

GRAY VIREOS WINTERING IN FRAGRANT BURSERA (*BURSERA FAGAROIDES*) IN CENTRAL SONORA

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ABSTRACT: The Gray Vireo (*Vireo vicinior*) winters primarily around the Gulf of California in coastal arid lands with high densities of the Elephant Tree (*Bursera microphylla*), eating a diet specialized on the fruit of this plant. We describe likely territorial behavior of the Gray Vireo at a site 112 km from the nearest coast in Sonora, Mexico, where the Fragrant Bursera (*Bursera fagaroides*) was the dominant *Bursera* species and Elephant Trees appeared to be absent. We also document the first observation of frugivory by a Gray Vireo on the fruit of Fragrant Bursera. Given that the Gray Vireo is vulnerable to habitat loss and population declines, our observations highlight the importance of investigating wintering Gray Vireos' diet in areas beyond the distribution of the Elephant Tree.

The Gray Vireo (*Vireo vicinior*) is a small songbird that breeds in the southwestern United States and extreme northern Mexico and winters primarily around the Gulf of California in coastal deserts where Elephant Trees (*Bursera microphylla*) are abundant. Populations wintering in Arizona and Sonora typically inhabit lowland desert scrub with little rainfall (Bates 1992a), as do those wintering in Baja California Sur (Hargrove et al. 2023). In most of its winter range, the Gray Vireo shifts from a largely insectivorous summer diet to one of primarily Elephant Tree fruit; the birds defend this resource in stable, individually held territories (Bates 1992a, b). Some populations, however, do not specialize on Elephant Trees: Gray Vireos that winter in Texas remain primarily insectivorous and/or possibly feed on unidentified local fruit (Barlow et al. 2020). In Mexico, studies of wintering Gray Vireos have been limited to their main habitat in the coastal deserts of the Gulf of California, so the diet of Gray Vireos that winter farther inland where Elephant Trees are less common or absent remains poorly documented.

OBSERVATIONS

While searching potentially suitable habitat for wintering Gray Vireos near Hermosillo, Sonora, as part of a study on migratory connectivity, we came across a site with vegetation structure suitable for the Gray Vireo (desert scrub with *Bursera* trees) but apparently lacking Elephant Trees. Instead, *Bursera* was represented by the Fragrant Bursera (*B. fagaroides*), which was typically tree-sized and, to a lesser extent, by the Torote Prieto (*B. laxiflora*). Given that Gray Vireos have been reported in the nonbreeding season from inland sites of Sonora where Elephant Trees are rare or absent (www.eBird.org), we

surveyed this site to assess whether Gray Vireos might be present despite the lack of Elephant Trees and, if so, whether the birds behaved territorially. Gray Vireos produce three main vocalizations related to territorial behavior. The primary song of the male functions in territory establishment and maintenance, attraction of mates, and informing the female of the male's location; trills are given in agonistic and territorial contexts, such as when intruders trespass into a territory, and as a general signal by females to males; and scold calls are typically directed at potential predators, or at neighboring males on both winter and breeding grounds (Barlow et al. 2020).

We surveyed for Gray Vireos on 25 February 2024 within Rancho PATROCIPES (Patronato del Centro de Investigaciones Pecuarías del Estado de Sonora), a management unit for the conservation of wildlife located in the municipality of Carbó, approximately 38 km north of Hermosillo. The terrain at our site was hilly with an average elevation of 527 m above mean sea level. Vegetation included Velvet Mesquite (*Prosopis velutina*), Yellow Paloverde (*Parkinsonia microphylla*), Ironwood (*Olneya tesota*), Fragrant Bursera, Torote Prieto, Brittlebush (*Encelia farinosa*), Wolfberry (*Lycium* sp.), Mexican Tree Ocotillo (*Fouquieria macdougalii*), and Organ Pipe Cactus (*Stenocereus thurberi*). Buffelgrass (*Cenchrus ciliaris*) was also present in the understory, and there were abundant signs of livestock grazing. We surveyed at 16 call points spaced at least 100 meters apart within the first three hours after sunrise. At each point, the 5-minute survey consisted of 1 minute of passive listening followed by 3 minutes during which we alternated broadcast of Gray Vireo vocalizations with periods of passive listening. The survey then ended with 1 more minute of passive listening. Broadcast vocalizations consisted of 1 minute of each of trills, song, and scold calls, interspersed with periods of silence. During the survey, the observers constantly scanned the surroundings for silent birds and stopped broadcasts as soon as a Gray Vireo was detected. To minimize the chances of double-counting individual Gray Vireos, we surveyed only at points located at least 200 meters from points that yielded a Gray Vireo detection. During our survey we searched for Elephant Trees within 100 meters of each of our 16 call points.

We detected four Gray Vireos during our survey. While we did not detect any Elephant Trees within 100 m of our call points, we usually located several Fragrant Burseras within this distance (Figure 1). The Fragrant Burseras were typically leafless, and of 26 plants that we checked, 73% were in fruit. Torote Prieto was also present at our site but was less abundant and less conspicuous because of its smaller size. The first Gray Vireo quietly approached us within the first minute of our broadcast. The second Gray Vireo, which was approximately 320 m from the first detection, silently flew into a shrub approximately 12 m away from the surveyors during the third minute of broadcast, after which the bird flew into a tree-sized Fragrant Bursera in fruit (Figure 2). The Gray Vireo remained quiet during the approximately 1 minute we observed it within the tree. Prior to flying away from the tree, we observed the bird holding a Fragrant Bursera fruit in its beak and promptly swallowing it. We could not discern whether the capsule that encases the seed and aril was still present. We observed the third Gray Vireo two call points away, skulking within nearby vegetation during the third minute of our broadcast, after which it produced a trill. The fourth Gray Vireo, which

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FIGURE 1. (A) Fragrant Bursera (*Bursera fagaroides*) in desert scrub in the municipality of Carbó, ~38 km north of Hermosillo, Sonora; (B) leaf; (C) fruit.

