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# Life With Big Cats: Local Perceptions of Big Cat Species

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## Abstract

Land use change, agricultural and urban expansion, and anthropogenic climate change are the major drivers of biodiversity loss across the globe. Big cats (a casual term including species such as tigers, lions, mountain lions, jaguars, leopards, snow leopards, and cheetahs) are impacted by these global changes. As human settlement and activity increasingly overlap with big cat habitat, the frequency of human conflict over wildlife is rising, often precipitating direct costs to people living near big cats. Big cats are rare, they play many critical roles in the ecosystems they inhabit, and are often flagship conservation species because they are poster-charismatic megafauna. Because many of the costs of conservation are borne by locals, local acceptance of big cats on the landscape is fundamental to the success of in-situ conservation of these species. Here, we explore this issue by conducting a systematic literature review of articles that directly measure local perceptions (or acceptance) of big cats quantitatively. We normalized all perception data so we could synthesize results across places and species. The final set of data included the views of 14,253 locals from 45 papers, interrogating five different question types on local perceptions of big cats. Across these studies, we found that locals generally hold neutral or slightly positive perceptions of big cats – particularly for tigers and mountain lions. On average, livestock owners have more negative perceptions of big cats compared to non-livestock owners. Geographically, there are large portions of big cat population ranges where no research on local perceptions exist. These results call for two things 1) rethinking the perception that locals largely hold negative views towards big cats across their ranges and 2) more systematic research across big cat species ranges to better understand local perceptions, what drives those perceptions, and how they impact the outcomes of conservation approaches.

## Key Words

Acceptance, Big Cats, Human-Animal Relationships, Perceptions, Human-Wildlife Conflict, Conservation Values, Charismatic megafauna

## Introduction

Big cats, a loosely defined 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 sometimes 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 varied as the African savannah to 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 offer an indication of ecosystem health, regulate prey populations, and impact the physical habitat creating niches for other species (Linnell et al. 2000). Being apex predators, big cats drive two major trophic responses by limiting mesopredator and herbivory populations through predation and competition. (Dorresteijn et al. 2015; Polis et al. 2000; Beschta & Ripple. 2009; Ripple & Beschta. 2012; Kuijper et al. 2013; Palomares & Caro. 1999; Polis & Hold. 1992; Brook et al. 2012).

Although crucial to ecosystem health, all big cat species populations are declining in at least some parts of their range (McCarthy et al. 2017; Quigley et al. 2017; Bauer et al. 2017; Nielsen et al. 2015; Goodrich et al. 2015; Stein et al. 2016). According to the IUCN Redlist, mountain lions are listed as of least concern, and jaguars are listed as near threatened. Lions, cheetahs, snow leopards, leopards are listed as vulnerable, and tigers endangered. Threats such as land use change, climate change, and retaliatory persecution due to livestock killings often work in unison to negatively affect big cat populations (Ripple et al. 2014; Bruskotter et al. 2015). 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, every big cat species has been hunted and killed for their body parts by humans (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 ecosystem change due to climate shifts (Li et al. 2016). In some locales 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 their cultural heritage (Inskip et al. 2016; Lagendijk et al. 2008). Conservation efforts such as environmental education attempt to reduce conflict and improve local perceptions of big cats, to varying levels of success (Holland et al. 2018). Despite this, the former norm (hostility by locals towards big cats) is often thought of as the current global truth (Holland et al. 2018). As such, large carnivore conservation is one of the most complex forms of wildlife management (Lute et al. 2018).

