

A Comparison of the Herpetofaunas of Ranchos Los Fresnos and El Aribabi in Northern Sonora, Mexico

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Abstract—To compare and contrast herpetofaunas at Ranchos Los Fresnos and El Aribabi in north-central Sonora, México, we conducted herpetological surveys during 2006-2011, contacted others working in these two areas, and queried 27 museums and collections for specimens collected at or near these ranches. Based on this work, nine and seven amphibian, and 27 and 24 reptile species are known to occur at Ranchos El Aribabi and Los Fresnos, respectively. Significant findings at Los Fresnos include presence of presumed Sonora tiger salamanders (*Ambystoma mavortium stebbinsi*), of which there are only three localities in México; Arizona treefrog (*Hyla wrightorum*) at several sites; and Mexican gartersnake (*Thamnophis eques*); and at El Aribabi, Neotropical whipsnake (*Coluber mentovarius*), a range extension of 144 km, Tarahumara salamander (*Ambystoma rosaceum*) near the northern edge of its range, and Mexican gartersnake. Both ranches support non-native American bullfrogs (*Lithobates catesbeianus*) and non-native fishes. Non-native crayfish (*Orconectes virilis*) are also present at Rancho Los Fresnos. In total, 46 species of amphibians and reptiles were found, 22 of which occur on both ranches. Rancho Los Fresnos supports high grassland species not found at El Aribabi, while a number of typically Sonoran Desert or foothills thornscrub species found at El Aribabi were not encountered at Los Fresnos.

Introduction

Sonora is the second largest of the Mexican states and extremely diverse topographically and in regard to biological communities. Mesic mixed conifer forests in the mountains of the northeast contrast with the arid Gran Desierto de Altar of the northwest and tropical deciduous forests of the southeast. Sonora's herpetofauna reflects this diversity in that 37 and 141 species of amphibians and reptiles, respectively, have been documented in the state exclusive of its islands (Rorabaugh 2008). However, many areas of Sonora are poorly explored herpe-

tologically and focused work often reveals significant range extensions, unexpected faunal associations, or other relationships. From 2006-2011, we conducted focused herpetological inventories at two ranches in northeastern Sonora: Rancho Los Fresnos and Rancho El Aribabi.

Study Sites

The 4,050-ha Rancho Los Fresnos, located about 35 km north-northwest of Cananea on the U.S.-Mexico border (figs. 1, 2), is owned by Naturalia, a conservation non-governmental organization. The ranch is characterized by rolling plains grasslands at 1,460-1,600 m, and is notable not only for its intact plains grassland community, but also its well-developed ciénegas and riparian corridors along Portrero del Alamos, Arroyo Los Fresnos, Arroyo Los Alisos, Agua Dulce, and other drainages (Varela-Romero *et al.* 1992). Oak savannahs in the northeastern portion of the ranch and occasional rocky outcrops increase the heterogeneity of amphibian and reptile habitats.

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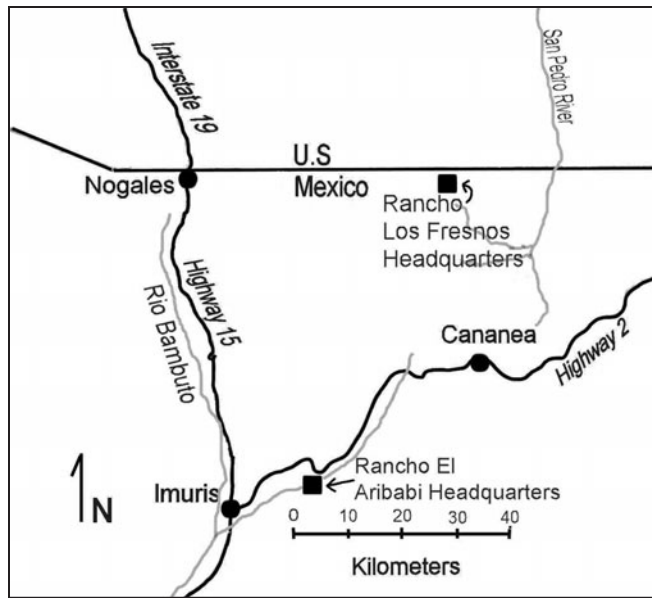


Figure 1—Locations of Ranchos El Aribabi and Los Fresnos in the context of north-central Sonora, México.

