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Unravelling negative interactions between humans, mammalian carnivores and raptors in South America

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Abstract. Human-wildlife interactions can be negative when the needs and behavior of wildlife negatively influence human goals, or vice-versa, and management of these interactions may lead to conflict. Here, we review information on negative interactions between humans and wildlife in South America contained in 136 scientific publications, focusing on terrestrial mammalian predators and raptors. We found that most studies were conducted in Brazil, Argentina, Chile and Colombia. The methodology most commonly used to investigate negative interactions was interviews with rural inhabitants. Studies were performed mainly on interactions involving large felids such as *Panthera onca* and *Puma concolor*, and —to a lesser extent— on other mammalian predators and raptors such as eagles or scavenger birds. The main drivers of negative interactions involved perceived or actual impacts on human economy (material) (e.g., livestock or crop losses) or were based on non-material (intangible) aspects (e.g., fear, myths, and religious beliefs). The studies showed that negative attitudes and perceptions toward terrestrial mammalian predators and raptors are widespread in South America. Although non-lethal strategies for mitigation of negative interactions have been proposed, most are not widely used and lethal controls are still very common. A multidisciplinary approach is required, based on multiple actions (e.g., improving livestock practices, running educational programs, increasing stakeholder involvement, providing farmers with solutions), which would minimize negative interactions and promote coexistence between humans and wildlife. This is key to maintaining threatened species, ecological interactions and healthy environments in the anthropized landscapes of biodiverse South America.

[Keywords**:** carnivores, human-wildlife conflict, lethal control, predation, raptors]

Resumen. Desentrañando las interacciones negativas entre humanos, mamíferos carnívoros y rapaces en América del Sur. Las interacciones entre el ser humano y la fauna silvestre pueden ser negativas cuando las necesidades y el comportamiento de la fauna silvestre influyen negativamente en las metas de las personas, o viceversa, y manejar estas interacciones puede generar conflictos. En este artículo revisamos la información científica sobre este tipo de interacciones en 136 publicaciones realizadas en Sudamérica. Nos centramos en los mamíferos depredadores terrestres y en las aves rapaces . Encontramos que la mayoría de los estudios se realizaron en Brasil, Argentina, Chile y Colombia. La metodología más utilizada fueron las entrevistas a habitantes de zonas rurales. Los estudios se realizaron principalmente sobre interacciones con grandes félidos como *Panthera onca* y *Puma concolor*, y —en menor medida— sobre otros mamíferos depredadores y aves rapaces como las águilas o las aves carroñeras. Los impulsores principales de estas interacciones fueron los impactos -percibidos o reales- sobre la economía (materiales) (e.g., pérdidas de ganado o cultivos) o aspectos no materiales (intangibles) (e.g., miedo, mitos y creencias religiosas). Los estudios mostraron que las actitudes y percepciones negativas hacia los mamíferos depredadores y las aves rapaces están muy extendidas en Sudamérica. Aunque se propusieron estrategias no letales para mitigar las interacciones negativas, la mayoría no se utiliza ampliamente y los controles letales siguen siendo muy comunes. Se requiere un enfoque multidisciplinario, basado en diversas acciones (e.g., mejorar las prácticas ganaderas, realizar programas educativos, aumentar la participación de las partes interesadas, proporcionar soluciones a los agricultores) que minimicen las interacciones negativas y promuevan la coexistencia entre los seres humanos y la fauna silvestre. Esto es clave para conservar las especies amenazadas, fomentar las interacciones ecológicas y mantener entornos saludables en los paisajes antropizados de la biodiversa Sudamérica.

[Palabras clave: carnívoros, conflicto humano-fauna, control letal, depredación, rapaces]

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Introduction

Human wildlife interactions could be considered negative (commonly framed as human-wildlife conflict) or positive (e.g., ecosystem services performed by species) (Nyhus 2016). Negative interactions between humans and wildlife commonly produces human-wildlife conflict, particularly when the needs and behavior of wildlife impact negatively on human goals, or vice-versa (Dickman and Hazzah 2016; Nyhus 2016). Defining conflicts with wildlife is often difficult, given that almost all human activities affect wildlife, and thus a wide range of conflictive situations may occur; for instance, conflict may arise through competition for space because of agricultural expansion and deforestation, or simply because human activities (e.g., hunting) deprive animals of their 'right' to live. The IUCN has, therefore, defined the negative interactions that provoke human-wildlife conflict as "struggles that emerge when the presence or behavior of wildlife poses actual or perceived, direct and recurring threat to human interests or needs, leading to disagreements between groups of people and negative impacts on people and/or wildlife" (IUCN SSC HWCTF 2020).

Negative interactions between humans and wildlife leading to conflicts can be shaped by different drivers. Some of these are promoted by perceived or actual material (economic) losses. However, recent studies have demonstrated that negative interactions and human tolerance toward wildlife can be more closely related to non-material (intangible) drivers, encompassing social, cognitive and emotional factors (Dickman 2010; Carter and Linnell 2016; Nyhus 2016; Bhatia et al. 2020). These drivers (material and non-material) must be properly understood and analyzed on local and regional scales if we are to mitigate the potential consequences of negative human-wildlife interactions and promote healthy coexistence.

In the 16th and 17th centuries, South America went through a colonization process that modified land use in different ways (e.g., mining, deforestation, intensive agriculture and livestock husbandry) (Roig 1991). This transformation of natural habitats, which still occurs today, has been reinforced by centuries of extractive exploitation of natural resources (Armesto et al. 2010; Correa 2016). This has led not only to a loss of biodiversity, but also to a reduction in the capacity of ecosystems to provide services (Paruelo et al. 2014). One of the consequences of this complex transformative process is the change in natural prey composition (i.e., modification of the population abundances of prey consumed by mammalian predators and bird of prey in this geographical area) (Baldi et al. 2001; Novaro and Walker 2005; Palacios et al. 2012; Lambertucci et al. 2018; Guerisoli et al. 2020). The loss of native prey species has driven many predators and scavengers —probably due to their opportunistic behavior, to rely increasingly on alternative food resources— such as those directly or indirectly provided by human activities (e.g., livestock, invasive species) (Iriarte et al. 1990; Inskip and Zimmermann 2009; Lambertucci et al. 2009; Barbar and Lambertucci 2018), exacerbating negative human-wildlife interactions. This suggests that land use changes produced by humans are shaping negative human-wildlife interactions. The colonization process also affected the ancestral ecological knowledge of South American societies and incorporated new ideas and perceptions about native fauna that came from the 'Old World' (Jacques-Coper et al. 2019; Lambertucci et al. 2021a). These imported ideas have also influenced the relationship between humans and wildlife.

Although scientific information on negative interactions between humans and wildlife in South America is increasing, we lack a comprehensive review that analyzes the different species and evaluates different aspects and characteristics of these interactions at a regional level. Identifying aspects and characteristics of negative interactions is fundamental to develop efficient and consensual conservation strategies. In this article we review the available scientific information on negative interactions between humans and wildlife in South America, focusing on terrestrial mammalian predators (including domestic dogs and cats) and bird raptors (including hunters and obligate scavenging birds). Through this review we expect to achieve better understanding of the state of knowledge of this topic. We also aim to promote new research on the subject and combine insights and include reported conservation actions for mitigation of this problem. This review includes studies discussing ecological factors that influence human-wildlife conflict (e.g., dietary or movement studies) and those analyzing the human dimensions of wildlife (e.g., interview or questionnaire studies). We paid particular

attention to the reciprocal aspect of negative interactions (i.e., when wildlife impacts on human goals and that impact leads to a response toward wildlife species; for example, negative perceptions, persecution, lethal and non-lethal strategies.

Materials and Methods

We performed a bibliographic search in Google Scholar and Scopus to find scientific information about negative human-wildlife interactions in South America up to April 1st, 2021 (without restriction of year). We focused on terrestrial mammalian predators and bird raptors (hunters and obligate scavenging birds) as species of interest, since they are strongly affected by this conservation problem on a global scale (e.g., Inskip and Zimmermann 2009; Margalida et al. 2014). We also included feral and free-ranging dogs and feral cats in our searches because they are conflictive species that generate major negative interactions with humans through livestock and poultry damage, and because they also affect native wildlife (Lepczyk and Duffy 2017; Zamora-Nasca et al. 2021). We used the key term 'human-wildlife conflicts', both in English and Spanish, combined with the different countries of South America (Argentina, Brazil, Chile, Uruguay, Paraguay, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana, Suriname, French Guiana). The search was also carried out in Portuguese, which was combined only with Brazil. Through these searches we covered a wide range of negative interactions between humans and wildlife, not only those produced by livestock predation. In addition, we performed three additional searches with the terms 'human-wildlife coexistence', 'livestock attack' and 'livestock predation' combined with the same South American countries mentioned above in English, Spanish and Portuguese (only for Brazil). For Google Scholar, we analyzed up to the first 1000 results or until the topic of the articles found was not related to the aim of this study (usually 300-500 results), and for Scopus we analyzed all the articles obtained. We performed a flow diagram adapted from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al. 2021) (Supplementary Material 2, Figure S1). To check and complete our search, we used a 'snowball' approach (Goodman 1961), looking for additional relevant publications in all the references of the articles we found in our primary literature search. To prevent the repetition of information already published in the scientific literature, we excluded theses, technical reports, non-scientific (i.e., popular) articles, book chapters (except they presented new data, not published in papers) and review articles that discussed and evaluated human wildlife conflicts but presented no new data.

From each scientific article found we extracted the year of publication and geographic location of the study, the species studied and their global conservation status according to the global IUCN Red List (IUCN 2017). In addition, we extracted information about: a) the methodology used in each study, b) the kind of negative interaction (e.g., animal livestock interaction), c) people's perception of studied species, and d) the potential reasons or drivers shaping the negative interactions addressed or suggested by the authors. To define the type of negative interaction we used the classification proposed in Peterson et al. (2010). We classified the drivers of negative interactions and conflicts between humans and wildlife into two main categories: material (economic) (i.e., when perceived and actual economic losses were the main reasons for negative interactions between humans and wildlife) and non-material (intangible) drivers (i.e., when negative interactions between humans and wildlife were primarily related to social, cognitive and emotional factors). These categories were not mutually exclusive since some articles addressed or mentioned both material and non-material drivers simultaneously. Finally, we gathered information on the conservation actions to mitigate human-wildlife conflict proposed by the articles reviewed and identified knowledge gaps to be considered in future research.

