

Preliminary List of Flying Mammals in the Ajos-Bavispe National Forest Reserve and Wildlife Refuge, Sonora

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Abstract—Information on bat communities, including their composition, abundance, distribution and ecology, can support management programs in protected areas, and also provide information and initiatives for the designation of new protected areas. In 2010 and 2011, monitoring was conducted in the Ajos Mountains, a sky island, that is part of the Ajos Bavispe Reserve. During this period of time, we recorded a total of eight species (*Myotis californicus*, *Myotis auriculus*, *Myotis volans*, *Myotis thysanodes*, *Lasiurus cinereus*, *Lasiurus blossevillii*, *Eptesicus fuscus* y *Choeronycteris mexicana*), in riparian and oak-pine forests. This preliminary species list will assist in assessing ecosystem health in this part of the reserve and provides an example of the monitoring we are hoping to extend to the other Sky Islands within the Ajos-Bavispe Natural Protected Area: La Madera, El Tigre, Buenos Aires and La Purica. The intention of this paper is to use the information we have gathered on abundance and distribution of bat species as a tool to assess the conservation status and ecosystem health of these Sky Islands. Bats are a good indicator taxon because they are abundant, diverse, and relatively easy and cost effective to monitor. As a result the status of bat communities (composition and abundance) will support conservation and management decisions in the short and long term in this important protected area.

Introduction

Research on the abundance, diversity, distribution, ecology, and species composition is an essential part of the development and implementation of management programs in natural protected areas (Kalko 1993). Therefore, it is necessary to develop projects and monitoring protocols for natural protected areas to complement and guarantee the conservation of the ecosystems with proper management of resources over time.

Castner and others (1996) conducted an inventory of bats in wet Beaver Creek Wilderness Area (Coconino National Forest) to establish a bat management project which implies the importance of and results in the preservation of bats. The National Forest Reserve and Refuge Fauna Silvestre Ajos- Bavispe (RFN y RFS Ajos-Bavispe), are the oldest reserves of Mexico. They were designated in the first decree in 1936 and included barely 21,494 hectares of national land formed by

the mountains of “Los Ajos”, “Buenos Aires” and “Purica”. By 1939, the Presidential Decree was ratified adding a total of 184 000 hectares including the sierras “El Tigre” and “Pilares of Teras”, “Pilares of Nacozari”, “San Diego”, and “la Madera”. RFN y RFS Ajos-Bavispe is located in the physiographic region of the Sierra Madre Occidental (CONANP 2001). These ranges are part of the region called islands of the sky (The Sky Islands) and are known to be complex systems with uniquely high biodiversity (McLaughlin 1995; Warshall 1995).

Information on flora and fauna of Ajos Bavispe, a Protected Natural Area (ANP) has been collected in recent years; however, information on volant mammals (bats) in the ANP is not known. We believe that bats can be used as indicators to assess the conservation status of different ecosystems present within the reserve, because of their diversity, and the relative ease and cost effectiveness of monitoring bats.

The order Chiroptera is ecologically diverse and has a global distribution. The development of flight and the sophisticated sensory adaptations (echolocation) of these flying mammals has allowed bats to inhabit extremely diverse habitats and has provided them with the ability to exploit a wide variety of resources for food (Sampaio and others 2003, Ávila Flores and Medellín 2004).

This study is intended to provide an inventory of bats for the RFN y RFS Ajos-Bavispe and thus identify sites with greatest diversity and abundance. This information will be used for planning and decision

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making of refuge management when prioritizing conservation actions and habitat protection.

Methodology

Sampling was conducted in section 4 of the RFN y RFSAjos-Bavispe situated in the Sierra Los Ajos in Gallery forests and pine-oak forest. In addition abandoned buildings, caves and mine adits were sampled. All sample sites were near perennial water sources. The sample sites are: Cañon de Evans, La Sal and El Guerigo (fig. 1).

The monitoring took place in October 2010 and May, July and August 2011, by surveying for bats with mistnets (Ávila and Medellín, 2004; Rabe and Rosenstock 2005). Three to four mistnets of 3, 6, 9 and 12 m (Martínez 2007; Sánchez and Medellín 2007) were deployed at sunset. Sampling was concluded when bat activity was no longer detectable or when weather conditions (i.e. low temperatures, high winds or rain) necessitated closing the nets. The mist nets were installed close to or over bodies of water, and in flyways used by bats (Lopez and Garcia 2006). For the monitoring in abandoned buildings, caves or mines hand nets were used to capture and identify bats (Lopez and Garcia 2006).

