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SIERRA SANTA ROSA: AN OASIS OF BIRD DIVERSITY IN ARID NORTHERN MEXICO

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Resumen. **– Sierra Santa Rosa: un oasis de diversidad de aves en el norte árido de México. –** La Sierra Santa Rosa es parte de una serie de cordilleras en el norte de Coahuila que componen una red de "montañas aisladas." Desde 2004 al 2006, realizamos tres visitas a un lugar en la Sierra Santa Rosa ubicado a 880 m de altitud en la vertiente este de una cordillera paralela de baja altura. Reportamos una diversa avifauna poco característica de la región que incluye un nuevo registro de reproducción para Vireo Amarillo-verdoso (*Vireo flavoviridis*) en Coahuila y marcadas extensiones en la distribución de Zambullidor Menor (*Tachybaptus dominicus*), Parula Tropical (*Parula pitiayumi*), Chipe Gorrirrufo (*Basileuterus rufifrons*), Tángara Dorsirrayada (*Piranga bidentata*) y Gorrión Oliváceo (*Arremonops rufivirgatus*). Este lugar constituye una extensión de varios elementos de la avifauna del trópico de la Sierra Madre y la costa del golfo, ambos a varios cientos de kilómetros, y enfatizan la necesidad de realizar otras expediciones de inventarios de aves en las alejadas montañas aisladas del norte de Coahuila.

Abstract. **–** The Sierra Santa Rosa is part of a regional network of "sky island" mountain ranges in northern Coahuila. From 2004 to 2006, we made three visits to a site in the Sierra Santa Rosa located at 880 m elevation on the eastern slope of a low-lying parallel range. We report a diverse avifauna uncharacteristic for the region, including a new breeding record for the Yellow-green Vireo (*Vireo flavoviridis*) in Coahuila and major breeding range extensions for the Least Grebe (*Tachybaptus dominicus*), Tropical Parula (*Parula pitiayumi*), Rufous-capped Warbler (*Basileuterus rufifrons*), Flame-colored Tanager (*Piranga bidentata*), and Olive Sparrow (*Arremonops rufivirgatus*). This site extends many elements of tropical, Sierra Madre, and Gulf Coast bird communities hundreds of kilometers to the north and east. These results emphasize the need for more bird surveys in the remote sky islands of northern Coahuila. *Accepted 18 March 2007*.

Key words: Birds, Sierra Santa Rosa, Coahuila, Mexico, avifauna, bird communities, distribution, sky islands, Sierra Madre Oriental, range extension, *Vireo flavoviridis, Arremonops rufivirgatus, Parula pitiayumi.*

INTRODUCTION

The extent to which birds of tropical affinities reach into temperate regions can be useful in describing biogeographical patterns, inferring historical and current climate change, and in locating corridors that facilitate the movement of birds from south to north. The Sierra Madre Occidental provides such a corridor in western Mexico, and many elements of the

