

Hunting the unexpected: Harris's Hawks (*Parabuteo unicinctus*) preying on bats in a Neotropical megacity

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ABSTRACT: Many wildlife species have modified their behaviors in order to thrive within cities. Since the 1980's, Harris's Hawk has become a regular resident species in Mexico City, Mexico. Here, we report on what may be an urban adaptation – two Harris's Hawks hunting bats in urban, southern Mexico City. This represents the first formal record of Harris's Hawk preying on bats, either within anthropogenic or natural ecosystems. Cities might facilitate access to novel food resources for particular sorts of species, including urban adaptable ones such as the Harris's Hawk.

KEY-WORDS: Accipitridae, diet, falconry, hunting, Mexico City, raptor, urbanization.

Urban development affects original ecosystems worldwide by altering all levels of biological organization, from ecosystemic to individual ones (Blair 2004, Grimm *et al.* 2008). As a result of the stress and hazards imposed by urbanization, many animals have modified their behavior in order to thrive within urban ecosystems (Ditchkoff *et al.* 2006). Birds are often the focus of urban ecology studies (McKinney 2008), and raptors are a particularly well-studied group (Chace & Walsh 2006). Most raptor studies analyzed the variation of their abundances across urban gradients (Palomino & Carrascal 2007). Other studies determined urban habitat use (*e.g.*, breeding, foraging), the effects of urban development on the size of their home ranges (Chace & Walsh 2006), and the impacts of urban hazards on raptor populations (Dwyer & Mannan 2007). However, little research has been devoted to evaluate the influence of urbanization on raptor behavior.

The Harris's Hawk (*Parabuteo unicinctus*) is a charismatic raptor, mainly because of its unique social hunting strategy and its habitual use in falconry (Bednarz 1988, Dwyer & Bednarz 2011). The response of this hawk to urban development is widely variable throughout its distribution in the Americas (Dwyer & Bednarz 2011). For example, in the U.S., Harris's Hawks initially experienced declines in some areas due to habitat degradation/loss from urbanization, but later some individuals adapted to the altered, urban habitat and are thriving in some urban areas (*e.g.*, Phoenix and Tucson,

Arizona; Dawson 1998). In other areas of the continent, urbanization has created new conditions that offer novel resources to the species, resulting in the colonization of urban areas by this hawk (Dwyer & Bednarz 2011). Since the 1980's, Harris's Hawk has become a regular resident species in Mexico City (Gómez de Silva *et al.* 2005), one of the largest metropolitan areas in the world. Originally, this species was not present in the region, however, it is now established in the city as a result of escapes from captivity (Gómez de Silva *et al.* 2005), as it is a common species used in falconry throughout the country. Today, this raptor can be observed in urban parks of Mexico City, where it breeds and hunts mainly for Rock Pigeons (*Columba livia*), rats (*Rattus norvegicus*) and squirrels (*Sciurus aureogaster*; Gómez de Silva *et al.* 2005). A similar, urban phenomenon has been reported for Lima, Peru, where Harris's Hawks are now established (including escaped captives) and are preying primarily on Pacific Doves (*Zenaida meloda*; Beingolea 2010).

The natural history of the Harris's Hawk, including its food habits, is relatively well known. This raptor has a quite flexible diet. It hunts mainly for medium-sized mammals (*i.e.*, hares, rabbits); to a lesser extent, it also preys on small mammals (*i.e.*, rodents), birds (*e.g.*, herons, egrets, ducks, roadrunners, chachalacas, tinamous, gallinules, doves, quail, small passerines), snakes, frogs, and occasionally on insects, arthropods, and arachnids (Bednarz 1988, Jiménez & Jaksic 1993, Figueroa & González-Acuña 2006, Pache 1974, Pavez

et al. 2010, Dwyer & Bednarz 2011, Salvador 2012). Nevertheless, there are no published reports about this raptor preying on bats, neither in natural ecosystems nor in anthropogenic ones (reviewed in Coulson & Coulson 2012).

From December 2012 to March 2013, we recorded, on four evenings, a pair of Harris's Hawks hunting bats outside a supermarket located in urban, southern Mexico City, Mexico. This region of the city is highly residential-commercial and it is close (~3km) to major green areas, such as Xochimilco. We observed hawks from a distance of 90m with the aid of 10x42mm binoculars. Our observations were occasional and varied in relation to their duration, ranging from 10 to 25 minutes, between 18:30 and 19:40 hrs. We could not identify hawks' age classes or sexes. For three evenings, hawks arrived together to the site; however, only one of them appeared for the last day of observation. The hawks always showed up at the scene during early sunset (~18:45 hrs) and perched on antennas located on the roof of the supermarket, above (~1m) the bats' roost. From this strategic site, the hawks waited until dusk (~19:10-19:25 hrs), when a few number of bats (~18 individuals/minute) appeared from their roost in a scattered pattern. By using alternatively their both feet, the two hawks stroke bats through a series of short flights, making more than one attempt after a particular bat. If bats flew off, the hawk returned back to the antenna to perch and waited for another bat. Hunting behavior of each hawk was completely independent of the other. As a consequence of the bats' erratic movements, the hawks repeatedly missed in their attempts to catch these mammals, thus, we only witnessed two captures that occurred on different evenings. Immediately after capturing a bat, a hawk flew out of sight with the prey clutched in one foot, followed by the other hawk. We did not determine if both captures were performed by the same hawk. Because of the casual nature of our observations, we did not estimate a capture rate for the recorded individuals. Moreover, we were not able to identify the bats to species. Bat species recorded for this area include *Eptesicus fuscus*, *Myotis sp.*, *Eumops perotis*, *Nyctinomops macrotis*, and *Tadarida brasiliensis* (Ávila-Flores & Fenton 2005).

Although preying on nocturnal bats is not uncommon among certain species of diurnal raptors (e.g., accipiters, hawk-eagles, falcons; Baker 1962, Fenton & Fleming 1976, Speakman 1991), this represents the first formal record of Harris's Hawk hunting and capturing bats. Moreover, the hunting hour is remarkable, as this diurnal raptor usually forages under suitable light conditions. We find the behavior intriguing, as hawks might be expected to hunt for their usual, abundant urban prey (i.e., Rock Pigeon).

Three main factors related to characteristics of the species, energetic costs, and urban habitat properties,

could have facilitated the unusual behavior. First, although it prefers medium-sized mammals, this hawk's diet is flexible, enabling it to forage for unusual/novel food resources (Dwyer & Bednarz 2011, Coulson & Coulson 2012). It is also capable of exhibiting considerable flight maneuverability when necessary (e.g., catching small birds; Dwyer & Bednarz 2011), which may also be useful when preying on bats (Baker 1962, Fenton & Fleming 1976). Second, short flights needed for catching bats could be energetically more efficient than capturing fast-flying doves. Finally, artificial, urban light might compensate for low-light conditions at sunset, enhancing this diurnal hawk's vision and facilitating the hunting process on crepuscular and nocturnal prey (i.e., bats). Further studies might elucidate on the role of each of these factors on the reported behavior.

Cities might facilitate the access to novel food resources for particular sorts of species, including urban adaptable ones such as the Harris's Hawk. We believe that urban ethology might benefit from increasing the study of urban wildlife, as the complex effects that urbanization has on ecosystems might detonate unique behaviors, even in well-known species.

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