2019

Big Cats Around the Globe: How Communities Around the World Perceive Their Backyard Big Cats

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A thesis project submitted in partial fulfillment
of the requirements for the degree of Bachelor of Arts

Environmental Program
College of Arts and Science
University of Vermont

2019

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Abstract

Because of human population growth and activity such as habitat removal, poaching, and anthropogenic climate change, all big cat species populations are on the decline. Conservation of big cats, a group we define as including tigers, lions, mountain lions, jaguars, leopards, snow leopards and cheetahs, is crucial to the health of ecosystems worldwide as these apex predators have an effect on many other species their environment. As human settlements and big cat habitats often overlap, instances of conflict are on the rise, sometimes at the coast of people living near big cats. As such, local acceptance of big cats on the landscape is fundamental to the success of in-situ conservation. Here, we explore this issue by conducting a systematic literature review of local perceptions of big cat species. We searched for articles that quantitatively measured local perceptions of big cats. Our criteria took us from an original database of 1,328 articles, but dwindled to only 45 articles (asking 14,253 locals) that fit our rigorous criteria. We normalized the data in each article to derive overall perceptions of big cats. Generally, we found that locals hold neutral or slightly positive perceptions of big cats. Livestock owners have more negative perceptions of big cats compared to non-livestock owners. Geographically, there are large portions of big cat ranges where no research on local perceptions of big cats exist. This is the first time a systematic literature review of this kind has been done on such a charismatic set of mega-fauna.

Acknowledgements

I would like to first thank the Environmental Program at the University of Vermont for everything they have given me over my four years at UVM. I am now leaving the University with a sense of ability and foundational knowledge that will gives me the tools to succeed in all my future endeavors.

Within the Environmental Program there are several individuals who have made a profound impact on me that I would like to acknowledge as well. Professor Amy Seidl has been a mentor of mine since my first semester, she worked with me to make a plan that fit my needs and has been one of my biggest role models. Professor Rachelle Gould has been a great advisor and supporter of mine during my last two years here, I thank her for her support and guidance. Professor Laurie Kutner has been a great source of positive affirmation and support during this thesis process, she is undoubtedly by favorite librarian and source of knowledge here at UVM. I also want to thank Ibit Wright, who up until this year has been one of my closest confidants and motivators, Ibit we all miss you at Bittersweet and are wishing you well in retirement!

Of course, I want to thank my friends and family who have been by my side through this thesis project and all my other endeavors beyond UVM. Lexi, Shannon, and Mary, thank you for always thinking in my best interests and making me feel loved. Mom and Dad, thank you for making my ability to attend college possible and allowing me the freedom to study what I am most passionate about. Maeve, thank you for being my rock and keeping me sane throughout our time at UVM. To all my friends who made my time at UVM the most memorable and special time of my life, thank you for being you. None of what I have done at UVM would be possible without my great friends and family – thank you!

I also want to be sure to thank the Cystic Fibrosis Adult Clinic at the University of Vermont Medical Center – especially Abe, Kitty, and Lisa - for helping me stay healthy and able during my time at UVM.

Lastly, of course, I want to thank my advisors, Professor Brendan Fisher and Professor Joe Roman, for your guidance and support in this project. I am immensely proud of our work together and I thank you for your guidance during this last year and a half. I hope we can get this research out into the world so that we can positively impact the research community and conservation of big cat species.

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Introduction

Big cats, a group of species that includes tigers (*Panthera tigris*), lions (*Panthera leo*), mountain lions (*Puma concolor*), jaguars (*Panthera onca*), leopards (*Panthera pardus*), snow leopards (*Panthera uncia*), and cheetahs (*Acinonyx jubatus*), are apex predators that play critical roles in ecosystems around the world (Estes et al. 2011; Ripple et al. 2014). Big cats inhabit six continents, and they thrive in biomes as harsh as the African Savannah and the fringes of the Russian tundra (McCarthy et al. 2017; Quigley et al. 2017; Bauer et al. 2017; Nielsen et al. 2015; Goodrich et al. 2015; Stein et al. 2016). As keystone species, big cats create habitat for other species, offer an indication of ecosystem health, and regulate prey populations (Linnell et al. 2000). Being apex predators, big cats help regulate the environment in which live in, including two major trophic cascades (Dorresteijn et al. 2015). Big cats limit herbivores through predation and force behavioral change in habitat use, resulting in increased vegetation growth (Polis et al. 2000; Beschta & Ripple. 2009; Ripple & Beschta. 2012; Kuijper et al. 2013). Big cats also limit mesopredators through interference competition, disrupting mesopredators hunting habits and supplementing part of their diet by preying upon mesopredators (Palomares & Caro. 1999; Polis & Hold. 1992; Brook et al. 2012). For this reason, predation of mesopredators by big cats can increase small mammal and bird populations (Ritchie & Johnson. 2009; Crooks & Soulé. 1999).

Although crucial to ecosystem health, all big cat species populations are on the decline (McCarthy et al. 2017; Quigley et al. 2017; Bauer et al. 2017; Nielsen et al. 2015; Goodrich et al. 2015; Stein et al. 2016). Over the past 100 years, tigers have disappeared from much of their original territory and now inhabit less than 6% of their historic range (Sanderson et al. 2006; Walston et al. 2010). Similarly, lion populations currently occupy 17% of their historical range (Bauer et al. 2017). Jaguars occupy about 50% of their historic range, and they have been particularly prone to habitat fragmentation, as nearly 90% of their population is isolated within the Amazon basin (Quigley et al. 2017; De La Torre et al. 2017). Population and range data on leopards are sparse, yet researchers estimate that they have decreased by >30% since the last global assessment in 2008 (Stein et al. 2016). Snow leopard populations are estimated to be between 2,000-7,500 mature individuals, with that number decreasing annually, similarly cheetah populations are estimated to be at about 6,500 individuals, with more than 4,000 individuals geographically isolated in southern Africa (Durant et al. 2015; McCarthy & Chapron 2003; Jackson et al. 2010). Researchers do not have an agreeable population estimate for

mountain lions, yet we know that their population is declining and some isolated populations, such as the Florida panther, are endangered (Nielsen et al. 2015).

Humans are the driving force behind many of the threats against big cats, which are shared across species (Durant et al. 2015; McCarthy et al. 2017; Quigley et al. 2017; Bauer et al. 2017; Nielsen et al. 2015; Goodrich et al. 2015; Stein et al. 2016). Although they are charismatic megafauna, big cats are among the most imperiled species worldwide (Ripple et al. 2014). Human actions such as land use change that removes habitat, burning of fossil fuels that accelerates climate change, and persecution due to livestock killings often work in unison to negatively affect big cat populations (Ripple et al. 2014; Bruskotter et al. 2015). Isolation caused by human habitat removal and fragmentation causes disruptions in gene flow that can lead to extinction due to interbreeding (de la Torre et al. 2017). This is the case for lion populations, which are affected by inbreeding because of a lack of gene flow between isolated populations (Björklund. 2003). Big cat species are particularly vulnerable to killings from humans; poaching, trophy hunting, and retaliatory killings have significant effects on cat populations worldwide (Ripple et al. 2014). Empowered by beliefs related to religion and cultural norms, big cat species have been hunted and killed for their body parts. This human behavior has impacted every big cat species (Durant et al. 2015; McCarthy et al. 2017; Quigley et al. 2017; Bauer et al. 2017; Nielsen et al. 2015; Goodrich et al. 2015; Stein et al. 2016). Big cats are also threatened by climate change (McCarthy et al. 2017; Fletcher, 2013). Snow leopards are particularly prone to climate change threats because of their preferred habitat in the Himalayas which is experiencing tree line shifts, increased glacial melting, and other ecosystem changes due to climate change (Li et al. 2016). As keystone species, the threats that stress big cats will impact ecosystem health and have cascading effects on ecological communities (Polis et al. 2000; Beschta & Ripple. 2009; Ripple & Beschta. 2012; Kuijper et al. 2013; Newsome et al, 2017; Palomares & Caro. 1999; Polis & Hold. 1992; Brook et al. 2012).

