



# Bat Predation by a Cuban Treefrog (*Osteopilus septentrionalis*, Hylidae) and a Summary of Bat Predation by West Indian Amphibians and Reptiles

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The West Indian treefrog genus *Osteopilus* comprises eight species native to some Bahamian islands, Cuba, Jamaica, and Hispaniola (Meshaka 2001; Henderson and Powell 2009). These frogs are opportunistic predators, consuming a high diversity of invertebrates and smaller vertebrates (Henderson and Powell 2009; Kaiser et al. 2016). The Cuban Treefrog (*Osteopilus septentrionalis* Duméril and Bibron 1841; Fig. 1) is native to the Bahamas, the Cuban Archipelago, and the Cayman Islands, but has been widely introduced to several Lesser Antillean islands, Puerto Rico, Hawaii, and mainland Florida (Henderson and Breuil 2012; Frost 2015), where it has become an invasive species (Meshaka 2001). In Cuba, this species is widely distributed and occupies a wide range of habitats (Díaz and Cádiz 2008; Rivalta et al. 2014). Its diet comprises a variety of invertebrates, including insects, arachnids, crustaceans, and gastropods, but it also is known to consume conspecifics, other species of frogs, and lizards (Meshaka 1996; Henderson and Powell 2009; Armas 2014; Kaiser et al. 2016).

Compared to non-volant mammals of similar size, bats face few predators (Altringham 1996; Lima and O’Keefe 2013). Furthermore, predation on bats by amphibians is rare and infrequently documented in the literature (Mikula 2015). Herein, we report an event of bat predation by a Cuban Treefrog.

In January 2016, we observed a large adult female Cuban Treefrog (nearly 130 mm SVL) eating a bat at dusk in a house at “Reperto Universitario” (22°26’00.05”N, -79°54’28.00”W; reference datum: WGS84), Santa Clara, Villa Clara Province, in central Cuba. The frog was on a concrete floor swallowing a bat headfirst (Fig. 2A); induced regurgitation (Fig. 2B) revealed an adult male Pallas’s Mastiff Bat (*Molossus molossus*, Molossidae; 12 g body mass). The lack of *rigor mortis* suggested that the bat probably was alive when captured by the frog.

Pallas’s Mastiff Bats (Fig. 3), like most molossids, have narrow wings and a high wing load (Norberg and Rayner 1987), limiting their capacity to lift off from the ground,



**Fig. 1.** Adult female Cuban Treefrog (*Osteopilus septentrionalis*). Photograph © C.A. Mancina.

which increases their vulnerability to predation by frogs (or other opportunistic predators such as cats) when on the ground (or floor). Both *O. septentrionalis* and *M. molossus*

occur throughout Cuba and frequently use buildings as foraging sites and diurnal retreats (Silva 1979; Díaz and Cádiz 2008). The fact that both are most frequently encountered



**Fig. 2.** Adult female Cuban Treefrog (*Osteopilus septentrionalis*; Hylidae) eating a Pallas’s Mastiff Bat (*Molossus Molossus*; Molossidae). Photographs © Leticia Mas Castellanos.

**Table 1.** Amphibians and reptiles reported as bat predators in the West Indies. References marked with an asterisk (\*) were not examined but were cited in Henderson and Powell (2009).

