°00'43"N, 085°31'25"W–084°11'32"W). The area of the protected area is 832,339 ha and has three macrozones recognized according to land management: core, buffer, and cultural (Martínez 2014). From 13–22 September 2018, we surveyed bats in the drainage area of the Río Plátano basin (core zone), which is connected to Río Wuarska, Río Blanco, and Río Malo, in the Municipality of Iriona, Departament of Colón (Table 1; Fig. 1). The annual precipitation is 2800 mm, and the average temperature is 23 °C (Escuela Nacional de Ciencias Forestales 2013). According to the Holdridge Life Zone System (1967), the ecosystem is a very humid subtropical forest (Fig. 2), with a predominant vegetation

comprised of platanillos (Heliconiaceae), suitas (Arecaceae), *Ficus* spp. (Moraceae), and *Cecropia peltata* (Urticaceae).

We captured bats with two 12 × 2.5 m mist nets with denier mesh of 35 mm. The mist nets were set at ground level and opened from 17:20 to 01:30 h. Their position at each site was selected based on the surrounding vegetation and topography, and also considered the availability of water bodies and fruiting and flowering plants (Kunz and 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 10 days (Straube and Bianconi 2002). Two individuals of *M. cozumelae* were captured, and one of them was prepared as voucher according to the guidelines of the use of mammals in wildlife research (Sikes et al. 2019). A 100 g spring scale was used to obtain body mass data from these individuals. The following external measurements [for all of them we followed Srinivasulu et al. (2010), except for the tragus length and width for which we followed Dietz and von Helversen (2005)] were recorded to the nearest 0.01 mm with a digital caliper: 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); third metacarpal length (3mt); length of the third phalanx of digit III (3ph); length of the second phalanx of digit III (2ph); and the length of the first phalanx of digit III (1ph). Skull measurements obtained from the voucher according to Giménez and Giannini (2016) included condylobasal length (CBL), zygomatic breadth (ZB), height of braincase (HB), mastoid breadth (MB), maximum external width between left and right upper molars (WUM), maxillary tooththrow length (CM³), rostrum length (LR), palatal length (LP), upper canine length (LUC), upper canine width (CC), height of mandibular body at lower third premolar (HM), lower canine length (LLC), mandible length (LM), mandibular tooththrow (CM₃), and three measurements of the coronoid process (HC1, HC2, HC3). Comparisons and taxonomic identification of *M. cozumelae* were mainly based on Valdez and LaVal (1971), Williams and Genoways (2008), Gregorin et al. (2008), Reid (2009), and Hurtado et al. (2014). We consider *Dermanura* as a distinct genus from *Artibeus* following Van Den Bussche et al. (1993), and we followed

Table 1. New and historical localities of the records of *Mimon cozumelae* in Honduras. These data were used to create an updated distributional map, presented in Figure 1. Geographical coordinates for sites 2 and 3 refer to their respective municipalities, Aguacates and Catacamas.

Site	Department	Locality	Latitude	Longitude	Altitude (m a.s.l.)	Reference
1	Atlántida	Lancetilla	Not given	Not given	41	Valdez and LaVal 1971
2	Colón	Aguacates	15°55'00"N	085°04'00"W	-	McCarthy et al. 1993
3	Olancho	Catacamas	14°53'00"N	085°55'00"W	-	McCarthy et al. 1993
4	Atlántida	Lancetilla	15°27'25"N	087°27'25"W	-	Dick 2013
5	Colón	Wuarska	15°20'24"N	085°15'32"W	418	This study
6	Colón	El Limón	15°22'39"N	085°11'45"W	311	This study