Results and discussion

Year of publication and geographical areas studied

We found 136 articles from South American countries. Most of these (74%) were published during the last decade, from 2011 to 2021 (Figure 1A; Supplementary Material 1, Table S1), whereas the remainder were published from 2001 to 2010 (24%) and 1991-2000 (2%) (Figure 1A; Supplementary Material 1, Table S1). These results show that interest in this topic has increased greatly over the last decade, possibly in association with the pronounced changes in land use that occurred in this region (De-Sy et al. 2015; Salazar et al. 2015), which

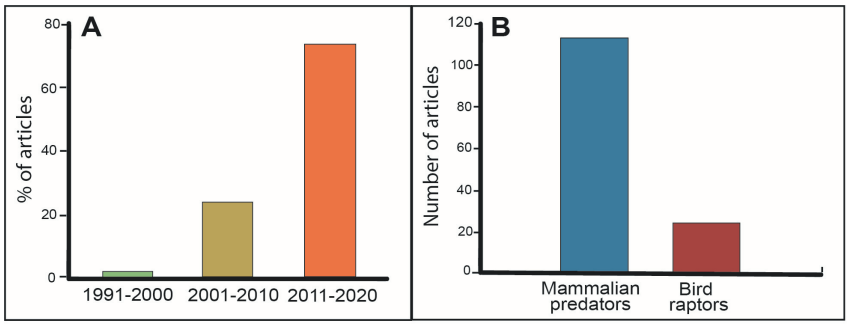

Figure 1. A) Percentage of articles published over the last three decades. B) Absolute number of interactions studies involving mammalian predators and raptors.

Figura 1. A) Porcentaje de artículos publicados en las últimas tres décadas. B) Número absoluto de estudios sobre las interacciones negativas involucrando depredadores mamíferos y rapaces.

led to negative interactions and competition for resources between humans and wildlife (Jorgenson and Sandoval 2005; Jampel 2016; Caruso et al. 2017). Moreover, the recent loss of traditional livestock farming practice in this geographical region and the increase in farm size and mechanization —with reductions of workforce— could have led to a reduction in positive perception of wildlife (perceptions primarily related to the contributions provided by wildlife to humans' lives) and to the deterioration of interactions between humans and wildlife (Silva-Rodríguez et al. 2009; Silva-Andrade et al. 2016). However, this trend could also be explained by the increasing interest of scientists in approaching the subject from the social and conservation perspectives (Bennett et al. 2017).

Although we found scientific publications from 10 countries, most retrieved articles came from Brazil (n=46), followed by Argentina (n=33), Chile (n=18) and Colombia (n=16), which together represented almost 83% of the articles we found (Figure 2; Supplementary Material 1, Table S1). These results were to be expected, since Brazil, Argentina, Chile and Colombia generally produce more scientific articles than the other South American countries (Noorden 2014). This could result in a significant bias (data for several species were available from only four of the thirteen countries) because although there is little scientific information from several countries, it is likely that negative interactions are happening there and producing unknown consequences on wildlife (Figure 2; Supplementary Material 1, Table S1). Geographical and taxonomic representation in the scientific information collected should therefore be improved for better understanding of this problem and its local complexities and particularities.

Species studied

The studies we found showed that at least 56 species were involved in negative interactions with humans in South America (Table 1). Of these species, 30% are included by the IUCN in categories of conservation concern (Table 1). The most frequently studied species were the puma (*Puma concolor*) and the jaguar (*Panthera onca*), and, to a lesser extent, the Andean bear (*Tremarctos ornatus*) (Table 1). Other species such as small felids, canids (e.g., some foxes), mustelids and raptors (including scavenging birds) were mentioned less in the articles we analyzed (Table 1). Articles studying mammals (n=117) were much more numerous than those studying raptors (n=24) (Figure 1B; Supplementary Material 1, Table S1). The fact that large felids are the most studied species is not surprising, given that they are well-adapted to preying on large mammals (Macdonald and Sillero-Zubiri 2002). Furthermore, negative interactions between felids and humans are more severe when the body mass of the felid is large (Inskip and Zimmermann 2009), and pumas and jaguars are the only two large South American felids, as well as the two largest carnivores in the continent. Added to this, the higher number of studies on large felids may be associated not only to greater frequency of conflicts, but also to a bias for these charismatic species that attract more public attention and conservation effort than other species (Macdonald et al. 2015).

Of the raptors, the most studied species were black vultures (*Coragyps atratus*), turkey vultures (*Cathartes aura*), Southern caracaras

Figure 2. Map of species involved in negative interactions between humans and wildlife, showing the countries where the studies were performed. The different countries are represented by geometric symbols and the numbers in parentheses indicate the quantity of articles published in each country.

Figura 2. Mapa de las especies implicadas en las interacciones negativas entre el ser humano y la fauna silvestre, en el que se muestran los países donde se realizaron los estudios. Los diferentes países están representados por símbolos geométricos y los números entre paréntesis indican la cantidad de artículos publicados en cada país.

(*Caracara plancus*), Andean condors (*Vultur gryphus*), black-and-chestnut eagles (*Spizaetus isidori*), crowned eagles (*Harpyhaliaetus coronatus*) and harpy eagles (*Harpia harpyja*) (between three and seven studies per species) (Table 1). These species are persecuted by some farmers for being perceived as harmful to livestock, leading to economic losses (Ballejo et al. 2020a; Restrepo-Cardona et al. 2020; Giraldo-Amaya et al. 2021). The smaller amount of information found on negative interactions between raptors and humans compared to mammalian carnivores and humans (Figure 1B) may be because raptors generally cause smaller economic losses than mammals (Ballejo et al. 2020b) or because research efforts on these birds are more limited than those on mammals. All these results suggest a need to promote further research on species that are poorly studied and to evaluate the general perception of each species in the different geographical areas of South America. This would improve our knowledge and our ability to design specific mitigation actions for each species and geographical area, but also to understand better the particularities of negative interactions according to species involved.

Table 1. South American species reportedly involved in negative interactions with humans, conservation status and number of articles mentioning negative interactions for each species. In bold, species with a global conservation status of concern.

Tabla 1. Especies sudamericanas implicadas en interacciones negativas con el ser humano, estado de conservación y número de artículos que mencionan interacciones negativas para cada especie. En negrita se indican las especies en estado de conservación global preocupante.

Species	Global conservation status	Number of articles
Raptors		
Crowned eagle (*Harpyhaliaetus coronatus*)	**Endangered**	3
Black-and-chestnut eagle (*Spizaetus isidori*)	**Endangered**	5
Harpy eagle (*Harpia harpyja*)	**Vulnerable**	3
Andean condor (*Vultur gryphus*)	**Vulnerable**	4
Black vulture (*Coragyps atratus*)	Least concern	6
Turkey vulture (*Cathartes aura*)	Least concern	5
Lesser yellow-headed vulture (*Cathartes burrovianus*)	Least concern	1
Black-chested buzzard-eagle (*Geranoaetus melanoleucus*)	Least concern	2
Rufous-legged owl *(Strix rufipes)*	Least concern	2
Short-eared owl (*Asio flammeus*)	Least concern	1
Burrowing owl (*Athene cunicularia*)	Least concern	2
Austral pygmy-owl (*Glaucidium nana*)	Least concern	2
Tropical screech-owl (*Megascops choliba*)	Least concern	1
Spectacled owl (*Pulsatrix perspicillata*)	Least concern	1
Barn owl (*Tyto alba*)	Least concern	3
Southern caracara (*Caracara plancus*)	Least concern	7
Chimango (*Milvago chimango*)	Least concern	4
Roadside hawk (*Rupornis magnirostris*)	Least concern	2
Great black hawk (*Urubitinga urubitinga*)	Least concern	1
Harris's hawk (*Parabuteo unicinctus*)	Least concern	1
Variable hawk (*Geranoaetus polyosoma*)	Least concern	2
Mammalian carnivores		
Puma (*Puma concolor*)	Least concern	65
Jaguar (*Panthera onca*)	**Near threatened**	46
Andean cat (*Leopardus jacobita*)	**Endangered**	3
Geoffroy's cat (*Leopardus geoffroyi*)	Least concern	4
Ocelot (*Leopardus pardalis*)	Least concern	5
Pampas cat (*Leopardus colocolo*)	**Near threatened**	5
Margay (*Leopardus wiedii*)	**Near threatened**	2
Güiña (*Leopardus guigna*)	**Vulnerable**	5
Northern tiger cat (*Leopardus tigrinus*)	**Vulnerable**	1
Jaguarundi (*Herpailurus yagouaroundi*)	Least concern	6
Culpeo (*Lycalopex culpaeus*)	Least concern	15
Chilla (*Lycalopex griseus*)	Least concern	7
Pampas fox (*Lycalopex gymnocercus*)	Least concern	3
Crab-eating fox (*Cerdocyon thous*)	Least concern	8
Hoary fox (*Lycalopex vetulus*)	**Near threatened**	1
Darwin's fox (*Lycalopex fulvipes*)	**Endangered**	1
Sechuran fox (*Lycalopex sechurae*)	**Near threatened**	1
Maned wolf (*Chrysocyon brachyurus*)	**Near threatened**	4
Crab-eating raccoon (*Procyon cancrivorus*)	Least concern	4
Coati (*Nasua nasua*)	Least concern	4
Western mountain coati (*Nasuella olivacea*)	**Near threatened**	1
Molina's hog-nosed skunk (*Conepatus chinga*)	Least concern	6
Striped hog-nosed skunk (*Conepatus semistriatus*)	Least concern	1
Opossum (*Didelphis aurita*)	Least concern	3
White-eared opossum (*Didelphis albiventris*)	Least concern	3
Common opossum (*Didelphis marsupialis*)	Least concern	1
Andean white-eared opossum (*Didelphis pernigra*)	Least concern	1
Brown four-eyed opossum (*Metachirus nudicaudatus*)	Least concern	1
Andean bear (*Tremarctos ornatus*)	**Vulnerable**	12
Tayra (*Eira Barbara*)	Least concern	4
Long-tailed weasel (*Mustela frenata*)	Least concern	2
Neotropical otter (*Lontra longicaudis*)	**Near threatened**	2
Lesser grison (*Galictis cuja*)	Least concern	2
Kinkajou (*Potos flavus*)	Least concern	1
Dog (*Canis lupus familiaris*)	---------	7

Methods implemented

The articles addressing negative interactions between humans and wildlife in South America we found employed a wide range of techniques (Supplementary Material 1, Table S1). Field observations, camera trap studies, case reports and livestock predation surveys were mainly used to detect the presence, abundance and behavior of target species. For instance, camera traps and field observations were used to determine the landscape used by several species (e.g., pumas) (Caruso et al. 2017; Guerisoli et al. 2019), their abundance or density and some behavioral patterns such as predation behavior (e.g., Quiroga et al. 2016; de Souza et al. 2018). Similarly, movement studies (e.g., through radio- or GPS-tagged individuals) were employed to study habitat use and potential negative interactions such as predation events (e.g., pumas and jaguars) (Cavalcanti and Gese 2010; Elbroch and Wittmer 2013). Habitat modeling was used to detect landscape characteristics affecting the use by predatory species (e.g., pumas) (Caruso et al. 2015) and to map risky areas (i.e., areas with high risk of predation for livestock) (e.g., Kissling et al. 2009). Diet studies were used mainly to address the presence/prevalence of livestock in wildlife diets (e.g., raptors feeding on poultry or felids eating livestock), which could lead to persecution by humans (De Azevedo and Murray 2007; Sarasola et al. 2010; Aráoz et al. 2017; Guerisoli et al. 2021).