Predator	Bat species	Island	Sources
AMPHIBIA: ANURA			
<i>Leptodactylus fallax</i> (Leptodactylidae)	Unidentified	Dominica	Lescure (1979)*
<i>Lithobates catesbeianus</i> (Ranidae)	Unidentified (bones in stomach)	Cuba	Vogel (1965)*
<i>Osteopilus septentrionalis</i> (Hylidae)	<i>Eptesicus fuscus</i>	Cuba	Silva (1979)
	<i>Molossus molossus</i>	Cuba	This paper
REPTILIA: SQUAMATA			
<i>Gekko gekko</i> (Gekkonidae)	<i>Molossus molossus</i> , <i>Tadarida brasiliensis</i>	Martinique	Breuil (2009)*
<i>Boa orophias</i> (Boidae)	<i>Brachyphylla cavernarum</i>	Saint Lucia	Arendt and Anthony (1986)
<i>Boa nebulosa</i> (Boidae)	<i>Brachyphylla cavernarum</i>	Dominica	Angin (2014)
<i>Chilabothrus angulifer</i> (Boidae)	<i>Brachyphylla nana</i> , <i>Mormoops blainvillei</i> , <i>Phyllonycteris poeyi</i> , <i>Erophylla sezekorni</i> , unidentified species	Cuba	Hardy (1957b), Sheplan and Schwartz (1974) Mancina (2011), Rodríguez-Cabrera et al. (2015)
<i>Chilabothrus inornatus</i> (Boidae)	<i>Brachyphylla cavernarum</i> , <i>Erophylla sezekorni</i> , <i>Monophyllus redmani</i> , <i>Pteronotus quadridens</i> , <i>Mormoops blainvillei</i>	Puerto Rico	Rodríguez and Reagan (1984), Rodríguez-Durán (1996), Wiley (2003), Puente-Rolón and Bird-Picó (2004), Puente-Rolón (2012)
<i>Chilabothrus subflavus</i> (Boidae)	<i>Artibeus jamaicensis</i> , unidentified species	Jamaica	Prior and Gibson (1997), Koenig and Schwartz (2003), Dávalos and Eriksson (2004)
<i>Cubophis cantherigerus</i> (Dipsadidae)	<i>Phyllonycteris poeyi</i> , unidentified species	Cuba	Hardy (1957a), Henderson and Sajdak (1996)
<i>Bothrops lanceolatus</i> (Viperidae)	Unidentified	Martinique	Pinchon (1967)*



**Fig. 3.** Flying Pallas's Mastiff Bats (*Molossus molossus*; left) and a cluster of individuals roosting in a building crevice (right). Photographs © C.A. Mancina.

in urban environments suggests that similar events may be relatively frequent although rarely observed and documented.

In a recent review paper, Mikula (2015) compiled 37 cases of bat predation by amphibians, listing 14 frog species preying on bats and 16 bat species as prey. Mikula (2015) did not include any frogs in the genus *Osteopilus*, although Silva (1979) identified a Big Brown Bat (*Eptesicus fuscus*, Vespertilionidae) taken from the stomach of an *O. septentrionalis* found in a toilet at a tourist village in central Cuba. Also in Cuba, Vogel (1965) recorded the presence of bones of an unidentified bat in the stomach of an invasive American Bullfrog (*Lithobates catesbeianus*, Ranidae).

The most common predators of bats in the Antillean islands are nocturnal avian raptors (e.g., Hernández and Mancina 2013) and falconids (e.g., Rodríguez-Durán and Lewis 1985); however, at least 11 species of amphibians and reptiles are known to prey on bats (Table 1). With the exception of some boids of the genus *Chilabothrus* that regularly feed on bats (e.g., Rodríguez-Cabrera et al. 2015), these are best considered opportunistic bat predators. In the Greater Antilles, caves with high aggregations of bats are abundant, and bats there are potentially vulnerable to predators, particularly during emergence. Eastern Giant Toads (*Peltophryne peltocéphala*) have been observed at Cayo Caguanes, in north-central Cuba, posted at dusk near the openings of caves that shelter large colonies of Gervais's Funnel-eared Bats (*Nyctiellus lepidus*, Natalidae; 2.5 g body mass), apparently waiting for emerging bats, although predation has not been confirmed (H. Vela, pers. comm.). Richards and Hall (2012) observed similar behavior in Australian caves by the invasive Cane Toad (*Rhinella marina*), a species widely introduced in the West Indies (albeit not in Cuba; Powell et al. 2011).

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