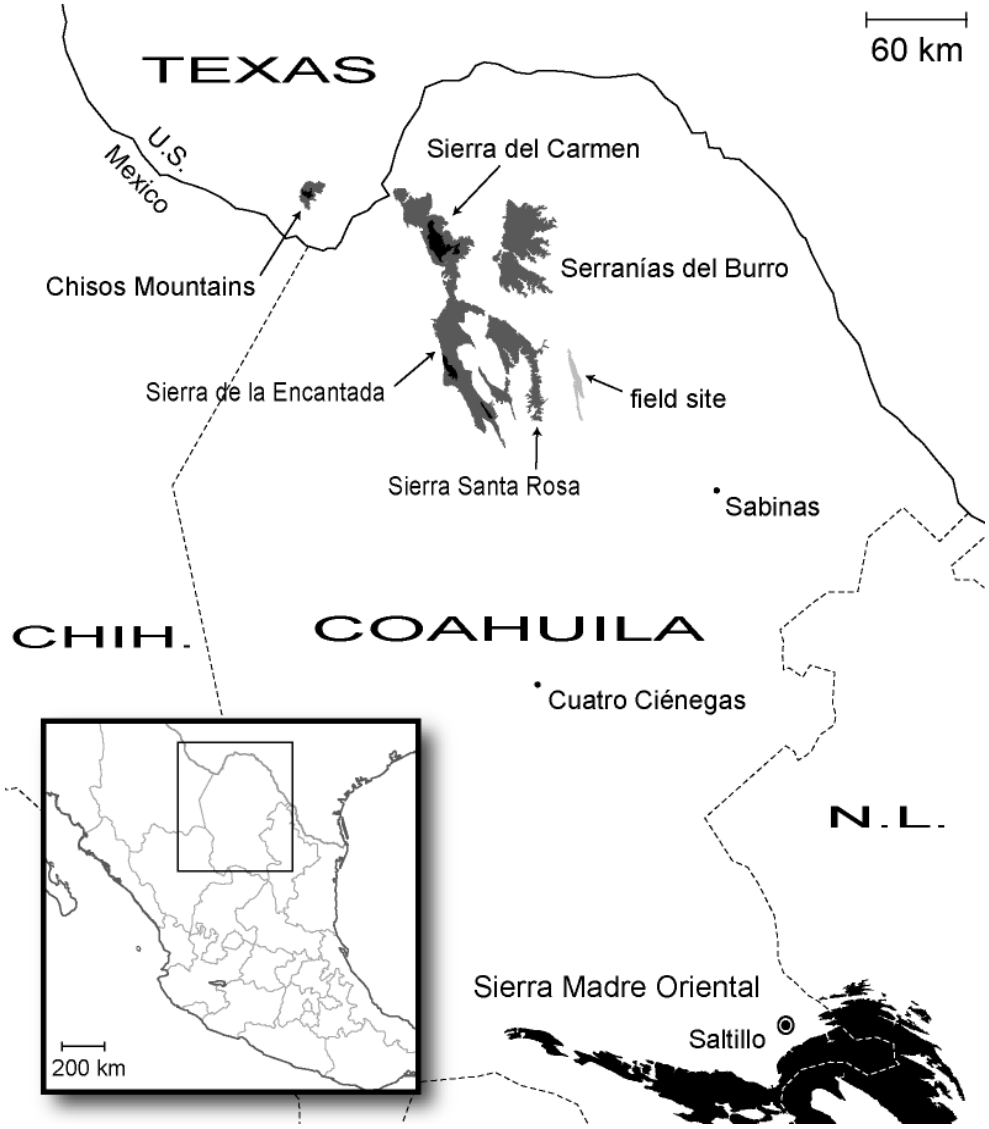

FIG. 1. A map of Coahuila, Mexico showing the location of the field site in the Sierra Santa Rosa as well as other locations mentioned in the text. Mountain ranges between the Sierra Santa Rosa and the Sierra Madre Oriental have been omitted. Shading denotes elevation: light gray, 1000–1500 m (only shown near field site); dark gray, 1500–2000 m; black, >2000 m.

tropical bird fauna can be found in the isolated mountain ranges of northern Sonora and the southwestern United States. The broken ranges north of the Sierra Madre Oriental have apparently proven less useful as a corridor for the dispersal of bird fauna from the south, as evidenced by the relative paucity of tropical species found in the Sierra del

Carmen of northern Coahuila and Chisos Mountains of southwestern Texas (Miller 1955, Wauer & Ligon 1977). However, compared to their counterparts in the southwestern United States and northern Sonora, the bird communities of the remote mountain ranges of northern Coahuila are a mystery, most of them never having been the subject of an ornithological survey. Thus it is worth asking if the current state of knowledge about bird distribution in northern Coahuila is accurate or has suffered from lack of study.

The bird fauna of northern Coahuila has been described in scattered publications (Marsh & Stevenson 1938, Miller 1955, Urban 1959, Wauer & Ligon 1977, Benson *et al.* 1989, Contreras-Balderas *et al.* 2004), but is under-studied compared to other parts of Mexico. Species occurrences from Howell & Webb (1995) generally follow the annotated list for Coahuila by Urban (1959) with some exceptions and additions. The latter publication was criticized for lack of thoroughness and the arbitrary attribution of breeding status for many species and is best considered incomplete (Dickerman 1962). That is to say that the status of many bird species in Coahuila and their habitat associations, especially in the remote northern mountains, is not well known.

From 2004–2006, we made three trips to the Sierra Santa Rosa, a mountain range in northern Coahuila, for surveying birds at a mid-elevation woodland site. We based our survey on records of sight and sound, mist-netting, and tape recording. We focus on species not previously described from the region.