In some regions of the world, a deeply rooted hostility for big cats has persisted in human culture because of perceptions that big cats negatively affect human livelihoods (Chapron et al. 2014). In other places, humans recognize big cats as a part of the local ecosystem or cultural heritage (Inskip et al. 2016; Lagendijk et al. 2008). As such, large carnivore conservation is one of the most complex forms of wildlife management (Lute et al. 2018). Human tolerance and acceptance are recognized as key factors in successful wildlife management; experts have

concluded that promoting human tolerance is crucial to the success of predator conservation (Treves & Bruskotter. 2014; Bruskotter et al. 2014; Bruskotter et al. 2015). Studying human perceptions of big cats can help us understand how people formulate judgements about their acceptability and support for big cats on the landscape (Bruskotter et al. 2014). Conservation strategists see local acceptance as a crucial part of conservation efforts for big cats, although it is not regularly included in habitat suitability models (Behr et al. 2017; Lute et al. 2018). Studying local perceptions and acceptance of big cat species is crucial to informing wildlife management practices, and improving conservation efforts for big cats (Behr et al. 2017). Although other researchers have studied local perceptions of their nearby big cat species, there has not been a systematic review of this literature (Oli et al. 1994; Conforti & Cesar Cascelli de Azevedo. 2003; Marker et al. 2003). Through a systematic literature review and meta-analysis, our study examines how local communities around the globe perceive big cat species, with the aim of informing future research and conservation strategies. Our review focused on peer-reviewed journal articles that shared quantitative data on local perceptions of nearby big cat species.

Methods

We conducted a systematic literature review to understand how locals around the world perceive their nearby big cat species (Fig. 1). The chosen electronic databases included: Academic Search Premier, Agricultural & Environmental Science Database, Environment Complete, Wildlife & Ecology Studies Worldwide, and Web of Science, to identify studies that included data on local people's perceptions on big cat species that inhabit the local areas. We used two sets of search terms to identify studies, the first includes species names: (Tiger* OR Lion* OR Jaguar* OR Leopard* OR Snow Leopard* OR Cougar* OR Puma* OR Panther* OR Cheetah* OR Mountain Lion* OR Big cat* OR *Panthera tigris** OR *Panthera leo** OR *Panthera onca** OR *Pathera pardu** OR *Panthera unica** OR *Puma concolor** OR *Acinonyx jubatus** OR *Feline** OR *Felidae** OR Large Carnivore*) this allowed us to find articles that used a wide variety of accepted names for big cats. We used the boolean search function with 'and' between sets to properly find all relevant articles. A second set of terms was used to describe words related to human attitudes: (Accept* OR Viewpoint* OR Thought* OR Opinion* OR Retaliat* OR Danger* OR Unaccept* OR Toleran* OR Perce* OR Attitud* OR Feeling* OR Compensat* OR Conflict* OR Local*) this allowed us to find articles that used a variety of

words related to human attitudes. Our search was conducted in December 2018, we had no year restrictions while searching for articles. We limited the search to these keywords appearing in the title. As such, any combination of our big cat species and attitude terms in the titles of peer-reviewed journal articles would return a paper for evaluation.

When we did not limit the search terms to title. Our search yielded 14,617 potential papers from the Academic Search Premier, Agricultural & Environmental Science Database, Environment Complete, Wildlife & Ecology Studies Worldwide Databases, and 11,554 returns from the Web of Science Database. We tested if by limiting our search terms to the title we would miss key papers. We did this by cross checking the 100 most cited and 100 most recent papers without our title filter to see if the filter negatively impacted our search. After looking at the 100 top cited articles and the 100 most recent articles, we found only one article - Gebresenbet et al. 2018 - that was missed by our more refined search. This paper led us to alter our search to include "large carnivore*" as an option in the title. This addition provided 37 more articles to be considered for the review in the Web of Science search, and 109 additional papers from the Academic Search Premier, Agricultural & Environmental Science Database, Environment Complete, Wildlife & Ecology Studies Worldwide Databases.

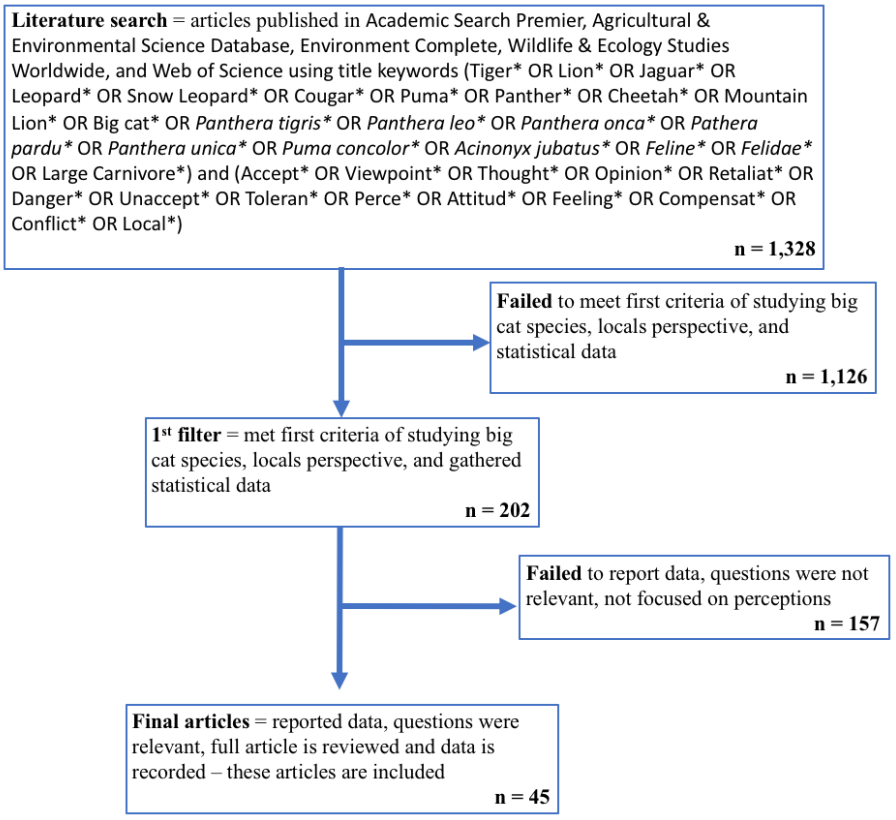

Figure 1 - Systematic literature review decision tree

Using our title filter in our search, we found 553 articles within the Web of Science database, and 775 within the Academic Search Premier, Agricultural & Environmental Science Database, Environment Complete, Wildlife & Ecology Studies Worldwide Databases. From there we removed duplicate articles and examined the titles and abstracts of all of the articles to

identify papers for review. We reviewed only the titles and abstracts of those articles to find ones that fit our inclusion criteria of: (1) includes a big cat species, (2) local's perceptions, (3) clear data or statistics on people's perceptions of these big cats. This yielded 202 studies. We then reviewed all of the 202 articles to make sure they fit our criteria. Many articles were cut during this stage because they focused on perceptions of predation on livestock by big cats, opinions on big cat conservation strategies, or did not report their results from select survey or interview questions that we needed. Our search also returned a series of articles that looked at local perceptions toward big cats in landscapes where they have gone extinct (Campbell et al. 2011; Caruso et al. 2013). These articles were not included in the analysis as they represent hypothetical views about perceptions of big cats.