Importantly, most of the studies found (n=91, 66%) were mostly based on questionnaires and interviews with diverse stakeholders such as farmers and local people (Supplementary Material 1, Table S1). These studies mainly focused on stakeholder's perceptions and attitudes toward wildlife (n=80), but also defined the presence or behavior of a particular species in a specified geographical area and the mitigation actions performed by farmers (n=11) (Supplementary Material 1, Table S1). The predominance of this method may be due its suitability for collecting relevant information with limited economic costs. Moreover, this kind of study may uncover important information as it enables researchers to explore people's attitudes, tolerance and behaviors toward species of interest and potentially identify the drivers underlying negative interactions (e.g., Guerisoli et al. 2017; Ballejo et al. 2019). Specifically, perceptions of pumas, jaguars and raptors were studied in several South American countries such as Argentina, Brazil and Colombia (e.g., Conforti and De Azevedo 2003; Ballejo et al. 2020a; Caruso et al. 2020; Llanos et al. 2020; Nanni et al. 2020; Restrepo-Cardona et al. 2020). Most of the studies evaluating perception of and attitudes toward wildlife (96%) reported that these were negative with regard to several species (Supplementary Material 1, Table S1), and many studies showed that lethal strategies were frequently implemented to deal with conflictive wildlife. However, one of the main limitations of these studies is that they did not evaluate in detail the actual impact of the species involved in the conflict. To compensate for this, a few studies complemented questionnaires and interviews with field observations (e.g., Perovic and Herrán 1998; Ballejo et al. 2020a; Escobar-Lasso et al. 2020). Contrasting perceived with actual economic losses (e.g., Ballejo et al. 2020a) is useful, because this information can clarify whether people's persecution of wildlife is due to actual negative impacts produced by the species involved or is primarily associated with other (non-material) drivers leading to low tolerance of wildlife (Lucherini et al. 2018; Nanni et al. 2020; Lambertucci et al. 2021a,b). Further research should focus on this issue in different species and geographical areas of South America. In addition, it is important to further clarify the pros and cons of each methodology implemented when the aim is to detect different causes of negative interactions between humans and wildlife.

Type of conflict and main drivers

Identifying geographical areas, types of conflict and species-specific drivers leading to negative human wildlife interactions is key to understand human-wildlife relationships and to promote their coexistence. The detailed analysis of the studies shows that the most relevant type of conflict in South America corresponded to animal-livestock interaction (n=121), followed by those related to human safety (n=39), animal-crop interaction (n=8), exploitation of animal parts (n=5) and disease transmission (n=2). This is expected given mammalian predators and raptors are the target species of this review.

The studies we found reported both material and non-material drivers (Figure 3; Supplementary Material 1, Table S1) that gave rise to reduced tolerance toward wildlife species and, thus, to negative interactions and conflicts. The perceived or actual economic (material) losses associated with wildlife

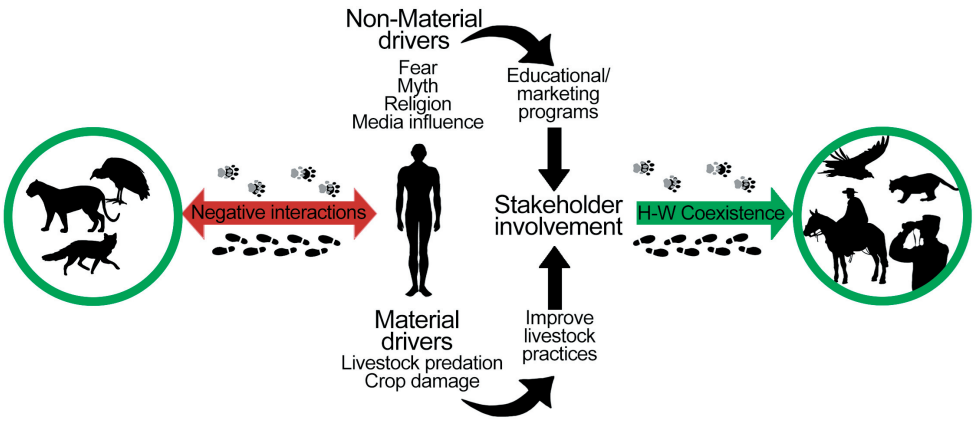

Figure 3. Scheme showing drivers of negative interactions between wildlife species and humans, and actions proposed to favor human-wildlife coexistence.

Figura 3. Esquema sobre los impulsores de las interacciones negativas entre las especies silvestres y los humanos, y las acciones propuestas para favorecer la coexistencia entre ambos.

(e.g., livestock predation or crop damage) were mentioned frequently in the articles we found (Supplementary Material 1, Table S1). However, non-material drivers shaped by social, cognitive and emotional factors such as fear, myths, beliefs and the influence of social media were also reported as leading to negative interactions between humans and wildlife (Supplementary Material 1, Table S1) (Lambertucci et al. 2021b).

Material drivers (economic). Most of the articles we retrieved (n=125) mentioned economic loss as the main reason for negative interactions between humans and wildlife (e.g., Mazzolli et al. 2002; Guerisoli et al. 2017; Cossios et al. 2018; de Lima et al. 2020; Nanni et al. 2020; Zuluaga et al. 2021) (Supplementary Material 1, Table S1). However, because most studies —both on mammals and birds— are based on human perception of loss, it is often difficult to distinguish between perceived and actual damage for any particular species. Thus, some damages may be caused by other species or factors different from those perceived, such as health problems, climate or inadequate husbandry practices. Very few articles aimed to quantify the actual damage or economic loss that wildlife causes to humans (e.g., Mazzolli et al. 2002; Palmeira et al. 2008; Boulhosa and De Azevedo 2014; Tortato et al. 2015). Although the economic loss provoked by wildlife tends to be comparatively limited, extreme situations can also occur. For example, for local communities that rely on subsistence livestock breeding, the level of damage caused by carnivore predation can be so high that their lifestyle may become economically unsustainable (Schulz et al. 2014; Guerisoli et al. 2017). Nonetheless, the potential mismatch between perception and actual damage in terms of economic loss should be assessed for different species and geographical areas. This could be key to the design of strategies to reduce the impact of negative interactions between wildlife and humans associated with perceived livelihood loss.

We found that several mammal species are persecuted due to the damage they cause on livestock or crops. For instance, ranchers perceived pumas and jaguars as a threat to their production and economy due to felid predation on livestock; pursuing and killing the felids is often the ranchers' main solution to this problem in many areas of South America (e.g., Argentina, Brazil, Uruguay, Bolivia, Colombia) (Lucherini et al. 2008; Palmeira et al. 2008; Carvalho and Pezzuti 2010; Garrote 2012; Guerisoli et al. 2017; Gáspero et al. 2018; Villalva and Palomares 2019; Nanni et al. 2020). Of concern, in some geographical areas (e.g., Argentina), provincial governments even promote lethal strategies (e.g., trapping or hunting with firearms) to control predators such as pumas and foxes (Llanos et al. 2014). The Andean bear is persecuted in Perú, Colombia, Ecuador and Venezuela mainly because it may damage crops and livestock (Goldstein 1991; Jorgenson and Sandoval 2005; Figueroa Pizarro 2015; Zukowski and Ormsby 2016; Robles and Gómez-Carrillo 2017; Escobar-Lasso et al. 2020). Other species including foxes, maned wolves (*Chrysocyon brachyurus*), small cats (*Leopardus* spp.) and skunks are perceived negatively particularly because they may prey on poultry (Silva-Rodríguez and Ortega-Solís 2007; Lucherini

and Merino 2008; Silva-Rodríguez et al. 2009; García-Olaechea and Hurtado 2018; Aximoff et al. 2020; Bickley et al. 2020). In particular foxes, but also other mammalian predators, are frequently involved in severe negative interaction with humans, especially in association with predation on goats, sheep and poultry (Travaini et al. 2000; Cossíos Meza 2004; Caruso et al. 2017; Bickley et al. 2020). As a consequence, attitudes toward them are negative and people are known to have implemented lethal strategies to reduce negative impacts (Caruso et al. 2017; Cossios et al. 2018; Sacristán et al. 2018; Benavides Medina 2020; De-Lima et al. 2020). Sometimes, however, negative and positive attitudes of local people toward carnivores can be spatially heterogeneous and this can lead to landscape level population persistence (Novaro and Walker 2005).

Several strategies that can be implemented to reduce the risk of predation on livestock are mentioned in the articles (see *Action proposed to promote coexistence*). In some cases, losses can be partially compensated for by the income and services provided by these species (e.g., income from tourism, reduction of the presence of other carnivores or pests) (Wallach et al. 2015; Tortato et al. 2017; Jiménez et al. 2019; Ohrens et al. 2021). Therefore, a potential strategy to promote human-wildlife coexistence is to highlight the positive contributions of predators and scavengers to human life, contrasting them with the negative impacts. It would, thus, be possible to show that reducing the presence of top carnivores or scavengers may even be more expensive and harmful than allowing them to live, since they might be limiting the increase of conflictive species such as rodents, feral dogs, mesopredators and other species that can produce diverse impacts on ecosystems and conflicts with humans (e.g., disease transmission) (O'Bryan et al. 2018).

We did not find articles that mentioned negative interactions driven by economic loss associated with feral cats. However, several articles mentioned the impact of feral and free-ranging dogs (Supplementary Material 1, Table S1). It is worth noting that these animals are currently one of the main causes of livestock loss (especially of small ruminants) in some regions of the continent such as Chile and Argentina; they generate even more predation events and economic damage than large felids and other carnivores combined (Gáspero et al. 2019; Montecino-Latorre and San Martín 2019; Rodriguez et al. 2019). Lethal strategies frequently used to control feral dogs could affect wildlife in general. For example, poisoned bait targeting dogs (and also foxes) (Travaini et al. 2000) caused massive mortality in other species such as obligate scavenger birds (Plaza and Lambertucci 2020). Moreover, some predation events caused by feral dogs may be erroneously attributed to carnivores. The lethal control of feral dogs with ethical methods could be necessary to solve this problem in some particular cases, but education and neutering programs are also essential, together with the promotion of responsible care (e.g., sterilization) as a preventative measure (Plaza et al. 2019).