Human tolerance and acceptance of predators are recognized as key factors in successful wildlife management and 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). In this paper we use both words - acceptance and tolerance - of big cat species on the landscape to evaluate local views on local big cat populations. The words tolerance and acceptance are closely linked within human-wildlife interaction literature (Frank et al. 2019). Tolerance and acceptance represent inaction along the wildlife conservation behavior continuum, where intolerance and stewardship each signify action being taken against or in favor of conservation efforts respectively. Human tolerance and acceptance of big cats is recognized to be influenced by a web of factors including individual, societal and cultural aspects (Dickman et al. 2013; Dickman. 2010; Nyhus. 2016; Woodroffe et al. 2005; Frank et al. 2019). One strategy to study human-wildlife conflict or tolerance of species is using the conflict-to-coexistence continuum (Frank. 2016). This continuum, proposed in Frank. (2016), describes conflict on one end of the spectrum, a form of intolerance that includes killing all animal species in conflict with humans. The opposite side of the spectrum describes full coexistence, where locals may even forgo their own interests to further those of wildlife. Some scholars believe the term human-wildlife conflict is detrimental to the end goal of coexistence because it ignores the theory that most human–wildlife conflict is truly human-human conflict in disguise (Peterson et al. 2010).

Human-human conflict may be defined as human disagreements over wildlife management decisions. These situations may result in future human-wildlife conflict (Peterson et al. 2010). Locals may suffer financial losses due to forgone agricultural opportunities and increased wildlife damage when conservation campaigns are implemented, reducing the success of such campaigns (Green et al. 2018). While conservationists typically see local acceptance as a crucial part of conservation efforts for big cats, it is not regularly included in habitat suitability models (Behr et al. 2017; Lute et al. 2018; Marchini. 2014). 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; Marchini. 2014).

Though there are many articles on local perceptions of big cat species, there has not been a systematic review of this literature in order to understand perceptions across borders and species, which has been stated as a need (Oli et al. 1994; Conforti & Cesar Cascelli de Azevedo. 2003; Marker et al. 2003). Reviews of people's perceptions of non-big cat species have previously been helpful in promoting research in this area and providing context for conservation policy and education (Kansky et al. 2014; Dressel et al. 2015). Of particular interest within this subject is studying livestock owners and herders' perceptions of big cats, as this population may have an increased chance of human conflict over big cats (Hill. 2004).This type of systematic reviews allow us to have a snapshot of all the available literature in one succinct article, which may aid future research endeavors for other megafauna whose perceptions may be comparable to big cats. Our review fills a gap in the literature and investigates if there is a global norm in terms of acceptance of big cats by locals.

## Materials and Methods

We conducted a systematic literature review to understand how locals around the world perceive their nearby big cat species (Fig. 1). Our review focused on peer-reviewed journal articles that shared quantitative, interval, or ordinal data on local perceptions of nearby big cat species. For the purpose of our review, 'local' was defined for us by the authors of the original articles as locals, stakeholders, or otherwise people that shared land or interacted with big cat species on a regular basis. 'Perceptions' is a term loosely used to describe thoughts and feelings people have about big cat species, other words authors may have used include attitudes,

tolerances, or beliefs (Kellert. 1983; Messmer. 2009). We aimed to find articles on the following big cat species: tigers (*Panthera tigris)*, lions (*Panthera leo)*, jaguars (*Panthera once)*, leopards (*Pathera pardu)*, snow leopards (*Panthera unica)*, mountain lions (*Puma concolor)*, and cheetahs (*Acinonyx jubatus)*. To identify studies that included data on local people's perceptions of big cat species that inhabit the local areas we used the following databases: Academic Search Premier, Agricultural & Environmental Science Database, Environment Complete, Wildlife & Ecology Studies Worldwide, and Web of Science. In all databases we used their core collections to find articles. We used two sets of search terms to identify studies. The first set of words included species names of our species of interest: (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. A second set of terms was used to describe words related to human perceptions: (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. We used the boolean search function with 'and' between the two sets of words to properly find all relevant articles. Our search was conducted in December 2018, we had no year restrictions while searching for articles. The search was limited to articles written in English. 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.