Captured bats were identified and sex, age (adult or juvenile), reproductive status (pregnant, nursing, post-lactante, scrotal, non-breeding, not scrotal), weight, forearm length and ear length (Ávila and Medellín 2004; Lopez and Vaughan 2004; Russell and others 2005; López and García 2006; Sánchez and Medellín 2007;) were recorded. For species identification a key to the bats of Mexico (Medellín and

others 2008) was used and when necessary we consulted experts to assist in species determination. For taking measurements we used dial calipers (DialMax) and a ruler, mass was measured with a pesola scale (100 g) and photos were taken of all captured bat species.

Results and Discussion

During our surveys in 2010-2011 we recorded a total of eight bat species (*Choeronycteris mexicana*, *Myotis auriculus*, *Myotis californicus*, *Myotis thysanodes*, *Myotis volans*, *Eptesicus fuscus*, *Lasiurus blossevillei* and *Lasiurus cinereus*) in our study sites. These species represent two families of bats Phyllostomidae (leaf-nosed bats) and Vespertilionidae (Vesper or evening bats) (table 1). Our sample recorded 34% of the 23 possible species that may occur in this area according to distribution maps in Medellín and others (2008).

Choeronycteris mexicana was found in an abandoned cabin in the months July and August and we estimated the number of individuals by having three observers count individuals at the same time. This method yielded a result of 90 to 100 estimated individuals. The discovery of this colony for the ANP is important evidence that the Ajos Mountains are being used as a roost by this important pollinating bat species which is listed as threatened in the NOM-059 (SEMARNAT 2010). We plan to monitor this roost at Güerigo regularly in order to obtain additional information on size and times of roost use. This information will assist in determining the actions necessary for protection of this colony by the ANP.