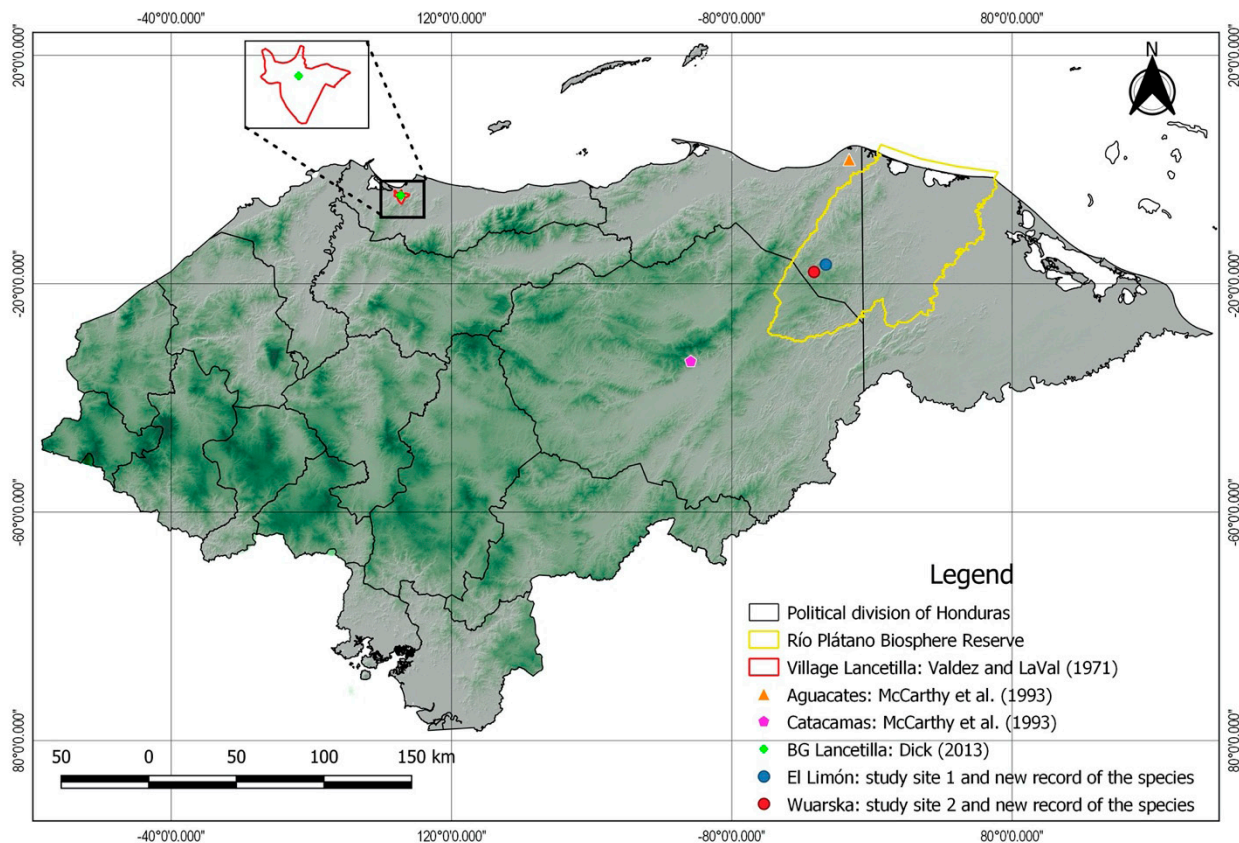


Figure 1. Distribution map of *Mimon cozumelae* in Honduras. Note that the distribution is limited to the northern (Atlántida) and eastern (Olancho and Colón) Honduras. The new records (red and blue circles) are the first for the core of the Río Plátano Biosphere Reserve. In detail, delimited in red, the region of Lancetilla; no further geographic reference is available for the record in Valdez and LaVal (1971). See Table 1 for details of the other records.



Figure 2. Forest with predominance of platanillos (*Heliconiaceae*), in which the first individual of *Mimon cozumelae* was captured in the core zone of the Río Plátano Biosphere Reserve, Wuarska, Colón.

Gardner (2008) for the taxonomy and nomenclature of the other taxa cited here.

A collecting license was provided by the Región Forestal Biosfera del Río Plátano, of the Instituto Nacional de Conservación y Desarrollo Forestal, Áreas Protegidas y Vida Silvestre (ICF), of which MM and MATC are representatives. All vouchers prepared in our survey were deposited in the collection of the Museum Biodiversidad

y Ciencia in the Universidad Nacional Autónoma de Honduras located in the Sula Valley (UNAH-VS), in the Department of Cortés.