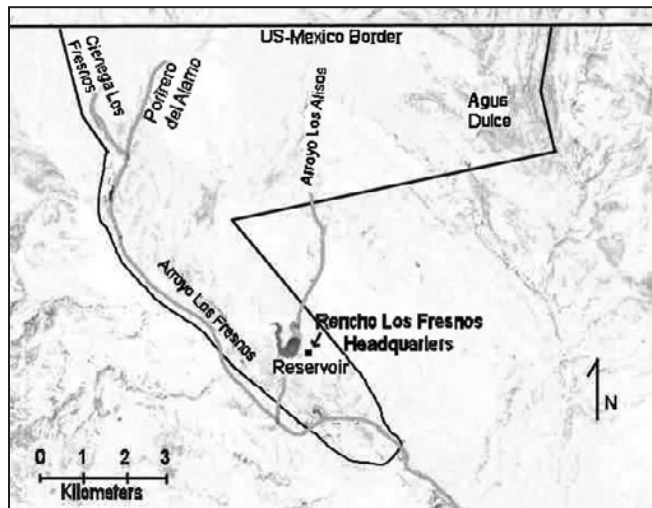


Figure 2—Rancho Los Fresnos, approximately 35 km NNW of Cananea, Sonora, México.

Rancho El Aribabi, owned by the Robles family, extends over 13,000 ha and is located approximately 16-31 km northeast of Imuris (figs. 1, 3). El Aribabi includes biotic communities ranging from Sonoran desertscrub at the very lowest elevations (960 m) to mesquite grasslands, Madrean oak woodlands, and pine-oak woodlands at the highest elevations (about 2,000 m). The Río Cocospera, which includes an impressive riparian corridor and associated ciénega, runs through the western portion of the ranch. Much of our work was focused on the approximate 4,046 ha managed by Carlos Robles.

Naturalia recently acquired Rancho Los Fresnos and was interested in inventorying the ranch's natural resources, including its herpetofauna. The U.S. Fish and Wildlife Service (USFWS) and Arizona Game

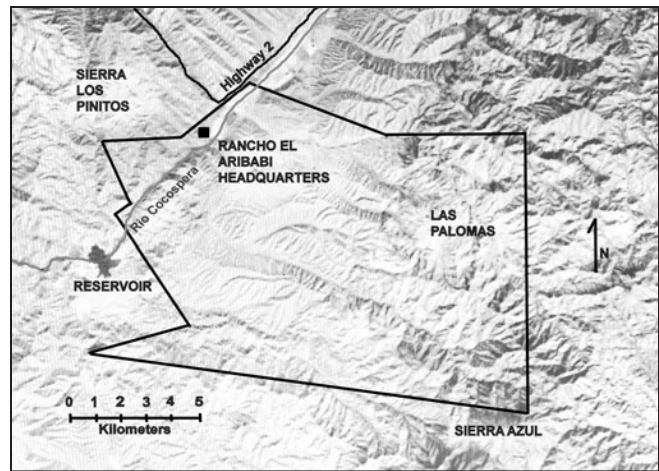


Figure 3—Rancho El Aribabi, Approximately 16-31 km ENE of Imuris, Sonora, México.

and Fish Department (AGFD) were interested in the ranch as well, because of ongoing conservation and species recovery activities in the San Rafael Valley, Arizona, and the potential for complementary conservation at Los Fresnos, which is located in the southern portion of that valley. Carlos Robles was interested in pursuing federal reserve status for Rancho El Aribabi through México's federal La Comisión Nacional de Áreas Naturales Protegidas (CONANP), and describing the ranch's biological diversity was one of the first steps in that process. That federal reserve status was assigned to the ranch in May of 2011.

