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Ecology

# Flea diversity and prevalence on arid-adapted rodents in the Oriental Basin, Mexico

## Diversidad de pulgas y prevalencia en roedores de zonas áridas en la Cuenca Oriental, México

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**Abstract**

Inventorying biodiversity is basic for conservation and natural resources management because constant loss of natural areas increases the need for fast biodiversity inventories. Desert flea diversity and associations are not well known in Mexican deserts, especially in the Oriental Basin (OB). Rodents were trapped in the Oriental Basin through June 2007, 2009, and 2010, and July 2008, in 10 localities. A total of 144 rodents belonging to 10 species were trapped, of which 133 were parasitized by 350 fleas belonging to 18 species. *Peromyscus difficilis* had the highest parasite richness with 9 species, followed by *P. maniculatus* with 8. The most abundant fleas in the OB were *Polygenis vazquezi*, *Plusaetis parus*, *Meringis altipecten*, and *Plusaetis mathesoni*. Seven species were found representing new records for 3 states.


*Keywords:* Mammals; Mexican arid zones; Parasites; Siphonaptera

**Resumen**

Tener un inventario de la diversidad biológica es fundamental para la conservación y gestión de los recursos naturales, ya que la pérdida constante de áreas naturales aumenta la necesidad de realizar inventarios rápidos de la biodiversidad. En particular la diversidad de pulgas y sus asociaciones no son muy conocidas en zonas áridas de los desiertos mexicanos, especialmente en la Cuenca Oriental. Por lo anterior, fueron colectados roedores en 10 localidades de la Cuenca Oriental en junio de 2007, 2009, 2010 y julio de 2008. Se recolectó un total de 144 roedores pertenecientes a 10 especies; 133 estaban parasitados por 350 pulgas pertenecientes a 18 especies. *Peromyscus difficilis* tuvo la riqueza más alta de pulgas con 9 especies, seguido por *P. maniculatus* con 8. Las pulgas más abundantes en la Cuenca Oriental fueron *Polygenis vazquezi*, *Plusaetis parus*, *Meringis altipecten* y *Plusaetis mathesoni*. Se encontraron 7 especies que representan nuevos registros para 3 estados.


*Palabras clave:* Mamíferos; Zonas áridas mexicanas; Parásitos; Siphonaptera

## Introduction

Inventorying biological diversity is a basic scientific activity, essential for good conservation practices and natural resources management. Financial resources and human efforts dedicated to document biodiversity of a given area ideally promote better conservation activities and policies (Brooks, da Fonseca, & Rodrigues, 2004a, 2004b; Ferrier et al., 2004). Constant loss of natural areas located near cities and drastic changes in land use increase the need for fast biodiversity inventories. An area located in Central Mexico that may vanish in the short term is the Oriental Basin (OB; Hafner & Riddle, 2005).

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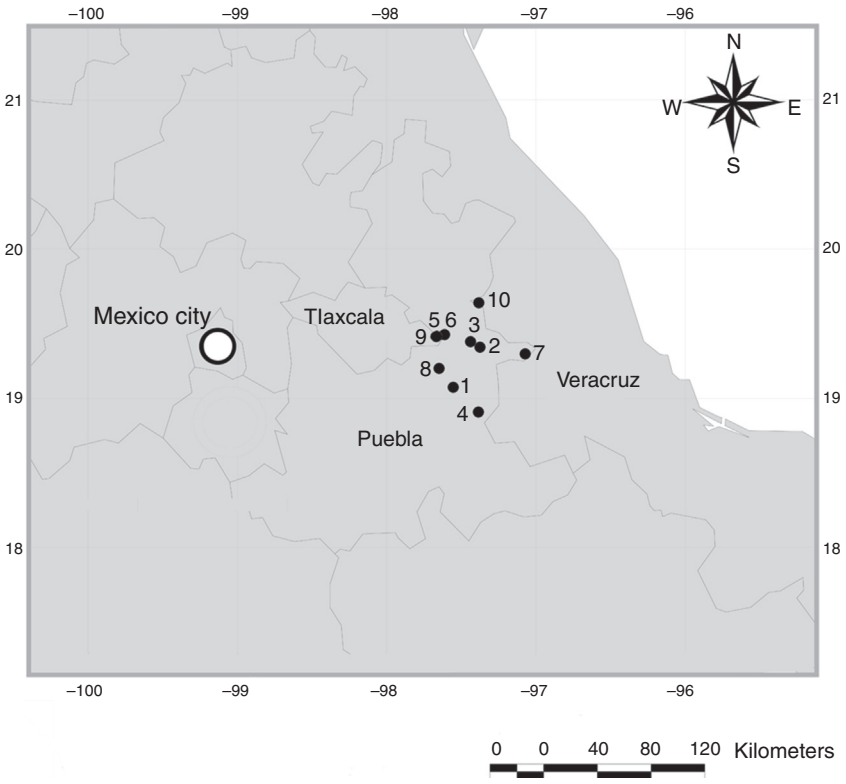


