



Short communication

Dealing with conflicts between people and colonizing native predator species

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ABSTRACT

The conflicts associated with the return of flagship species and the consequences of exotic species invasion have been extensively assessed, but there is a lack of information about conflicts derived from the colonization of common native species. The present study aims to assess the perception of different profiles of stakeholders regarding the spread of a native medium-sized mammal found in Spain: the case of the Egyptian mongoose (*Herpestes ichneumon* L.), which can compromise the conservation of rabbit and red-legged partridge and the economic activity of rural areas. Using a sample of 116 landowners and 251 hunters and multiple bounded uncertainty choice data, we analyzed the stakeholders' perception of predators, the stakeholders' preferences of different management measures for predator control, and the role of local people for controlling the Egyptian mongoose.

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1. Introduction

Predators have strong regulatory effects on ecosystems, both indirectly, through controlling food webs and ecosystem functioning, and via direct effects on uses of the ecosystems, such as wildlife watching and hunting (i.e., [Ripple et al., 2014](#)). Predators include both species that humans have pushed to near-extinction and species with abundant populations that come into conflict with other human interests such as beehives, cattle, hunting, fishing or the health and physical integrity of human beings ([Delibes-Mateos et al., 2013](#); [Fernández-Gil et al., 2016](#); [Graham et al., 2005](#); [Kubo and Shoji, 2016](#); [Piédallu et al., 2016](#); [Reynolds and Tapper, 1996](#); [Ripple et al., 2014](#); [Villafuerte et al., 1998](#); [Virgós and Travaini, 2005](#)). In this context, the interests and perceptions of stakeholders cannot be left aside when planning schemes for the management and conservation of species, as the success of these programs depends largely on their prior acceptance ([Johansson et al., 2016](#)). Furthermore, the interests and perceptions within society vary among stakeholders and wildlife species ([Dayer et al., 2016](#); [García-Llorente et al., 2011](#); [Kansky et al., 2014](#)).

Currently, climate change, the dynamics of land-use change, and some specific management measures are promoting the migration of

certain predators throughout the countryside, sometimes causing the emergence of conflicts. For example, there is evidence of the return of old conflicts arising from the recovery of large mammals that today are listed as endangered species in Europe and North America ([Chapron et al., 2014](#)). That is because the successful management efforts to promote populations of large predators have entailed more encounters with humans and domestic animals. Large populations of certain predators can renew the use of controversial tools for predator control either to preserve or to regulate their populations ([Trevés and Karanth, 2003](#)). In the literature, we have found analyses of the perceptions of the return of these conflicts associated with flagship species ([Piédallu et al., 2016](#)). However, threatened species can skew perceptions toward the extremes, and conclusions cannot be transferred to common species (i.e., [Delibes-Mateos et al., 2015](#); [Kaltenborn and Brainerd, 2016](#)).

Conflicts related to exotic invasive species have also received attention in the literature ([Vilà et al., 2011](#)), and society already recognizes the associated important threats to biodiversity and global change ([Bremner and Park, 2007](#); [García-Llorente et al., 2011](#)), but these results should not be directly applied to the case of a native species that migrates from one place to another. This fact is particularly important because native species can cause harmful ecological and economic impacts similar to those commonly associated with non-native invasive species ([Carey et al., 2012](#)), but stakeholders' perceptions and preferences of these two types of species might differ ([Dayer et al., 2016](#)).

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Thus, we have detected a lack of knowledge regarding the perceptions of conflicts derived from the colonization of common native species. This is important because migration of native species is a possible scenario currently and in the future due to various causes, such as adaptation to climate change (Levinsky et al., 2007), habitat loss and changes in resource availability (Flynn et al., 2009), and the disappearance of apex predators (Ritchie and Johnson, 2009). The present study aims to assess the perceptions of different stakeholders about a native medium-sized predator undergoing range expansion in the Iberian Peninsula. In this particular case, the Egyptian mongoose (*Herpestes ichneumon* L.) in the Iberian Peninsula (Detry et al., 2011; Gaubert et al., 2011), will improve knowledge about the social perception of a native species that is colonizing a territory and that can damage the conservation of certain species and certain types of economic activity. With this species, we have tried to avoid extreme human reactions, either fascination or rejection of management actions, that can be derived from being a flagship species, an exotic species, a species in danger of extinction, or a species that induces a sense of danger to physical safety (Delibes-Mateos et al., 2015). Moreover, we analyzed the stakeholders' acceptance of predator control, the stakeholders' preferences of different management measures for control, including lethal predator control, and whether there is room for compensation between different stakeholders. In summary, this study provides clues for policy makers and managers about stakeholders' sensitivities on the expansion of mammals' ranges due to the success of conservation programs, to changes in land-use, or to the effects of the displacement of species by climate change.

