Short Communication

Past and current evidence of persecution of the Endangered crowned eagle *Harpyhaliaetus coronatus* in Argentina

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Abstract The crowned eagle *Harpyhaliaetus coronatus* is a large Neotropical eagle categorized as Endangered throughout its range. However, the threats to this species are poorly understood. We present data on the causes of death of crowned eagles in semi-arid forests of La Pampa province, central Argentina. Data was obtained from field surveys and from interviews with 62 local landowners during 1999–2004. Over this period five eagles were shot, one killed by a car, one was found dead in a cattle water trough, and one was found in captivity. From the interviews information was obtained about a further 10 cases of eagles being shot, disturbed or trapped. Five (13%) of 38 interviewed landowners who positively identified the species admitted having killed or disturbed eagles in the past but only two (5%) mentioned predation of eagles upon livestock as a problem. Persecution seems to be a significant threat to this species in central Argentina and future research and conservation action should be focused not only on gaining a better knowledge of the biology of the species but also on conservation and educational programmes involving local people.

Keywords Argentina, crowned eagle, *Harpyhaliaetus coronatus*, persecution, semi-arid forest.

The crowned eagle *Harpyhaliaetus coronatus* of southern South America inhabits lowland areas of semi-open seasonal dry country and moderate altitude hill ranges (Del Hoyo *et al*., 1994; De la Peña & Rumboll, 1998). It is included in the threatened fauna lists of both Argentina and Brazil (Chebez, 1994; García-Fernandez *et al*., 1997) and has presumably been extirpated from Uruguay where no sightings have been reported since 1933 (Alvarez, 1933; Collar *et al*., 1992; BirdLife International, 2004). The crowned eagle was previously categorized as Vulnerable on the IUCN Red List (Collar *et al*., 1992; IUCN, 2006) but its status was recently uplisted to Endangered, with a declining world population estimated at <1,000 individuals in 2001 (BirdLife International, 2004; IUCN, 2006). About 200 individual sightings have been recorded (Bellocq *et al*., 2002) but only three active nests have been described (Giai, 1952; De la Peña, 1992), the last almost 25 years ago.

The causes of the Endangered status of the crowned eagle are not well documented. Both habitat loss (Collar *et al*., 1992; Bellocq *et al*., 1998) and persecution (De Lucca, 1993) have been separately suggested as the main cause of the species' decline. Direct persecution is recognized as occurring in at least some parts of the species' range (e.g. Paraguay; BirdLife International, 2004) although there are no quantitative data supporting this claim. The aim of the present study was to gather information on the causes of death of crowned eagles in central Argentina.

From 1999 to 2004 we conducted *c*. 1,000 km of field surveys each year in the central and eastern portions of La Pampa province, central Argentina. Surveys were conducted by 2–3 observers driving a car at a speed of 70–80 km h^{-1} along main and secondary roads in the Toay, Chalileo and Loventué counties, mainly during September – January each year. We aimed to sight eagles during the breeding season, enabling us to locate possible reproductive territories. In this 21,000 km^2 area the caldén *Prosopis caldenia* forest is the dominant habitat, characteristic of the Espinal and Epinal-Monte ecotone biomes in the semi-arid pampas (Cabrera, 1976). Additional information on dead eagles was obtained for Caleu-Caleu and Maracó counties in southern and northern La Pampa province, respectively.

Information on dead eagles came from our own records (i.e. eagles found dead near roads or on ranches) and from information gathered by interviewing local landowners. These interviews were made opportunistically. The landowners were first asked whether they had seen the crowned eagle. If their description closely resembled that of the species we showed them a field

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guide plate for confirmation of their identification. We then asked them about their encounters with crowned eagles and the sites where eagles had been seen.

During 1999–2004 we recorded a total of six dead crowned eagles, and one in captivity, in La Pampa province (Table 1). Forty–six ranches were visited and 62 landowners and other rural personnel interviewed. The total area covered by our interviews was *c*. 2,000 km^2 (10% of the total area). The majority of interviewees (38/62, 61.2%) positively identified the species. Of these, five landowners (13%) declared they had trapped, disturbed or shot eagles in the past and two others provided information on eagles shot at other sites (Table 1). Some of the landowners were not able to provide accurate dates either for sighting of individuals or for persecution incidents, but all of them occurred within the last 30–40 years. Including references from De Lucca (1992, 1993) and Pereyra-Lobos (2004), the number of incidents included a total of 20 crowned eagles (Table 1).

Persecution by local people seems to be a significant threat to the crowned eagle in the semi-arid forests of central Argentina. Considering our relatively short study period, the small fraction of the species' range surveyed and the number of records for the species in this area (Bellocq *et al*. 2002), the number of incidents of crowned eagles persecuted or killed in central Argentina is relatively high. This is of concern given the species' presumed low productivity. All reported nests of crowned eagles have raised only one chick (Giai, 1952; De la Peña, 1992) and there is some evidence that females lay only one egg per breeding attempt (Sick & Teixeira, 1977; De la Peña, 1992; Del Hoyo *et al*., 1994).

Table 1 Details of shooting, trapping and disturbance of crowned eagles in central Argentina, arranged chronologically.