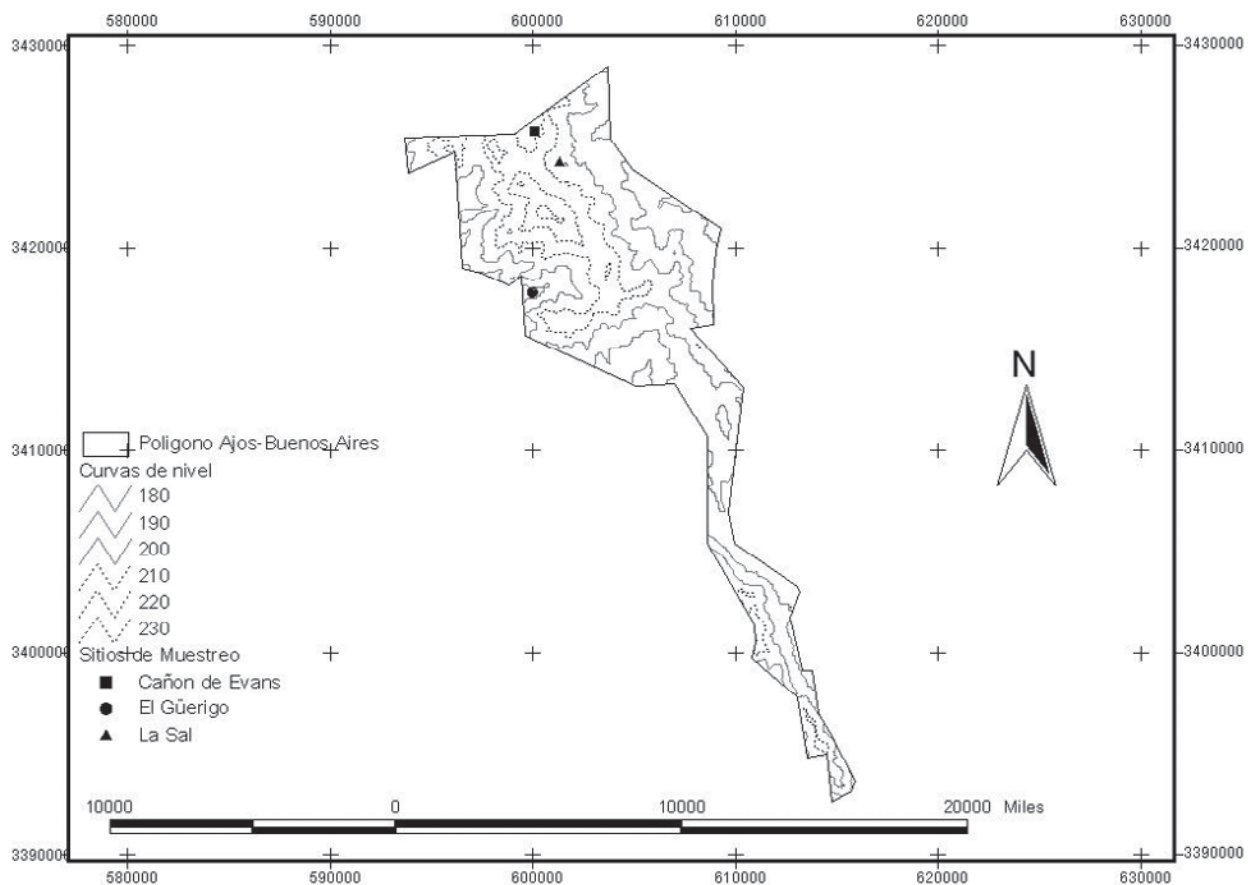


Figure 1—This map depicts the monitoring locations for bats in the Los Ajos Mountains.

Table 1—Displays the documented species in RFN and RFS Ajos-Bavispe.

Family	Scientific name	Common name	Number of individuals
Phyllostomidae	<i>Choeronycteris mexicana</i>	Murciélago nariz de cochi	90-100
Vespertilionidae	<i>Myotis auriculus</i>	Miotis Suroeste	7
	<i>Myotis californicus</i>	Murciélago de California	5
	<i>Myotis thysanodes</i>	Miotis Bordado	6
	<i>Myotis volans</i>	Murciélago de patas largas	2
	<i>Eptesicus fuscus</i>	Murciélago grande café	7
	<i>Lasiurus blossevillei</i>	Murciélago rojo occidental	2
	<i>Lasiurus cinereus</i>	Murciélago canoso	4

This species uses a wide range of habitats including desert scrub, deciduous tropical forests and pine-oak forests (Arroyo - Cabrales and others 1987). Our study found *C. mexicana* associated with oak forest and forest galleries represented mainly by *Quercus oblongifolia*, *Quercus eggersii*, *Juniperus deppeana* and forest of galleries represented chiefly by alder (*Platanus wrightii*), alamos (*Populus fremontii*), and güerigos (*Populus brandegeei*).

Arroyo-Cabrales and others (1987) writes that for *C. mexicana* migration to Arizona and New Mexico may take place in June, however, we recorded the presence of this colony in July and August 2011; it is clear that more population and ecological data of this colony is needed to understand this species spatial and temporal use of the habitat in the Sky Island region. A better understanding of its dynamics is needed to make decisions for species conservation. *Myotis auriculus*, *Myotis californicus*, *Myotis thysanodes*, *Myotis volans*, *Eptesicus fuscus*, *Lasiurus blossevillei*, *Lasiurus cinereus*, were found in Oak-Juniper Forests and forest riparian forests represented mainly by *Quercus arizonica*, *Juniperus deppeana*, *Acer grandidentatum*, *Platanus wrightii*, with perennial water sources. Even though these species may occur in various types of habitat, the habitat they use is usually in good condition (Shump and Shump 1982, Warner Richard 1982, Warner and Czaplewsky 1984; Simpson 1993; Avila and Fenton 2005). As preliminary result we can assume that the Canyon de Evans and La Sal are in good condition and we recommended the use these sites as permanent monitoring stations to obtain abundance, diversity, and community structure data for the bat species present in the reserve.

No settlements or anthropogenic activities (i.e. livestock, agriculture) are within these sampled sites. They are nationally owned lands which have resulted in a good quality of habitat, as mentioned above these three sites have perennial water sources. For the Cañon of Evans and la Sal, we recorded the presence of *Ambystoma rosaceum* which are indicators of good water quality (Rorabaugh 2008) and complement the ecological importance of these sites in the Sierra Ajos.

A greater sampling effort is needed at the study sites, especially in the early spring. Bat surveys at additional sites within the Ajos mountains are necessary for a comprehensive assessment of the area. Also it is important to include Sierra del Tigre, Madera and the Purica which are part of the ANP in future sampling efforts.

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