Results

In 4860 m²·h we captured 43 individuals (0.008 individuals per m²·h) of 11 species (0.002 species per m²·h) from Phyllostomidae (88.4 % of the captures) and Mormoopidae (11.6% of the captures). In Wuarska we captured 27 individuals of the following species (relative abundance in parentheses): *Pteronotus mesoamericanus* (0.15), *Phyllostomus discolor* Wagner, 1843 (0.11), *Mimon cozumelae* (0.03), *Carollia perspicillata* (0.22), *Carollia castanea* H. Allen, 1890 (0.04), *Dermanura phaeotis* Miller, 1902 (0.03), *Sturnira parvidens* É. Geoffroy, 1810 (0.07), *Centurio senex* Gray, 1842 (0.03), *Desmodus rotundus* (0.26), and *Diphylla ecaudata* (0.03). The list of El Limón included 16 individuals of the following species: *P. mesoamericanus* (0.06), *M. cozumelae* (0.06), *C. perspicillata* (0.56), *Carollia sowelli* Baker, Solari & Hoffmann, 2002 (0.06), *C. castanea* (0.06), and *D. phaeotis* (0.19).

Mimon cozumelae Goldman, 1914

Material examined. HONDURAS, Colón • Río Plátano Biosphere Reserve, Wuarska; 15°20'24"N, 085°15'32"W; 420 m elev.; 16 Sept. 2018; Hefer Daniel Ávila-Palma,



Figure 3. Live photograph of the adult male *Mimon cozumelae* (UVS-V-02059) collected at Wuarska, Colón.

Danny Ordoñez, Marcio Martínez leg., 1 adult male, UVS-V-02059 (Fig. 3) • Río Plátano Biosphere Reserve, El Limón; 15°22'39"N, 085°11'45"W; 310 m elev.; 18 Sept. 2018; Hefer Daniel Ávila-Palma, Danny Ordoñez, Marcio Martínez leg.; 1 adult male.

Both individuals were captured between 18:25 and 18:40 h, while the moon phase was first quarter with illumination between 42.9 and 62.1% of moonlight. There was drizzling rain when these bats were captured. Neither individual presented evidence of reproductive activity. We recorded ectoparasites only on the individual from El Limón, which was captured in an area within the very humid subtropical forest in which platanillos (*Heliconia* sp.; Fig. 2) were abundant. The specimen from Wuarska was captured in a ravine emerging from a cave (approximately 15 m above) surrounded by forest and ending in the Río Plátano. This specimen vocalized while it was being taken out from the mist net and attracted other bats (some individuals of *C. perspicillata* were caught during these calls). These distress calls are emitted by bats under the physical stress of being caught by a predator and, similarly, when constrained in a trap or by an experimenter, and the attraction of other bats may help to escape by distracting or frightening the predator (Russ et al. 2004; Eckenweber and Knörnschild 2016).

Identification. Both individuals have spatulated upper inner incisors (pointed in *M. bennettii*), dark brown dorsal pelage (brown-reddish in *M. bennettii*), and white

wingtips (dark in *M. bennettii*). The collected specimen presented a narrow talonid on the third lower molar (larger in *M. bennettii*), V-shaped posterior edge of the palate (U-shaped in *M. bennettii*), mandible length longer than 16.7 mm (shorter than 16.7 mm in *M. bennettii*), and second lower premolar (p4) enlarged with a posterior cingulum (reduced posterior cingulum in *M. bennettii*) (Simmons and Voss 1998; but see Gregorin et al. 2008).