Our search protocol returned 553 articles within the Web of Science database, and 775 within the other databases. Duplicates existed between the two searches. We reviewed all titles and abstracts to find articles that fit our criteria of including 1) a focus on a specific big cat species, 2) includes local perceptions of this (these) species, (3) quantitative data or statistical results on local perceptions of these big cat. This yielded 202 studies. We then read these 202 articles to make sure they fully fitted our criteria. Many articles were cut during this stage because they did not focus on local perceptions of the big cat species, but rather focused on perceptions of predation threats, opinions on big cat conservation strategies, or did not report the simple descriptive statistics we needed (local perception of big cats). We contacted several first

authors for access to this data, but were unsuccessful. 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. We made note of any explicitly mentioned types of human conflict over big cats, local conservation or mitigation practices, mechanisms that influenced attitudes, and if the study participants perceptions had changed over time. We then recorded the methods, respondent size, respondent description (livestock owner or non-livestock owner, sometimes described as herder or non-herder in the text), questions asked, and the quantitative results for each study. Since there were a suite of different ways that each study recorded its results, we translated each of the results of a perception question to a -1 to +1 scale. For example, in Fort et al. 2018 a 5-point scale regarding a respondent's view towards local jaguars ranged from - "extremely negative" "slightly negative" "neutral" "slightly positive" "very positive" was rescaled to -1, -0.5, 0, +0.5, +1, respectively. A single datapoint entails the mean translated response for a given attitude/perception question in a given paper. All translated attitude/perception question responses were combined (after weighting for sample size) for the mean perception score for a given species. We followed the same process for the herder-non-herder analysis after delineating respondents who identified as livestock herders from those who did not identify as such. In rescaling each article's quantitative assessment, we were able to compare how locals perceived each species on a -1 to +1 scale across studies and across species. We also recorded data from each paper related to the type of human-wildlife conflict in a given study area, any mention of conservation interventions present in the area, and any discussion of mechanisms that might drive, impact, or influence local perceptions of big cats. This latter stream of data allowed us to contextualize the synthetic perception results.

## Results

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 found studies conducted in 17 countries, with large gaps in spatial coverage across cheetah, leopard,

and tiger ranges (Fig. 2). 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. In 1994 there were two studies that met our criteria, in 2018 there were seven (Fig. S1). Questionnaires and surveys conducted through interviews were the predominant data gathering method from the articles reviewed. Three articles used mail surveys or telephone surveys to collect 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 per species were 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 - 1) attitude, 2) conservation and protection, 3) fear or feeling threatened by species, 4) desire to see a species or have it in region and 5) other (Table 1). Attitude questions, such as "What is your attitude toward jaguars?" or "How much do you like or dislike tigers?" were asked in 27 studies (e.g. Marchini et al. 2018; Macura et al. 2016). Conservation and protection questions, such as "Should species x be conserved?" were asked in a total of 23 (e.g. Suryawanshi et al. 2014). Questions related to feelings of fear or being threatened by big cats such as "Leopards are a threat?" were asked in three studies (e.g. 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 in 21 studies (e.g. Gebresenbet et al. 2018; Schumann et al. 2008). The other category consisted of questions similar to asking people to describe if they would trap, shoot, or kill a 'big cat' (e.g. Dos-Santos et al. 2008; Campbell et al. 2010; Campbell et al. 2013).

We calculated point estimates (mean weighted response from our normalized scale) and 95% confidence intervals for our pooled data across 1) all species together 2) each individual species (Fig. 3) and 3) perceptions of herders vs non-herders (Fig. 4). Local perceptions are varied, but for 5 of the 7 species, local people hold, on average, relatively neutral views. For tigers and mountain lions, views were slightly positive and significantly different from neutral. Tigers scored a 0.18 [0.11 , 0.25] and mountain lions a 0.12 [0.02 , 0.21] on our normalized -1 to +1 scale. There is a large amount of variation in perceptions for cheetahs 0.03 [-0.31 , 0.24] and

lions -0.02 [-0.20 , 0.06]. Jaguars, snow leopards, and leopards scored 0.10 [-0.03 , 0.23], -0.02 [-0.09 , 0.05], and -0.09 [-0.23 , 0.06] respectively. See Table 1 for sample sizes.

We then explored the data to determine if locals who were livestock owners (described as herders in Fig. 4), held different views from others given that they face potential direct 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 we had n=1300 observations from herders. For what we are calling non-herders, we have 80 questions across 45 studies with a total sample size of 12,308 individuals, but given the multiple variations on acceptance questions the total sample size was n = 24,252. Herders generally had negative perceptions of big cats -.12 [-.23 , -.02]. Non-herders generally held slightly positive perceptions of big cats .08 [.03 , .14] (Fig. 4).