Materials and Methods

We used the following three methods to investigate the herpetofauna of Ranchos Los Fresnos and El Aribabi.

Herpetological Inventories

Rancho Los Fresnos was visited 22-25 May, 23-25 August, and 3-5 October 2006; and 17-19 September 2007. An initial reconnaissance was also made 20-21 December 2005 and additional herpetological records were obtained during amphibian workshops held 19-21 August 2008, 7-9 July 2009, and 20-23 September 2010; and a bat workshop held 6-10 June 2011. Rancho El Aribabi was visited 10-12 May, 20-22 September, and 6-8 October 2006; 20-22 April, 19-21 June, and 7-9 August 2007; 14-18 July 2008; and 18-20 November 2011. Inventories at both ranches included day and night visual encounter surveys, driving roads (especially just before and after dark), listening for calling amphibians, and hoop nets and Gee minnow traps placed in streams and ponds to capture tadpoles, turtles, and gartersnakes (*Thamnophis* sp.). We also employed a 10-m seine at cattle tanks at Los Fresnos to survey for amphibians. We made incidental observations of native and non-native fishes and introduced invertebrates, which can influence distribution or presence of native riparian or aquatic vertebrates (Rosen and Schwalbe 2002). Cover board arrays were used on a limited basis at Rancho El Aribabi, and at that ranch, concrete cattleguard boxes were found to act as opportunistic pit fall traps. One of us (C. Robles Elías) frequently visited El Aribabi and periodically photo-documented amphibians and reptiles in the course of other work. Due to good

accessibility, we were able to sample all biotic communities and most areas of the ranch at Los Fresnos; however, at Rancho El Aribabi, the majority of our work was done in the lowlands, and few trips were made into the higher montane woodlands. Due to poor access, we did not visit the pine-oak woodlands at Rancho El Aribabi, which occur in the extreme southeastern corner of the ranch in the Sierra Azul. Total person hours spent searching for amphibians and reptiles at Ranchos Los Fresnos and El Aribabi were approximately 381 and 343, respectively. Numbers of minnow trap and hoop net trap days (24-hour periods) were 17.0 and 49.0 at Rancho Los Fresnos and 5.3 and 28.5 at Rancho El Aribabi, respectively. Six 1-m² cover boards were also run for 2 days (12 trap days) along the Río Cocospera at Rancho El Aribabi. We attempted to photo voucher at least one of each species found at the ranches. Photo vouchers were deposited at the University of Arizona herpetological collection (UAZ).

Museum and Literature Searches

The museums listed in table 1 were queried for specimen data at and near Ranchos Los Fresnos and El Aribabi.

Interviews of Other Workers

We contacted others working in the area of the two ranches regarding their herpetological observations, including for Rancho Los Fresnos, biologists with BIDA (Biodiversidad y Desarrollo Armónico), students from the Universidad de Sonora, Sally Stefferud (retired U.S. Fish and Wildlife Service), and Peter Warren (The Nature Conservancy); and for Rancho El Aribabi, Dale Turner (The Nature Conservancy), Sergio Avila, Trevor Hare, and Tom Van Devender (Sky Island Alliance), and Tom Wood (Southeastern Arizona Bird Observatory).

Results

Our investigations, including herpetological inventories, review of museum collections, and interviews with others, documented nine and seven species of amphibians, and 27 and 24 species of reptiles at Ranchos El Aribabi and Los Fresnos, respectively (table 2). In total, 46 amphibian and reptile species were found at Ranchos Los Fresnos and El Aribabi, of which 22 occurred at both ranches (table 2), resulting in a Jaccard Similarity Index (Baroni-Urbani 1980) of $22/46 = 0.48$. All species were documented via our own observations, except for six found by others working in the area. No museum collections were definitively from the two ranches, although KUNHM specimens collected primarily by Joseph R. Alcorn in 1957 and 1958 at “9 mi NNE of Imuris” (table 3) may have come from Rancho El Aribabi. Alcorn’s locality plots in the Sierra Los Pinitos were about half way between the Río Bambuto and the Río Cocospera; the latter river is on Rancho El Aribabi. The collections include riparian species, such as Mexican gartersnake (*Thamnophis eques*), Sonoran mud turtle, and Lowland leopard frog (*Lithobates yavapaiensis*); however, habitat for these species is currently absent at 9 mi NNE of Imuris, and it seems likely that Alcorn collected either at the Río Bambuto or the Río Cocospera. Our efforts to locate Alcorn’s field notes or other clarification of the collection locality have been unproductive. As a result, for the purposes of tables 2 and 3 we have assumed these collections were made near but not within Rancho El Aribabi. Species not documented by us at El Aribabi or Los Fresnos, but which were found in museum collections or were reported by others from localities in contiguous habitats near the two ranches are noted in table 3.