After examining each of the 202 articles, we had 45 articles that fit our criteria and were to be reviewed further. We then recorded each articles methods, respondent size, respondent description (livestock owner or non-livestock owner), questions asked, and the results of questions asked. Each article had different ways of recording their results, we translated each of the results to our own -1 to +1 scale in order to analyze them. In rescaling each article into our own scale we were able to map how locals perceived each species on a -1 to +1 scale.

Results

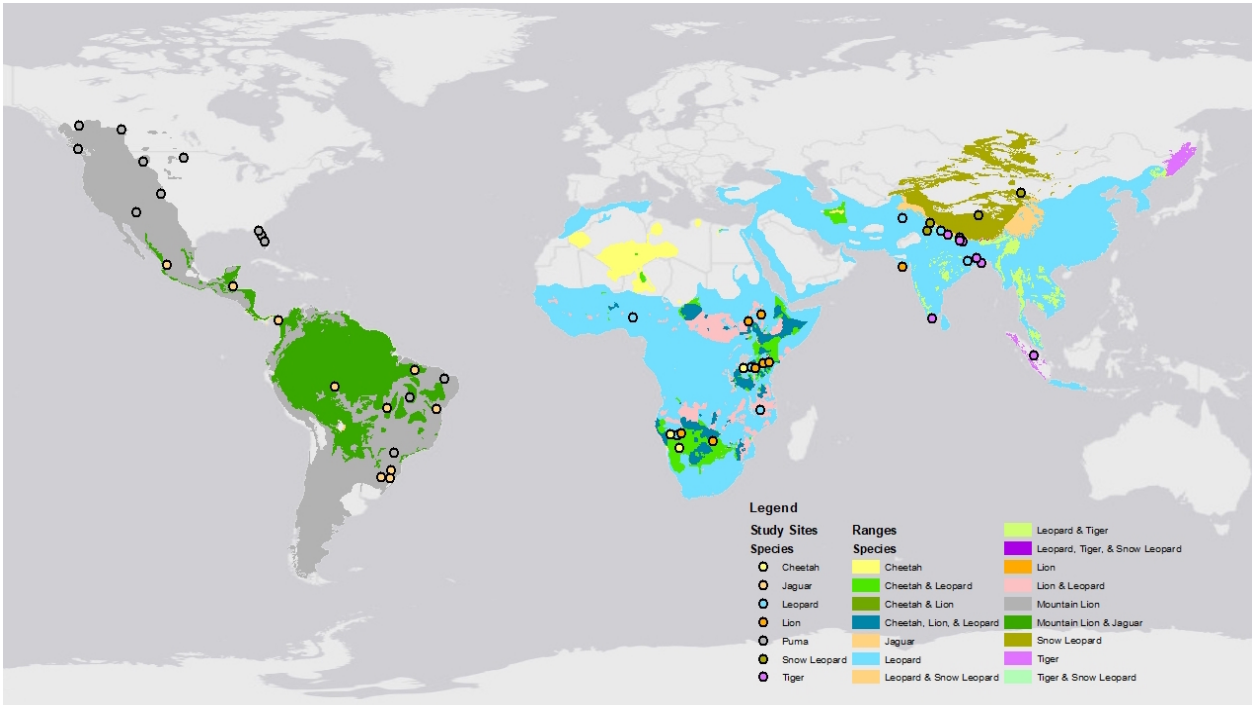

Figure 2 - Big cat ranges across the globe & study locations of research specifically enquiring about local perceptions

Our systematic literature review uncovered 45 articles that fit our criteria of evaluating local perceptions of big cats quantitatively. Our review of human-big cat relationships highlighted studies in 17 countries (Fig. 2). The distribution of studies generally mirrored species ranges, except for large gaps across cheetah, leopard, and tiger ranges. Publication dates for the articles we sampled ranged from 1994 to 2018, with the number of published articles increasing over this time period for all seven species included in the review. Questionnaires and surveys conducted through interviews were the predominant method of gathering data the articles reviewed. Three articles used mail back surveys or telephone calls to gain data (Thornton et al. 2010; Manfredo et al. 1998. Riley et al. 2000). Some articles had data on several species such as Schumann et al. 2008, while some data was repeated in two articles (Engel et al. 2017; Engel et al. 2016). The total number of articles that were able to be used for each species are as follows: snow leopard (5), leopard (7), cheetah (3), tiger (7), jaguar (10), lion (8), mountain lion (13) (Table 1).

There were five main categories of questions asked throughout the 45 studies included in this review: 1) attitude, 2) conservation and protection, 3) fear or feeling threatened by species,

4) desire to see a species or have it in region 5) other. Attitude questions, such as “What is your attitude toward jaguars?” or “How much do you like or dislike tigers?” was asked 27 total times in all of our articles (Marchini et al. 2018; Macura et al. 2016). Conservation and protection questions, such as “Should this snow leopards be conserved?” were asked 23 total times in all of our articles (Suryawanshi et al. 2014). Questions related to feelings of fear or being threatened by big cats such as "Leopards are a threat?” were asked 3 total times in all of our articles(Malviya et al. 2015). Questions related to wanting to see or have a species in your region such as “Do you want leopards on your ranch?” or “Would you like lions to disappear from your community?” were asked 21 times total times in all of our articles (Gebresenbet et al. 2018; Schumann et al. 2008). The other category consisted of 3 total questions that either asked people to describe if they would trap, shoot, or kill a mountain lion in their backyard, or had school-aged children draw pictures of jaguars to evaluate perceptions (Dos-Santos et al. 2008; Campbell et al. 2010; Campbell et al. 2013).

Species	# of articles	Total sample size	Types of questions
Snow Leopard	5	838	Attitude toward species (3) Fearful or threatened by species (2) Species should be conserved/protected (5) Want to see or have species in area (1)
Leopard	7	1653	Attitude toward species (4) Fearful or threatened by species (1) Species should be conserved/protected (1) Want to see or have species in area (3)
Cheetah	3	688	Attitude toward species (2) Want to see or have species in area (1)
Tiger	7	4750	Attitude toward species (3) Species should be conserved/protected (4) Want to see or have species in area (6)
Jaguar	10	1214	Attitude toward species (7) Species should be conserved/protected (2) Want to see or have species in area (2) Other (1)
Lion	8	1411	Attitude toward species (2) Species should be conserved/protected (6) Want to see or have species in area (6)
Mountain Lion	13	4835	Attitude toward species (6) Species should be conserved/protected (5) Want to see or have species in area (2) Other (2)

Table 1 - Describing the results of our systematic literature

We calculated 95% confidence intervals for our pooled data across 1) all species together 2) each individual species 3) herders vs non-herders. Contrary to popular conceptions, we found that locals do not hold strongly negative views toward big cats (Fig. 3) (Chapron et al. 2014; Treves & Karanth. 2003). Local perceptions are varied, but for 5 of the 7 species, local people hold relatively neutral views. For tigers and mountain lions, views were slightly positive and significantly different from neutral. Tigers scored a .18 [.11 , .25] and mountain lions a .12 [.02 ,

.21] on our normalized -1 to +1 scale. There is a large amount of variation in perceptions for cheetahs and lions. We only have 3 articles for local perceptions of cheetahs, with 688 people interviewed within that sample size. For lions we have 8 articles and a sample size of more than 1,400.