STUDY AREA & METHODS

The Sierra Santa Rosa and Sierra de la Encantada are a joined mountain complex in northern Coahuila, Mexico, whose northern extent is located approximately 60 km from the United States border (Fig. 1). This complex is part of a regional network of "sky islands" – mountain ranges isolated from one another by intervening desert – that begins north of the Sierra Madre Oriental in southeastern Coahuila and extends to the Davis Mountains in western Texas. The region is characterized by high aridity, especially as one travels west. Moist air from the Gulf of Mexico is intercepted by mountain ranges parallel to the coast, resulting in the eastern side of a mountain range receiving more precipitation than the western side, which falls in a rain shadow.

We visited a site (28°22'59"N, 101°51' 03"W) at 880 m elevation on the eastern slope of a low-lying parallel range (called the Sierra Santa Ana on some maps) of the Sierra Santa Rosa from 19 to 23 October 2004, from 19 to 24 May 2005, and from 30 April to 4 May 2006. Our field camp was situated near a spring surrounded on three sides by high rock walls and was unusually humid and vegetated for the region at that elevation (sites at similar elevation in the Sierra del Carmen and Chisos Mountains are Chihuahuan desert). The immediate vegetation consisted of a lush understory beneath a dense canopy of oak (*Quercus*) and hophornbeam (*Ostrya knowltonii*). In some places, vegetation was xeric with elements of the Chihuahuan desert scrub and Tamaulipan thorn scrub communities (*sensu* Muller 1947). We noted the unusual occurrence of a rock palm (*Brahea bella*), considered an element of the Piedmont scrub named by Muller (1947), which occurs sparsely and irregularly in northern Coahuila on the eastern slopes of mountain ranges at higher elevation than Tamaulipan thorn scrub.

On a given day, we set up 6–14 mist-nets (12 m, 61 mm mesh) along a primitive road leading to a water tank and observed birds opportunistically while checking nets. Birds mist-netted, identified, weighed, measured in standard morphological features (bill length,

TABLE 1. Bird species documented during three trips to the La Rosita ranch in the Sierra Santa Rosa, Coahuila, Mexico (19-23 October 2004, 19-24 May 2005, 30 April–4 May 2006). Types of records include sight (S), vocalization (V), and mist-net (N). Common names of species with significant range extensions discussed in the text are marked with an asterisk (*).

Common names	Scientific names	2004	2005	2006	Record
Mallard	*Anas platyrhynchos*			X	S
Blue-winged Teal	*Anas discors*			X	S
Wild Turkey	*Meleagris gallopavo*	X	X	X	S
Least Grebe*	*Tachybaptus dominicus*		X	X	S
Black Vulture	*Coragyps atratus*		X	X	S
Turkey Vulture	*Cathartes aura*		X	X	S
Sharp-shinned Hawk	*Accipiter striatus*	X			N
Cooper's Hawk	*Accipiter cooperii*	X		X	N
Red-tailed Hawk	*Buteo jamaicensis*	X	X	X	S
American Kestrel	*Falco sparverius*	X		X	SV
White-winged Dove	*Zenaida asiatica*		X	X	SV
Mourning Dove	*Zenaida macroura*		X		SV
Common Ground-Dove	*Columbina passerina*		X		S
White-tipped Dove*	*Leptotila verreauxi*	X	X	X	SV
Yellow-billed Cuckoo	*Coccyzus americanus*		X		N
Eastern Screech-Owl	*Megascops asio*	X	X	X	V
Northern Pygmy-Owl	*Glaucidium gnoma*	X			V
Whip-poor-will	*Caprimulgus vociferus*		X	X	V
Black-chinned Hummingbird	*Archilochus alexandri*		X	X	S
Broad-tailed Hummingbird	*Selasphorus platycercus*			X	S
Ladder-backed Woodpecker	*Picoides scalaris*	X	X		SVN
Northern Flicker	*Colaptes auratus*	X			SVN
Vermillion Flycatcher	*Pyrocephalus rubinus*		X	X	S
Eastern Phoebe	*Sayornis phoebe*	X			SV
Ash-throated Flycatcher	*Myiarchus cinerascens*		X		SVN
Yellow-green Vireo*	*Vireo flavoviridis*		X	X	SVN
Black-capped Vireo	*Vireo atricapilla*		X	X	SV
Hutton's Vireo	*Vireo huttoni*	X	X		SVN
White-eyed Vireo	*Vireo griseus*	X			S
Mexican Jay	*Aphelocoma ultramarina*	X	X	X	SVN
Common Raven	*Corvus corax*	X			S
Black-crested Titmouse	*Baeolophus atricristatus*	X	X	X	SVN
Bushtit	*Psaltriparus minimus*			X	S
House Wren	*Troglodytes aedon*	X			SV
Carolina Wren*	*Thryothorus ludovicianus*	X	X	X	SV
Bewick's Wren	*Thryomanes bewickii*	X	X	X	SV
Canyon Wren	*Catherpes mexicanus*	X	X	X	SV
Ruby-crowned Kinglet	*Regulus calendula*	X	X	X	S
Blue-gray Gnatcatcher	*Polioptila caerulea*	X		X	S
Hermit Thrush	*Catharus guttatus*	X		X	SN
Long-billed Thrasher*	*Toxostoma longirostre*		X		N
Nashville Warbler	*Vermivora ruficapilla*	X		X	S

