



Conservation status of rodents of the families Geomyidae and Heteromyidae of Mexico

Estado de conservación de los roedores de las familias Geomyidae y Heteromyidae de México

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Abstract. Mexico is considered a mammal diversity hotspot, and most conservation efforts involving mammals focus on large and charismatic species. Herein, we provide an assessment of the conservation status of species that are often overlooked in conservation programs, Mexican rodents of the families Geomyidae (pocket gophers) and Heteromyidae (pocket mice and kangaroo rats). Based on distributional maps and recent systematic studies, a taxonomic and biogeographical distributional checklist was made. The conservation lists of the International Union for Conservation of Nature and the Mexican Secretaría de Medio Ambiente y Recursos Naturales were used to identify 8 geomyid species, and 8 species and 27 subspecies of heteromyids as endangered. Major threats to their conservation are change in land use, destruction of habitat and a lack of knowledge about their current distribution and population trends.

Key words: biogeographic distribution, habitat destruction, kangaroo rat, mammal, pocket gopher, pocket mouse, threatened species.

Resumen. México es una región del mundo con un elevado nivel de diversidad de mamíferos y la mayoría de los esfuerzos de conservación se concentran en las especies grandes, más carismáticas. Aquí, proveemos una evaluación del estado de conservación de especies que generalmente no son consideradas, los roedores mexicanos de las familias Geomyidae and Heteromyidae. Basados en mapas de distribución y estudios sistemáticos recientes, se preparó una lista taxonómica y de distribución biogeográfica de los roedores geómidos y heterómidos de México. Las listas de conservación de la Unión Internacional para la Conservación de la Naturaleza y la Secretaría de Medio Ambiente y Recursos Naturales de México se utilizaron para identificar 8 taxa de geómidos, 8 especies y 27 subespecies de heterómidos en peligro de extinción. Las principales amenazas para su conservación son: cambio en el uso de suelo, la destrucción del habitat y la falta de conocimiento acerca de su distribución actual y sus tendencias poblacionales.

Palabras clave: distribución biogeográfica, destrucción de habitat, rata canguro, mamífero, tuza, ratón de abazones, especies amenazadas.

Introduction

Rodentia is the most species-rich order in the class Mammalia. Carleton and Musser (2005) listed 2 277 species of rodents, representing more than 42% of the mammal species of the world. Each year the list of rodent species grows as new species are described and taxonomic revisions supported by new evidence, much of it molecular,

are published. Based on the list reported by Ramírez-Pulido et al. (2008), 240 (48.5%) of the 495 species of Mexican terrestrial mammals are rodents, and 169 (34.1%) are endemics. Despite the high diversity of rodents in México, there is a surprising deficit in the number of experts on Mexican rodents, especially those focused on neotropical and tropical rodent faunas (Amori and Gippoliti, 2003), as well as experts focused on Nearctic desert rodents and rodents such as pocket gophers (Geomyidae).

Rodents are an essential part of most natural communities because they often constitute the most

important food item of carnivores in food chains. Many rodent species in México are directly important to humans as well because they serve as a food source, potential vector of diseases, or cause economic impact by direct or indirect damage to crops and croplands. Yet despite the ecological and economic importance of rodents in México, basic aspects of rodent biology are still poorly understood, including their life histories, ecological roles in the community, present demographic status of populations, and phylogenetic relationships. This lack of basic knowledge of rodent biology leaves rodent faunas vulnerable to extirpation, even extinction (Lidicker, 2007). Because of the usual negative perception by most people about rodents, it has been difficult to convince the public of the importance of rodent conservation. As a result, more than half of mammalian extinctions worldwide before 1999 were rodents (MacPhee and Flemming, 1999). In the last 20 years, only 2 initiatives (both efforts of the World Conservation Union, IUCN) have called attention to rodent species at risk of extinction in an effort to establish conservation programs worldwide (Lidicker, 1989) and in North America (north of México; Hafner et al., 1998).

Although México is among the top 3 countries in the world in terms of mammalian species diversity (Myers et al., 2000; Ceballos et al., 2002), Mexican rodents were not included in the 2 published surveys of rodent species of conservation concern (Lidicker, 1989; Hafner et al., 1998): no information was available for the first (worldwide) survey, and México was not included within the geographic scope of the latter survey. The current IUCN Red List of Threatened Species (IUCN, 2012), evaluated only at the species level, includes 81 rodent species of México. Fully 60 of these species are in the family Cricetidae, with 4 other families represented: Heteromyidae (8 species), Geomyidae (5), Scuriidae (7), and Dasyproctidae (1). Of the 81 total species, 17 are restricted to islands; several of these currently are considered subspecies of more widely distributed species. By focusing at the species level, the list is biased by uneven taxonomic application. When the IUCN evaluates Mexican rodents at the subspecies level, as done by Hafner et al. (1998) for North America (north of México), many restricted island forms will most likely be added to this growing list of endangered taxa. For example, 23 additional island-restricted heteromyid subspecies currently are included in the list of species at risk by the Mexican Secretaría de Medio Ambiente y Recursos Naturales (Semarnat, 2010). Clearly, the rodents of México need more attention from conservation-oriented scientists.

The natural history of certain rodent species makes them more prone to extinction than others (Rabinowitz, 1981). Species susceptible to extinction are characterized

by small, often fragmented, populations located in small geographic areas. The patchy distributions of these species often result from their high habitat specificity. Close proximity of preferred habitat to urban developments or to areas of soil suitable for agricultural conversion increases the likelihood of extinction.

Pocket gophers of the rodent family Geomyidae and pocket mice and kangaroo rats of the family Heteromyidae exhibit natural history characteristics that make rodent species prone to extinction. Pocket gophers live in small, isolated populations often located near areas of urban development or in fertile valleys often converted to agricultural production (Hall, 1981; Hafner et al., 2004, 2005), while arid-adapted heteromyids occupy many small, arid islands near the western coast of México as well as regions that are being subjected to rapid agricultural conversion. Most species in these families are endemic to the southern part of North America, and their distribution is mainly in the United States and México, although some species range into Central America and northern South America (Fig. 1). There are currently 40 named species of pocket gophers (Geomyidae), of which 20 occur in México (Table 1). Thirteen of these 20 species (nearly one-third of all extant pocket gopher species) are endemic to México. The family Heteromyidae shows a similarly high level of endemism in México. The family contains 60 named species, of which 39 (65.0%) occur in México and 12 (one-fifth of all living heteromyids) are endemic to México (Table 2).

Family Geomyidae. Hafner and Hafner (2009) recognized central México as the probable center of diversification of the family Geomyidae. Most Mexican species inhabit tropical, subtropical, or forested temperate regions in the Trans-México Volcanic Belt (TMVB), and the Sierra Madre del Sur, although a few species live in the shrub-covered deserts of the Mexican Plateau. The most speciose genera are *Cratogeomys* and *Thomomys* with 7 and 5 species, respectively, followed by *Orthogeomys* (4 species), *Geomys* (3 species), and *Pappogeomys* and *Zygogeomys* with 1 species each. Pocket gophers are well equipped for their subterranean lifestyle, having cylindrical bodies, reduced eyes, and strong and well-developed forearms for digging. They possess external, fur-lined cheek pouches in which they transport food items, particularly roots. They prefer habitats with deep soils, which allow them to dig deep, spacious burrow systems (Stein, 2000). All geomyid species are solitary and aggressive, coming together only to mate.

Family Heteromyidae. Heteromyid rodents originated and evolved for 35 million years in North America, spreading into South America only during the last 3 million years (Schmidly et al., 1993). Although the family ranges from

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