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Cover Photograph: Ferruginous Pygmy-Owl (*Glaucidium brasilianum*) hunting in a vacant lot of Xalapa, Mexico. Photographs © Dulce A. Paz and Rubén Ortega-Álvarez.

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The Ferruginous Pygmy-Owl: Hunting Observations from a Neotropical City

Rubén Ortega-Álvarez[1*] and Dulce A. Paz[2]

Abstract - *Glaucidium brasilianum* Gmelin (Ferruginous Pygmy-Owl) has received little attention in neotropical settings. We provide foraging observations of an individual of this species in a vacant lot in Xalapa, Mexico. For one afternoon and one morning, we recorded 20 hunting attempts for a total of two hours, all of which were successful. Prey included Jerusalem crickets, stick insects, grasshoppers, moths, caterpillars, earthworms, millipedes, and spiders. The raptor used vegetation and urban infrastructure to stalk prey. *Quiscalus mexicanus* Gmelin (Great-tailed Grackle) harassed the owl and may limit its hunting success in urban areas. Data on the natural history of the Ferruginous Pygmy-Owl in urban areas is relevant to both understanding the conditions that enable its survival and identifying factors that may threaten its populations.

Introduction. *Glaucidium brasilianum* Gmelin (Ferruginous Pygmy-Owl) is a widespread raptor that uses a great variety of habitats across the American continent, including cities (Proudfoot et al. 2020). It is not a rare species in most of its range (Enríquez 2015). However, like other owl species, it has received little attention as an urban raptor (Borsellino and García Arena 2021). Some isolated records from a few countries of the region (i.e., Argentina, Brazil, Mexico) have demonstrated its ability to forage and breed within urban areas (Borsellino and García Arena 2021, Castro et al. 2010, Sánchez-Soto 2020, 2021). Yet more information about the Ferruginous Pygmy-Owl is needed to comprehend the ecological factors that facilitate its persistence within cities, given that increased levels of development could negatively impact its populations (Johnson et al. 2004). Here we describe foraging observations of the Ferruginous Pygmy-Owl in Xalapa, Mexico. Specifically, we document a series of hunting events, foraging behaviors, interspecific interactions, and prey items for the species. We speculate that vacant lots might prove vital for urban survival of this bird, increasing the need to perform research in such sites.

Field Notes on the Ferruginous Pygmy-Owl. Our observations took place in the city of Xalapa, Veracruz, eastern Mexico (19°31.501'N, 96°56.438'W). The urban area has an extent of ~47.8 mi^2 with a population of ~490,000 inhabitants (INEGI 2020). Cloud forests once covered the area. The city has numerous green areas that cover 37.2% of its surface (Falfán et al. 2018), which includes vacant lots that provide important habitats for urban wildlife. During February 2022, we performed ad libitum observations of the birds that used a vacant lot situated in the southwestern region of Xalapa (19°31.690'N, 96°56.312'W). Observations were made with 8x42 binoculars. The lot is ~0.44 acres, mainly surrounded by houses and streets, and is adjacent to El Haya Park (34.5 acres). Vegetation in the lot is abundant: about 60% of the lot is shaded by tall trees (32–49 ft), 20% has shrubs, and 60% is covered with herbaceous vegetation. The understory is erratically managed by the owners, who remove most of the herbaceous cover

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twice a year. No impervious surfaces are present within the site, so there is a lot of bare soil and dead leaves below the tree canopy (20% of the area). Entrance to the vacant lot is restricted; only a couple of dogs and cats occasionally roam within its boundaries. These conditions support the presence of birds inside the lot; 77 species have been recorded.

We observed a Ferruginous Pygmy-Owl among the avifauna that fed inside the vacant lot. We detected the raptor three out of thirteen days of continuous bird surveys on the site. We noticed the owl for the first time during the late afternoon of 14 February, and we documented its behavior for an entire hour before sunset. We got as close as 23 ft to the bird because it did not respond to our presence and focused its attention on searching for prey. The Ferruginous Pygmy-Owl used two different tree branches as hunting perches, which were ~5.5 ft and ~6.5 ft above the ground. Tree cover was limited and herbaceous cover was abundant around these perches. During this hour, we recorded fourteen hunting attempts, all of which were successful. Prey items included Jerusalem crickets (*Stenopelmatus* sp.), stick insects (Phasmatidae), grasshoppers (Acrididea), moths (Lepidoptera), caterpillars (Lepidoptera), spiders (Araneae), millipedes (Chilognatha), and earthworms (Lumbricidae) (Table 1). Each prey item was captured on the ground, but taken to and ingested on the hunting perch.