External measurements (in mm) are as follows (for UVS-V-02059 and the released individual, respectively): FA = 54.46, 55.75; Tib = 23.06, 23.30; E = 29.40, 29.48; EW = 16.30, 17.90; Th = 5.25, 6.45; LN = 19.71, 20.05; Tr = 9.25, 10.03; TrW = 3.21, 3.21; Ca = 18.11, 18.13; T = 16.52, 18.05; BH = 64.25, 69.22; HF = 12.95, 13.3; 3mt = 46.09, 46.31; 3ph = 16.32, 16.55; 2ph = 25.86, 26.33; 1ph = 18.35, 20.07; body mass = 23.0, 23.0 g. For the skull of the specimen UVS-V-02059, we obtained the following data: CBL = 25.91; ZB = 13.24; HB = 8.32; MB = 10.92; WUM = 9.75; CM³ = 7.27; LR = 5.39; LP = 10.34; LUC = 3.86; CC = 7.34; HM = 2.22; LLC = 4.25; LM = 17.43; CM₃ = 9.81; HC1 = 7.02; HC2 = 6.27; HC3 = 6.74.

Discussion

Valdez and LaVal (1971) provided the first record of *M. cozumelae* for Honduras based on three specimens (two males and one female) collected in Lancetilla, northern region of the country (Fig. 1). Mensural data reported

by these authors [FA (55.6, 56.4 mm), third metacarpal (47.8, 48.5 mm), and body mass (21.5, 22.9 g)], the only ones available for Honduran specimens, are slightly lower to those we present here. McCarthy et al. (1993) mentioned two more localities for *M. cozumelae*, both in northeastern Honduras: Aguacates, Colón, where two specimens were collected, and Catacamas, Olancho, where four specimens were obtained. Subsequently, Dick (2013) mentioned records of bat flies in individuals captured in 2001. These individuals represent the most recent captures of *M. cozumelae* in Honduras, and the reported locality (Lancetilla) maybe the same cited by Valdez and LaVal (1971) for the first specimens available for the country. There are two more citations of *M. cozumelae* for Honduras (Rodríguez Herrera and Sánchez 2015; Mora et al. 2018), but no reference to capture records or voucher specimens were reported.

The new records of *M. cozumelae* at two sites in Colón represent, therefore, the fifth and sixth localities of this species in Honduras, and the first record since 2001. They also represent a range extension of 60 km from the nearest record in Aguacates, Colón, and 90 km from the records mentioned by McCarthy et al. (1993) in Catacamas, Olancho. Additionally, the records reported herein are the first ones in the core of the RPBR, which is the largest and most important protected area in Honduras—it is part of the Mesoamerican Biological Corridor and part of our worldwide heritage (Medina-Fitoria and Turcios-Casco 2019). Areas embraced by this conservation unit have been sampled since the mid 1900s (e.g. Goodwin 1942; Benschhoof et al. 1984), but no record of *M. cozumelae* was obtained until 1971. Recently, Medina-Fitoria and Turcios-Casco (2019) surveyed bats in Ciudad Blanca, La Mosquitia, also in the core of the RPBR, and found that 16.6% of the 30 species recorded are indicators of well-conserved areas. In Nicaragua, where it is also a rare species, known only by a single record obtained in 2013 from the Indio Maíz Biological Reserve in the southeastern part of the country (Medina-Fitoria 2014; Medina-Fitoria et al. 2015).

Currently, 11 bat species are recognized as threatened in Honduras, including eight phyllostomids (Hernández 2015). Deforestation is a major threat to these species and is mainly associated with extensive cattle raising (Hernández 2015, Turcios-Casco et al. 2019). In La Mosquitia region (including the RPBR), for example, illegal cattle ranching is responsible for more than 90% of the forest degradation (Larsen 2019). About 10 years ago in Wuarska, there was intense deforestation by non-native people, but in this case, they were growing their crops, in addition to raising livestock. Considering the rarity of *M. cozumelae* in Honduras and its association with primary forests, as recorded in Guatemala (Kraker-Castañeda et al. 2016), we suggest the inclusion of this species in the conservation and management plan of the RPBR and a reevaluation of its conservation status at the national level. In Costa Rica, *M. cozumelae* is also known from

only of a few records and is treated as a threatened species (Rodríguez Herrera et al. 2015).

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Authors' Contributions

HDAP and MATC conducted ecological and morphological analysis; MM conceived and coordinated the survey of the record; DO and DIOM made the distribution map. All the authors were involved in the writing, edition, and improvement the manuscript.

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