The material (economic) driver is also involved in negative interaction between humans and raptors (hunter and obligate scavenging birds). For instance, the endangered black-and-chestnut eagle is at risk due to persecution in several countries, such as Argentina and Colombia, because it may consume poultry (Zuluaga and Echeverry-Galvis 2016; Aráoz et al. 2017; Restrepo-Cardona et al. 2019; Zuluaga et al. 2021). Although the available information suggests the crowned eagle rarely consumes livestock, it is also persecuted and killed in Argentina (Sarasola and Maceda 2006; Sarasola et al. 2010; Barbar et al. 2016). Similarly, the harpy eagle is persecuted in parts of its distribution, in some cases because it is perceived as a threat to livestock (Trinca et al. 2008; Giraldo-Amaya et al. 2021). In several parts of the world, including South America, people blame obligate scavenger birds for economic losses associated with attacks on livestock (specially on newborns) and consequently persecute them (Avery and Cummings 2004; Margalida et al. 2014). However, the available evidence suggests that predation events associated with scavenger birds are rare and likely to take a long time to be carried out because these birds are well adapted to eating carrion, but not to killing (Toledo et al. 2013; Ballejo et al. 2020a; Lambertucci et al. 2021a). This suggests that perceptions of the losses generated by these birds may be worse than the actual damage they cause, probably associated also with non -material (intangible) factors such as fear, beliefs and myths among others (see section 3.4.2).

Non-material (intangible) drivers. We found that perceptions and attitudes toward wildlife could also be influenced by non-material (intangible) drivers such as myths,

fear, cultural customs, supernatural beliefs, religious cultural patterns and social media. These factors were mentioned by 60 articles as being responsible for negative interactions (Supplementary Material 1, Table S1). For instance, some people from Chile have negative attitudes toward the kodkod (or güiña, *Leopardus guigna*) because it is considered a symbol of negative events or bad luck (Napolitano et al. 2016). Molina's hog-nosed skunk (*Conepatus chinga*) is hunted in Perú to give prestige to hunters (Cossios et al. 2018), suggesting that this practice is related to ancestral customs. Moreover, the Sechuran fox (*Lycalopex sechurae*) is used in alternative medicine (ancestral customs) and parts of this species are sold as handicrafts in Perú (Cossíos Meza 2004). Several harpy eagles killed or persecuted in Brazil were associated with dread, fear or curiosity (Trinca et al. 2008; Giraldo-Amaya et al. 2021). Moreover, although people are aware of the important ecosystem service that birds such as owls perform by eating pest species (e.g., rodents), owls are traditionally considered diabolic and persecuted in Argentinian Patagonia (Molares and Gurovich 2018). Similarly, superstitions are present in Chile, where some birds of prey are thought to bring bad luck (Muñoz-Pedreros et al. 2018).

It is likely that fear often lies behind negative interactions between wildlife and humans in South America. We found 35 articles (58% of articles mentioning non-material drivers) mentioning that fear is a major factor leading to negative interactions and conflicts (Supplementary Material 1, Table S1). Many people consider wildlife species, such as jaguars and pumas, or even raptors, as threats to their lives. It is true that some species (e.g., jaguars and pumas) can occasionally attack people and cause injury or even death, but they are very rare events (Coss et al. 2009; Neto et al. 2011; Iserson and Francis 2015; Lambertucci et al. 2021b). In fact, negative perceptions, lack of tolerance, persecution and the hunting of jaguars in the Argentinean Chaco, Brazilian Atlantic forest, Amazonia and Pantanal seem to be more associated with fear than with livestock predation and its concomitant economic loss (Altrichter et al. 2006; Marchini and Macdonald 2012; Engel et al. 2016; Porfirio et al. 2016). Similarly, a study performed in Argentina found that all interviewees mentioned that jaguars are dangerous and harmful and expressed a desire to eliminate them, even though most interviewees had never seen jaguars or even signs of their presence (Altrichter et al. 2006). Moreover, species that do not kill humans, such as Molina's hog-nosed skunk in Perú, can be hunted out of fear or aversion (Cossios et al. 2018). Fear is therefore an important non-material driver that should be considered in order to understand and mitigate negative human-wildlife interactions in South America (Figure 3) (Lambertucci et al. 2021b).

Finally, over recent years, the negative influence of fake or misleading news in the media has become an emergent threat to wildlife species (especially threatened species). Misinformed or fake news could negatively influence human perception of species and increase the severity of negative attitudes and extant conflicts (e.g., farmer-scavenger conflicts) (Llanos et al. 2016; Ballejo et al. 2021; Lambertucci et al. 2021a, b). The study of the effect of fake news on interaction between humans and wildlife is an emergent topic; further research is needed to evaluate the influence and consequences of fake news on species of conservation concern in South America. In addition, it would be interesting to explore the potential usefulness of social marketing tools to improve the image of carnivores, raptors and scavenging birds and thus favor human-wildlife coexistence (Veríssimo et al. 2017).

The examples mentioned above regarding non-material (intangible) drivers involved in negative interactions between humans and wildlife shed light on the many challenges involved in the conservation of some wildlife species in South America. In this sense, it is important to note that perceptions of wildlife species vary according to people's cultural patterns. Mitigation action should therefore be specific to each culture and consider local perspectives so as to include a broader view of human needs, perceptions and knowledge (Camino et al. 2016).

Action proposed to promote coexistence

Husbandry practices. In the articles we found a range of recommendations for husbandry measures to mitigate the amount of damage caused by wild animals and to reduce negative interactions between humans and wild animals in South America. For instance, the use of livestock protection dogs in Argentina reduced predation on livestock (e.g., goats, sheep) by pumas and foxes and, as a consequence, the implementation of lethal strategies by ranchers (González et al. 2012; Novaro et al.

2017). Although the cost-effectiveness of using dogs to protect livestock needs to be carefully assessed in each productive context (Moral et al. 2016), this tool appears to be successful at mitigating conflict. The incorporation of fences and flashlights on corrals can also help to reduce predation events by large felids (Polisar et al. 2003; Guerisoli et al. 2017; Ohrens et al. 2019). The risk of predation by large South American felids can be high near forest patch remains (Michalski et al. 2006; Palmeira et al. 2008; Kissling et al. 2009; Schulz et al. 2014; Carvalho et al. 2015) because species such as pumas avoid deforested landscapes (Caruso et al. 2015, 2017). Therefore, keeping livestock as far as possible from these areas would help reduce predation events (Schulz et al. 2014; De-Souza et al. 2018). The restoration of native herbivore populations may also be effective in reducing the livestock damage associated with large felids, as wild prey scarcity increases the probability of livestock predation (Polisar et al. 2003; Khorozyan et al. 2015). Finally, the presence of people during the livestock birth season (routine patrols) has been suggested as an action to reduce predation events by scavenging birds (Ballejo et al. 2020a).

The removal of problematic individuals of some mammalian predators belonging to 'least-concern' species, such as pumas, has been proposed as a potential strategy to facilitate human wildlife coexistence in South America (Elbroch and Wittmer 2013; Llanos et al. 2014). From the conservation perspective, it has been argued this could be preferable than the indiscriminate removal of individuals that is legally approved in some geographical areas (e.g., Argentinian Patagonia) (Llanos et al. 2014). This action might favor the presence of individuals that are more likely to avoid humans and the role of the species within the ecosystem would not be lost (Jorgensen et al. 1978; Treves et al. 2002). However, if applied, this method must be mediated by prior surveys that can identify problematic individuals. Moreover, the elimination of individuals may have unforeseen negative consequences on other individuals through destabilization of social structures. This strategy may also allow other problematic species (e.g., dogs, foxes) to occupy the position of the removed animal (Swan et al. 2017). Hence, if implemented, it should be accompanied by studies that assess its effectiveness and unexpected impacts in specific management and ecological contexts (Laundré and Papouchis 2020). In fact, there is still little evidence that the removal of a few problematic individuals will increase human tolerance of those remaining (Treves et al. 2016; Swan et al. 2017). Therefore, well-designed studies are required to improve our understanding of the ecological implications and usefulness of selective management.

A combination of methods applied in other geographical areas could be implemented and evaluated in South America. In Mexico, predation events by jaguars were significantly reduced using mixed interventions such as electric fences associated with the use of guard animals, sounds and scarecrows (Khorozyan and Waltert 2021). The effectiveness of livestock protection interventions against pumas varied depending on the geographical area (Khorozyan and Waltert 2021), but visual and auditory deterrents produced promising results in Mexico (Zarco-González and Monroy-Vilchis 2014). Moreover, there is a need to evaluate the potential adverse effects on the ecosystem of some interventions (e.g., guard dogs consuming native wildlife as secondary food, Whitehouse Tedd et al. 2020) in order to evaluate the benefits and impacts of actions before or during the implementation of these strategies. Finally, to reduce negative interaction between wildlife and humans, governments and authorities should help farmers improve their husbandry practices and infrastructure, with special emphasis on subsistence farmers for whom livestock raising is the primary means of subsistence.

Educational programs. Education in diverse forms (e.g., formal and informal) may help to mitigate human-wildlife negative interactions and increase tolerance toward wildlife species. Educational programs should be implemented to reduce negative attitudes toward scavenging birds in diverse geographical areas of South America (Cailly Arnulphi et al. 2017; Castillo-Figueroa et al. 2019; Restrepo et al. 2019; Lambertucci et al. 2021a). Similarly, education seems to be a plausible strategy for reducing negative perception of mammalian predators such as jaguars and Andean bears (Espinosa and Jacobson 2012; Engel et al. 2016; Sacristán et al. 2018). To be effective, however, educational programs should consider the diversity of stakeholders and the diversity of their cultural patterns (Camino et al. 2016). In other words, these programs should be tailored to each social group according to their cultural and religious idiosyncrasies, which merit special attention in pursuit of human-wildlife coexistence.

A multidisciplinary approach. Mitigation of negative human-wildlife interaction requires an understanding of how ecological theories work within domestic predator-prey systems (Wilkinson et al. 2020). In addition, given the diversity of intangible factors that can affect the dynamics of human-wildlife interactions, the incorporation of social and communication scientists is essential in order to reduce the effect of these negative interactions (Marchini 2014; Kansky et al. 2016). Our review found that interdisciplinary strategies were frequently proposed in the literature, but, as yet there is little implementation or experience of this. Further efforts should aim to include experts from the social sciences (e.g., anthropology and sociology) in the design and implementation of strategies to improve interaction between wildlife and humans. Such strategy would also facilitate the integration of rural communities, particularly livestock breeders, in the decision-making process of conflict management plans, an approach that is largely advocated but still rarely implemented. Also, the incorporation of marketing specialists to design communication approaches is likely to be of help in our quest for human-wildlife coexistence (Veríssimo et al. 2017).