Date	No. of birds	Sex	Age	Type of incident	Primary causes	Source / observations
Unknown	3	Unknown	Unknown	Shooting/ disturbance	Predation on sheep	Interview. An old farmer reported he killed two eagles & tried unsuccessfully to kill a third.
Unknown	1	Unknown	Unknown	Shooting	Unknown	Interview. Skin exhibited in a gun store in General Pico.
Unknown	1	Unknown	Juvenile	Shooting	Unknown	Interview. Skin exhibited in the Museo de Ciencias Naturales y Antropológicas, Santa Rosa.
June 1984	1	Unknown	Juvenile	Trapping	Unknown	De Lucca (1992)
July 1985	1	Unknown	Juvenile	Shooting	Unknown	Interview. Stuffed & kept by the farmer who killed it.
May 1988	1	Unknown	Juvenile	Trapping	Unknown	Interview. Caught near Victorica, La Pampa province & transported to Santa Fe (700 km N) where it was released in the wild several years later.
1990	1	Unknown	Juvenile	Shooting	Predation on sheep	Interview. The farmer who found the dead eagle had observed it preying on sheep.
Oct. 1990	2	Unknown	Adult	Disturbance	Unknown	Interview. Eagles perched in a tree shot by farmer; eagles were not seen again on this ranch.
Unknown	1	Unknown	Juvenile	Shooting	Unknown	De Lucca (1993)
Jan. 1999	1	Unknown	Subadult	Shooting/ accidental	Unknown	Field survey. Found dead in cattle water trough.
June 2000	1	Male	Subadult	Shooting	Unknown	Field survey. See also Maceda *et al*. (2003).
Mar. 2001	1	Female	Subadult	Accidental	Car casualty	Field survey. See also Maceda *et al*. (2003).
May 2001	1	Unknown	Juvenile	Shooting	Unknown	Field survey/interview
June 2001	1	Unknown	Juvenile	Shooting	Unknown	Field survey/interview
June 2001	1	Male	Adult	Shooting	Unknown	Field survey/interview. See also Maceda *et al*. (2003). Shot at night while roosting in a tree.
Sep. 2002	1	Unknown	Unknown	Disturbance	Unknown	Pereyra-Lobos (2004)
Jan. 2004	1	Female	Adult	Trapping	Unknown	Field survey/interview. Trapped by local farmer who kept it captive in Victorica, La Pampa province.

The six dead eagles we recorded should be considered a minimum for 1999–2004 within the area studied. It is likely that the number of persecution incidents we documented is an underestimate for the study period because most of the reports came from interviews with people who were involved in persecution of the eagle and who may therefore have wished to minimize the appearance of their involvement. Two of the interviewees suggested that the crowned eagle is persecuted because it predates domestic sheep *Ovis aries*. However, we believe that eagle predation on sheep is sporadic in the study area, for several reasons. The relative economic cost of livestock killed by natural predators, and hence farmers' perception of predation, should be greater for small-scale than for extensive sheep rearing (Moberly *et al*., 2003). Sheep in the study area are reared in herds of a few individuals for local consumption. Predation in such a situation would be readily perceived, yet only 5% of the farmers that identified the species mentioned predation by eagles, and remains of livestock were not found in the stomach contents of three of the shot eagles (Maceda *et al*., 2003). We believe that persecution of crowned eagles stems from a social and cultural attitude towards large predators in general, irrespective of whether or not the species preys on sheep.

Several studies have revealed sex and age-related differences in the incidence of anthropogenic causes of mortality of birds of prey (Ferrer & Hiraldo, 1992; Real *et al*., 2001). In our study the recorded persecution was largely of immature birds (juveniles and subadults; Table 1). It is not known whether this bias reflects the age ratios in the crowned eagle population or is indicative of the vulnerability of juveniles to persecution. In the latter case, several factors could be responsible for such vulnerability: behavioural traits related to the inexperience of young birds approaching houses or failing to escape from humans, and density-dependent mechanisms in which occupancy of more suitable sites by adults forces immature birds to establish in areas where they are more likely to be persecuted (Real *et al*., 2001). Adult mortality has dramatic effects on the viability of species such as large eagles that have low productivity rates and delayed maturity (Newton, 1979; Whitfield *et al*., 2004), and if adults are less susceptible to persecution than immature eagles the demographic consequences of human induced mortality could be less than the relatively large number of deaths suggest.

To our knowledge no conservation plans have been proposed or established for the crowned eagle in any of the countries comprising the species range. Most of the cases of shooting and trapping of crowned eagles that we recorded were located in one of the three areas identified by Bellocq *et al*. (2002) as sites where research and conservation efforts for the species should be intensified in Argentina. As priority issues, breeding biology, feeding ecology, movements and habitat requirements need to be investigated in any future research on the crowned eagle. Educational campaigns focused on rural people and legal protection for the species are urgently needed and should be in conjunction with any research activities. Local people could also be involved in such research, collecting field data on the occurrence of the eagles that would otherwise be difficult to obtain because of the low density and secretive habits of the species. Some of these research and conservation actions, such as an intensive search for breeding territories, study of the eagle's breeding biology, and the promotion of educational campaigns, are currently carried out in La Pampa province by the Centro para el Estudio y Conservación de las Aves Rapaces en Argentina. However, similar activities need to be initiated in other areas of the species' range to establish a broad scale conservation strategy to conserve crowned eagle populations in southern South America.

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Biographical sketches

José Hernán Sarasola's research focuses on the ecology of birds of prey in both the human-modified and natural landscapes of Argentina. Juan José Maceda has been working on bird species assemblages in semi-arid forests of Argentina and is particularly interested in the ecology of crowned eagles in this habitat. They are both members of the Centro para el Estudio y Conservación de las Aves Rapaces en Argentina, a research team that aims to study and conserve resident and migrant raptors in southern South America.