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Conservation

Current distribution status of Golden Eagle (*Aquila chrysaetos*) in Northwestern Baja California, Mexico

Estatus de distribución actual del águila real (Aquila chrysaetos) *en el noroeste de Baja California, México*

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Abstract

The current distribution status, abundance and nesting of the Golden Eagle in Northwestern Baja California, Mexico, based on samplings during 2 years (January 2013–December 2014) throughout a series of scanned transects of 100 km that resulted in a total of 1634 km in length is documented. The average number of individuals detected/100 km was statistically similar between 2013 and 2014, with an average value of 1.5 ± 0.6 during both years. Number of eaglets per nest showed to be statistically independent ($p > 0.05$) from the abundance of potential prey, altitude, types of vegetation and lineal distance to urban zones. One hundred and one individuals of the Golden Eagle that have been historical (1843–1995) or recently recorded (2000–2014) for 11 localities of Baja California (3 historical and 9 recent) were reported. Five priority areas were identified for habitat conservation of this species in Baja California (Tecate, Valle de Guadalupe, Sierra de Juárez, Valle de Santo Domingo, and Sierra de San Pedro Mártir). Chronologically, the population of the Golden Eagle in Baja California has maintained active its distribution and nesting areas at least during the last 2 decades.

Keywords: Distribution status; Abundance; Nesting

Resumen

Se documentó el estatus de distribución actual, abundancia y anidación del águila real en el noroeste de Baja California, México, basados en muestreos durante 2 años (enero 2013 a diciembre 2014) a través de un conjunto de trayectos de 100 km escudriñados que resultaron en un total de 1634 km de longitud. El número promedio de individuos detectados/100 km fue estadísticamente similar entre 2013 y 2014, con un valor promedio de 1.5 ± 0.6 individuos en ambos años. El número de pollos por nido resultó ser estadísticamente independiente ($p > 0.05$) de la abundancia de presas potenciales, altitud, tipos de vegetación y distancia lineal a zonas urbanas. Se reportaron 101 individuos de águila real que ha sido histórica (1843–1995) y reciente (2000–2014) registrados para 11 localidades de Baja California (3 históricas y 9 recientes). Se identificaron 5 áreas prioritarias de conservación del hábitat para esta especie en Baja California (Tecate, valle de Guadalupe, sierra de Juárez, valle de Santo Domingo y sierra de San Pedro Mártir). Cronológicamente, la población de águila real en Baja California ha mantenido activa su distribución y sitios de anidación al menos durante las últimas 2 décadas.

Palabras clave: Estatus de distribución; Abundancia; Anidación

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Introduction

The Golden Eagle (*Aquila chrysaetos*) is a top predator widely distributed throughout the world in terrestrial ecosystems, with populations in America from Alaska, Canada, the United States, Northern México, including the Baja California peninsula, to central México (Kochert & Steenhof, 2002; Kochert, Steenhof, McIntyre, & Craig, 2002; Newton, 1979; Rodríguez-Estrella, 2002; Watson, 2010). This species receives special concern in North America (Good, Nielson, Sawyer, & McDonald, 2007; Katzner et al., 2012; Kochert & Steenhof, 2002) and Europe (Watson, 1992; Whitfield, Fielding, McLeod, & Haworth, 2008).

In the United States, the Golden Eagle is listed as a species of concern by numerous states and federal agencies, including the California Department of Fish and Game, who considers it as "fully protected" since 1918. In spite of protection, Golden Eagle populations have shown a decrease in southern California (Harlow & Bloom, 1989) and in the U.S. eastern region (Boal, Haralson, & Howe, 2008; Hoffman & Smith, 2003; Katzner et al., 2012; Kochert & Steenhof, 2002; Millsap et al., 2013). Although some populations occurring in locations with no anthropogenic influence suggest a stable trend (Millsap et al., 2013).

In México, the Golden Eagle is considered as a threatened species (NOM-059- Semarnat-2010; Semarnat, 2010) due to population decline resulting from habitat loss, pesticide poisoning, poaching and electrocution, among other hazards (Rodríguez-Estrella, Llinas, & Cancino, 1991; Semarnat, 2008). Due to its legal status and importance in ecosystems, several specific conservation programs have been implemented in México (Semarnat, 2008). However, little is known about historical and current records of the Golden Eagle in México, particularly in the Baja California peninsula (Rodríguez-Estrella, 2002).