We found three main types of conflict in the studies: depredation of livestock, attacks on humans by big cats, and poaching or retaliatory killings of big cats (Table S2). Conflict was present in all but three of our articles. Local conservation or mitigation practices were present in the majority of our articles, mainly in the form of local protected areas. Livestock compensation programs, ecotourism, and environmental education programs were also present in some studies. Researchers hypothesized the mechanisms by which local perceptions were formed about big cats in all but two of our articles. Researchers posited that things such as compensation and conservation programs, environmental education, and cultural beliefs all drive local attitude formation towards big cats, and therefore local perceptions.

## Discussion

We found that contrary to the popular literary narrative, locals did not generally hold negative views toward the big cats living nearby; for mountain lions and tigers, locals on average held positive viewpoints (Chapron et al. 2014; Treves & Karanth. 2003). Human conflict over big cats is at the center of this popular perception, with one meta-analysis finding over 186 journal articles studying human conflict over big cats (Holland et al. 2018). Negative interactions often drive the narrative of human-big cat relationships, but our research shows that when we

look at pooled data, despite those undesirable interactions, locals have either neutral or positive perceptions of big cats.

Human conflict over big cats was a focal area of concern in all but three of the studies included in our analysis (Arjunan et al. 2006; Casey et al. 2005; and Davenport 2010). In these cases, locals and big cat habitat did not often overlap because locals did not rely on forest resources (Casey et al. 2005; Davenport 2010), or conservation programs are so effective that conflicts have largely been mitigated in the region (Arjunan et al. 2006). Across our studies we found three main drivers of conflict: depredation of livestock or pets, attacks on humans, and poaching/retaliatory killings of big cats. These drivers of conflict have a varied impact on tolerance. Predation can lead to negative attitudes in a region (Oli et al. 1994, Rodgers & Pienaar 2017, Steinberg. 2016) and often leads to economic losses for individuals or communities as a whole (Saberwal. 1994). Rarely, locals think of depredation of livestock by a big cat as a sign of good fortune, or just as part of living in the landscape (Sidhu et al. 2017; Suryawanshi et al. 2014; Li et al. 2013). Fear and or risk of human injury can also drive negative perceptions, especially when locals are forced to enter big cat habitat for forest products or to allow livestock to graze (Zimmerman et al. 2005; Campbell & Lancaster. 2010). Despite conflict over big cats being at the center of the bulk of the papers in our study, our results show neutral-to-positive overall perceptions of locals towards the big cats in their landscape. Mid-point scores are notoriously difficult to decipher, especially when no follow-up qualitative methodology is used to tease at why an individual answered in the way that they did (Jordan. 1965; Garland. 1991). In the context of local perceptions of big cat species, neutral perceptions may exist because locals recognize living with big cats is a part of their way of life and they must learn to coexist rather than feel negatively toward them.

Most studies in our review attempted to articulate the mechanisms by which attitudes towards big cats are constructed in the study landscapes. Threat and fear are often interrogated as drivers of attitude formation, but a variety of formative and covarying aspects of local context are examined in our studies from age, sex, education, and economic status of respondents to religious beliefs, extent of ecotourism, cultural history (folklore), environmental education campaigns, and existence of local protected areas in the region.

As far as the phenomena that seem to covary with perceptions, in two studies women had more negative perceptions of big cats than men (Fort et al. 2018, Thornton & Quinn. 2010) and

the potential mechanism was their greater likelihood of responsibility of household safety and foraging activities. Older respondents sometimes had more negative views of big cats as compared to younger aged people (Porfirio et al. 2016, Rodgers & Pienaar. 2018). As we have shown as well, respondents with a less direct risk of economic loss had more positive views on average (Oli et al. 1994; Saberwal. 1994).

Our sample included a suite of studies that point to activities or beliefs that may aid in the formulation of more positive attitudes towards big cats on the landscape. Pro-nature religious beliefs (Bhatia et al. 2017), ecotourism (Bhattarai & Fischer. 2014) and increased ecological knowledge (Rodgers & Pienaar. 2018) have all been associated with varying, but generally positive, perceptions of local big cat populations. Such studies support the evidence base for popular conservation initiatives such as attempts to change values, provide economic incentives and roll out educational campaigns. Here we see that in general such things can be associated with more positive views of local wildlife, however the attitude-action gap is likely to remain in many contexts.