Foraging behavior proceeded as follows: the Ferruginous Pygmy-Owl perched motionless on the hunting perch. It held its head completely still and did not move it as described for other owl species (Payne 1971). The owl always focused its attention on the ground below the perch. With a sudden move, it dove to capture prey on the ground with its talons. After capturing the invertebrates, the owl did not immediately leave the ground, but scanned the surroundings for a couple of seconds, then returned to the perch to swallow the prey. Once the food was ingested, the Ferruginous Pygmy-Owl resumed hunting.

During the entire hour of observation, the owl concentrated on hunting and did not exhibit preening behaviors, even if its beak was covered with soil. Other bird species present in the lot included *Psarocolius montezuma* Lesson (Montezuma Oropendola), *Turdus grayi* Bonaparte (Clay-colored Thrush), *Empidonax occidentalis* Nelson (Cordilleran Flycatcher), and *Saucerottia cyanocephala* Lesson (Azure-crowned Hummingbird). Only the hummingbird annoyed the raptor. Once the sun went down, the Ferruginous Pygmy-Owl perched in a different tree and stopped hunting.

The following day, 15 February, we detected the owl in the same area of the vacant lot by mid-morning. For about thirty minutes, it sat on a branch, sunbathing. Then it spent approximately six minutes preening, after which it began hunting. On this occasion, the owl hunted from a thin branch ~4 m high on a dead tree, a branch on a leafless tree ~5 m high, and a chimney ~6 m high on a nearby building. It used the same hunting technique previously described. The owl performed six hunting attempts; again, all were successful. Prey items did not vary from those observed the day before (Table 1). However, it did consume one prey item (an earthworm) while on the ground. Other bird species that were in the area included *Quiscalus mexicanus* Gmelin (Great-tailed Grackle), *Polioptila caerulea* Linnaeus (Blue-gray Gnatcatcher), and Azure-crowned Hummingbird. This time, two grackles attacked the Ferruginous Pygmy-Owl after it had hunted for approximately thirty minutes, which prevented the owl from continuing to hunt. After the harassment of the grackles, the owl left the vacant lot. We heard the species again only in the late afternoon of 22 February but we were unable to observe it.

Implications of our Observations. The Ferruginous Pygmy-Owl has a broad diet (Carrera et al. 2008). It is well known for feeding on birds (Motta-Junior 2007, Sazima 2015), reptiles (Sánchez-Soto 2013, Molina et al. 2017, Vieira et al. 2018), mammals (Hannibal et al. 2016, Quiroga-Carmona and Isasi-Catalá 2013, Sarasola and Santillán 2014), insects (Sarasola and Santillán 2014), and even seeds (Di Sallo et al. 2016). However, most of these records have been observed in natural systems.

Table 1. Prey of the Ferruginous Pygmy-Owl in a vacant lot in Xalapa, Mexico. Observations were performed during the late afternoon of 14 February 2022 for an entire hour before sunset, and during the mid-morning of 15 February 2022, for about another hour. The site was located in the southwestern region of the city (19°31.690'N, 96°56.312'W).

Type of Prey	**Number of Captured Prey**	
	14 February	**15 February**
CLASS: CLITELLATA		
Order: Haplotaxida		
Family: Lumbricidae (earthworms)	1	1
CLASS: ARACHNIDA		
Order: Araneae		
Spiders	2	1
CLASS: DIPLOPODA		
Subclass: Chilognatha		
Millipede	1	0
CLASS: INSECTA		
Order: Orthoptera		
Suborder: Ensifera		
Family: Stenopelmatidae		
Stenopelmatus sp. (Jerusalem crickets)	2	0
Suborder: Caelifera		
Infraorder: Acrididea (grasshoppers)	1	2
Order: Phasmatodea		
Family: Phasmatidae (stick insects)	1	0
Order: Lepidoptera		
Moths	2	0
Caterpillars	4	0
Undetermined invertebrate	0	2
TOTAL	14	6

