Ferruginous Pygmy-Owl (Glaucidium brasilianum) and Eastern Screech-Owl (Megascopes asio): New Hosts for Philornis mimicola (Diptera: Muscidae) and Ornithodoros concanensis (Acari: Argasidae)

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Ferruginous Pygmy-Owl (*Glaucidium brasilianum*) and Eastern Screech-Owl (*Megascopes asio*): New Hosts for *Philornis mimicola* (Diptera: Muscidae) and *Ornithodoros concanensis* (Acari: Argasidae)

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ABSTRACT: While banding ferruginous pygmy-owls (*Glaucidium brasilianum*) and Eastern screech-owls (*Megascops asio*) in south Texas during 2004, we recorded *Philornis mimicola* (Diptera: Muscidae) and *Ornithodoros concanensis* (Acari: Argasidae) parasitizing nestlings. Inspection of nestlings revealed 54 *P. mimicola* and one *O. concanensis*. Inspection of nest material revealed 111 *P. mimicola*, including 57 puparia. The effect (e.g., blood loss, anemia) of these hematophagous parasites might have contributed to the demise of at least one Eastern screech-owl nestling. This is the first record of *P. mimicola* and *O. concanensis* parasitizing ferruginous pygmy-owls and Eastern screech-owls.

Key words: *Glaucidium*, *Megascops*, *Ornithodoros*, *Philornis*, pygmy-owl, screech-owl.

Since 1994, nest boxes have been used to research the nesting ecology of ferruginous pygmy-owls (*Glaucidium brisilianum*) in Texas (Proudfoot and Johnson, 2000). From 1994 to 2004, ferruginous pygmy-owls used 143 nest boxes as nest sites, with an average clutch of 4.96±1.04 eggs. Nest box use was not restricted to the target species, and during the same time period Eastern screech-owls (*Megascops asio*) used 123 nest boxes as nest sites, with an average clutch of 3.24±0.77 eggs. Ferruginous pygmy-owls and Eastern screech-owls never cohabited the same nest box. The number of nest boxes gradually increased from 40 in 1994 to 154 in 2004, which provided a total of 552 opportunities for owls on the study area to use nest boxes.

On 10 May 2004, during routine banding and nest box inspection, ten maggots of *Philornis mimicola* (Diptera: Muscidae) were removed from one Eastern screech-owl nestling. Species was identified using descriptive characteristics provided in Huckett and Vockeroth (1987) and Dodge (1968), and from adults reared from larvae collected from nestlings and nest material. The maggots were removed from the base of primary feathers three, four, and five on the right wing; from the base of primary feathers three and eight on the left wing; and from the inner thigh of the right leg. Inspection of the nestling's two siblings revealed an additional six maggots. These maggots were removed from nestling number two from the outer corner of the right eye, the eyelid of the right eye, the right corner of the mouth, the base of primary feather number two on the right wing, and the base of primary feather number two on the left wing. One maggot was removed from the throat of nestling number three. All specimens identified in this study were vouchered as study specimens at the Department of Entomology's insect collection at Texas A&M University, College Station, Texas and assigned accession number 658.

The Eastern screech-owl nestlings in the infested nest box were 28 days old and did not display defensive behavior (bill clapping or grasping researchers with talons) when handled; they also were lethargic and did not respond "normally" to banding or physical inspection. The nestling from which ten maggots were removed weighed 58 g; the two siblings (with fewer maggots) weighed 64 g and 70 g. In addition, the average weight of these three nestlings was 28 g less than that recorded for four Eastern screech-owl

nestlings of the same age from a non-infested nest box on the study area. On 7 June 2004, the nest box containing the three infested screech-owl nestlings was revisited to check for fledging success. The inspection revealed the dead remains of the nestling with the highest infestation level. This evidence is congruent with the tasty chick hypothesis (i.e., correlation between chick mass and size rank within the brood and ectoparasite attacks, with the smallest chick experiencing the greatest blood loss) (Christe et al., 1998; Simon et al., 2003). However, without additional study the validity of this hypothesis with *Philornis mimicola* and Eastern screech-owl ecology remains unsubstiantiated. Inspection of nest material from the infested nest box revealed an additional 20 *P. mimicola* maggots and two *P. mimicola* puparia. Three additional *P. mimicola* were collected the same day from another Eastern screech-owl nestling on the study area; the nest boxes were 735 m apart. Forty-two nestling Eastern screech-owls from 14 nest sites were examined during 2004; only two (14%) of the nest boxes were infested. To the best of our knowledge, this is the first record of *P. mimicola* parasitizing screech-owls and the first documentation of *P. mimicola* occurring in the United States since the species was identified (Dodge, 1968). Infested nest boxes were located at 26° 34′ 22″ latitude, 97° 58′ 27″ longitude.

