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Roadside hawk (*Rupornis magnirostris*) hit by an oncoming vehicle while capturing a striped snake (*Lygophis anomalus*)

Myšiak zobatý (*Rupornis magnirostris*) zasiahnutý protiidúcim vozidlom pri love *Lygophis anomalus*

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Abstract: One of the most apparent origins of biodiversity loss caused by humans is infrastructural development of roads. Yet they offer certain benefits for some animals, such as hunting opportunities with lower energy costs and consumption of carrion earlier hit by vehicles. Raptors find roads a particularly favorable environment, perching on poles or overhead cables and waiting to attack their prey as it crosses a road. This paper describes the first ever recorded predation by a roadside hawk (*Rupornis magnirostris*) of a striped snake (*Lygophis anomalus*) supportable by material evidence, when both the raptor and the snake were hit by a vehicle immediately after the snake was caught. The study contributes to knowledge about the roadside hawk's diet and illuminates the problem these human infrastructures pose for animals. Future research on roads birds of prey use as hunting sites could contribute toward improvements in conservation programs for birds of prey species.

Abstrakt: Jednou zo zjavných príčin straty biodiverzity spôsobenej ľuďmi je rozvoj cestnej infraštruktúry. Niektorým druhom zvierat však ponúka výhody, ako sú energeticky menej náročný lov či konzumácia uhynutých živočíchov zasiahnutých vozidlami. Dravce vyhľadávajú cesty ako mimoriadne vhodné prostredie. Sedia na stĺpoch či vedeniach, kde vyčkávajú aby zaútočili na korisť križujúcu cestu. Tento článok popisuje vôbec prvú zaznamenanú predáciu hada (*Lygophis anomalus*) myšiakom zobatým (*Rupornis magnirostris*) keď dravca aj korisť zrazilo vozidlo bezprostredne po útoku. Štúdia prispieva k poznatkom o potrave myšiaka zobatého a zvýrazňuje problémovosť cestnej infraštruktúry pre zvieratá. Ďalší výskum dravých vtákov využívajúcich cesty ako lovné plochy by mohol prispieť k zlepšeniu programov ochrany týchto druhov.

Key words: human-wildlife conflict, roadkill, diet, conservation,accipitridae, dipsadidae

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Road networks are attractive locations for a variety of wildlife and, in some cases, present apparent benefits, which have a substantial impact on the species that take advantage of roads for obtaining food (Meunier et al. 2000; St. Clair et al. 2019). For example, they can serve as foraging habitats for predators and allow especially raptors and owls a place to perch while they are scouting for prey (Morelli et al. 2014). The availability of perches and a high abundance of small vertebrates (Dean & Milton 2003) make roads important wildlife corridors (Bennett 1990). The roadsides may be major foraging sites for small animal predators, with raptors and scavengers likely to forage at these sites, too (Dean & Milton 2003). However, mortality caused by vehicles is among the most commonly reported effects of roads on wildlife, and traffic speed appears to be related to bird mortality

(e.g., Meunier et al. 2000; Benítez-López et al. 2010). Several studies have reported the presence of raptors near roads that had been hit by vehicles while searching for animal carrion (Lambertucci et al. 2009) or actively hunting for prey (Dean & Milton 2003). Nonetheless, the majority of studies on the mortality of birds of prey on roads have focused on the Strigidae family, probably because owls have been the birds most found as roadkill (Anderson 2006; Arnold et al. 2019; Boves & Belthoff 2012; Guinard et al. 2012; Illner 1992). There have also been studies where barn owls (*Tyto alba*) and spotted eagle-owls (*Bubo africanus*) (Arnold et al. 2019; Bullock et al. 2011; Dean & Milton 2003) were the birds most commonly killed on roads. It is also well evident that many vehicle-killed raptors had been feeding on either live prey captured on a road or on carrion found there because of the high concentration of invertebrates, small vertebrates and/or road-killed carcasses noticeable on or near them (Bullock et al. 2011; Cuyckens et al. 2016; Dean & Milton 2003; Donázar et al. 1993; Eakle 1994; Ellis et al. 1990; Knight & Kawashima 1993; Marin & Schmitt 1996; Thompson et al. 2013; Travaini et al. 1995; Visagie & Anderson 2006). For instance, the southern pale chanting goshawk (*Melierax canorus*) is the most frequently observed raptor killed on roads in Southern Africa (Oschadleus & Harebottle 2002).

The roadside hawk (*Rupornis magnirostris*) is a common, medium-sized species widespread in the Neotropical region (Baladrón et al. 2016), which ranges from northern Mexico to the Río Negro valley in central Argentina (Thiollay 1994). It inhabits open fields, forests, and urbanized areas (dos Santos & Rosado 2009). The species is closely associated with agroecosystems and natural grasslands (Mazar-Barnett & Pearman 2001).

This raptor is opportunistic (Panasci & Whitacre 2000), preferring easy-to-capture prey like the young of other birds (dos Santos & Rosado 2009). They also take advantage of special opportunities, such as hunting insects escaping from army-ant swarms, capturing frogs immediately after rain, and prey fleeing from fires (Panasci and Whitacre 2000). In addition, the roadside hawk is a passive-seeking predator (Baladrón et al. 2016) that employs a sit-and-wait strategy. Its hunting behaviour consists of perching on branches, utility poles, and overhead electric cables; waiting, and springing onto its prey (Panasci & Whitacre 2000; dos Santos and Rosado 2009).

