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Conservation

The conservation status of the freshwater and terrestrial turtles of Mexico: a critical review of biodiversity conservation strategies

El status de conservación de las tortugas de agua dulce y terrestres de México: una revisión crítica de las estrategias de conservación de la biodiversidad

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Abstract

The continental turtle fauna of Mexico is composed of 7 families, 13 genera, and 45 species; when subspecies are included, a total of 61 distinct taxa are recognized. We searched for the imperiled level or protection status of each taxon according to the IUCN Red List, CITES appendices, the 25 most endangered freshwater turtles and tortoises, and the protection lists issued by the Mexican Government. We explored the overlap of conservation status between Mexican and international agencies by comparing listing status. Among the 61 taxa, 37 were in the IUCN Red List, 16 taxa were listed on CITES appendices, 39 taxa were in NOM-059 (Mexican Government list), 4 taxa were in Conabio's list (Mexican Government list), and only 1 species was included in the world's 25 most endangered freshwater turtles and tortoises. The Central American river turtle (*Dermatemys mawii*), the desert tortoises (*Gopherus* spp.) and the black soft shell turtle (*Apalone atra*) were the only taxa included in all the lists surveyed. Our comparison of the lists indicates that at least 25 taxa of Mexican turtles are lacking basic information and require further study to inform their comprehensive conservation status. Further, we detected a noteworthy discrepancy between international and Mexican conservation priorities for turtle conservation.

Keywords: Conservation priorities; Cuatrociénegas; *Dermatemys mawii*

Resumen

Las tortugas continentales de México están compuestas por 7 familias, 13 géneros y 45 especies. Contando a las subespecies es posible distinguir un total de 61 taxa. En este trabajo buscamos el estatus de conservación o el grado de amenaza para cada taxón en la Lista Roja de la IUCN, los apéndices de CITES, las 25 especies de tortugas de agua dulce y terrestre más amenazas, así como las listas de protección de especies generadas por el Gobierno de México. Exploramos la superposición de los estatus de conservación entre las listas, y de los 61 taxa, 37 se incluyen en la Lista Roja de la IUCN, 16 taxa están incluidos en algún apéndice de CITES, 39 en la NOM-059, 4 en la lista de especies prioritarias de Conabio y solo uno lo está en la lista de las 25 especies de tortugas más amenazadas en el mundo. La tortuga blanca *(Dermatemys mawii)*, las tortugas terrestres (*Gopherus* spp.) y la tortuga de concha blanda de Cuatrociénegas *(Apalone atra)* fueron los únicos taxa incluidas en todas las listas revisadas.

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Nuestra comparación entre listas indica que por lo menos 25 taxa de tortugas mexicanas carecen de la información necesaria para tener una idea clara de su estado de conservación, además, detectamos una discrepancia significativa entre las prioridades de conservación internacionales y las de México.

Palabras clave: Prioridades de conservación; Cuatrociénegas; *Dermatemys mawii*

Introduction

Chelonians are among the most endangered clades of vertebrates in the world (Böhm et al., 2013; Primack, 2012; Rhodin et al., 2011). There is no other reptile clade that includes as high a proportion of families and genera in endangered categories (Böhm et al., 2013), although chelonians are not as species-rich as lepidosaurians (Fritz & Havas, 2013). Even though the main conservation threats to turtles differ between taxa and regions of the world, general global hotspots for conservation challenges could be detected (van Dijk, Iverson, Rhodin, Shaffer, & Bour, 2014). Around the world, the most important threats for turtle populations are habitat loss, habitat degradation, poaching, introduced species, and subsidized predators (Klemens, 2000). For the Southeastern Asia hotspot, for instance, poaching and commercial trade have been the main factors reducing turtle populations. In other regions of the world such as the Americas, habitat loss plus habitat degradation are the main factors in turtle population reduction.

International efforts to create task forces such as the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, the Turtle Conservation Fund, and the Turtle Survival Alliance, have been undertaken in order to prevent turtle declines (Rhodin et al., 2011); however, country laws and concurrent public policies on species protection, conservation plans, and local trade regulations differ greatly between countries and even differ between states, provinces, and other levels of government. One consequence of these issues is threatened species and their associated conservation problems are attached to the jurisdictional and legal administration within countries, states, municipalities, counties, districts, etc. (Primack, 2012). In other words, conservation of species has become a government problem rather than merely a biological issue.

Mexico has the greatest reptile species richness in the Americas, and second worldwide (Conabio, 2008; Flores-Villela & García-Vázquez, 2014). Also it has the second-richest turtle fauna in the world after the U.S.A. (Legler & Vogt, 2013; van Dijk et al., 2014). The Mexican turtle (non-marine) fauna is composed of 7 families, 13 genera, and 45 species with at least 31 recognized subspecies – considered to be geographic variants (*sensu* Wilson & Brown, 1953). All together, species and subspecies compose a block of 61 taxa (Flores-Villela & García-Vázquez, 2014; Legler & Vogt, 2013; van Dijk et al., 2014). Fifty-seven percent of these taxa (35) are endemic and the probabilities remain high for potential new discoveries or upgrades from subspecies to species (Flores-Villela & García-Vázquez, 2014). The knowledge of natural history, ecology, and systematics of Mexican turtles is still incomplete (Iverson, Le, & Ingram, 2013) and Legler and Vogt (2013) have observed that more research is needed to increase the knowledge of life history of Mexican turtles in order to solve conservation problems.

Biodiversity conservation in Mexico is primarily the jurisdiction of the Federal Government. Mexican government agencies such as Semarnat (Ministry for Environment and Natural Resources), Conabio (National Commission for the Study of Biodiversity – a scientific authority), Profepa (Federal Attorney for Environmental Protection), Inecc (National Institute of Ecology and Climatic Change – a scientific authority and policy maker), CNF (National Commission of Forestry), and DGVS (General Directorate of Wildlife – part of Semarnat, and in charge of regulating wildlife management and game) are in charge of listing threatened species, protecting the listed species, designing and developing conservation programs for native species, and removing introduced species (Semarnat, 2014). Many of these agencies work under the Semarnat agenda (the higher-level agency and part of the executive government); however, internal agendas, lack of communication between agencies, and the frequent political and electoral uses of governmental programs within the Federal Government in Mexico limits conservation efforts and the allocation of financial resources for conservation (Mathews, 2014; Possingham et al., 2002).

According to international agreements signed by Mexico in environmental affairs, the threatened turtles of Mexico could be included in five lists/acts of imperiled species: NOM-059-Semarnat-2010 (NOM-059 from now), a list issued by the Federal Government (Semarnat, 2010) based on the Extinction Risk Manual (MER in Spanish), which generates individual profiles of species with data on distribution, demography, threats, and records. A call for papers is issued periodically for scholars, non-profit organizations, and research institutions to submit proposals for species to be included in the list. This list was first issued in 1994 under Ernesto Zedillo's government; since then, at least three updates have been published (Sedesol, 1994; Semarnat, 2001, 2010). The importance of NOM-059 for regional turtle conservation was discussed by Moll and Moll (2004, p. 268).

The Conabio List of Priority Species (Conabio, 2012) is another list issued by the Mexican government and is based upon a closed workshop of specialists from the federal government, academia, national non-governmental organizations (NGOs), international NGOs such as the IUCN, and private consultants (non-academics, but experts on conservation biology). The