With respect to conservation initiatives, nearly all of the study locations in our review were situated near formal protected areas, and access to these locations was sometimes cited as a potential mechanism for attitude formation (Hazzah et al. 2013, Carter et al. 2014). For example Hazzah et al. (2013) studied how the Maasai people of Southern Kenya had improved attitudes towards lions when conservation efforts did not inhibit them from still entering lion habitat. A recent study by Naidoo et al (2019) called into question another common perception (i.e. that protected areas imposed significant costs on locals) and showed that across more than 600 protected areas in 34 developing countries, protected areas delivered improved health and economic outcomes to local households compared with matched households far from protected areas. Such studies can shed light on the delivered benefits of protected areas that some locals experience, and may hint at reasons for positive local perceptions of wildlife that inhabit protected areas.

Our result that 'herders' had generally negative perceptions of big cats is not surprising (see Ghoddousi et al. 2016, Elbroch & Quigley. 2013, Fig. 4), given the potential of direct economic losses of herders to big cat predation. Schumann et al. (2008) highlighted this fact by comparing local 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, non-conservancy locals with livestock, and non-conservancy locals without livestock. Their results for wanting cheetahs on their ranch show that non-livestock owning, conservancy farmers (78%) and non-conservancy locals without livestock (51.9%) have more positive responses compared to livestock conservancy farmers (51.9%) and non-conservancy locals with livestock (26.7%). The results were similar for leopards and lions as well (Schumann et al. 2008). This result from Schumann et al. 2008 as well as our own findings suggest that we have work to do with the stakeholders across all big cat ranges that face the most direct economic costs of sharing habitats. Several approaches currently exist in trying to overcome the mutually detrimental effects of this competition for a shared habitat between herders and big cats. For example, compensation programs that compensate livestock owners when a big cat attacks their livestock, aim to generate goodwill and a level of tolerance for big cats (Goodrich. 2010; Treves & Karanth 2003). Nyhus et al. (2005) believe successful compensation programs need to also monitor wildlife populations and work to reduce issues such as unsustainably high compensation costs, difficulties in verifying claims, high numbers of false claims, and difficulty in paying livestock owners on time in rural areas. Although a full quantitative analysis of the efficacy of compensation programs was beyond the scope of our review, we found several studies where compensation programs had no impact on perceptions of big cats (Hemson et al. 2009, Carter & Allendorf. 2016, Saberwal. 1994).

Our results suggest that local support for big cat conservation (which is crucial to a successful conservation campaign) is likely possible across the suite of big cat ranges - given the generally neutral to positive attitudes held for big cats. That said, we certainly need more data across species ranges, but perhaps, as our analysis suggests, the 'norm' is one of at least tolerance. This norm needs to be promoted as it may be an "unknown norm." Social identity theory is a metric known to be predictive of human-behavior and must be utilized when aiming to positively influence perceptions of wildlife (van Eeden et al. 2020). People often hold beliefs (or act) either lukewarmly or secretly because they think their beliefs (or actions) are contrary to what others believe (or how they act) (van Eeden et al. 2020). This can lead to suboptimal outcomes. Group identity specifically, especially in an increasingly less place-based world, is predictive of attitudes toward wildlife (Lute et al. 2014). Making "unknown" or misperceived norms more familiar can have a big effect on behavior (Lute et al. 2014). As such, campaigns

promoting and reflecting the actual "acceptance towards big cats" norm could have a positive impact on conservation efforts. Human conflict over big cats, rooted in depredation and big cat killings, is the subject of a large amount of research, making the narrative largely negative (Holland et al. 2018). Our research illustrates the opposite, that there are a lot of positive perceptions of big cats by humans living nearby them. Awareness of positive human–big cat interactions may improve conservation efforts of big cat species.