Historical records of the presence of Golden Eagles in Baja California date back to the late 19th century (Anthony, 1893), with subsequent occasional and sporadic records, particularly for the central region of the peninsula (Rodríguez-Estrella, 2002). In this paper, we document the distribution, abundance and nesting records (both historical and recent) of Golden Eagles in northwestern Baja California, in order to assist in evaluating its current conservation in the most southwestern region of North America. Information obtained here might be useful for the development of research lines focused on restoration and conservation, and could also be used in the formulation of public policies aimed at the conservation of this species at federal and regional levels.

Materials and methods

The Baja California peninsula is 1,250 km long and 100 km of average width, with a mosaic of climatic conditions along a latitudinal and altitudinal gradient with temperatures ranging from 1 °C to 25 °C (Mediterranean climate) in the highlands, and from 25 °C to 30 °C in lowland deserts (Inegi, 2001; Rzedowski, 1978). The study area encompasses the northern part of the peninsula (Fig. 1), with dominant vegetation composed of chaparral and coastal sage scrub in lowlands, and coniferous forest in high mountains (Delgadillo, 1998). Coastal sage scrub vegetation ranges from sea level to 600 m, dominated by *Artemisia californica* and *Rhus integrifolia*. The chaparral vegetation occurs from 600 to 1,800 m and is composed mainly by perennial plants of the genera *Ceanothus*, *Arctostaphylos* and *Adenostoma*. Coniferous forest is represented in the Sierra de Juárez and Sierra de San Pedro Mártir along elevations ranging from 1,200 to 3,000 m; being the dominant species in both mountains *Pinus jeffreyii* and *Pinus quadrifolia.* In Lower Colorado River and Central Deserts districts of Baja California, the vegetation is dominated by desert elements such as *Larrea tridentata* and *Fouquiera splendens* (Peinado, Alcaraz, Delgadillo, & Aguado, 1994).

Occurrence records of the Golden Eagle in Baja California were compiled from 6 sources: (1) historical sighting records published prior to 1995; (2) voucher specimens or egg records in museums, both, in Mexico and in the USA; (3) unpublished sighting records generated by the authors between 1995 and 2007; (4) occasional photographic records obtained by the authors during 2002–2014; (5) recent sighting records through systematic monitoring (January 2013 to November 2014), and (6) records filed in the North American Birds database (R.A. Erickson, pers. comm.).

We used the definition of active nest as defined by Postupalsky (1974) by referring to the place where: (1) the young were raised, (2) eggs were laid, (3) 1 adult was observed and in incubation position, (4) 2 adults were observed on or near the nest, (5) 1 adult and 1 eagle in subadult plumage were observed in or near the nest and mating behavior also was observed, and (6) the nest was repaired and fresh sticks and Golden Eagle feathers molted that year were present.

Information of egg records and voucher specimens of the Golden Eagle from Baja California was consulted or requested in the following bird collections: Colección Ornitológica de la Universidad Autónoma de Baja California, Ensenada, Baja California, México (CO-UABC); Museo de Zoología "Alfonso L. Herrera" from the Departamento de Biología Evolutiva from Universidad Nacional Autónoma de México (MZFC-UNAM); The Western Foundation of Vertebrate of Zoology, Camarillo, California (WFVZ); The Museum of Vertebrate Zoology, Berkeley, California (MVZ); The San Diego Natural History Museum, San Diego, California (SDNHM); The Natural History Museum of Los Angeles County (LACM); and The Field Museum of Natural History (Birds), Chicago, Ill. (FMNH).

Recent sighting records of the Golden Eagle in the study area were obtained through the scanning of 8 transects (100 km-long) during breeding seasons (January–March 2013 and 2014) and non-breeding seasons (August–December 2013 and 2014). Each transect covered the same routes and was performed from a car on roads and trails in the study area, driving at an average velocity of 40 km/h. We traveled approximately a total of 1,634 km during 2 years, covering most of the state below 360 km of the south international border (Table 1). For each individual observed, habitat type, activity, age (subadult/adult) and sex (when possible) was recorded. In the case of detected nests, we analyzed them based on the characteristics proposed