Figure 1. Map of localities in the Oriental Basin in Central Mexico. 1, Chalchicomula de Serna, 3 km S Cd. Serdán entronque Cd. Serdán – Esperanza, Dirección Santa Catarina; 2, Guadalupe Victoria, 2 km W Guadalupe Victoria; 3, Guadalupe Victoria, 9.6 km W Guadalupe Victoria; 4, La Esperanza, 2 km W La Esperanza; 5, Oriental, 1 km S Oriental; 6, Oriental, 1.5 km S Oriental; 7, Quimixtlan, 10 km NE Huaxcaleca; 8, San Salvador El Seco, 1 km S Coyotepec; 9, El Carmen Tequexquitla, 2.5 km El Carmen; 10, Perote, 3 km S El Frijol Colorado.

This region is considered a relict of the Chihuahuan desert and its southern-most extension (Shreve, 1942; Fig. 1). The vegetation is characterized by alkaline grass and thorn scrub in the dry valleys, and coniferous forest in the surrounding mountains (Valdéz & Ceballos, 1997). The OB area has been isolated at least since Pleistocene times, and several endemic mammals can be found here: *Cratogeomys fulvescens* Merriam, 1895 (Hafner et al., 2005), *Peromyscus bullatus* Osgood, 1904 (González-Ruíz & Álvarez-Castañeda, 2005), *Neotoma nelsoni* Goldman, 1905 (Fernández, 2012; González-Ruíz, Ramírez-Pulido, & Genoways, 2006), and *Xerospermophilus spilosoma perotensis* (Bennett, 1833) (Best and Ceballos, 1995; Fernández, 2012).

Interspecific interactions such as parasitism are considered an important part of biodiversity (Wilson, 1992). Some of the most common mammal parasites are fleas (Insecta: Siphonaptera). Siphonapterans are characterized by the lack of wings, and a buccal apparatus adapted for biting and sucking blood. Their body is small (1–9 mm) and laterally compressed, with strong legs and big coxae (Barrera, 1953; Rothschild, 1975).

Fleas are bird and mammal parasites. However, bird fleas represent only 5% of the known flea diversity. Most of the flea species have been found in mammals, and 70% of all fleas have been collected in rodents (Traub, Rothschild, & Haddow, 1983). Usually, when their host dies, fleas leave the body and look for a new host. Many flea species are apparently host specific, whereas others lack a close relationship with a specific host and are able to parasitize several mammal species (Barrera, 1953; Whitaker & Morales-Malacara, 2005).

Parasite conservation may not be a popular topic, but preserving and studying parasite diversity and interactions represent many benefits. Christe, Michaux, and Morand (2006) point out that parasites must be preserved not only for being part of biodiversity, but also for actively modeling community structure and keeping diversity, for being good indicators of ecosystem health by accumulating heavy metals in their tissues, for their use in biomedicine, and because their DNA may provide a biological record of evolutionary dynamics between parasites and hosts.

In Mexico, 163 flea species have been recorded (Salceda-Sánchez & Hastriter, 2006), and recent work raised the number to 172 (Acosta, 2014). However, flea species diversity in Mexico is probably higher, because many large areas like desert regions lack extensive flea inventories and show only scattered records (Gutiérrez-Velázquez, Acosta, & Ortiz, 2006; Ponce & Llorente, 1996; Salceda-Sánchez & Hastriter, 2006).

Arid land studies on Mexican fleas are not abundant, but some of them have documented new species, generated regional checklists, distributional records, taxonomic revisions, and explored co-distributional aspects (Table 1). Only 2 recent publications exist for the study area: Acosta, Fernández, Llorente, and Jimenéz (2008) presented data for 6 and 5 flea species in El Carmen Tequexquitla (Tlaxcala) and La Esperanza (Puebla),