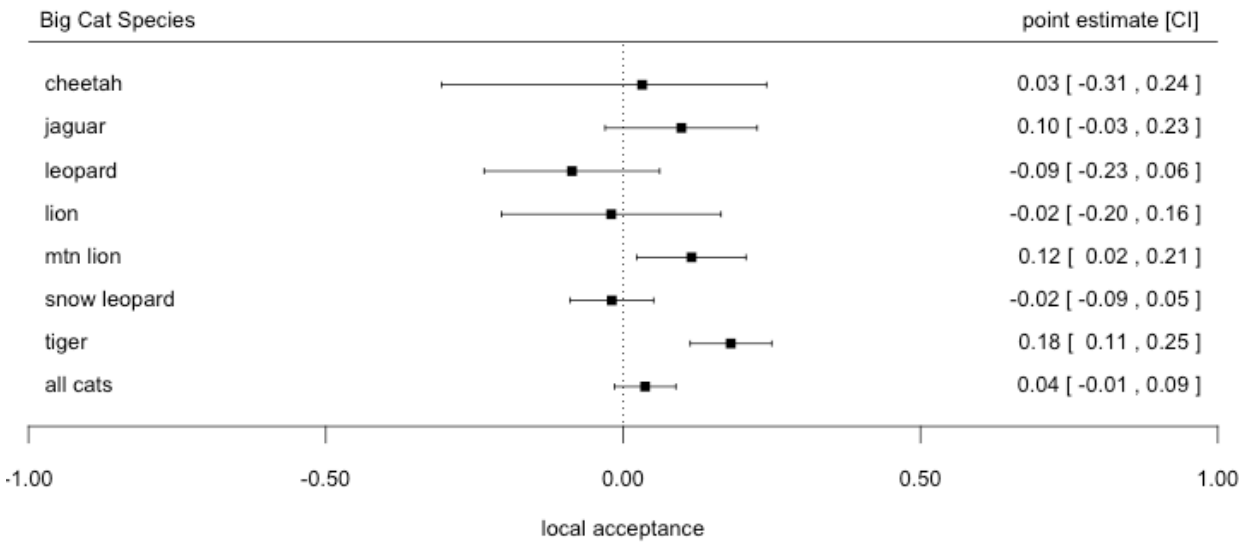

Figure 3 - Local perceptions of big cats

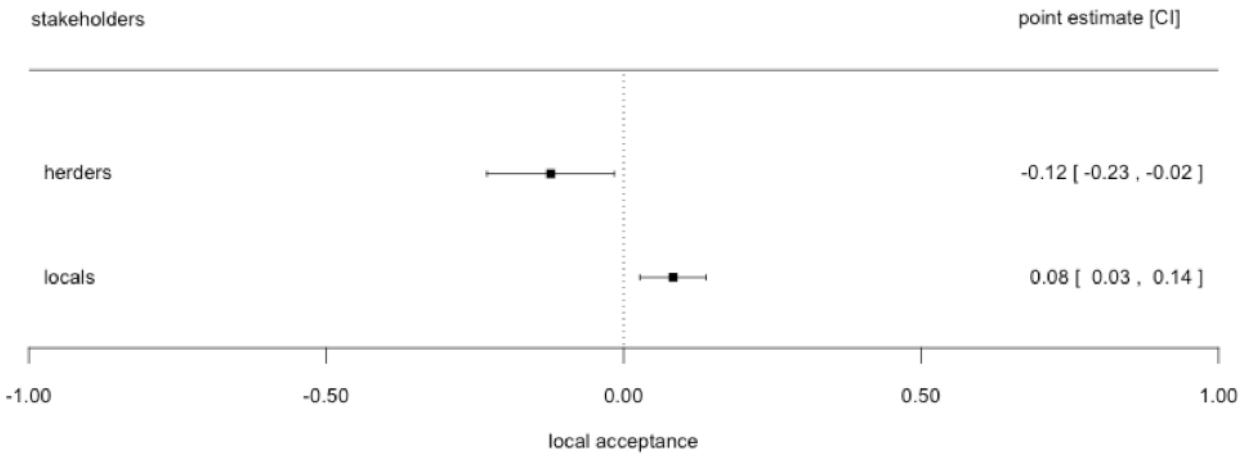

Figure 4 - Herders (livestock owners) vs locals (non-livestock owners) perceptions of big cats

We then asked if locals who were livestock owners (described as herders in Fig. 4), held different views from others given that they face economic costs of having big cats on the landscape (Fig. 4). Our sample consisted of 23 questions asking herders about their tolerance of big cats on the landscape across 6 studies with a total sample size of 788 individuals, but given the multiple variations on acceptance questions observations – n = 1300. For what we are calling non-herders, we have 80 questions across 46 studies with a total sample size of 12,308

individuals, but given the multiple variations on acceptance questions, – n = 24,252. Here we found a result in-line with expectations: herders generally had negative perceptions of big cats -.12 [-.23 , -.02]. When herders were removed from the sample, non-herders generally held slightly positive perceptions of big cats .08 [.03 , .14].

Discussion

Our systematic literature review discovered that large parts of big cat's ranges do not have research on local perceptions of those big cat species (Fig 2.). For example, mountain lions exist throughout much of North, Central, and South America, yet 10 out of the 13 studies are located in North America. Areas in which human population is high, big cats roam, and wildlife research is abundant, have many studies that are found in our review. Northern India, Nepal, and the Himalayas have a concentration of studies for tigers, snow leopards, and leopards (Carter et al. 2014; Malviya et al. 2015; Li et al. 2013). Whereas within the Amazon rainforest, where a high density of jaguars and some mountain lions live, yet few people, only have a couple studies (Marchini et al. 2018; Dos-Santos et al. 2008). Where humans and big cats live in closest proximity there are many studies. For example in Florida, USA, where mountain lions and locals live near each other, often only separated by fencing or small waterways, we have three studies (Rodgers et al. 2018; Rodgers et al. 2017; Jacobs et al. 2015).

We found that local non-livestock holders' perceptions of big cats are more positive than locals with livestock, this may be a result of big cats using livestock as part of their diet (Ghoddousi et al. 2016). Possibly because big cats sometimes hunt livestock for subsistence, or teach their young how to attack prey by practicing on livestock, our results show that livestock owners have predominantly negative perceptions of big cats (Fig. 4) (Ghoddousi et al. 2016; Elbroch & Quigley. 2013). Schumann et al. (2008) highlighted this fact by comparing local's perceptions of leopards, cheetahs, and lions, by asking, "Do you want (species name) on your ranch?" Schumann et al. (2008) asked four different local groups, members of a conservancy with livestock, members of a conservancy without livestock, regular locals with livestock, and regular locals without livestock. Their results for cheetahs as an example, show that non livestock conservancy farmers and regular locals without livestock (78% and 51.9% wanting cheetahs on ranch respectively) have more positive responses compared to livestock conservancy farmers and regular locals with livestock (51.9% and 26.7 wanting cheetahs on ranch

respectively). These results are similar for both leopards and lions as well. Schumann et al. 2008 highlights the fact that across species, locals who own livestock often hold more negative views on big cats than non-livestock holders.

Livestock holders often hold more negative perceptions of big cats for several reasons, mainly because big cats may attack their livestock (Ghoddousi et al. 2016). Big cats such as leopards, may teach their young how to hunt by attacking livestock as they are an easy target (Elbroch & Quigley. 2013). Being easy prey, livestock are often an easy source of nutrition during dry seasons and when prey is less abundant (Ghoddousi et al. 2016). Livestock and big cats are often in close proximity to each other because herders may bring their livestock further from settlements to graze, and livestock herders often live in areas of lower human population density, where big cats are more likely to persist.