TABLE 1. Continued.

Common names	Scientific names	2004	2005	2006	Record
Tropical Parula*	*Parula pitiayumi*	X	X	X	SV
Black-throated Gray Warbler	*Dendroica nigrescens*	X			S
Yellow-rumped Warbler	*Dendroica coronata*	X			S
Blackpoll Warbler*	*Dendroica striata*			X	S
Wilson's Warbler	*Wilsonia pusilla*	X		X	S
Painted Redstart	*Myioborus pictus*		X	X	SV
Rufous-capped Warbler*	*Basileuterus rufifrons*	X	X	X	SVN
Yellow-breasted Chat*	*Icteria virens*		X		SVN
Western Tanager	*Piranga ludoviciana*	X		X	SN
Summer Tanager	*Piranga rubra*		X	X	SN
Flame-colored Tanager*	*Piranga bidentata*	X	X	X	SVN
Olive Sparrow*	*Arremonops rufivirgatus*	X	X	X	SVN
Spotted Towhee	*Pipilo maculatus*	X	X	X	SVN
Rufous-crowned Sparrow	*Aimophila ruficeps*	X	X		SN
Chipping Sparrow	*Spizella passerina*	X		X	S
Lark Sparrow	*Chondestes grammacus*		X		S
Black-throated Sparrow	*Amphispiza bilineata*		X		S
Northern Cardinal	*Cardinalis cardinalis*	X	X	X	S
Black-headed Grosbeak	*Pheucticus melanocephalus*	X	X	X	SV
Blue Grosbeak	*Passerina caerulea*		X	X	SN
Painted Bunting	*Passerina ciris*		X		S
Lazuli Bunting	*Passerina amoena*			X	S
Indigo Bunting*	*Passerina cyanea*			X	SN
Varied Bunting	*Passerina versicolor*			X	S
Brown-headed Cowbird	*Molothrus ater*	X	X		S
Audubon's Oriole*	*Icterus graduacauda*	X	X	X	SVN
House Finch	*Carpodacus mexicanus*		X	X	S
Pine Siskin	*Carduelis pinus*	X			S
Lesser Goldfinch	*Carduelis psaltria*	X	X		S

width, and depth, tarsus, wing, and tail), aged, sexed if possible, assessed for molt and fat, and released. Noteworthy records were documented with photographs (for mist-netted birds) or tape recordings of vocalizations (for those identified only by sound). We also documented with photographs the nests and brood patches for females of species not known to breed in the area.

RESULTS

We recorded 71 bird species (Table 1) by sight, sound, and mist-netting. The local avifauna was diverse and unusual for northern Mexico, reflecting elements of tropical Sierra Madre and Gulf Coast bird communities in addition to those of the desert and Madrean woodland communities more typical for the area. Species with significant range extensions from those described by Howell & Webb (1995) are given in detail below.

Species Accounts

Least Grebe (Tachybaptus dominicus). Howell & Webb (1995) document one migrant occurrence in northern Coahuila of this normally more coastal species. Sight records exist

from Cuatro Ciénegas Basin roughly 200 km to the south (Contreras-Balderas *et al.* 2004). We observed two different pairs on 22 May and 24 May 2005, and another pair on 30 April 2006 on human-made reservoirs near the field camp, which suggests local breeding.