From 24–26 May 2004, ferruginous pygmy-owl nestlings ($n=96$) from 24 nest sites were inspected for *P. mimicola*. Forty-four nestlings at 11 (46%) of these nest sites were infested with *P. mimicola*, and one *Ornithodoros concanensis* (Acari: Argasidae) was removed from a nestling's right leg. For identification, 89 *P. mimicola* maggots were removed from the owls; maggots were located in the nasal cavity, on the neck, around the eyes, on the upper leg, between toes, and at the base of feather quills of the wings and tail. In addition, 35 *P. mimicola* puparia were removed from nest material in nest boxes. Eleven maggots were placed in 95% ethanol and the remaining maggots ($n=78$) and puparia ($n=35$) were reared to the adult stage for identification. Fifty-seven *P. mimicola* adults emerged. To the best of our knowledge, this is the first record of *P. mimicola* and *O. concanensis* parasitizing ferruginous pygmy-owls.

Philornis are generally considered a genus of neotropical Diptera, with as many as 50 species occurring in the New World; only two species have been reported in the United States (Roberts, 1957; Spalding et al., 2002; Couri and Carvalho, 2003). The nonparasitic, mobile, adult flies (commonly known as botflies) place their eggs on birds, typically nestlings, or in nest material. Larvae either feed on blood as ectoparasites or burrow into the skin and feed subcutaneously on blood and body fluids (Uhazy and Arendt, 1986). It is unknown how these infestations affect avian health, but results from studies of brown cacholote (*Pseudoseisura lophotes*) and firewood-gatherers (*Anumbius annumbi*) in Argentina suggest that infestations of 14 *Philornis* maggots/nestling could be lethal for nestlings (Nores, 1995) Although considered a recent immigrant on the Galápagos archipelago, *Philornis downsi* is recognized as a potential threat to Darwin's finches, due to high infestation levels (97%) and resulting nestling mortality (Fessl and Tebbich, 2002). In describing the effects of parasitism of botfly larvae on nestling beechey jays (*Gymnorhinus cyanocephalus*), Winterstein and Raitt (1983) noted that parasitized nestlings could not hold their head up or stand by day 20, and "They suffered from severe spasms that caused their bodies to shake continuously during the measurement period."

Ticks of the genus *Ornithodoros* are hematophagous parasites that commonly feed on adult birds and nidicolous nestlings (Duffy, 1983; Keirans et al., 1992; Ramos et al., 2001; Norcross and Bolen, 2002). Nest desertion was attributed to high infestation of *Ornithodorus* on gua-

nay cormorants (*Phalacrocoras bougainvillii*), Peruvian boobys (*Sula variegata*), and brown pelicans (*Pelecanus occidentalis*) (King et al., 1977a, b; Duffy, 1983; Wilkinson et al., 1994). Results from a study of cattle egrets (*Bubulcus ibis*) suggest that infestations exceeding 24 ticks (*Argas robertisi*)/chick can cause nestling mortality (McKilligan, 1996). In addition to causing nestling mortality and nest abandonment, at least five species of *Ornithodorus* are known vectors of West Nile Virus (WNV), which can be fatal to birds (Hurlbut, 1956; Hubálek and Halouzka, 1999; Anderson et al., 2003; Lawrie et al., 2004).

It is unknown if these infestations are affecting nesting success, but effects of parasitic blood loss can include mortality, anemia, and retarded tissue growth due to reductions in hemoglobin levels and transport of oxygen to tissue (O'Conner, 1977; Gold and Dahlsten, 1983; O'Brien et al., 2001). There is no direct evidence that parasitic blood loss had an effect on the survival of these owls. However, after reviewing current research on *Philornis*, we would not rule out parasitic blood loss as a factor contributing to the mortality of the screech-owl nestling. In Texas, the ferruginous pygmy-owl is a threatened species, and the remaining population of ferruginous pygmy-owls in Arizona is federally listed as endangered (U.S. Fish and Wildlife Service, 1997). Because this is the first record of *P. mimicola* and *O. concanensis* parasitizing owls in Texas and the first observation of these parasites in 11 yr of these owl studies, continued research should be conducted to determine the potential impact that these newly discovered parasites might have on these and other avian populations in the region.

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