Table 1—Herpetological museums queried for specimens collected at or near Ranchos El Aribabi and Los Fresnos.

Museum acronym	Full name
AMNH	American Museum of Natural History
ASU	Arizona State University Herpetology Collection
BMNH	Bishop Museum of Natural History
BYU	Brigham Young University
CAS	California Academy of Science
CUMV	Cornell University Museum of Vertebrates
KUNHM	University of Kansas Natural History Museum
INHS	Illinois Natural History Survey
LACM	Los Angeles County Museum
LSUMNH	Louisiana State University Museum of Natural History
MCZ	Harvard University Museum of Comparative Zoology
MSUM	Michigan State University Museum
MVZ	Museum of Vertebrate Zoology
PSM	Slater Museum of Natural History
ROM	Royal Ontario Museum
SDNHM	San Diego Natural History Museum
SU	Stanford University collections (housed at CAS)
TNHC	University of Texas at Austin
UAZ	University of Arizona Herpetology Collection
UCM	University of Colorado Museum at Boulder
UIMNH	University of Illinois Museum of Natural History
UMMZ	University of Michigan Museum of Zoology
UNAM	Universidad Nacional Autónoma de México
USNM	National Museum of Natural History
UTA	University of Texas at Arlington
UTEP	University of Texas at El Paso

Both ranches were found to support introduced predators. At Rancho Los Fresnos, we found American bullfrog (*Lithobates catesbeianus*) to be abundant and widespread, as well as introduced crayfish (*Orconectes virilis*), Green sunfish (*Lepomis cyanellus*), and Black bullhead (*Ameiurus melas*), which were locally abundant. The native Longfin dace (*Agosia chrysogaster*) was only abundant in Arroyo Los Fresnos. American bullfrog was found in the Río Cocospera at Rancho El Aribabi, but only appeared to be abundant in the pools at the ciénega, which is also the only area where we found tadpoles of that species. We found introduced Mosquitofish (*Gambusia affinis*) and Green sunfish in the Río Cocospera at Rancho El Aribabi during 2006–08, and Largemouth bass (*Micropterus salmoides*) was found in 2011. However, we also found native dace (*Agosia* sp.), Sonora chub (*Gila ditaenia*), and topminnow (*Poeciliopsis* sp.).

Discussion

Faunal Differentiation and Causal Factors

The herpetofauna of Rancho Los Fresnos is in part a grassland assemblage, as reflected in the presence of species such as Tiger

Table 2—Amphibian and reptile species documented by vegetation community type at Ranchos Los Fresnos and El Aribabi. “UAZ” indicates the species is photo-vouchered in the University of Arizona Herpetological Collection. If no voucher exists, occurrence is shown with an “X”. All species documented by the authors unless indicated in the footnotes.