We also found that contrary to popular perception, locals do not generally hold negative views toward the big cats living nearby; for mountain lions and tigers, locals held positive viewpoints (Chapron et al. 2014; Treves & Karanth. 2003). Although livestock owners may have predominantly negative perceptions of big cats, we found that locals in general hold either neutral or slightly positive perceptions of big cats (Fig. 3). This finding is unexpected, as much of the narrative around human - big cat relationships is that locals dislike big cats for a variety of reasons. Human-big cat conflict is at the center of this popular conception, with one meta-analysis finding over 186 journal articles studying human-big cat conflict (Holland et al. 2018). Human-wildlife conflict is defined as when the needs or behaviors of wildlife or humans negatively impact the livelihoods of wildlife or humans. (Madden. 2003). These conflicts have been the driving narrative of human-big cat relationships for decades, but our research shows that when we look at pooled data, despite those conflicts, locals have either neutral or positive relationships with big cats.

One area with some of the highest regard for big cats was near the Atlantic Forest, in Brazil. The Atlantic Forest, a forest that runs along the south-eastern side of Brazil has both mountain lion and jaguar populations. Engel et al. (2017) and Engel et al. (2016) asked locals several questions related to their perceptions of both mountain lions and jaguars. This is where jaguars were most positively received, scoring a .255 and .26 on our translated scale to questions related to local attitudes on the species. There are several reasons why the Atlantic Forest may be a hub of positive human-big cat relationships, among them is the Serra do Mar Ecological

Corridor and protection status of much of the Atlantic Forest that allows the two big cat species to have large, unfragmented habitat away from humans (Critical Ecosystems Partnership Fund). By providing corridors and large protected parts of the forest, these big cats can easily evade humans and avoid conflict, resulting in positive human-big cat relationships.

By conducting a systematic literature review, we were able to compare how local communities may have shifted their views on big cat species overtime as multiple studies occurred in the same area several years apart. Hazzah et al. (2013) and Hazzah et al. (2017) studied local's perceptions of lions in southern Kenya by national parks. Although the two studies had a difference in sample size by about 100 individuals, locals reported more positive perceptions of lions in the year 2013 compared to 2017. In the 2013 study, 79% of locals agreed that lions deserve protection, compared to in 2017 only 51% of locals agreed to this statement. This could be for a multitude of reasons: environmental degradation such as drought has hit the area in recent years, human settlements have grown and expanded, and lion's prey populations have dwindled, forcing them farther from the nearby national parks - all of this may increase human - lion conflict. Hazzah et al. (2013) and Hazzah et al. (2017) are clear examples of how quickly local's perceptions on a species can shift.

For two of our species, mountain lions and tigers, locals held positive perceptions. Mountain lions are one of the most adaptable species in the world, their geographic range is the largest of any terrestrial mammal in the western hemisphere (Sunquist & Sunquist. 2002). Mountain lions coexist with humans well in much of western North America, most notably near Los Angeles, California, where a population of mountain lions have integrated into surviving in suburbs (Riley et al. 2014; Ernest et al. 2003). Mountain lions adaptability in coexisting near high-density human populated areas is reflected in our results, as locals often have positive perceptions of this species. Our finding of locals having generally positive perceptions of tigers was surprising because within India, the epicenter for the tiger population, tigers and locals live within close proximity (Ramesh et al. 2019). Cases of livestock depredation or human killings by tigers are abundant, yet across the studies analyzed, locals generally held positive views on tigers (Dhanwatey et al. 2013). This may be a result of the large-scale tiger conservation campaigns in India, which often seek to have locals take pride in having tigers on the landscape (Sekhar. 2003). Tigers also bring a ecotourism market to India, of which locals benefit economically (Lyngdoh et al. 2017). Positive perceptions of tigers in India is also linked to Hinduism, the

countries predominant religion. Hinduism promotes the worshiping of nature and wild beings, this is thought to have positively impacted conservation efforts in the region (Sinha. 1995; Nagarajan. 1998)**.**

Our work was limited by the scarcity of articles that directly measured local perceptions of nearby big cat species quantitatively. Additionally, we limited our search to articles written in English and in peer-reviewed literature. Although research on local perceptions of big cat species has been conducted worldwide, not all of it is written in English or has been published in a peer-reviewed journal. The 45 articles included in our review are limited geographically, and hence culturally.

Conclusion

Big cat populations are being challenged worldwide, as pressures such as climate change, human population growth, and lack of prey abundance impact big cats, their species will continue to be threatened and persecuted. Big cat conservation strategies are still emerging, yet understanding local perceptions and having them on board with conservation projects has been shown to be critical to successful conservation outcomes (Treves & Bruskotter. 2014; Bruskotter et al. 2014; Bruskotter et al. 2015). We found large gaps in the geographic locations of studies researching human perceptions of big cats. We also found that people generally have either neutral or slightly positive views on big cats, contrary to popular conception. Lastly, we found that local perceptions are heavily influenced by whether or not they own livestock, because big cats may predate on livestock, causing issues for livestock holders. Our review highlights the fact that there are not enough studies on human-big cat relationships. These studies and review are important in crafting conservation strategies because without generally neutral or positive perceptions, locals will not want to aid in conserving big cat species. Humans are at fault for the decline of worldwide big cat populations, it is crucial that we work to conserve these species who are fundamental to the wellbeing of biomes globally by continuing to study locals perceptions in order to craft successful conservation campaigns.

Citations:

Alexander, J., Chen, P. J., Damerell, P., Youkui, W., Hughes, J., Shi, K., & Riordan, P. (2015). Human wildlife conflict involving large carnivores in Qilianshan, China and the minimal paw-print of snow leopards. *Biological Conservation, 187*, 1-9. doi:10.1016/j.biocon.2015.04.002

Arjunan, M., Holmes, C., Puyravaud, J.-P., & Davidar, P. (2006). Do developmental initiatives influence local attitudes toward conservation? A case study from the Kalakad–Mundanthurai Tiger Reserve, India. *Journal of Environmental Management, 79*(2), 188-197. doi:10.1016/j.jenvman.2005.06.007

Bauer, Packer, Funston, & Nowell, H. (2017). Panthera leo. The IUCN Red List of Threatened Species 2016. Retrieved from http://www.iucnredlist.org/details/15951/0

Baynham-Herd, Z., Redpath, S., Bunnefeld, N., Molony, T., & Keane, A. (2018). Conservation conflicts: Behavioural threats, frames, and intervention recommendations. *Biological Conservation, 222*, 180-188. doi:https://doi.org/10.1016/j.biocon.2018.04.012

Beschta, R. L., & Ripple, W. J. (2009). Large predators and trophic cascades in terrestrial ecosystems of the western United States. *Biological conservation, 142*(11), 2401-2414.

Behr, D. M., Ozgul, A., & Cozzi, G. (2017). Combining human acceptance and habitat suitability in a unified socio-ecological suitability model: a case study of the wolf in Switzerland. *Journal of Applied Ecology, 54*(6), 1919-1929. doi:10.1111/1365-2664.12880

Bhatia, S., Redpath, S. M., Suryawanshi, K., & Mishra, C. (2017). The Relationship Between Religion and Attitudes Toward Large Carnivores in Northern India? *Human Dimensions of Wildlife, 22*(1), 30-42. doi:10.1080/10871209.2016.1220034

Bhattarai, B. R., & Fischer, K. (2014). Human-tiger Panthera tigris conflict and its perception in Bardia National Park, Nepal. *Oryx, 48*(4), 522-528. doi:10.1017/s0030605313000483

Brook, L. A., Johnson, C. N., & Ritchie, E. G. (2012). Effects of predator control on behaviour of an apex predator and indirect consequences for mesopredator suppression. *Journal of applied ecology, 49*(6), 1278-1286.

Björklund, M. (2003). The risk of inbreeding due to habitat loss in the lion (Panthera leo). *Conservation Genetics, 4*(4), 515-523.