Conclusions

Our review shows that the drivers leading to negative interactions between humans and wildlife in South America include material (economic) (e.g., livestock or crop loss) and non-material (intangible) factors (e.g., mainly fear). Negative attitudes toward terrestrial mammalian predators and raptors are still widespread in this region and lead, in some cases, to the use of lethal strategies to deal with wildlife. These lethal strategies are sometimes even promoted by governments and authorities in order to reduce livestock losses. However, important knowledge gaps must be addressed if we are to properly understand negative interactions between wildlife and humans in South America. First, information should be gathered on the levels and outcomes of negative interactions for several species and geographical areas. Second, the actual economic losses generated by target species should be put into context and compared, for instance, with the perceived losses and with losses caused by other sources of livestock mortality (e.g., poor livestock management, parasitic and infectious diseases and starvation). It is also essential to weigh the costs generated by wildlife against the species' contributions to humans and nature, even though these benefits may be difficult to quantify (e.g., Gilbert and Carter 2021). Third, a detailed assessment of current mitigation strategies is required, as some of these may be effective only in certain areas and may even have a negative effect on some socio-ecological systems; new mitigation methodologies should also be explored and evaluated. At the same time, human appreciation of the intrinsic value of these species should be promoted. Finally, social scientists, biologists, conservation agents, managers and marketing specialists should work together to identify strategies and define action that will increase tolerance toward wildlife species. This multidisciplinary approach will aid understanding the drivers of negative interactions between humans and wildlife and help farmers sustain production while reducing its impact on native wildlife. In addition, this approach would be useful to reduce hegemonic discourses about this conservation problem and promote the consensus approach needed. This work should consider the diversity and richness of the different cultures inhabiting this vast geographical area, while striving for conservation of its high biological diversity.

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References

Altrichter, M., G. Boaglio, and P. Perovic. 2006. The decline of jaguars *Panthera onca* in the Argentine Chaco. Oryx 40: 302-309. https://doi.org/10.1017/S0030605306000731.

Aráoz, R., J. M. Grande, C. López, and F. H. Vargas. 2017. The First Black-and-Chestnut Eagle (*Spizaetus isidori*) Nest Discovered in Argentina Reveals Potential Human - Predator Conflicts. Journal Raptor Research 51:79-82. https://doi.org/10.3356/JRR-16-49.1.

Armesto, J. J., D. Manuschevich, A. Mora, C. Smith-Ramirez, R. Rozzi, A. M. Abarzúa, and P. A. Marquet. 2010. From the Holocene to the Anthropocene: A historical framework for land cover change in southwestern South America in the past 15,000 years. Land Use Policy 27:148-160. https://doi.org/10.1016/j.landusepol.2009.07.006.

Avery, M. L., and J. L. Cummings. 2004. Livestock depredations by black vultures and golden eagles. Sheep and Goat Research Journal 19:58-63.

Aximoff, I., W. D. Carvalho, D. Romero, C. E. L. Esbérard, J. C. Guerrero, and L. M. Rosalino. 2020. Unravelling the drivers of maned wolf activity along an elevational gradient in the Atlantic Forest, south-eastern Brazil. Mammalian Biology 100:187-201. https://doi.org/10.1007/s42991-020-00017-x.

Baldi, R., S. Albon, and D. Elston. 2001. Guanacos and sheep: Evidence for continuing competition in arid Patagonia. Oecologia 129:561-570. https://doi.org/10.1007/s004420100770.

Ballejo, F., M. Graña Grilli, and S. A. Lambertucci. 2019. A long and troublesome journey: People's perceptions and attitudes along the migratory path of a scavenger bird. Ethnobiology and Conservation 8:1-13. https://doi.org/10.15451/ec2019-10-8.13-1-13.

Ballejo, F., P. I. Plaza, and S. A. Lambertucci. 2020a. The conflict between scavenging birds and farmers: Field observations do not support people's perceptions. Biological Conservation 248:108627. https://doi.org/10.1016/j.biocon.2020.108627.

Ballejo, F., P. I. Plaza, and S. A. Lambertucci. 2020b. The productive, ecological, and perception problem of the "unacceptable" livestock losses due to scavenger birds. Biological Conservation 250:108723. https://doi.org/10.1016/j.biocon.2020.108723.

Ballejo, F., P. I. Plaza, and S. A. Lambertucci. 2021. Framing of visual content shown on popular social media may affect viewers' attitudes to threatened species. Scientific Reports 11:1-10. https://doi.org/10.1038/s41598-021-92815-7.

Barbar, F., A. Capdevielle, and M. Encabo. 2016. Direct Persecution of Crowned Eagles *Buteogallus coronatus* in Argentina: A New Call for Their Conservation. Journal of Raptor Research 50:115-120. https://doi.org/10.3356/rapt-50-01-115-120.1.

Barbar, F., and S. A. Lambertucci. 2018. The roles of leporid species that have been translocated: a review of their ecosystem effects as native and exotic species. Mammal Review 48:245-260. https://doi.org/10.1111/mam.12126.

Benavides Medina, S. P. 2020. The Insolent Fox: Human-Animal Relations with Protected Predators in Central-Southern Chile. Anthrozoos 33:597-612. https://doi.org/10.1080/08927936.2020.1799547.

Bhatia, S., S. M. Redpath, K. Suryawanshi, and C. Mishra. 2020. Beyond conflict: Exploring the spectrum of human-wildlife interactions and their underlying mechanisms. Oryx 54:621-628. https://doi.org/10.1017/S003060531800159X.

Bickley, S. M., F. G. Lemo, F. C. C. De Azevedo, M. P. Gilmore, E. W. Freeman, and N. Songsasen. 2020. Human perceptions of and interactions with wild canids on cattle ranches in central Brazil. Oryx 54:546-553. https://doi.org/10.1017/S0030605318000480.

Boulhosa, R. L. P., and F. C. C. De Azevedo. 2014. Perceptions of ranchers towards livestock predation by large felids in the Brazilian Pantanal. Wildlife Research 41:356-365. https://doi.org/10.1071/WR14040.

Cailly Arnulphi, V. B., S. A. Lambertucci, and C. E. Borghi. 2017. Education can improve the negative perception of a threatened long-lived scavenging bird, the Andean condor. PLoS ONE 12:1-13. https://doi.org/10.1371/journal.pone.0185278.

Camino, M., S. Cortez, A. Cerezo, and M. Altrichter. 2016. Wildlife conservation, perceptions of different co-existing cultures. International Journal of Conservation Science 7:109-122.

Carter, N. H., and J. D. C. Linnell. 2016. Co-Adaptation Is Key to Coexisting with Large Carnivores. Trends in Ecology and Evolution 31:575-578. https://doi.org/10.1016/j.tree.2016.05.006.

Caruso, F., P. G. Perovic, A. Tálamo, C. B. Trigo, M. S. Andrade-Díaz, G. A. Marás, D. Saravia, C. Sillero-Zubiri, and M. Altrichter. 2020. People and jaguars: New insights into the role of social factors in an old conflict. Oryx 54:678-686. https://doi.org/10.1017/S0030605318001552.

Caruso, N., M. Guerisoli, E. Luengos Vidal, D. Castillo, E. Casanave, and M. Lucherini. 2015. Modelling the ecological niche of an endangered population of *Puma concolor*: first application of the GNESFA method to an elusive carnivore. Ecological Modelling 297:11-19. https://doi.org/10.1016/j.ecolmodel.2014.11.004.

Caruso, N. C., E. M. Luengos Vidal, M. Lucherini, M. Guerisoli, S. Martínez, and E. B. Casanave. 2017. Carnívoros en el sudoeste de la provincia de Buenos Aires: ecología y conflictos con los ganaderos. Revista de Investigaciones Agropecuarias 43:165-174.

Caruso, N., M. Lucherini, D. Fortin, and E. B. Casanave. 2016. Species-specific responses of carnivores to human-induced landscape changes in central Argentina. PLoS ONE 11:1-16. https://doi.org/10.1371/journal.pone.0150488.

Carvalho, E. A. R., and J. C. B. Pezzuti. 2010. Hunting of jaguars and pumas in the Tapajós-Arapiuns Extractive Reserve, Brazilian Amazonia. Oryx 44:610-612. https://doi.org/10.1017/S003060531000075X.

Carvalho, E. A. R., M. M. Zarco-González, O. Monroy-Vilchis, and R. G. Morato. 2015. Modeling the risk of livestock depredation by jaguar along the Transamazon highway, Brazil. Basic and Applied Ecology 16:413-419. https://doi.org/10.1016/j.baae.2015.03.005.

Castillo-Figueroa, D., M. A. Cely-Gómez, and F. Sáenz-Jiménez. 2019. Environmental education, attitudes and knowledge of rural communities about the Andean Condor in the El Almorzadero paramo (Santander, Colombia). Revista Luna Azul 48:70-78. https://doi.org/10.17151/luaz.2019.48.4.

Cavalcanti, S. M. C., and E. M. Gese. 2010. Kill rates and predation patterns of jaguars (*Panthera onca*) in the southern Pantanal, Brazil. Journal of Mammalogy 91:722-736. https://doi.org/10.1644/09-MAMM-A-171.1.

Conforti, V. A., and F. C. C. De Azevedo. 2003. Local perceptions of jaguars (*Panthera onca*) and pumas (*Puma concolor*) in the Iguacu, National Park area, south Brazil. Biological Conservation 111:215-221. https://doi.org/10.1016/S0006-3207(02)00277-X.

Correa, F. 2016. Beyond the city: Resource extraction urbanism in South America. University of Texas Press, Austin, TX. USA. https://doi.org/10.7560/309414.

Coss, R. G., E. L. Fitzhugh, S. Schmid-Holmes, M. W. Kenyon, and K. Etling. 2009. The effects of human age, group composition, and behavior on the likelihood of being injured by attacking pumas. Anthrozoos 22:77-87. https://doi.org/10.2752/175303708X390491.

Cossios, D. E., F. Valdez Ridoutt, and A. Luna Donoso. 2018. Relationships between Molina's hog nosed skunks, *Conepatus chinga* (Mammalia, Mephitidae) and human beings in the Chaupihuaranga river basin, Pasco, Peru. Ecología Aplicada 17:207. https://doi.org/10.21704/rea.v17i2.1240.

Cossíos Meza, E. D. 2004. Relaciones entre el zorro de sechura, *Pseudalopex schurae* (Thomas), y el hombre en el Perú. Ecología Aplicada 3:134. https://doi.org/10.21704/rea.v3i1-2.282.