Species	Rancho El Aribabi					Rancho Los Fresnos			
Amphibians	Vegetation community type					Vegetation community type			
Caudata	Sonoran Desert	Mesquite Grassland	Riparian/ Ciénega	Mesquite/ Oak Savanna	Oak Savanna	Plains Grassland	Plains Grassland/ Scattered Oaks	Riparian	Ciénega
<i>Ambystoma mavortium</i>							X ^a		X ^b
<i>Ambystoma rosaceum</i>		UAZ		UAZ ^c					
Anura									
<i>Anaxyrus punctatus</i>	X	UAZ	X	X		UAZ		X	X
<i>Anaxyrus woodhousei</i>		UAZ	X			UAZ		X	X
<i>Hyla arenicolor</i>		UAZ		X		UAZ		UAZ	
<i>Hyla wrightorum</i>								UAZ	UAZ
<i>Lithobates catesbeianus</i>			UAZ			X		UAZ	X
<i>Lithobates yavapaiensis</i>	X	X	UAZ						
<i>Incilius alvarius</i>		UAZ	X						
<i>Scaphiopus couchii</i>		X	UAZ						
<i>Spea multiplicata</i>		UAZ	X			UAZ		X	
Reptiles									
Testudines									
<i>Kinosternon sonoriense</i>			UAZ					X	UAZ
<i>Terrapene ornata</i>			UAZ			X			UAZ
Squamata - Lizards									
<i>Aspidoscelis burti</i>				UAZ					
<i>Aspidoscelis sonorae</i>		X	X	X		X		X	
<i>Coleonyx variegatus</i>		UAZ							
<i>Crotaphytus collaris</i>						UAZ			
<i>Elgaria kingii</i>			UAZ				X	UAZ	
<i>Heloderma suspectum</i>		X ⁴	UAZ						
<i>Holbrookia elegans</i>	X	X	UAZ			X		UAZ	
<i>Plestiodon callicephalus</i>			X						
<i>Phrynosoma hernandesi</i>							UAZ	X	
<i>Sceloporus clarkii</i>	X	UAZ	X	X		X		X	
<i>Sceloporus jarrovi</i>							UAZ		
<i>Sceloporus slevini</i>								UAZ	X
<i>Urosaurus ornatus</i>		X	UAZ	X		UAZ	X	X	
Squamata - Snakes									
<i>Coluber bilineatus</i>				X					
<i>Coluber flagellum</i>		X	X			X			
<i>Coluber mentovarius</i>				UAZ					
<i>Crotalus atrox</i>		UAZ	X			UAZ			

Table 2—Cont.

<i>Crotalus molossus</i>			UAZ		UAZ		X		
<i>Crotalus scutulatus</i>		X ^e				UAZ			
<i>Crotalus tigris</i>				UAZ					
<i>Diadophis punctatus</i>			UAZ						
<i>Heterodon kennerlyi</i>						X ^f			
<i>Hypsiglena chlorophaea</i>		UAZ		UAZ			UAZ	UAZ	
<i>Micruroides euryxanthus</i>	UAZ								
<i>Pituophis catenifer</i>			UAZ			UAZ		UAZ	
<i>Rhinocheilus lecontei</i>			UAZ			X ^f			
<i>Sonora semiannulata</i>									X ^b
<i>Salvadora grahamiae</i>						UAZ			
<i>Salvadora hexalepis</i>		X ^d				UAZ			
<i>Senticolis triaspis</i>		UAZ							
<i>Thamnophis cyrtopsis</i>			UAZ			UAZ		UAZ	
<i>Thamnophis eques</i>			X ^g			UAZ		UAZ	X ^b
<i>Trimorphodon lambda</i>		UAZ							

^aIn a cattle tank^bReported by S. Stefferud^cDocumented by R. Serraglio, S. Avila, and M. Quigley^dReported by D. Turner^eReported by T. Wood^fPhotographed by students from the Universidad de Sonora, Hermosillo^gReported by T. Hare**Table 3**—Species present in museum collections or reported by others from localities close to Ranchos Los Fresnos or El Aribabi and in contiguous habitats.

