Stakeholders perceptions of the endangered Egyptian vulture: Insights for conservation

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ABSTRACT

The inclusion of perceptions, interests and needs of stakeholders in biodiversity conservation is critical for the long-term protection of endangered species. Yet, the social dimensions of endangered species conservation are often overlooked. We examined the social perceptions of the conservational importance of the globally endangered Egyptian vulture (*Neophron percnopterus*) in one of the most important breeding areas worldwide: the Bardenas Reales Protected Area, northern Spain. We assessed the factors that influence the stakeholders' views of its conservation importance and identified the management strategies that would have social support. We found that the understandings of the Egyptian vulture differed among stakeholders. Hunters had the highest level of knowledge about its presence, threatened status and role as provider of ecosystem services. Livestock keepers recognized the worth of the Egyptian vulture for carcass removal, whereas other regulating services (e.g. biological control) were frequently acknowledged by tourists. Hunters and livestock keepers were more critical about the effectiveness of ongoing conservation strategies for preserving the Egyptian vulture than tourists. Moreover, each stakeholder group identified different actions for the conservation of the Egyptian vulture in the area. The consideration of the diversity of conservation actions suggested by stakeholders could catalyze broader support for the preservation of the Egyptian vulture.

1. Introduction

Considerable time and effort have been invested to implement accurate conservation initiatives to preserve endangered species worldwide. The focus of conservation biology has evolved over time from preserving species in protected areas to including the importance of social systems for achieving sustainable human-wildlife interactions (Mace, 2014). Most conservation efforts have focused on the reduction of human pressure on wildlife species (Groom et al., 2006; Vié et al., 2008). However, it is now accepted that "*conservation is as much about people as it is about species*" (Mascia et al., 2003) and that conservation problems will never be solved by ignoring human dimensions (Balmford and Cowling, 2006; Chan et al., 2007; Sandbrook et al.,

2013; Martín-López and Montes, 2015; Bennett et al., 2017a,b). Indeed, Mace (2014) recognized that the current emphasis in biodiversity conservation relies on a 'human in nature' framing, in which a better understanding of human dimensions of conservation is required.

Social-ecological approaches for biodiversity conservation, where perceptions, knowledge, interests and needs of multiple social actors are explicitly acknowledged, have been recently pointed out in different conservation forums (e.g. Ban et al., 2013; Martín-López and Montes, 2015; Bennett et al., 2017a,b). Indeed, different conservation challenges have been addressed by applying a social-ecological approach, such as the management of protected areas (e.g. Palomo et al., 2014; Ferraro and Pressey, 2015), conservation planning (e.g. Ban et al., 2013; Levin et al., 2013; Guerrero and Wilson, 2017), wildlife

protection (e.g. Manfredo, 2008; Carter et al., 2014; Pfeiffer et al., 2015) or the design of campaigns for the preservation of flagship species (Verissimo et al., 2014). Despite these developments, human dimensions of biodiversity conservation still remain underutilized in many conservation decisions and actions (Ban et al., 2013; Bennett et al., 2017b).

Avian scavenger populations are a case in point: in spite of the historical interaction between humans and vultures (Moleón et al., 2014, Cortés-Avizanda et al., 2015b, DeVault et al., 2016), the conservation approaches for vultures have predominantly relied on their biology (e.g. Houston, 2001; Donázar et al., 2009a). Vultures have abruptly declined worldwide, with populations collapsing in Asia, Africa, and Europe (Green et al., 2004, Ogada et al., 2011, 2015, Cortés-Avizanda et al., 2016; Buechley and Şekercioğlu, 2016). The primary reasons for the collapse of vultures worldwide are poisoning, persecution, habitat destruction, high concentration of antibiotic residues in their systems, decreased availability of food and the loss of traditional farming practices (Olea and Mateo-Tomás, 2009; Cortés-Avizanda et al., 2015b, 2016; Ogada et al., 2015; Buechley and Şekercioğlu, 2016). Furthermore, vultures declining has negative consequences on humans' quality of life because certain ecosystem services may be negatively affected, such as carcass removal and control of diseases, ecotourism or spiritual values (Markandya et al., 2008; Morales-Reyes et al., 2017). Despite the contributions of vultures to humans' quality of life and despite the conservation of vultures depends on human actions, social perceptions of vultures and their conservation have been largely ignored in conservation research and practice.

The Egyptian vulture (*Neophron percnoterus*) is a globally threatened medium-sized avian scavenger (ca 2 kg) with a breeding population in Europe estimated at 3000–4700 pairs (BirdLife International, 2015). Although formerly the Egyptian vulture was very abundant, the species has experienced a severe decline throughout its range due to human-related mortality. The Spanish population comprises ca. 97% of the European Union population and in some regions has seen a concerning decline in the last two decades (Margalida et al., 2010). Bardenas Reales Natural Park (northern Spain, see below) is one of the most important area for the species because it held one of the densest population of Egyptian vultures with up to 50 breeding pairs (1 pair/10 km^2). However, the population currently has between 20 and 25 active breeding pairs, which mean a decrease of about 50% of the initial breeding pairs (Carrete et al., 2007; Cortés-Avizanda et al., 2009, 2015a; Sanz-Aguilar et al., 2017).