2. Materials and methods

2.1. Case study: Egyptian mongoose in Southern Europe

The mongoose is a native small mammal that is widely distributed in Africa and in a small part of Europe, only in the southern part of the Iberian Peninsula, although there is much evidence of expansion of its range in the Iberian Peninsula (Balmori and Carbonell, 2012; Barros et al., 2015; Detry et al., 2011; Gaubert et al., 2011). Some causes of expansion are rural abandonment, which promotes larger and denser scrublands, a generalized decrease in the illegal use of tools for predator control, and the generalist nature of this species (Barros et al., 2015; Palomares, 1993; Recio and Virgós, 2010).

In the Iberian Peninsula, the main conflict presented by the mongoose is predation on red-legged partridge (*Alectoris rufa* L.) and rabbit

(*Oryctolagus cuniculus* L.) (Palomares, 1993), which competes directly with the economic activity of hunting and with the necessary food of species in danger of extinction (e.g. Iberian lynx). The mongoose is not a game species in Spain (contrarily to Portugal), but there is a current debate about the possibility to turn this species in a game species.

2.2. Survey design and data

Landowners and hunters were selected as the interested stakeholders regarding mongoose because this species directly affects both groups. Data for this study were obtained from two e-mail surveys conducted in March 2016 using the web platform www.tickstat.com. Landowners and hunters were contacted by the main landowners' and hunters' association in Andalusia. Fig. 1A shows the municipalities sampled according to the type of respondent, corresponding to the locations of the sampled landowners and the locations where the hunters spent most of their hunting journeys in the previous hunting season (2015–2016).

In addition to requesting demographic and socioeconomic information, we asked landowners to answer questions regarding their hunting estates and the hunting activity in the last year, and we asked hunters to answer questions about their small game hunting activity in the last year. Additionally, we asked respondents to answer questions regarding the following: (1) their attitudes, knowledge and beliefs about predators, (2) their attitudes, knowledge and beliefs about the Egyptian mongoose, and (3) their acceptance of predator control and preferences among different management measures for predator control. Finally, we asked both types of stakeholder to participate in an economic exercise to elucidate whether there is room for compensation between landowners and hunters. The questionnaire and database used for this analysis are available on request from the authors.

2.3. Analysis

We used a multiple bounded uncertainty contingent valuation that allows respondents to express their level of uncertainty for a range of bids or money thresholds (Welsh and Poe, 1998). This approach allows respondents to state their preferences using the scale: "Definitely no", "Probably no", "Not sure", "Probably yes", and "Definitely yes" to indicate whether they would pay (or accept) every bid.

Landowners were asked about their certainty levels of willingness to pay to cull mongoose in case there were changes in the law that would enable active management of this species in their region. Annual costs

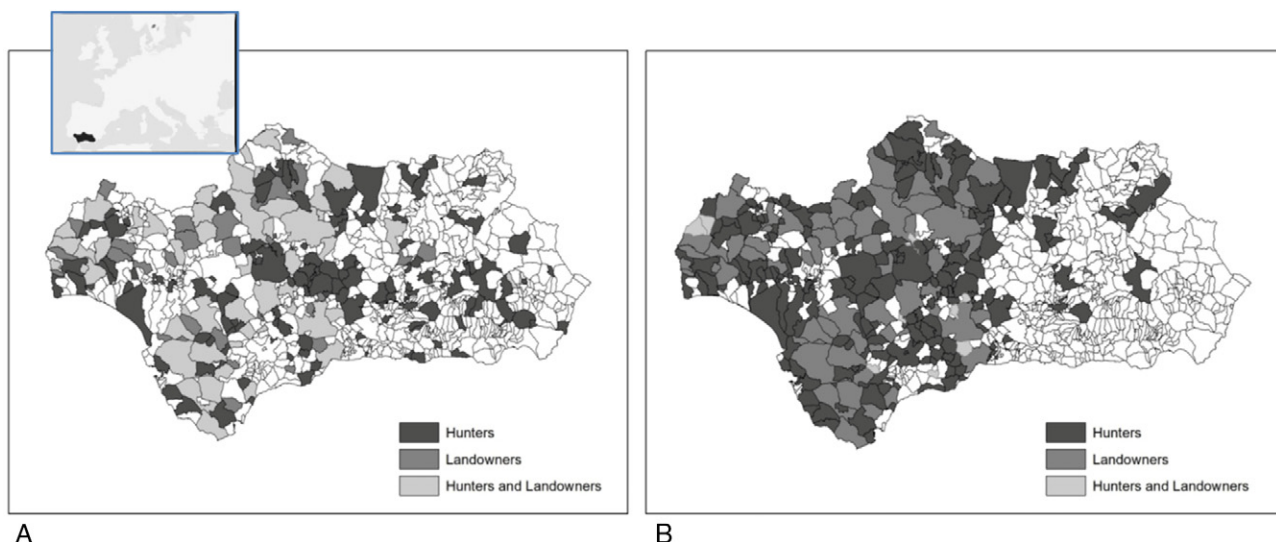


Fig. 1. A) Municipalities sampled according to the type of respondent. B) Municipalities where the Egyptian mongoose has been reported according to the type of respondent.

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