Bruskotter, J. T., & Wilson, R. S. (2014). Determining Where the Wild Things will be: Using Psychological Theory to Find Tolerance for Large Carnivores. *Conservation Letters, 7*(3), 158-165. doi:10.1111/conl.12072

Bruskotter, J. T., & Wilson, R. S. (2014). Determining Where the Wild Things will be: Using Psychological Theory to Find Tolerance for Large Carnivores. *Conservation Letters, 7*(3), 158-165. doi:10.1111/conl.12072

Bruskotter, J. T., Singh, A., Fulton, D. C., & Slagle, K. (2015). Assessing Tolerance for Wildlife: Clarifying Relations Between Concepts and Measures. *Human Dimensions of Wildlife, 20*(3), 255-270. doi:10.1080/10871209.2015.1016387

Campbell, M., & Lancaster, B.-L. (2010). Public Attitudes toward Black Bears (Ursus americanus) and Cougars (Puma concolor) on Vancouver Island. *Society & Animals, 18*(1), 40-57. doi:10.1163/156853010790799839

Campbell, M. O. N. (2013). The Relevance of Age and Gender for Public Attitudes to Brown Bears (Ursus arctos), Black Bears (Ursus americanus), and Cougars (Puma concolor) in Kamloops, British Columbia. *Society & Animals, 21*(4), 341-359. doi:10.1163/15685306-12341260

Carter, N., Riley, S., Shortridge, A., Shrestha, B., & Liu, J. (2014). Spatial Assessment of Attitudes Toward Tigers in Nepal. *AMBIO - A Journal of the Human Environment, 43*(2), 125-137. doi:10.1007/s13280-013-0421-7

Carter, N. H., & Allendorf, T. D. (2016). Gendered perceptions of tigers in Chitwan National Park, Nepal. *Biological Conservation, 202*, 69-77. doi:10.1016/j.biocon.2016.08.002

Casey, A. L., Krausman, P. R., Shaw, W. W., & Shaw, H. G. (2005). Knowledge of and Attitudes Toward Mountain Lions: A Public Survey of Residents Adjacent to Saguaro National Park, Arizona. *Human Dimensions of Wildlife, 10*(1), 29-38. doi:10.1080/10871200590904860

Chapron, G., Kaczensky, P., Linnell, J. D., von Arx, M., Huber, D., Andrén, H., . . . Anders, O. (2014). Recovery of large carnivores in Europe's modern human-dominated landscapes. *Science, 346*(6216), 1517-1519.

Conforti, V. A., & Cesar Cascelli de Azevedo, F. (2003). Local perceptions of jaguars (Panthera onca) and pumas (Puma concolor) in the Iguac¸u National Park area, south Brazil. *Biological Conservation, 111*(2), 215.

Critical Ecosystems Partnership Fund. (2001, December 11). *ATLANTIC FOREST BIODIVERSITY HOTSPOT* (Rep.).

Crooks, K. R., & Soulé, M. E. (1999). Mesopredator release and avifaunal extinctions in a fragmented system. *Nature, 400*(6744), 563.

Conforti, V. A., & Cesar Cascelli de Azevedo, F. (2003). Local perceptions of jaguars (Panthera onca) and pumas (Puma concolor) in the Iguac¸u National Park area, south Brazil. *Biological Conservation, 111*(2), 215.

Davenport, M. A., Nielsen, C. K., & Mangun, J. C. (2010). Attitudes Toward Mountain Lion Management in the Midwest: Implications for a Potentially Recolonizing Large Predator. *Human Dimensions of Wildlife, 15*(5), 373-388. doi:10.1080/10871209.2010.507564

Dhanwatey, H. S., Crawford, J. C., Abade, L. A. S., Dhanwatey, P. H., Nielsen, C. K., & Sillero-Zubiri, C. (2013). Large carnivore attacks on humans in central India: a case study from the Tadoba-Andhari Tiger Reserve. *Oryx, 47*(2), 221-227. doi:10.1017/s0030605311001803

de la Torre, J. A., Núñez, J. M., & Medellín, R. A. (2017). Habitat availability and connectivity for jaguars (Panthera onca) in the Southern Mayan Forest: Conservation priorities for a fragmented landscape. *Biological Conservation, 206*, 270-282. doi:10.1016/j.biocon.2016.11.034

Dorresteijn, I., Schultner, J., Nimmo, D. G., Fischer, J., Hanspach, J., Kuemmerle, T., . . . Ritchie, E. G. (2015). Incorporating anthropogenic effects into trophic ecology: predator–prey interactions in a human-dominated landscape. *Proceedings of the Royal Society B: Biological Sciences, 282*(1814), 20151602.

Dos-Santos, F. R., De-Almeida-Jacomo, A. T., & Silveira, L. (2008). Humans and jaguars in five Brazilian biomes: same country, different perceptions. *Cat News, 49*(Special Issue Nr. 4), 21-25.

Durant, S., Mitchell, N., Ipavec, A. & Groom, R. 2015. *Acinonyx jubatus*. *The IUCN Red List of Threatened Species* 2015: e.T219A50649567. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T219A50649567.en. Downloaded on 17 March 2019.

Elbroch, L. M., & Quigley, H. (2013). Observations of wild cougar (Puma concolor) kittens with live prey: implications for learning and survival. *The Canadian Field-Naturalist, 126*(4), 333-335.

Engel, M., Vaske, J., Bath, A., & Marchini, S. (2017). Attitudes toward jaguars and pumas and the acceptability of killing big cats in the Brazilian Atlantic Forest: An application of the Potential for Conflict Index. *AMBIO - A Journal of the Human Environment, 46*(5), 604-612. doi:10.1007/s13280-017-0898-6

Engel, M. T., Vaske, J. J., Bath, A. J., & Marchini, S. (2016). Predicting Acceptability of Jaguars and Pumas in the Atlantic Forest, Brazil. *Human Dimensions of Wildlife, 21*(5), 427-444. doi:10.1080/10871209.2016.1183731

Ernest, H. B., Boyce, W. M., Bleich, V. C., May, B., Stiver, S. J., & Torres, S. G. (2003). Genetic structure of mountain lion (Puma concolor) populations in California. *Conservation Genetics, 4*(3), 353-366.

Estes, J. A., Terborgh, J., Brashares, J. S., Power, M. E., Berger, J., Bond, W. J., . . . Jackson, J. B. (2011). Trophic downgrading of planet Earth. *science, 333*(6040), 301-306.

Figel, J. J., Ruíz-Gutiérrez, F., & Brown, D. E. (2016). Densities and perceptions of jaguars in coastal Nayarit, Mexico. *Wildlife Society Bulletin, 40*(3), 506-513. doi:10.1002/wsb.686

Fletcher, C. 2013. What is the Greenhouse Effect and How is it Being Altered by Human Activities? In *Climate Change: What the Science Tells Us*. New York: Wiley. pp. 33-38. (from Chapter 1, 4/24/2018)

Fort, J. L., Nielsen, C. K., Carver, A. D., Moreno, R., & Meyer, N. F. V. (2018). Factors influencing local attitudes and perceptions regarding jaguars Panthera onca and National Park conservation in Panama. *Oryx, 52*(2), 282-291. doi:10.1017/S0030605317001016

Gebresenbet, F., Baraki, B., Yirga, G., Sillero-Zubiri, C., & Bauer, H. (2018). A culture of tolerance: coexisting with large carnivores in the Kafa Highlands, Ethiopia. *Oryx, 52*(4), 751-760. doi:10.1017/s0030605316001356

Gebresenbet, F., Bauer, H., Vadjunec, J. M., & Papeş, M. (2018). Beyond the numbers: Human attitudes and conflict with lions (Panthera leo) in and around Gambella National Park, Ethiopia. *PLoS ONE, 13*(9), 1-17. doi:10.1371/journal.pone.0204320