In this context, our primary goal was to understand the social perceptions of conservation of an emblematic avian scavenger, the Egyptian vulture, by different stakeholders. We specifically aimed to: (i) identify which were the factors that might affect the different stakeholders' perceptions of the importance of conserving the Egyptian vulture and (ii) explore the different conservation strategies that could foster the protection of the focal species whilst having the social support of diverse stakeholder groups. Ultimately, we intend to provide insights for the conservation of the Egyptian vulture in its most important European breeding areas.

2. Material and methods

2.1. Study area

The research was performed in the Bardenas Reales, northern Spain (Fig. 1), which encompasses around 50,000 ha and was declared a Natural Park by the regional government in 1999 and World Biosphere Reserve by UNESCO in 2000. It is a semiarid landscape with < 300 mm of annual precipitation and with an average annual temperature around 13 °C. This area is dominated by large flat areas and small hills (280–659 m.a.s.l.) with natural vegetation dominated by scrublands and small wooded patches (for more details, see Cortés-Avizanda et al., 2015a). It is also a unique site due to its geomorphology and because it

is home to charismatic steppe birds of high conservation priority such as Dupont's lark (*Chersophilus duponti*) and Pin-tailed Sandgrouse (*Pterocles alchata*). Bardenas Reales is also one of the most important breeding areas for the endangered Egyptian vulture. The site previously had the highest densities of breeding pairs in Europe (see above), although the number has declined by about 50% since 1990 (Cortés-Avizanda et al., 2009; Sanz-Aguilar et al., 2017).

In the past, this protected area was devoted to traditional agricultural practices such as dry cereal croplands and pasturelands but human settlements no longer exist within the park boundaries. Currently, large numbers of domestic herds (up to 90,000 sheep) graze in this area from autumn to spring, when herders move from the Pyrenees to Bardenas Reales. The area outside the protected area is densely populated (> 150,000 people within a 30-km radius) and it is also used for intensive farming, such as large irrigated crops and intensive livestock management, as well as game preserves (Cortés-Avizanda et al., 2009, 2015a). The number of visitors in the Natural Park has increased since the last decade and currently reaches 56,094 visitors in 2016 (Information Center, personal communication). Because of these social and ecological characteristics, Bardenas Reales represents an optimal scenario to examine the role of stakeholders' perceptions for the conservation of endangered species, such as the Egyptian vulture.

2.2. Data collection

Data sampling was conducted in two main phases. In September 2014, we conducted 10 semi-structured interviews with farmers, hunters, shepherds and rangers of the park, to identify: (i) stakeholders related with Bardenas Reales and its biodiversity, (ii) the main motivations for the conservation of biodiversity in the region, and the ecosystem services provided by the Protected Area and particularly by vultures. In this research, we understood ecosystem services as all the benefits that societies obtain from nature (Díaz et al., 2015), regardless of whether these benefits were directly perceived by people or not. We applied a snowball sampling technique to identify additional respondents, i.e. we asked respondents to name others who could be contacted for their knowledge about this region and its biodiversity and ecosystem services. Interviews were digitally recorded, transcribed and coded. All the interviews were conducted with the signed consent of interviewees.

From March–April 2015, we conducted 354 direct face-to-face questionnaires in the Protected Area. The population sampled was restricted to individuals over 18 years old and covered a wide range of people including local inhabitants, tourists, livestock keepers and hunters. For each stakeholder group, we estimated a representative sample size of respondents at a 95% confidence level, with a sampling error ranging between 4.4% and 6.0% (see Appendix A). We structured the questionnaire based on the information obtained through the semi-structured interviews. The questionnaire included four sections: (i) socio-demographic characteristics of respondents (i.e., place of residence, age and gender); (ii) their environmental behavior (i.e., frequency of visits to the Bardenas Reales Protected Area per year; number of other Protected Areas visited in the last year); (iii) their knowledge about Bardenas Reales Protected Area, particularly about the main reasons for having been declared a Natural Park and Biosphere Reserve, its management practices as well as the traditional uses and practices currently performed in the region; (iv) their perceptions about the species inhabiting in the Protected Area and their conservation status, with a particular focus on (v) the Egyptian vulture (i.e. presence in the Protected Area, its threatened status, ecosystem services that this species provides, the role of the Protected Area for its conservation and the suggested conservation actions to advance its conservation; see Appendix B for the questionnaire structure and content).

Variables belonging to the section regarding the Egyptian vulture (section v) were the response variables for data analysis. Variables