White-tipped Dove (Leptotila verreauxi). Urban (1959) attributed a sight record to Hellmayr & Conover (1942) near Sabinas, 75 km to the southeast (see Fig. 1). We heard the low and distinctive calls of this species several times per day during all three visits. Observations of nesting in the Sierra del Carmen (Cañon Agua de las Vacas, 10 September 2004) and the lack of records from earlier surveys of the area (Miller 1955, Wauer & Ligon 1977) suggest that this species is spreading to the northwest from its formerly more coastal range, as documented elsewhere (Hogan 1999).

Yellow-green Vireo (Vireo flavoviridis). Locally common. First recorded on 20 May 2005 singing continuously from treetops. We mist-netted ten individuals (7 males, 1 female, and 2 of unknown sex) between 20 May and 24 May 2005 and five individuals (3 males and 2 of unknown sex) from 1 May and 3 May 2006. The known female from 2005 showed an active brood patch. Mean morphological measurements for males were as follows: weight (16.4 g), wing (78.0 mm), tail (56.4 mm), tarsus (18.4 mm), bill length (9.9 mm), bill depth (4.2 mm), and bill width (3.6 mm). This species was distinguished from the Red-eyed Vireo (*Vireo olivaceus*) based on its fast song, lack of an obvious black border above the white supercilium, and longer bill. On 23 May 2005, we flushed a female and discovered a nest made of woven dried grasses 0.5 m off the ground in the branches of an evergreen sumac (*Rhus virens*). Inspection of the nest revealed 3 eggs. Two were white and likely those of the vireo, while one was densely speckled with browns and likely that of the Brown-headed Cowbird (*Molothrus ater*), which was locally common. To our knowledge, this is the first definitive sight and nesting record for the Yellow-green Vireo in Coahuila.

Carolina Wren (Thryothorus ludovicianus). Described by Howell & Webb (1995) as occurring in eastern Coahuila. A specimen exists from as far north as Sabinas (Lowery 1940). Daily observations during all three visits (and in Cañon Trevino in the Serranías del Burro in October 2004) and records from Cuatro Ciénegas Basin (Contreras-Balderas *et al.* 2004) push the range of this species well into central and northern Coahuila, coincident with a general northwestern range expansion (Haggerty & Morton 1995).

Long-billed Thrasher (Toxostoma longirostre). We discovered a nest of this species after flushing a female on 22 May 2005. A nest with five bluish eggs with brown speckles was located 1.5 m above the ground in the leaves of a yucca less than 1 m from a dirt road leading to the field camp. This pushes the described range from Howell & Webb (1995) well into central Coahuila, coincident with a possible westward range expansion (Tweit 1997).

Tropical Parula (Parula pitiayumi). Locally common. We saw and heard this species many (>5) times per day during all three visits, which suggests a local resident population. Urban (1959) cites the American Ornithologists' Union checklist (1957), which lists this species as a resident in Sabinas. However, Howell & Webb (1995) describe migratory summer residents reaching only as far north as western Nuevo León. These observations, therefore, extend the range of this species approximately 400 kilometers to the northwest.

Blackpoll Warbler (Dendroica striata). To our knowledge this species has not been recorded in northeastern Mexico. We saw a single individual foraging at mid-height near the spring on 30 April 2006. There are many reports of migrating individuals from the Chisos Mountains in southwestern Texas (Wauer 1996).

Rufous-capped Warbler (Basileuterus rufifrons). Locally common. Howell & Webb (1995) describe the range of this species as extending to western Nuevo León. We saw and heard individuals many (>5) times per day during all three visits. Three were mist-netted on 21 May 2005, two of them females with brood patches. This extends the breeding range of this species over 400 km to the northwest.

Yellow-breasted Chat (Icteria virens). A transient migrant in Coahuila, according to Howell & Webb (1995). Urban (1959) lists an equivocal breeding record near Sabinas (but see criticism by Dickerman 1962). This species was commonly seen and heard in the vicinity of an overflowing cattle tank near the field camp. Two males and one female (with brood patch) were mist-netted on 22 May 2005, and another male was mist-netted on 24 May 2005.

Flame-colored Tanager (Piranga bidentata). We sighted a male and female together on 20 May 2005 near the spring and again on 23 May in a mixed-species group mobbing a Mexican jay (*Aphelocoma ultramarina*). A female was mist-netted on 21 May, but escaped before inspection. On 3 May 2006, we mist-netted a male who had a swollen cloacal protuberance. Considering behavior and time of year, breeding in this location is probable. We did not see any individuals in October 2004. This would extend the breeding range of this species some 400 km to the northwest.