Ghoddousi, A., Soofi, M., Hamidi, A. K., Lumetsberger, T., Egli, L., Khorozyan, I., . . . Waltert, M. (2016). Assessing the Role of Livestock in Big Cat Prey Choice Using Spatiotemporal Availability Patterns. *Plos One, 11*(4). doi:10.1371/journal.pone.0153439

Goodrich, Lynam, Miquelle, Wibisono, Kawanishi, Pattanavibool, . . . Karanth, K. (2015). Panthera tigris. The IUCN Red List of Threatened Species 2015. Retrieved from http://www.iucnredlist.org/details/summary/15955/0

Hazzah, L., Bath, A., Dolrenry, S., Dickman, A., & Frank, L. (2017). From Attitudes to Actions: Predictors of Lion Killing by Maasai Warriors. *PLoS ONE, 12*(1), 1-13. doi:10.1371/journal.pone.0170796

Hazzah, L., Dolrenry, S., Kaplan, D., & Frank, L. (2013). The influence of park access during drought on attitudes toward wildlife and lion killing behaviour in Maasailand, Kenya. *Environmental Conservation, 40*(3), 266-276. doi:10.1017/S0376892913000040

Hemson, G., Maclennan, S., Mills, G., Johnson, P., & Macdonald, D. (2009). Community, lions, livestock and money: A spatial and social analysis of attitudes to wildlife and the conservation value of tourism in a human–carnivore conflict in Botswana. *Biological Conservation, 142*(11), 2718-2725. doi:10.1016/j.biocon.2009.06.024

Holland, K. K., Larson, L. R., & Powell, R. B. (2018). Characterizing conflict between humans and big cats Panthera spp: A systematic review of research trends and management opportunities. *Plos One, 13*(9), e0203877.

Inskip, C., Carter, N., Riley, S., Roberts, T., & MacMillan, D. (2016). Toward Human-Carnivore Coexistence: Understanding Tolerance for Tigers in Bangladesh. *PLoS ONE, 11*(1), 1-20. doi:10.1371/journal.pone.0145913

Jackson, R. M., Mishra, C., McCarthy, T. M., & Ale, S. B. (2010). Snow leopards: conflict and conservation. *The Biology and Conservation of Wild Felids*, 417-430.

Jacobs, C., Main, M., & Pienaar, E. F. (2015). Florida ranchers and Florida panthers: risk perceptions, support for recovery, and evaluation of potential livestock depredation compensation programs. *Florida Scientist, 78*(3/4), 130-148.

Jorge, A. A., Vanak, A. T., Thaker, M., Begg, C., & Slotow, R. O. B. (2013). Costs and Benefits of the Presence of Leopards to the Sport-Hunting Industry and Local Communities in Niassa National Reserve, Mozambique. *Conservation Biology, 27*(4), 832-843. doi:10.1111/cobi.12082

Kuijper, D., De Kleine, C., Churski, M., Van Hooft, P., Bubnicki, J., & Jędrzejewska, B. (2013). Landscape of fear in Europe: wolves affect spatial patterns of ungulate browsing in Białowieża Primeval Forest, Poland. *Ecography, 36*(12), 1263-1275.

Lagendijk, D., & Gusset, M. (2008). Human–Carnivore Coexistence on Communal Land Bordering the Greater Kruger Area, South Africa. *Environmental Management, 42*(6), 971-976. doi:10.1007/s00267-008-9204-5

Li, J., Yin, H., Wang, D., Jiagong, Z., & Lu, Z. (2013). Human-snow leopard conflicts in the Sanjiangyuan Region of the Tibetan Plateau. *Biological Conservation, 166*, 118-123. doi:10.1016/j.biocon.2013.06.024

Li, J., McCarthy, T. M., Wang, H., Weckworth, B. V., Schaller, G. B., Mishra, C., . . . Beissinger, S. R. (2016). Climate refugia of snow leopards in High Asia. *Biological Conservation, 203*, 188-196.

Linnell, J. D. C., Swenson, J. E., & Andersen, R. (2000). Conservation of biodiversity in Scandinavian boreal forests: large carnivores as flagships, umbrellas, indicators, or keystones? *Biodiversity & Conservation, 9*(7), 857-868. doi:10.1023/A:1008969104618

Lute, M. L., Carter, N. H., López-Bao, J. V., & Linnell, J. D. C. (2018). Conservation professionals agree on challenges to coexisting with large carnivores but not on solutions. *Biological Conservation, 218*, 223-232. doi:10.1016/j.biocon.2017.12.035

Lyngdoh, S., Mathur, V. B., & Sinha, B. C. (2017). Tigers, tourists and wildlife: visitor demographics and experience in three Indian Tiger Reserves. *Biodiversity and Conservation, 26*(9), 2187-2204. doi:10.1007/s10531-017-1352-6

Macura, B., Secco, L., Pisani, E., Pullin, A., & Reyes-García, V. (2016). All that glitters is not gold: the effect of top-down participation on conservation knowledge, attitudes and institutional trust in a Central Indian tiger reserve. *Regional Environmental Change, 16*, 125-140. doi:10.1007/s10113-016-0978-3

Madden, F. (2004). Creating coexistence between humans and wildlife: global perspectives on local efforts to address human–wildlife conflict. *Human dimensions of wildlife, 9*(4), 247-257.

Madden, F., & McQuinn, B. (2014). Conservation's blind spot: The case for conflict transformation in wildlife conservation. *Biological Conservation, 178*, 97-106. doi:https://doi.org/10.1016/j.biocon.2014.07.015

Malviya, M., & Ramesh, K. (2015). Human-felid conflict in corridor habitats: implications for tiger and leopard conservation in Terai Arc Landscape, India. *Human-Wildlife Interactions, 9*(1), 48-57.

Manfredo, M. J., Zinn, H. C., Sikorowski, L., & Jones, J. (1998). Public acceptance of mountain lion management: a case study of Denver, Colorado, and nearby foothills areas. *Wildlife Society Bulletin, 26*(4), 964-970.

Marchini, S., & Macdonald, D. W. (2018). Mind over matter: Perceptions behind the impact of jaguars on human livelihoods. *Biological Conservation, 224*, 230-237. doi:10.1016/j.biocon.2018.06.001

Marker, L. L., Mills, M. G. L., & Macdonald, D. W. (2003). Factors influencing perceptions of conflict and tolerance toward cheetahs on Namibian farmlands. *Conservation Biology, 17*(5), 1290-1298. doi:10.1046/j.1523-1739.2003.02077.x

Marker, L. L., Mills, M. G. L., & Macdonald, D. W. (2003). Factors influencing perceptions of conflict and tolerance toward cheetahs on Namibian farmlands. *Conservation Biology, 17*(5), 1290-1298. doi:10.1046/j.1523-1739.2003.02077.x

McCarthy, Mallon, Jackson, Zahler, & McCarthy. (2017). Panther unica. The IUCN Red List of Threatened Species 2017. Retrieved from http://www.iucnredlist.org/details/22732/0

McCarthy, T. M., & Chapron, G. (2003). Snow leopard survival strategy. *International Snow Leopard Trust and Snow Leopard Network, Seattle, USA, 105*.