Photos by Nora Clark and Stephanie Cobbold



FIGURE 2. Gray Vireo perched near the fruit of a Fragrant Bursera (other plants are visible in this photograph). Shortly after the photo was taken, this individual ingested one of the fruits of this tree.

Photo by Ryan O'Donnell

we did not see, produced a trill within 20 seconds of the start of our broadcast and was approximately 580 m from the previous detection.

DISCUSSION

A total of four Gray Vireos approached us, two of which trilled in response to our broadcast calls. Thus the species was present and likely behaving territorially at a location where the Fragrant Bursera was the dominant *Bursera* species. While we did not hear singing, trills were the most frequent vocalization Bates (1987) reported during territorial interactions among Gray Vireos wintering in Sonora. The easternmost records of the Elephant Tree lie near our study site, where its presence may be determined by competition with the Fragrant Bursera and Torote Prieto (Turner et al. 2005). Floristic inventories suggest that the Elephant Tree is absent or rare near our study site, including at similar elevations. For instance, in a 3117-ha portion of Rancho PATROCIPES approximately 7 km to the north of our site, at elevations from approximately 467 to 815 m above sea level, *Bursera* is represented only by the Fragrant Bursera, Red Elephant Tree (*B. hindisiana*), and Torote Prieto (CEDES 2024). The Elephant Tree is also absent from the plant inventory compiled by Grupo Neoen (2017) for a 20,819-ha area near the town of Carbó and approximately 12 km north of our site. The inventory, which was based on field surveys and a review of existing botanical data, covered elevations ranging from 427 to 678 m above sea level.

Our observation of frugivory on the Fragrant Bursera suggests that Gray Vireos were likely defending territories with trees of this species at our site. We have observed a similar behavior during Gray Vireo surveys in Elephant Tree habitat, in which a bird initially drawn in by our broadcast begins to forage shortly afterward and occasionally is observed ingesting fruit. The size and shape of Fragrant Bursera fruit are similar to those of Elephant Tree fruit (<http://swbiodiversity.org/seinet>), which suggests that Fragrant Bursera fruit is within the range of the Gray Vireo's bill gape. The seeds of both species are covered by a pseudaril that is orange-red at maturity (Johnson 1992) and rich in lipids, making the seeds attractive to birds (Ramos-Ordoñez et al. 2013). In addition, both the Elephant Tree and Fragrant Bursera produce fruits that ripen gradually and a few at a time, as is typical of *Bursera* species that produce trivalvate fruit (Johnson 1992). In contrast, in *Bursera* species whose fruit is bivalvate, such as the Torote Prieto, the fruits appear to mature more or less simultaneously (Johnson 1992). Thus the gradual ripening of Fragrant Bursera fruits may generate a stable and reliable food resource enabling Gray Vireos to maintain winter territories at this site. While this is the first report of the Gray Vireo's frugivory on the Fragrant Bursera, the frequency of this interaction remains to be determined.

The Gray Vireo's close association with the Elephant Tree may explain the extensive overlap between the bird's winter range and the Elephant Tree's distribution (Bates 1992a, b, Unitt 2000). Nevertheless, in Sonora some Gray Vireos appear to winter in areas that lack Elephant Trees. For instance, reports and photographs at eBird.org document Gray Vireos in the winter south of Alamos, in an area of tropical deciduous forest that is beyond the Elephant Tree's distribution as depicted by Turner et al. (2005). In general,

the winter distribution of the Gray Vireo may be more widespread than is currently recognized, as suggested by the collection of a healthy Gray Vireo in the state of San Luis Potosí, Mexico, by Fry et al. (1996). On the basis of that observation and other reports of the Gray Vireo in southwestern Coahuila and Durango, Fry et al. (1996) suggested that Gray Vireos breeding in the Chisos Mountains of Texas and the Sierra del Carmen in Coahuila may winter as far south as San Luis Potosí.

The Elephant Tree is typically a desert scrub species (Borchert et al. 2004) that is more restricted to extremely hot and arid habitats, reaching its best development along the central and northern coasts of the Gulf of California (Johnson 1992). Given that the Fragrant Bursera, widespread in Sonora, occurs in desert scrub, thorn scrub, tropical deciduous forest, and the lower edge of oak woodland (Johnson 1992), it may represent a resource for Gray Vireos wintering in parts of Mexico that lack Elephant Trees.

In the Yucatán Peninsula, Greenberg et al. (1995) reported a close association between the White-eyed Vireo (*Vireo griseus*) and the Gumbo Limbo (*Bursera simaruba*) similar to that between the Gray Vireo and the Elephant Tree, with birds defending long-term winter territories. In Veracruz, however, wintering White-eyed Vireos eat the fruit and disperse the seeds of the Fragrant Bursera (Ortiz-Pulido and Rico-Gray 2006), and in the coastal southeastern United States they appear to rely on the Common Wax Myrtle (*Myrica serifera*; Borgmann et al. 2004), indicating that frugivory in wintering White-eyed Vireos is not restricted to one plant species. Similarly, the Gray Vireo may rely on the Fragrant Bursera and perhaps other plant species where Elephant Trees are rare or absent. Our observations highlight the need for further study of wintering Gray Vireos' diet in areas beyond the distribution of the Elephant Tree. The Gray Vireo's relatively small distribution and population size make the species vulnerable to habitat loss and population declines (Fink et al. 2023). A more thorough understanding of the species' winter ecology could prove critical for future conservation efforts.

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