Species	Locality and Museum
Rancho Los Fresnos	
<i>Lithobates chiricahuensis</i>	Bear Canyon, Huachuca Mountains, AZ, UAZ 24754
<i>Lithobates yavapaiensis</i>	2 mi NNE Sunnyside, AZ, UAZ 20294, 20273
<i>Diadophis punctatus</i>	Southern end of San Rafael Valley, AZ, JCR 0023
Rancho El Aribabi	
<i>Anaxyrus retiformis</i>	1 mi S Imuris, UAZ 31581-3
<i>Incilius mazatlanensis</i>	35 mi S Nogales, UIMNH 24455
<i>Smilisca fodiens</i>	1.5 mi N Imuris on Hwy 15, UAZ 31555
<i>Phrynosoma solare</i>	9 mi NNE Imuris, KUNHM 50729
<i>Sceloporus virgatus</i>	Sierra Azul, MABA son-trv-1418
<i>Crotalus willardi</i>	Sierra Azul (Campbell and Lamar 2004, MABA son-trv-1300)

salamander (*Ambystoma mavortium*), Mexican hog-nosed snake (*Heterodon kennerlyi*), and Slevin's bunchgrass lizard (*Sceloporus slevini*); however, many of the upland species occur elsewhere in a variety of biotic communities, and many of the riparian forms (e.g. Canyon treefrog [*Hyla arenicolor*], Sonoran mud turtle, Black-necked gartersnake [*Thamnophis cyrtopsis*], and Mexican gartersnake) occur over a wide elevational range in a variety of community types. The presence of Yarrow's spiny lizard (*Sceloporus jarrovi*), a montane species, is due to the rocky outcrops and oak savanna in the north-eastern portion of Rancho Los Fresnos, which is part of the bajada of the Huachuca Mountains in Arizona.

Species documented at Rancho El Aribabi reflect a greater range of community types, particularly emphasized by species more characteristic of lower elevations than are found at Rancho Los Fresnos (e.g. Couch's spadefoot [*Scaphiopus couchii*] and Gila monster [*Heloderma suspectum*]). The influence of the Sonoran Desert and associated foothills thornscrub communities is in evidence at Rancho El Aribabi in the presence of Western banded gecko (*Coleonyx variegatus*), and species found nearby to the west in contiguous habitats, such as Sonoran green toad (*Anaxyrus retiformis*), Sinaloa toad (*Incilius mazatlanensis*), and Lowland burrowing treefrog (*Smilisca fodiens*; table 3). Rancho El Aribabi also exhibits a subtropical faunal influence with the presence of Tarahumara salamander (*Ambystoma rosaceum*), Neotropical whipsnake (*Coluber mentovarius*), and Green ratsnake (*Senticolis triaspis*). If we had been able to survey the higher elevations of the Sierra Azul more thoroughly, including

the pine-oak woodlands, we no doubt would have added species and broadened the ecological representation of species upslope at Rancho El Aribabi. Despite the differences ecologically, our data show that much overlap exists between the two ranches, as demonstrated by a Jaccard Similarity Index of 0.48.

Significant Observations and Range Extensions

On 25 August 1990, S. Stefferud, P. Warren, and others documented a larval Tiger salamander at Rancho Los Fresnos (S. Stefferud's field notes). Based on its location, the former was almost certainly a Sonora tiger salamander (*Ambystoma mavortium stebbinsi*), which is widely distributed just to the north of Rancho Los Fresnos in the San Rafael Valley in Arizona (Collins *et al.* 1988). The salamander was found in ciénega pools in Portrero del Alamo, and assuming it was a Sonora tiger salamander, this would be the only record of breeding in that subspecies outside of artificial impoundments (U.S. Fish and Wildlife Service 2002), and may represent a natural habitat used by these salamanders before European settlement. We also found breeding Tiger salamanders that we presumed to be Sonora tiger salamanders in a cattle impoundment in the northeastern portion of the ranch and at another cattle tank on the ranch just west of Rancho Los Fresnos. But because morphologically similar introduced Barred tiger salamanders (*A. t. mavortium*) have been found in some cattle tanks in the vicinity of Parker Canyon Lake, about 18 km north-northwest of the Los Fresnos headquarters, we cannot rule out that the salamanders at Los Fresnos are that subspecies. In 1990, S. Stefferud, P. Warren, and others also found an Arizona treefrog (*Hyla wrightorum*). We too found this species at several localities at Los Fresnos, and within Sonora those localities represent a range extension of approximately 235 km north-northwest from the closest record at El Chorro, 8 km northeast of Nacori Chico, Sonora (UAZ 45595), although the closest out-of-country record is ca. 13 km north in Arizona (Maldonado-Leal *et al.* 2009). The Los Fresnos localities are also unusual in that they are from aquatic sites in valley grasslands, whereas in Cochise County, Arizona, and sites elsewhere in Sonora, the Arizona treefrog is known as a montane or bajada species in woodland communities or from meadows within woodlands.