De-Lima, N. da S., S. J. Napiwoski, and M. A. Oliveira. 2020. Human-wildlife conflict in the southwestern amazon: Poaching and its motivations. Nature Conservation Research 5:109-114. https://doi.org/10.24189/ncr.2020.006.

De-Souza, J. C., R. M. da Silva, M. P. R. Gonçalves, R. J. D. Jardim, and S. H. Markwith. 2018. Habitat use, ranching, and human-wildlife conflict within a fragmented landscape in the Pantanal, Brazil. Biological Conservation 217:349-357. https://doi.org/10.1016/j.biocon.2017.11.019.

De-Sy, V., M. Herold, F. Achard, R. Beuchle, J. G. P. W. Clevers, E. Lindquist, and L. Verchot. 2015. Land use patterns and related carbon losses following deforestation in South America. Environmental Research Letters 10:124004. https://doi.org/10.1088/1748-9326/10/12/124004.

De Azevedo, F. C. C. , and D. L. Murray. 2007. Evaluation of Potential Factors Predisposing Livestock to Predation by Jaguars. Journal of Wildlife Management 71:2379. https://doi.org/10.2193/2006-520.

Dickman, A., and L. Hazzah. 2016. Money, Myths and Man-Eaters: Complexities of Human-Wildlife Conflict. Pp. 1-603 *in* F. M. Angelici (ed.). Problematic Wildlife: A Cross-Disciplinary Approach. Switzerland. https://doi.org/10.1007/978-3-319-22246-2_16.

Dickman, A. J. 2010. Complexities of conflict: The importance of considering social factors for effectively resolving human-wildlife conflict. Animal Conservation 13:458-466. https://doi.org/10.1111/j.1469-1795.2010.00368.x.

Duriez, O., S. Descaves, R. Gallais, R. Neouze, J. Fluhr, and F. Decante. 2019. Vultures attacking livestock: a problem of vulture behavioural change or farmers' perception? Bird Conservation International 29:437-453. https://doi.org/10.1017/S0959270918000345.

Elbroch, L. M., and H. U. Wittmer. 2013. The effects of puma prey selection and specialization on less abundant prey in Patagonia. Journal of Mammalogy 94:259-268. https://doi.org/10.1644/12-MAMM-A-041.1.

Engel, M. T., J. J. Vaske, A. J. Bath, and S. Marchini. 2016. Predicting Acceptability of Jaguars and Pumas in the Atlantic Forest, Brazil. Human Dimensions of Wildlife 21:427-444. https://doi.org/10.1080/10871209.2016.1183731.

Escobar-Lasso, S., J. C. Cepeda-Duque, M. Gil-Fernández, and J. F. González-Maya. 2020. Is the banana ripe? Andean bear-human conflict in a protected area of Colombia. Human-Wildlife Interactions 14:1-16.

Espinosa, S., and S. K. Jacobson. 2012. Human-wildlife conflict and environmental education: Evaluating a community program to protect the Andean bear in Ecuador. Journal of Environmental Education 43:55-65. https://doi.org/10.1080/00958964.2011.579642.

Figueroa Pizarro, J. 2015. Interacciones humano-oso andino *Tremarctos ornatus* en el Perú: consumo de cultivos y depredación de ganado. Therya 6:251-278. https://doi.org/10.12933/therya-15-251.

García-Olaechea, A., and C. M. Hurtado. 2018. Assessment of the current distribution and human perceptions of the Pampas cat Leopardus colocolo in northern Peru and southern Ecuador. Oryx 52:587-590. https://doi.org/10.1017/S003060531700151X.

Garrote, G. 2012. Depredación del jaguar (*Panthera onca*) sobre el ganado en los llanos orientales de Colombia. Mastozoología Neotropical 19:139-145.

Gáspero, P., V. Fernández-Arhex, Ma. Easdale, F. Bidinost, and J. Pereira. 2019. Depredación por perros en sistemas ovinos rionegrinos. El enemigo menos pensado. Presencia 71:31-35.

Gáspero, P. G., M. H. Easdale, J. A. Pereira, V. Fernández-Arhex, and J. Von Thüngen. 2018. Human-carnivore interaction in a context of socio-productive crisis: Assessing smallholder strategies for reducing predation in North-west Patagonia, Argentina. Journal of Arid Environments 150:92-98. https://doi.org/10.1016/j.jaridenv.2017.12.005.

Gilbert, S., and R. N. Neil Carter. 2021. Predation services: quantifying societal effects of predators and their prey. Frontiers in Ecology and the Environment 19(5):292-299. https://doi.org/10.1002/fee.2336.

Giraldo-Amaya, M., H. Aguilar-Silva, K. M. Aparicio, and S. Zuluaga. 2021. Human Persecution of the Harpy Eagle: A Widespread Threat? Journal of Raptor Research 55:281-286. https://doi.org/10.3356/0892-1016-55.2.281.

Goldstein, I. 1991. Spectacled Bear Predation and Feeding Behavior on Livestock in Venezuela. Studies on Neotropical Fauna and Environment 26:231-235. https://doi.org/10.1080/01650529109360857.

González, A., A. J. Novaro, M. C. Funes, O. Pailacura, M. J. Bolgeri, and R. S. Walker. 2012. Mixed-breed guardian dogs reduce conflict between goat herders and native carnivores in Patagonia. Human-Wildlife Interactions 6(2):327-334.

Goodman, L. A. 1961. Snowball sampling. The annals of mathematical statistics. The Annals of Mathematical Statistics 32:148-170. https://doi.org/10.1214/aoms/1177705148.

Guerisoli, M. D. L. M., N. Caruso, E. M. Luengos Vidal, and M. Lucherini. 2019. Habitat use and activity patterns of *Puma concolor* in a human-dominated landscape of central Argentina. Journal of Mammalogy 100:202-211. https://doi.org/10.1093/jmammal/gyz005.

Guerisoli, M. D.L. M., O. Gallo, S. Martínez, E. M. Luengos Vidal, and M. Lucherini. 2021. Native, exotic, and livestock prey: assessment of *Puma concolor* diet in South American temperate region. Mammal Research 66:33-43. https://doi.org/10.1007/s13364-020-00549-0.

Guerisoli, M. de las M., E. Luengos Vidal, N. Caruso, A. J. Giordano, and M. Lucherini. 2020. Puma-livestock conflicts in the Americas: a review of the evidence. Mammal Review 51:228-246. https://doi.org/10.1111/mam.12224.

Guerisoli, M. de las M., E. Luengos Vidal, M. Franchini, N. Caruso, E. B. Casanave, and M. Lucherini. 2017. Characterization of puma-livestock conflicts in rangelands of central Argentina. Royal Society Open Science 4:1-13. https://doi.org/10.1098/rsos.170852.

Inskip, C., and A. Zimmermann. 2009. Human-felid conflict: a review of patterns and priorities worldwide. Oryx 43: 18. https://doi.org/10.1017/S003060530899030X.

Iriarte, J. A., W. L. Franklin, W. E. Johnson, and K. H. Redford. 1990. Biogeographic variation of food habits and body size of the America puma. Oecologia 85:185-190. https://doi.org/10.1007/BF00319400.

Iserson, K. V., and A. M. Francis. 2015. Jaguar attack on a child: Case report and literature review. Western Journal of Emergency Medicine 16:303-309. https://doi.org/10.5811/westjem.2015.1.24043.

Jacques-Coper, A., G. Cubillos, and J. T. Ibarra. 2019. The Andean Condor as bird, authority, and devil: an empirical assessment of the biocultural keystone species concept in the high Andes of Chile. Ecology and Society 24(2):35. https://doi.org/10.5751/ES-10939-240235.

Jampel, C. 2016. Cattle-based livelihoods, changes in the taskscape, and human-bear conflict in the Ecuadorian Andes. GEOFORUM 69:84-93. https://doi.org/10.1016/j.geoforum.2016.01.001.

Jiménez, J., J. C. Núñez-Arjona, F. Mougeot, P. Ferreras, L. M. González, F. García-Domínguez, J. Muñoz-Igualada, M. J. Palacios, S. Pla, C. Rueda, F. Villaespesa, F. Nájera, F. Palomares, and J. V. López-Bao. 2019. Restoring apex predators can reduce mesopredator abundances. Biological Conservation 238:108234. https://doi.org/10.1016/j.biocon.2019.108234.

Jorgensen, C., R. H. Conley, R. J. Hamilton, and O. T. Sanders. 1978. Management of black bear depredation problems. Pp. 297-319 *in* R. D. Hugie (ed.). Fourth Eastern Black Bear Workshop. Maine.

Jorgenson, J. P., and S. Sandoval. 2005. Andean bear management needs and interactions with humans in Colombia. Ursus 16:108-116. https://doi.org/10.2192/1537-6176(2005)016[0108:ABMNAI]2.0.CO;2.

Kansky, R., M. Kidd, and A. T. Knight. 2016. A wildlife tolerance model and case study for understanding human wildlife conflicts. Biological Conservation 201:137-145. https://doi.org/10.1016/j.biocon.2016.07.002.

Khorozyan, I., A. Ghoddousi, M. Soofi, and M. Waltert. 2015. Big cats kill more livestock when wild prey reaches a minimum threshold. Biological Conservation 192:268-275. https://doi.org/10.1016/j.biocon.2015.09.031.

Khorozyan, I., and M. Waltert. 2021. A global view on evidence-based effectiveness of interventions used to protect livestock from wild cats. Conservation Science and Practice 3:1-13. https://doi.org/10.1111/csp2.317.

Kissling, D. W., N. Fernández, and J. M. Paruelo. 2009. Spatial risk assessment of livestock exposure to pumas in Patagonia, Argentina. Ecography 32:807-817. https://doi.org/10.1111/j.1600-0587.2009.05781.x.

Lambertucci, S. A., A. Margalida, K. L. Speziale, A. Amar, F. Ballejo, K. L. Bildstein, G. Blanco, A. J. Botha, C. G. R. Bowden, A. Cortés-Avizanda, O. Duriez, R. E. Green, F. Hiraldo, D. Ogada, P. Plaza, J. A. Sánchez-Zapata, A. Santangeli, N. Selva, O. Spiegel, and J. A. Donázar. 2021a. Presumed killers? Vultures, stakeholders, misperceptions, and fake news. Conservation Science and Practice 3(6):e415. https://doi.org/10.1111/csp2.415.

Lambertucci, S. A., P. Plaza, and K. Speziale. 2021b. Minimizing fear of wildlife in urban areas. Science 374:947 https://doi.org/10.1126/science.abm6560

Lambertucci, S. A., J. Navarro, J. A. Sánchez Zapata, K. A. Hobson, P. A. E. Alarcón, G. Wiemeyer, G. Blanco, F. Hiraldo, and J. A. Donázar. 2018. Tracking data and retrospective analyses of diet reveal the consequences of loss of marine subsidies for an obligate scavenger, the andean condor. Proceedings of the Royal Society B: Biological Sciences 285: 20180550. https://doi.org/10.1098/rspb.2018.0550.