Olive Sparrow (Arremonops rufivirgatus). We observed and heard this species several (1–5) times per day in May 2005 and 2006, which confirmed tentative sightings in October 2004. A male and female were mist-netted on 21 May 2005, the latter showing an active brood patch. Another male with a well-developed cloacal protuberance was mist-netted on 1 May 2006. Individuals seen in the field and examined in the hand possessed extensive yellow feathers on the carpal patch, inner wing, and scattered yellow feathers on the crown, field marks not described as conspicuous elsewhere. Howell & Webb (1995) list this species as extending into southeastern Coahuila, yet Urban (1959) records possible breeding as far north as Sabinas based on recorded testes size of a museum specimen.

Indigo Bunting (Passerina cyanea). We mist-netted a male with a well-developed cloacal protuberance on 4 May 2006. There are no breeding records for this species in Coahuila, but breeding records from the southwestern United States have increased in recent years (Phillips *et al.* 1964).

Audubon's Oriole (Icterus graduacauda). We saw and heard individuals many (>5) times per day during all visits, suggesting a resident population. Two birds of unknown sex were mist-netted on 22 May 2005. Howell & Webb (1995) describe the range of this species as occurring along the Atlantic slope and Gulf Coast. Benson *et al.* (1989) reported a population from the Serranías del Burro in northern Coahuila. Like the White-tipped Dove, the Audubon's Oriole appears to be spreading west in Mexico, judging by its occurrence in the Sierra Santa Rosa, Sierra del Carmen (2002–2006), and Sierra Arteaga (Taray, May 2005) of Coahuila and the failure of previous surveys to document this vocal species with a distinctive song (Miller 1955, Urban 1959, Wauer & Ligon 1977). This possible western

expansion in Mexico is oddly concurrent with western population declines along the Lower Rio Grande Valley in the United States (Flood *et al.* 2002).

DISCUSSION

Our survey indicates that this site in the Sierra Santa Rosa is one of the farthest northwestern outposts for many tropical species previously thought only to extend to the limit of the Sierra Madre Oriental in southeastern Coahuila and western Nuevo León (e.g., *Piranga bidentata*, *Basileuterus rufifrons*, *Parula pitiayumi*). We also report the presence of several species that are typically more coastal (e.g., *Arremonops rufivirgatus*, *Vireo flavoviridis*, *Tachybaptus dominIcus*). Finally, we document, at this site and in some cases throughout the region, several species not reported from past surveys that are known to be experiencing a northwestern range expansion. One of these species (*Toxostoma longirostre*) is somewhat secretive in habits and was seen only at the site in the Sierra Santa Rosa; thus it is difficult to say if the occurrence of this species in northern Coahuila is the result of range expansion or if it occurs locally at sites overlooked by previous surveys. Other species (e.g., *Icterus graduacauda*, *Leptotila verreauxi*, *Thryothorus ludovicianus*) are common and easily detected where they do occur, making it unlikely that previous surveys failed to detect them (e.g., Sierra del Carmen, Miller 1955). Therefore, for these species, our data provide supporting evidence for recent range expansion into north-central Coahuila.

It should be noted that we gathered our observations opportunistically and used wide-mesh nets, making it likely that less conspicuous, less common, and smaller species were overlooked. Additionally, most of our efforts were confined to a relatively small woodland area around the spring; open nearby habitats such as the reservoirs were not frequently visited. Even with these drawbacks, our survey uncovered significant new bird diversity for northern Coahuila. These results emphasize the need for more study of the bird communities in the sky islands north of the Sierra Madre Oriental so that we might better understand the biogeography of the region, how past and present climate change has affected bird communities, and important corridors for bird dispersal.

Considering that many of these newly discovered populations are isolated from resident populations several hundreds of kilometers away, further study is warranted to determine if their presence in the Sierra Santa Rosa is the result of recent immigration caused by expanding range margins or if they are relict populations with a longer history of isolation, perhaps having been established during the warmer, wetter altithermal (i.e., Holocene climatic optimum; hypsithermal) of the mid-Holocene when subtropical habitat expanded in northern Coahuila (Van Devender 1990). Genetic analysis, in particular, would be useful in determining if bird populations in the Sierra Santa Rosa have a distinct evolutionary history, which would make them of considerable conservation interest.

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