Although we did not find them, leopard frogs (*Lithobates chiricahuensis* and/or *L. yavapaiensis*) were likely present in the streams and ciénegas at Los Fresnos historically, as they occurred both in drainages upstream in the nearby Huachuca Mountains (table 3), as well as downstream in the San Pedro River (Clarkson and Rorabaugh 1989). No leopard frogs, American bullfrogs, or crayfish were noted by S. Stefferud in her field notes during her visit to the Los Fresnos in 1990, despite detailed observations on other amphibians, reptiles, fishes, and invertebrates. The only non-native species noted by S. Stefferud and others (Varela-Romero *et al.* 1992, S. Stefferud's field notes) were Mosquitofish (not found by us at Rancho Los Fresnos) and Green sunfish. It is likely that leopard frogs, American bullfrogs, and crayfish were scarce or absent in 1990. Sonoran mud turtles were present and often abundant in all of the permanent waters we sampled at Rancho Los Fresnos, and were also commonly found in the Río Cocospera at Rancho El Aribabi, thus effects of introduced predators on this species appeared to be minimal.

Mexican gartersnakes were found at both ranches. At Los Fresnos, four were observed along or near Arroyo Los Fresnos, where non-native predator densities appeared low and there was an abundance of native Longfin dace. As evidenced by flood debris in the trees and a severe flood we witnessed on the evening of 24 August 2006,

this arroyo is subject to periodic scouring, which tends to suppress non-native fish (Minckley and Meffe 1987), American bullfrog, and crayfish (Rorabaugh pers. obs.; also see Rosen and Schwalbe 2002) populations. S. Stefferud (field notes) observed a Mexican gartersnake in the Los Fresnos Ciénega in 1990. We observed several *Thamnophis* in that area, but we were unable to capture or identify them to species. Mexican gartersnakes may be persisting in the ciénega despite the presence of non-native predators. A single Mexican gartersnake was observed and photographed by Trevor Hare (Sky Island Alliance) along the Río Cocospera at Rancho El Aribabi. The only other gartersnakes observed at El Aribabi were two Black-necked gartersnakes (*T. cyrtopsis*), also found along the Río Cocospera. The apparent low density of gartersnakes was unexpected, because predator densities are relatively low outside of the ciénega and the habitat appears suitable. Eight Mexican gartersnakes collected by Alcorn at "9 miles NNE Imuris" (table 3) may have been collected near or perhaps at the Río Cocospera (see discussion above in the results section).

At Rancho El Aribabi, Sergio Avila and Carlos Robles Elías photo documented Neotropical whipsnakes on the northwestern slopes of the Sierra Azul (e.g. UAZ 56736-PSV), which extends the range 144 km north-northwest of the closest known locality (21 km northeast of Mazocahui on Highway 20, Sonora; Rorabaugh *et al.* 2009) and places this largely tropical species within 57 km of the Arizona border (Avila *et al.* 2008). Most records of this species in Sonora are from the southeastern portion of the state, south of Highway 16 (Rorabaugh *et al.* 2009). We also documented Tarahumara salamanders from two localities on the northwestern slope, as well as the northwestern bajada of the Sierra Azul (table 2); these localities are near the northern edge of the distribution of this species.