Lambertucci, S. A., A. Trejo, S. Di Martino, J. A. Sánchez-Zapata, J. A. Donázar, and F. Hiraldo. 2009. Spatial and temporal patterns in the diet of the Andean condor: Ecological replacement of native fauna by exotic species. Animal Conservation 12:338-345. https://doi.org/10.1111/j.1469-1795.2009.00258.x.

Laundré, J. W., and C. Papouchis. 2020. The Elephant in the room: What can we learn from California regarding the use of sport hunting of pumas (*Puma concolor*) as a management tool? PLoS ONE 15(2):e0224638. https://doi.org/10.1371/journal.pone.0224638.

Lepczyk, C. A., and D. C. Duffy. 2017. Feral Cats. Pp. 269-289 *in* W. C. Pitt, J. C. Beasley and G. W. Witmer (eds.). Ecology and Management of Terrestrial Vertebrate Invasive Species in the United States. Taylor and Francis Group, USA. https://doi.org/10.1201/9781315157078-13.

Llanos, R., A. Andrade, and A. Travaini. 2020. Puma and livestock in central Patagonia (Argentina): from ranchers' perceptions to predator management. Human Dimensions of Wildlife 25:1-16. https://doi.org/10.1080/10871209.2019.1668987.

Llanos, R., M. B. Llanos, and A. Travaini. 2016. qué ves cuando me ves? El puma (*Puma concolor*) Y Su Representación En Los Medios De Prensa Escrita De Patagonia Argentina. Interciencia 41:16-22.

Llanos, R., A. Travaini, S. Montanelli, and E. Crespo. 2014. Estructura de edades de pumas (*Puma concolor*) cazados bajo el sistema de remoción por recompensas en Patagonia. ¿Selectividad u oportunismo en la captura? Ecología Austral 24:311-319. https://doi.org/10.25260/EA.14.24.3.0.8.

Lucherini, M., M. de las M. Guerisoli, and E. M. Luengos Vidal. 2018. Surplus killing by pumas *Puma concolor*: rumours

and facts. Mammal Review 48:277-283. https://doi.org/10.1111/mam.12135.

Lucherini, M., C. Manfredi, and J. Arellano. 2008. Human-Puma Conflicts in Three Areas from the Southern Cone of South America: Preliminary Data. Cat News 49:29-30.

Lucherini, M., and M. J. Merino. 2008. Perceptions of human-carnivore conflicts in the high Andes of Argentina. Mountain Research and Development 28:81-85. https://doi.org/10.1659/mrd.0903.

Macdonald, D. W., and C. Sillero-Zubiri. 2002. Large carnivores and conflict: lion conservation in context. Pp. 8 *in* A. J. Loveridge, T. Lynam and D. W. Macdonald (eds.). Lion Conservation Research. Workshop 2: modelling conflict. Oxford University, Oxford.

Macdonald, E. A., D. Burnham, A. E. Hinks, A. J. Dickman, Y. Malhi, and D. W. Macdonald. 2015. Conservation inequality and the charismatic cat: *Felis felicis*. Global Ecology and Conservation 3:851-866. https://doi.org/10.1016/j.gecco.2015.04.006.

Marchini, S. 2014. Who's in Conflict with Whom? Human Dimensions of the Conflicts Involving Wildlife. Pp. 189-209 *in* L. Verdade, M. Lyra-Jorge and C. Piña (eds.). Applied Ecology and Human Dimensions in Biological Conservation. Springer, Berlin. https://doi.org/10.1007/978-3-642-54751-5_13.

Marchini, S., and D. W. Macdonald. 2012. Predicting ranchers' intention to kill jaguars: Case studies in Amazonia and Pantanal. Biological Conservation 147:213-221. https://doi.org/10.1016/j.biocon.2012.01.002.

Margalida, A., D. Campión, and J. A. Donázar. 2014. Vultures vs livestock: conservation relationships in an emerging conflict between humans and wildlife. Oryx 48:172-176. https://doi.org/10.1017/S0030605312000889.

Mazzolli, M., M. E. Graipel, and N. Dunstone. 2002. Mountain lion depredation in southern Brazil. Biological Conservation 105:43-51. https://doi.org/10.1016/S0006-3207(01)00178-1.

Michalski, F., R. L. P. Boulhosa, A. Faria, and C. A. Peres. 2006. Human-wildlife conflicts in a fragmented Amazonian forest landscape: Determinants of large felid depredation on livestock. Animal Conservation 9:179-188. https://doi.org/10.1111/j.1469-1795.2006.00025.x.

Molares, S., and Y. Gurovich. 2018. Owls in urban narratives: implications for conservation and environmental education in NW Patagonia (Argentina). Neotropical Biodiversity 4:164-172. https://doi.org/10.1080/23766808.2018.1545379.

Montecino-Latorre, D., and W. San Martín. 2019. Evidence supporting that human-subsidized free-ranging dogs are the main cause of animal losses in small-scale farms in Chile. Ambio 48:240-250. https://doi.org/10.1007/s13280-018-1066-3.

Moral, R. A., F. C. C. Azevedo, and L. M. Verdade. 2016. The use of sheepdogs in sheep production in southeastern Brazil. Pastoralism 6, 18. https://doi.org/10.1186/s13570-016-0065-x.

Muñoz-Pedreros, A., M. Guerrero, and P. Möller. 2018. Knowledge and perceptions of birds of prey among local inhabitants in Chile: Implications for the biological control of rodent pests. Gayana 82:128-138. https://doi.org/10.4067/S0717-65382018000200128.

Nanni, A. S., T. Teel, and M. Lucherini. 2020. Predation on livestock and its influence on tolerance toward pumas in agroecosystems of the Argentine Dry Chaco. Human Dimensions of Wildlife 26(5): 429-444. https://doi.org/10.1080/10871209.2020.1843742.

Napolitano, C., I. Sacristán Yagüe, F. Acuña, E. Aguilar, S. R. Castro García, M. J. López, and E. Poulin. 2016. Conflicto entre güiñas (*Leopardus guigna*) y poblaciones humanas en el centro-sur de Chile. Pp. 389-399 *in* C. Castaño-Uribe, C. A. Lasso, R. Hoogesteijn, A. Diaz-Pulido and E. Payán (eds.). Conflictos entre Felinos y Humanos en América Latina. Serie Fauna Silvestre Neotropical.

Neto, M. F. C., D. Garrone Neto, and V. Haddad. 2011. Attacks by jaguars (*Panthera onca*) on humans in central Brazil: Report of three cases, with observation of a death. Wilderness and Environmental Medicine 22:130-135. https://doi.org/10.1016/j.wem.2011.01.007.

Noorden, R. Van. 2014. South America average. Nature 50:202-203.

Novaro, A. J., A. González, O. Pailacura, M. J. Bolgeri, M. F. Hertel, M. C. Funes, and R. S. Walker. 2017. Manejo del conflicto entre carnívoros y ganadería en Patagonia utilizando perros mestizos protectores de ganado. Mastozoologia Neotropical 24:47-58.

Novaro, A. J., and R. S. Walker. 2005. Human-induced changes in the effect of top carnivores on biodiversity in the Patagonian Steppe. Pp. 268-288 *in* (J. C. Ray, K. H. Redford, R. S. Steneck and J. Berger (eds.). Large Carnivores and the Conservation of Biodiversity. Island Press, Washington. USA.

Nyhus, P. J. 2016. Human-Wildlife Conflict and Coexistence. Annual Review of Environment and Resources 41:143-171. https://doi.org/10.1146/annurev-environ-110615-085634.

O'Bryan, C. J., A. R. Braczkowski, H. L. Beyer, N. H. Carter, J. E. M. Watson, and E. McDonald-Madden. 2018. The contribution of predators and scavengers to human well-being. Nature Ecology and Evolution 2:229-236. https://doi.org/10.1038/s41559-017-0421-2.

Ohrens, O., C. Bonacic, and A. Treves. 2019. Non-lethal defense of livestock against predators: flashing lights deter puma attacks in Chile. Frontiers in Ecology and the Environment 17:32-38. https://doi.org/10.1002/fee.1952.

Ohrens, O., F. R. Tortato, R. Hoogesteijn, R. J. Sarno, Q. Howard, D. Goic, and L. M. Elbroch. 2021. Predator tourism improves tolerance for pumas, but may increase future conflict among ranchers in Chile. Biological Conservation 258:109150. https://doi.org/10.1016/j.biocon.2021.109150.

Page, M. J., J. E. McKenzie, P. M. Bossuyt, I. Boutron, T. C. Hoffmann, C. D. Mulrow, L. Shamseer, J. M. Tetzlaff, E. A. Akl, S. E. Brennan, R. Chou, J. Glanville, J. M. Grimshaw, A. Hróbjartsson, M. M. Lalu, T. Li, E. W. Loder, E. Mayo-Wilson, S. McDonald, L. A. McGuinness, L. A. Stewart, J. Thomas, A. C. Tricco, V. A. Welch, P. Whiting, and

D. Moher. 2021. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 372:n71. https://doi.org/10.1136/bmj.n71.

Palacios, R., R. S. Walker, and A. J. Novaro. 2012. Differences in diet and trophic interactions of Patagonian carnivores between areas with mostly native or exotic prey. Mammalian Biology 77:183-189. https://doi.org/10.1016/j.mambio.2012.01.001.

Palmeira, F. B. L., P. G. Crawshaw, C. M. Haddad, K. M. P. M. B. Ferraz, and L. M. Verdade. 2008. Cattle depredation by puma (*Puma concolor*) and jaguar (*Panthera onca*) in central-western Brazil. Biological Conservation 141:118-125. https://doi.org/10.1016/j.biocon.2007.09.015.

Paruelo, J. M., E. G. Jobbágy, P. Laterra, H. Dieguez, M. A. García-Collazo, and A. Panizza (eds.). 2014. Ordenamiento Territorial Rural. Conceptos, métodos y experiencias. FAO, MAGyP, INTA y FAUBA. Pp. 794.

Perovic, P. G., and M. Herrán. 1998. Distribución del Jaguar *Panthera onca* en las provincias de Jujuy y Salta, Noroeste de Argentina. Mastozoología Neotropical 5:47-52.

Peterson, M. N., J. L. Birckhead, K. Leong, M. J. Peterson, and T. R. Peterson. 2010. Rearticulating the myth of human-wildlife conflict. Conservation Letters 3:74-82. https://doi.org/10.1111/j.1755-263X.2010.00099.x.