Given that the diet of the species varies among habitats (Sarasola and Santillán 2014), more foraging observations from cities are needed to better comprehend the ecological plasticity and urban habits of this species (Proudfoot and Beasom 1997, Sánchez-Soto 2020). In particular, the identification of the invertebrates that comprise its diet has been challenging because they are rarely found among prey remains in nest sites or pellets, are rapidly digested, or are mixed in the stomach contents along with other consumed prey (Carrera et al. 2008, Proudfoot and Beasom 1997). Our observations provide insight about poorly-known prey items of the Ferruginous Pygmy-Owl within less-studied urban habitats. In fact, we report for the first time the consumption of earthworms, millipedes, and spiders by this species in any habitat. Finally, our records suggest that this owl might be flexible when choosing hunting substrates, as it used both vegetation and urban infrastructure to stalk prey.

The relevance of invertebrate prey for the Ferruginous Pygmy-Owl is not fully understood (Carrera et al. 2008, Proudfoot and Beasom 1997). As with other owls (Enríquez 2015), invertebrates may be an essential source of protein for Ferruginous Pygmy-Owls (Proudfoot and Beasom 1997). Further, hunting invertebrates might require less energy, and invertebrates might be more easily captured than large vertebrates (Tennie et al. 2014). Our observations of this owl capturing up to fourteen prey items in a continuous series of hunting events within an hour demonstrates that this species can be efficient at foraging for invertebrates, perhaps reducing foraging costs. High prey availability in this lot may have contributed to the owl's

hunting success. We suspect that ground invertebrates were abundant given the patches of bare soil and the high vegetation cover (Jaganmohan et al. 2013, Raupp et al. 2010). We believe this highlights the relevance of urban spaces that are free from impervious surfaces and that benefit ground-living invertebrates and the raptors that prey on them.

During our observations, the owl did not show interest in us, even when hunting. This suggests that the species might be tolerant of human presence when foraging, which might enhance its ability to acquire food under anthropogenic activity.

We observed that an aggressive urban exploiter species, the Great-tailed Grackle, might represent a challenge for urban-dwelling Ferruginous Pygmy-Owls. We also observed that *Dives dives* Deppe (Melodious Blackbirds), another common bird of Xalapa, chase Ferruginous Pygmy-Owls from vacant lots when the owls are foraging on ground invertebrates (unpublished records). Both species probably attacked because they might be potential prey for this raptor. Although hummingbirds and other birds are known to harass Ferruginous Pygmy-Owls (Cunha and Vasconcelos 2009, Motta-Junior 2007), the antagonistic behaviors that we described by these icterids have not been previously reported. Future studies might benefit from analyzing how owls adapt their foraging strategies to avoid aggressive urban exploiter species.

Our observations verify that the Ferruginous Pygmy-Owl actively foraged during the morning and the late afternoon. It is unknown if the species hunts at night within the city. In natural habitats, the species usually forages during the day, but it might hunt during the night when brood-rearing (Proudfoot and Beasom 1997). Moreover, foraging could vary in cities where birds may exhibit different feeding schedules as a consequence of artificial light and variable prey behavior (Drewitt and Dixon 2008). Most of the foraging that we recorded was performed in microhabitats where large leaves might have reduced the owl's ability to see prey. Furthermore, some of the prey items (i.e., earthworms) may have been located beneath the surface of the soil. Given that owls have well-developed hearing, the Ferruginous Pygmy-Owl might also have used sounds to detect prey.

Our field notes provide both novel and complementary information about a neotropical raptor in an urban setting. We suggest that vacant lots may be key feeding grounds for this and other owls, as we have also observed *Strix virgata* Cassin (Mottled Owl) hunting in the same lot where we made these observations. Still, further research must be performed, as our records come from a single individual and limited hours of examination. In addition, specific ecological conditions of vacant lots that might affect owl foraging must be explored (e.g., size, proximity to the urban core, vegetation cover). Green areas other than parks should receive more attention in future studies to clarify their relevance to urban wildlife.

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