Species Likely to Be Found With Additional Effort

Figures 4 and 5 plot search effort (days) against cumulative number of species found for Ranchos Los Fresnos and El Aribabi, respectively. Both figures show that numbers of species found have plateaued, suggesting that adding species to the list will be time consuming and not very productive. Nonetheless, we believe several species not yet observed remain extant on the ranches. Species found nearby in similar habitats are listed in table 3. Of those, we believe all may occur on the ranches, with the exception of the Chiricahua leopard frog (*Lithobates chiricahuensis*) and Lowland leopard frog at Rancho Los Fresnos for the reasons discussed above. Other species that could be found include, for Rancho El Aribabi: Western narrow-mouthed toad (*Gastrophryne olivacea*), Barking frog (*Craugastor augusti*), Morafka's desert tortoise (*Gopherus morafkai*), Thornscrub hook-nosed snake (*Gyalopion quadrangulare*), Brown vinesnake (*Oxybelis aeneus*), and Chihuahuan mountain kingsnake (*Lampropeltis knoblochii*); for Rancho Los Fresnos: Desert grassland whiptail (*Aspidoscelis uniparens*), Ring-necked snake (*Diadophis punctatus*), and Chihuahuan hook-nosed snake (*Gyalopion canum*), and for both ranches: Black-headed snakes (*Tantilla* spp.), and Common kingsnake (*Lampropeltis getula*).

Acknowledgments

We gratefully thank staff of the natural history museums listed in "Museum and Literature Searches" in the results section above for sharing museum records and discussing specimens. Juan Carlos Bravo and Gerardo Carreón of Naturalia provided access to and use of facilities at Rancho Los Fresnos, and we thank the Robles family

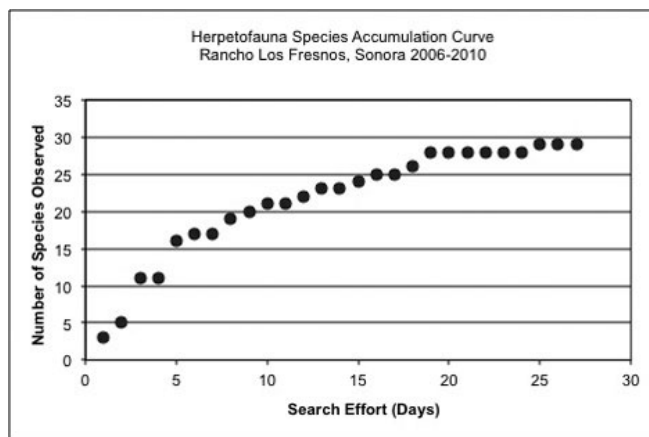


Figure 4—Species accumulation curve, Rancho Los Fresnos.

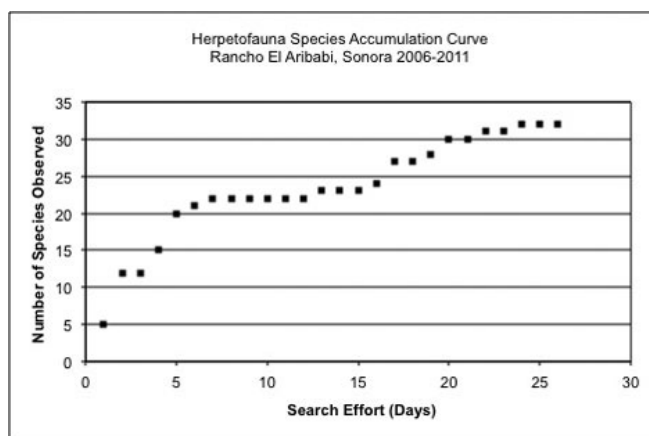


Figure 5—Species accumulation curve, Rancho El Aribabi.

for their hospitality at Rancho El Aribabi. Sergio Avila, students of Kevin Bonine's herpetology class at University of Arizona, students from the Universidad de Sonora, Antonio Esquer, Trevor Hare, Thomas R. Jones, Baruk Maldonado-Leal, Gricelda Meraz, Robert Mesta, Mike Quigley, Scott Richardson, Eduardo López Saavedra, Sally Stefferud, Robert Villa, Peter Warren, Tom Woods, and the

vaqueros at Rancho El Aribabi shared their observations with us and/or assisted with logistics in the field. Dale Turner and Don Swann graciously reviewed a draft of this paper.

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