Plaza, P. I., and S. A. Lambertucci. 2020. Ecology and conservation of a rare species: What do we know and what may we do to preserve Andean condors? Biological Conservation 251:108782. https://doi.org/10.1016/j.biocon.2020.108782.

Plaza, P. I., K. L. Speziale, L. B. Zamora-Nasca, and S. A. Lambertucci. 2019. Dogs and Cats Put Wildlife at Risk. Journal of Wildlife Management 83:767-768. https://doi.org/10.1002/jwmg.21637.

Polisar, J., I. Maxit, D. Scognamillo, L. Farrell, M. E. Sunquist, and J. F. Eisenberg. 2003. Jaguars, pumas, their prey base, and cattle ranching: Ecological interpretations of a management problem. Biological Conservation 109:297-310. https://doi.org/10.1016/S0006-3207(02)00157-X.

Porfirio, G., P. Sarmento, S. Leal, and C. Fonseca. 2016. How is the jaguar Panthera onca perceived by local communities along the Paraguai River in the Brazilian Pantanal? Oryx 50:163-168. https://doi.org/10.1017/S0030605314000349.

Quiroga, V. A., A. J. Noss, A. Paviolo, G. I. Boaglio, and M. S. Di Bitetti. 2016. Puma density, habitat use and conflict with humans in the Argentine Chaco. Journal for Nature Conservation 31:9-15. https://doi.org/10.1016/j.jnc.2016.02.004.

Restrepo-Cardona, J. S., M. Á. Echeverry-Galvis, D. L. Maya, F. H. Vargas, O. Tapasco, and L. M. Renjifo. 2020. Human-raptor conflict in rural settlements of Colombia. PLoS ONE 15:1-14. https://doi.org/10.1371/journal.pone.0227704.

Restrepo-Cardona, J. S., C. Márquez, M. Á. Echeverry-Galvis, F. H. Vargas, D. M. Sánchez-Bellaizá, and L. M. Renjifo. 2019. Deforestation May Trigger Black-and-Chestnut Eagle (*Spizaetus isidori*) Predation on Domestic Fowl. Tropical Conservation Science 12:1-10. https://doi.org/10.1177/1940082919831838.

Restrepo, J., F. Sáenz-Jiménez, and A. A. Lieberman. 2019. Traditional Knowledge and perceptions towards the Andean condor (*Vultur gryphus* Linnaeus, 1758) in the Central Andes of Colombia. Ethnoscientia 4:1-7. https://doi.org/10.22276/ethnoscientia.v4i1.211.

Robles, I. A. S., and R. M. Gómez-Carrillo. 2017. Conflicto del oso andino (*Tremarctus ornatus*) con actividades antrópicas en Zetaquira-Boyacá. Conexión Agropecuaria 7:33-45.

Rodríguez, V., D. A. Poo-Muñoz, L. E. Escobar, F. Astorga, and G. Medina-Vogel. 2019. Carnivore-livestock conflicts in Chile: Evidence and methods for mitigation. Human-Wildlife Interactions 13:50-62.

Roig, V. G. 1991. Desertification and distribution of mammals in the southern cone of South America. Pp. 239-279 *in* M. A. Mares and D. J. Schmidly (eds.). Latin American Mammalogy: History, Biodiversity, and Conservation. University of Oklahoma Press, USA.

Sacristán, I., A. Cevidanes, F. Acuña, E. Aguilar, S. García, M. J. López, J. Millán, and C. Napolitano. 2018. Contrasting human perceptions of and attitudes towards two threatened small carnivores, *Lycalopex fulvipes* and *Leopardus guigna*, in rural communities adjacent to protected areas in Chile. Journal of Threatened Taxa 10:11566-11573. https://doi.org/10.11609/jott.4030.10.5.11566-11573.

Salazar, A., G. Baldi, M. Hirota, J. Syktus, and C. McAlpine. 2015. Land use and land cover change impacts on the regional climate of non-Amazonian South America: A review. Global and Planetary Change 128:103-119. https://doi.org/10.1016/j.gloplacha.2015.02.009.

Sarasola, J. H., and J. J. Maceda. 2006. Past and current evidence of persecution of the Endangered crowned eagle *Harpyhaliaetus coronatus* in Argentina. Oryx 40:347-350. https://doi.org/10.1017/S0030605306001013.

Sarasola, J., M. Santillán, and M. Galmes. 2010. Crowned eagles rarely prey on livestock in central Argentina: persecution is not justified. Endangered Species Research 11:207-213. https://doi.org/10.3354/esr00280.

Schulz, F., R. C. Printes, and L. R. Oliveira. 2014. Depredation of domestic herds by pumas based on farmer's information in Southern Brazil. Journal of Ethnobiology and Ethnomedicine 10:1-11. https://doi.org/10.1186/1746-4269-10-73.

Silva-Andrade, H. L., L. P. de Andrade, L. S. Muniz, W. R. Telino-Júnior, U. P. Albuquerque, and R. M. Lyra-Neves. 2016. Do Farmers Using Conventional and Non-Conventional Systems of Agriculture Have Different Perceptions of the Diversity of Wild Birds? Implications for Conservation. Plos ONE 11:e0156307. https://doi.org/10.1371/journal.pone.0156307.

Silva-Rodríguez, E. A., and G. R. Ortega-Solís. 2007. Human Attitudes Toward Wild Felids in a Human-dominated Landscape of Southern Chile. Cat News 46:19-21.

Silva-Rodríguez, E. A., M. Soto-Gambia, R. Ortega-Solís, and J. E. Jiménez. 2009. Foxes, people and hens: human dimensions of a conflict in a rural area of southern Chile. Revista Chilena de Historia Natural 82:375-386. https://doi.org/10.4067/S0716-078X2009000300005.

Swan, G. J. F., S. M. Redpath, S. Bearhop, and R. A. McDonald. 2017. Ecology of Problem Individuals and the

Efficacy of Selective Wildlife Management. Trends in Ecology and Evolution 32:518-530. https://doi.org/10.1016/j.tree.2017.03.011.

Toledo, L. M., M. J. R. Paranhos Da Costa, A. Schmidek, J. Jung, J. N. S. G. Ciryllo, and V. U. Cromberg. 2013. The presence of black vultures at the calving sites and its effects on cows' and calves' behaviour immediately following parturition. Animal 7:469-475. https://doi.org/10.1017/S1751731112001735.

Tortato, F. R., T. J. Izzo, R. Hoogesteijn, and C. A. Peres. 2017. The numbers of the beast: Valuation of jaguar (*Panthera onca*) tourism and cattle depredation in the Brazilian Pantanal. Global Ecology and Conservation 11:106-114.

Tortato, F. R., V. M. G. Layme, P. G. Crawshaw, and T. J. Izzo. 2015. The impact of herd composition and foraging area on livestock predation by big cats in the Pantanal of Brazil. Animal Conservation 18:539-547. https://doi.org/10.1111/acv.12207.

Travaini, A., S. C. Zapata, R. Martinez Peck, and M. Delibes. 2000. Percepción y actitud humanas hacia la prelación de ganado ovino por el zorro colorado (*Pseudalopex culpaeus*) en Santa Cruz, Patagonia Argentina 7:117-129.

Treves, A., R. R. Jurewicz, L. Naughton-Treves, R. A. Rose, R. C. Willging, and A. P. Wydeven. 2002. Wolf depredation on domestic animals in Wisconsin, 1976-2000. Wildlife Society Bulletin 30:231-241.

Treves, A., M. Krofel, and J. McManus. 2016. Predator control should not be a shot in the dark. Frontiers in Ecology and the Environment 14:380-388. https://doi.org/10.1002/fee.1312.

Trinca, C. T., S. F. Ferrari, and A. C. Lees. 2008. Curiosity killed the bird: arbitrary hunting of Harpy Eagles *Harpia harpyja* on an agricultural frontier in southern Brazilian Amazonia. Cotinga 30:12-15.

Veríssimo, D., G. Vaughan, M. Ridout, C. Waterman, D. MacMillan, and R. J. Smith. 2017. Increased conservation marketing effort has major fundraising benefits for even the least popular species. Biological Conservation 211:95-101. https://doi.org/10.1016/j.biocon.2017.04.018.

Villalva, P., and F. Palomares. 2019. Perceptions and livestock predation by felids in extensive cattle ranching areas of two Bolivian ecoregions. European Journal of Wildlife Research 65, 36. https://doi.org/10.1007/s10344-019-1272-8.

Wallach, A. D., W. J. Ripple, and S. P. Carroll. 2015. Novel trophic cascades: Apex predators enable coexistence. Trends in Ecology and Evolution 30:146-153. https://doi.org/10.1016/j.tree.2015.01.003.

Whitehouse Tedd, K., J. Abell, and A. Dunn. 2020. Evaluation of the use of psychometric scales in human-wildlife interaction research to determine attitudes and tolerance toward wildlife. Conservation Biology 28:250-250. https://doi.org/10.1111/cobi.13599.

Wilkinson, C. E., A. McInturff, J. R. B. Miller, V. Yovovich, K. M. Gaynor, K. Calhoun, H. Karandikar, J. V. Martin, P. Parker-Shames, A. Shawler, A. Van Scoyoc, and J. S. Brashares. 2020. An ecological framework for contextualizing carnivore-livestock conflict. Conservation Biology 34:854-867. https://doi.org/10.1111/cobi.13469.

Zamora-Nasca, L. B., A. di Virgilio, and S. A. Lambertucci. 2021. Online survey suggests that dog attacks on wildlife affect many species and every ecoregion of Argentina. Biological Conservation 256:109041. https://doi.org/10.1016/j.biocon.2021.109041.

Zarco-González, M. M., and O. Monroy-Vilchis. 2014. Effectiveness of low-cost deterrents in decreasing livestock predation by felids: A case in Central Mexico. Animal Conservation 17:371-378. https://doi.org/10.1111/acv.12104.

Zukowski, B., and A. Ormsby. 2016. Andean Bear Livestock Depredation and Community Perceptions in Northern Ecuador. Human Dimensions of Wildlife 21:111-126. https://doi.org/10.1080/10871209.2015.1126871.

Zuluaga, S., and M. Á. Echeverry-galvis. 2016. Domestic fowl in the diet of the black-and-chestnut eagle (*Spizaetus isidori*) in the eastern Andes of Colombia: A potential conflict with humans? Ornitologia Neotropical 27:113-120.

Zuluaga, S., F. H. Vargas, and J. M. Grande. 2021. Integrating socio-ecological information to address human-top predator conflicts: the case of an endangered eagle in the eastern Andes of Colombia. Perspectives in Ecology and Conservation 19:98-107. https://doi.org/10.1016/j.pecon.2020.10.003.