Mkonyi, F. J., Estes, A. B., Msuha, M. J., Lichtenfeld, L. L., & Durant, S. M. (2017). Local Attitudes and Perceptions Toward Large Carnivores in a Human-Dominated Landscape of Northern Tanzania. *Human Dimensions of Wildlife, 22*(4), 314-330. doi:10.1080/10871209.2017.1323356

Naha, D., Sathyakumar, S., & Rawat, G. S. (2018). Understanding drivers of human-leopard conflicts in the Indian Himalayan region: Spatio-temporal patterns of conflicts and perception of local communities towards conserving large carnivores. *PLoS ONE, 13*(10), 1-19. doi:10.1371/journal.pone.0204528

Nielsen, Thompson, Kelly, & Lopez-Gonzalez. (2015). Puma concolor. The IUCN Red List of Threatened Species 2015. Retrieved from http://www.iucnredlist.org/details/18868/0

Newsome, T. M., Greenville, A. C., Ćirović, D., Dickman, C. R., Johnson, C. N., Krofel, M., . . . Wirsing, A. J. (2017). Top predators constrain mesopredator distributions. *Nature Communications, 8*, 15469. doi:10.1038/ncomms15469

Oli, M. K., Taylor, I. R., & Rogers, M. E. (1994). SNOW LEOPARD PANTHERA-UNCIA PREDATION OF LIVESTOCK - AN ASSESSMENT OF LOCAL PERCEPTIONS IN THE ANNAPURNA CONSERVATION AREA, NEPAL. *Biological Conservation, 68*(1), 63-68. doi:10.1016/0006-3207(94)90547-9

Palomares, F., & Caro, T. M. (1999). Interspecific killing among mammalian carnivores. *The American Naturalist, 153*(5), 492-508.

Polis, G. A., & Holt, R. D. (1992). Intraguild predation: the dynamics of complex trophic interactions. *Trends in Ecology & Evolution, 7*(5), 151-154.

Polis, G. A., Sears, A. L., Huxel, G. R., Strong, D. R., & Maron, J. (2000). When is a trophic cascade a trophic cascade? *Trends in Ecology & Evolution, 15*(11), 473-475.

Porfirio, G., Sarmento, P., Leal, S., & Fonseca, C. (2016). How is the jaguar Panthera onca perceived by local communities along the Paraguai River in the Brazilian Pantanal? *Oryx, 50*(1), 163-168. doi:10.1017/s0030605314000349

Quigley, Foster, Petracca, Payan, & Harmsen, S. (2017). Panthera onca. The IUCN Red List of Threatened Species 2017. Retrieved from http://www.iucnredlist.org/details/15953/0

Ramesh, T., Kallea, R., Sankar, K., Qureshi, Q., Giordano, A. J., & Downs, C. T. (2019). To resettle or not?: Socioeconomic characteristics, livelihoods, and perceptions toward resolving human-tiger conflict in the Nilgiri Biosphere Reserve, India. *Land Use Policy, 83*, 32-46. doi:10.1016/j.landusepol.2019.01.019

Riley, S. J., & Decker, D. J. (2000). Wildlife stakeholder acceptance capacity for cougars in Montana. *Wildlife Society Bulletin, 28*(4), 931.

Ripple, W. J., & Beschta, R. L. (2012). Trophic cascades in Yellowstone: the first 15 years after wolf reintroduction. *Biological conservation, 145*(1), 205-213.

Riley, S. P., Serieys, L. E., Pollinger, J. P., Sikich, J. A., Dalbeck, L., Wayne, R. K., & Ernest, H. B. (2014). Individual behaviors dominate the dynamics of an urban mountain lion population isolated by roads. *Current Biology, 24*(17), 1989-1994.

Ripple, W. J., Estes, J. A., Beschta, R. L., Wilmers, C. C., Ritchie, E. G., Hebblewhite, M., . . . Nelson, M. P. (2014). Status and ecological effects of the world's largest carnivores. *science, 343*(6167), 1241484.

Ritchie, E. G., & Johnson, C. N. (2009). Predator interactions, mesopredator release and biodiversity conservation. *Ecology letters, 12*(9), 982-998.

Rodgers, P. D., & Pienaar, E. F. (2017). Amenity or Nuisance? Understanding and Managing Human-Panther Conflicts in Exurban Southwest Florida. *Human Dimensions of Wildlife, 22*(4), 295-313. doi:10.1080/10871209.2017.1318322

Rodgers, P. D., & Pienaar, E. F. (2018). Tolerance for the Florida panther in exurban southwest Florida. *Journal of Wildlife Management, 82*(4), 865-876. doi:10.1002/jwmg.21431

Saberwal, V. K. (1994). Lion-human conflict in the Gir Forest, India. *Conservation Biology, 8*(2), 501-507.

Sanderson, E. W., Forrest, J., Loucks, C., Ginsberg, J., Dinerstein, E., Seidensticker, J., . . . O'Brien, T. (2010). Setting priorities for tiger conservation: 2005–2015 *Tigers of the World (Second Edition)* (pp. 143-161): Elsevier.

Schumann, M., Watson, L. H., & Schumann, B. D. (2008). Attitudes of Namibian commercial farmers toward large carnivores: The influence of conservancy membership. *South African Journal of Wildlife Research, 38*(2), 123-132.

Sekhar, N. U. (2003). Local people's attitudes towards conservation and wildlife tourism around Sariska Tiger Reserve, India. *Journal of Environmental Management, 69*(4), 339-347. doi:10.1016/j.jenvman.2003.09.002

Sidhu, S., Raghunathan, G., Mudappa, D., & Raman, T. R. S. (2017). Conflict to Coexistence: Human - Leopard Interactions in a Plantation Landscape in Anamalai Hills, India. *Conservation & Society, 15*(4), 474-482. doi:10.4103/cs.cs_16_35

Sunquist, M., & Sunquist, F. (2017). *Wild cats of the world*: University of chicago press.

Stein, Athreya, Gerngross, Balme, Henschel, Karanth, . . . Ghoddousi, K. (2016). Panthera pardus. The IUCN Red List of Threatened Species 2016. Retrieved from http://www.iucnredlist.org/details/15954/0
Treves, A., & Bruskotter, J. (2014). Tolerance for predatory wildlife. *Science, 344*(6183), 476-477.

Steinberg, M. K. (2016). Jaguar Conservation in Southern Belize: Conflicts, Perceptions, and Prospects among Mayan Hunters. *Conservation & Society, 14*(1), 13-20. doi:10.4103/0972-4923.182801

Struebig, M. J., Linkie, M., Deere, N. J., Martyr, D. J., Millyanawati, B., Faulkner, S. C., . . . St John, F. A. V. (2018). Addressing human-tiger conflict using socio-ecological information on tolerance and risk. *Nature Communications, 9*. doi:10.1038/s41467-018-05983-y

Suryawanshi, K. R., Bhatia, S., Bhatnagar, Y. V., Redpath, S., & Mishra, C. (2014). Multiscale Factors Affecting Human Attitudes toward Snow Leopards and Wolves. *Conservation Biology, 28*(6), 1657-1666. doi:10.1111/cobi.12320

Thornton, C., & Quinn, M. S. (2010). Risk Perceptions and Attitudes Toward Cougars in the Southern Foothills of Alberta. *Human Dimensions of Wildlife, 15*(5), 359-372. doi:10.1080/10871200903582626

Treves, A., & Karanth, K. U. (2003). Human-carnivore conflict and perspectives on carnivore management worldwide. *Conservation Biology, 17*(6), 1491-1499. doi:10.1111/j.1523-1739.2003.00059.x

Walston, J., Robinson, J. G., Bennett, E. L., Breitenmoser, U., da Fonseca, G. A., Goodrich, J., . . . Karanth, K. U. (2010). Bringing the tiger back from the brink—the six percent solution. *PLoS biology, 8*(9), e1000485.

Zimmermann, A., Walpole, M. J., & Leader-Williams, N. (2005). Cattle ranchers' attitudes to conflicts with jaguar Panthera onca in the Pantanal of Brazil. *Oryx, 39*(4), 406-412. doi:10.1017/S0030605305000992