The geographical distribution of the striped snake (*Lygophis anomalus*) is restricted to the Pampean grasslands of Uruguay, southern Brazil, and east-central Argentina (Panzera et al. 2017; Williams et al. 2021). There are few confirmed cases of predation of snakes by birds of prey (e.g., Martins et al. 2003; DuVal et al. 2006; Costa et al. 2009, 2014; Medrano-Vizcaíno 2019; Sawaya et al. 2003; Travaglia-Cardoso & Almeida-Santos 2012), which include studies of roadside hawks hunting the two-headed sipo snake *Chironius bicarinatus* (Zocche et al. 2018) and snakes of the genera *Apostolepis*, *Philodryas*, *Erythrolamprus* and *Rhachidelus* (de Souza et al. 2022). Although there are equivocal reports of roadside hawk preying on striped snakes (Salvador et al. 2017) and other unidentified snakes (de la Peña 2011), this paper provides the first documented case of a roadside hawk preying upon a striped snake that is supportable by material evidence.

Both the roadside hawk and the striped snake were most likely hit together by a vehicle just after the snake had been captured by the hawk. This event was observed in central Argentina at a peri-urban patch of National Highway 168 (31°43'S, 60°28'W, Elevation 77 m) in the city of Paraná, Entre Ríos Province. The area is in the Argentine Espinal bioregion (Cabrera 1976), more recently described as a subtropical riparian forest (Oyarzabal et al. 2018) which is mostly devoted to agricultural production. Various species of grasses can be found between these fields and the road, as well as trees and utility poles supporting power lines (Fig. 1).

Fig. 1. Landscape next to National Highway 168 where the striped snake was caught by the roadside hawk and both animals were then hit.

Obr. 1. Krajina vedľa štátnej cesty 168, kde myšiak zobatý (*Rupornis magnirostris*) ulovil hada *Lygophis anomalus* a obe zvieratá následne zrazilo vozidlo.

The specimens were found dead on the side of the paved road in October 2010, and both were collected and deposited at the Herpetological Collection curated by the Museo de la Plata (Collection number MLP.R.7000).

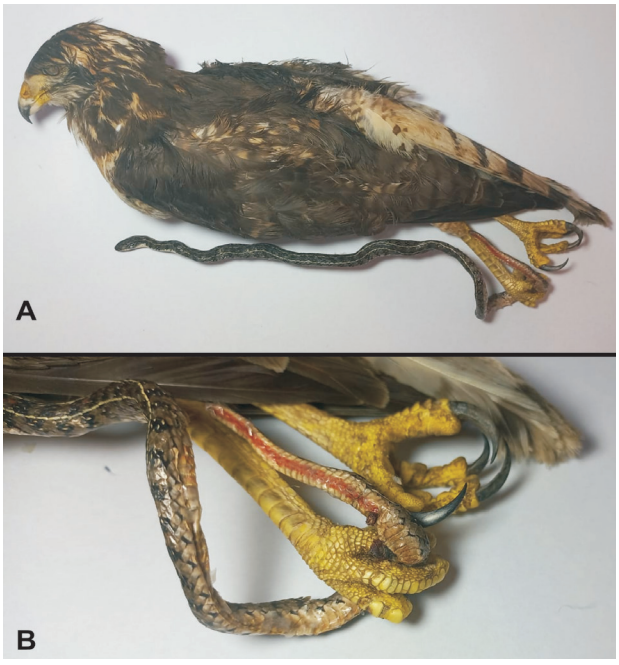

Fig. 2 A - Roadside hawk (*Rupornis magnirostris*) collected at the side of the road with a male striped snake (*Lygophis anomalus*). B - Close-up of the roadside hawk's left talon grasping the striped snake.
Obr. 2. Myšiak zobatý (*Rupornis magnirostris*) spolu so samcom *Lygophis anomalus*. B – Detailný záber na ľavý pazúr myšiaka zobatého, s uloveným *Lygophis anomalus*.

The raptor's left talon had held the snake by the caudal part of its body (Fig. 2a), with a lateroventral puncture wound appearing on the snake's right side that the roadside hawk's hallux claw had made. An evisceration was present approximately three centimeters cranially from cloaca and the hemipenes were everted (Fig. 2b). Neither animal had been stepped upon, which infers that the evisceration occurred from the force exerted by the claws squeezing hard on the snake (Fig. 2b). Of course, the eversion of the hemipenes could have been caused by the force of impact delivered by the vehicle, too.

Though observations of these events are scarce (Zocche et al. 2018), they provide meaningful knowledge about the diet of birds of prey worldwide and particularly in regions with scarce information about trophic ecology, such as among the Neotropical birds of prey group (del Hoyo et al. 1994; Bierregaard 1998; Bó et al. 2007). Finally, there has been great effort expended in recent years to conserve raptor and owl species as the pest control abilities of these predators and scavengers become recognized (Donázar et al. 2016). In this sense, the rapid increase in human infrastructure generates the need for increased knowledge about how these birds utilize roads as hunting sites, which would contribute to the development of conservation programs. Studying this topic further would enable the planning stages of future road development to be appropriately defined to generate the least possible impact on wildlife (Bennett 2017).

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