Our work here is 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. One key recommendation stemming from this work is that future research be conducted in order to evaluate how local perceptions of big cat species change over time. In order to better understand how perceptions of big cats change over time we need systematically designed, long-term, and repeated measures research in critical habitats. Additionally, our work illustrates the need for studies that clearly outline the mechanisms in which positive perceptions of big cats have been built over time and what survey questions tease out those factors If researchers are able to systematically outline why and how certain localities have more positive perceptions of big cats than others, we may be able to craft a blueprint for success in in-situ conservation campaigns. Such work could bolster our finding of a general tolerance across big cat ranges with how to increase that tolerance, mitigate conflict, and build more positive outcomes for big cats and their local human populations.

## Conclusion

Big cat populations are declining worldwide. Pressures such as climate change, human – wildlife conflict, land conversion, and reduction in prey abundance negatively impact big cats and conservation strategies to combat these threats are continually evolving. Understanding local perceptions and having locals 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) and our synthesis here suggests that at the very least locals 'on average' do not hold negative views of their local big cat populations, and even generally have positive levels of acceptance if they are not livestock herders. These results point towards a more optimistic view, compared to general human-wildlife conflict literature, of attaining local buy-in towards big cat conservation across the globe.

## Authors' Contributions

WC and BF conceived the ideas and designed methodology; WC collected the data; WC and BF analyzed the data; WC and BF wrote the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

## Data Availability Statement

Because this is a systematic review, we have no original data to archive. All data we used from other sources will be available as Supplementary Materials to the main manuscript and available at: http://blog.uvm.edu/bfisher-ecos/publications/

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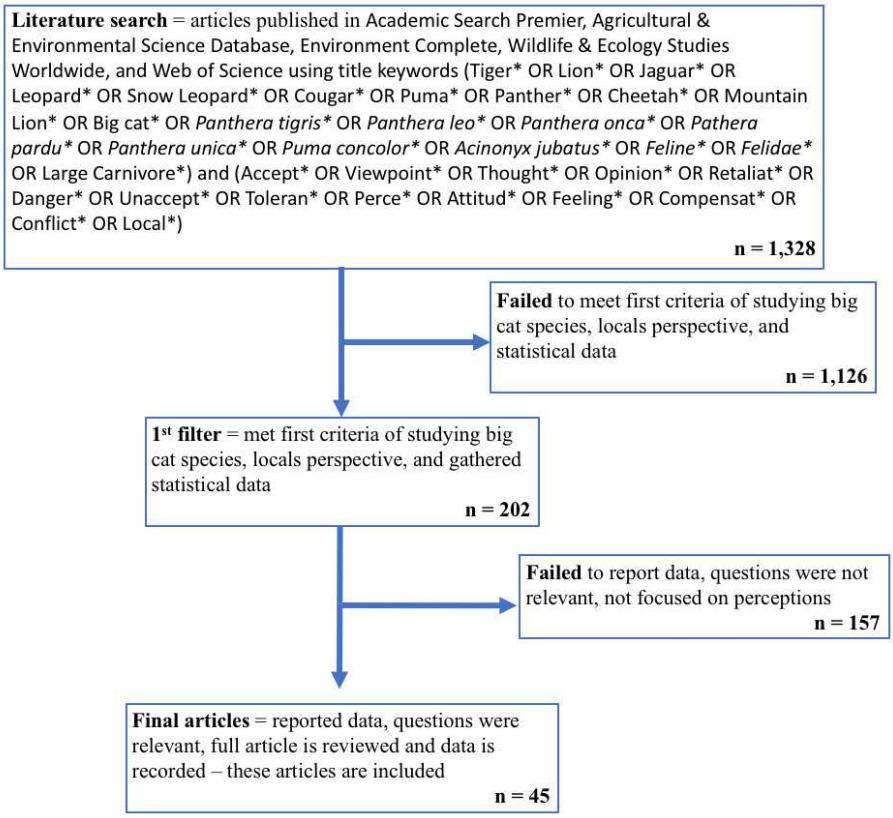


Figure 1. **Systematic literature review flow chart.** Describes our search terms, filters, and reasons for exclusion. 45 total articles included in final review.

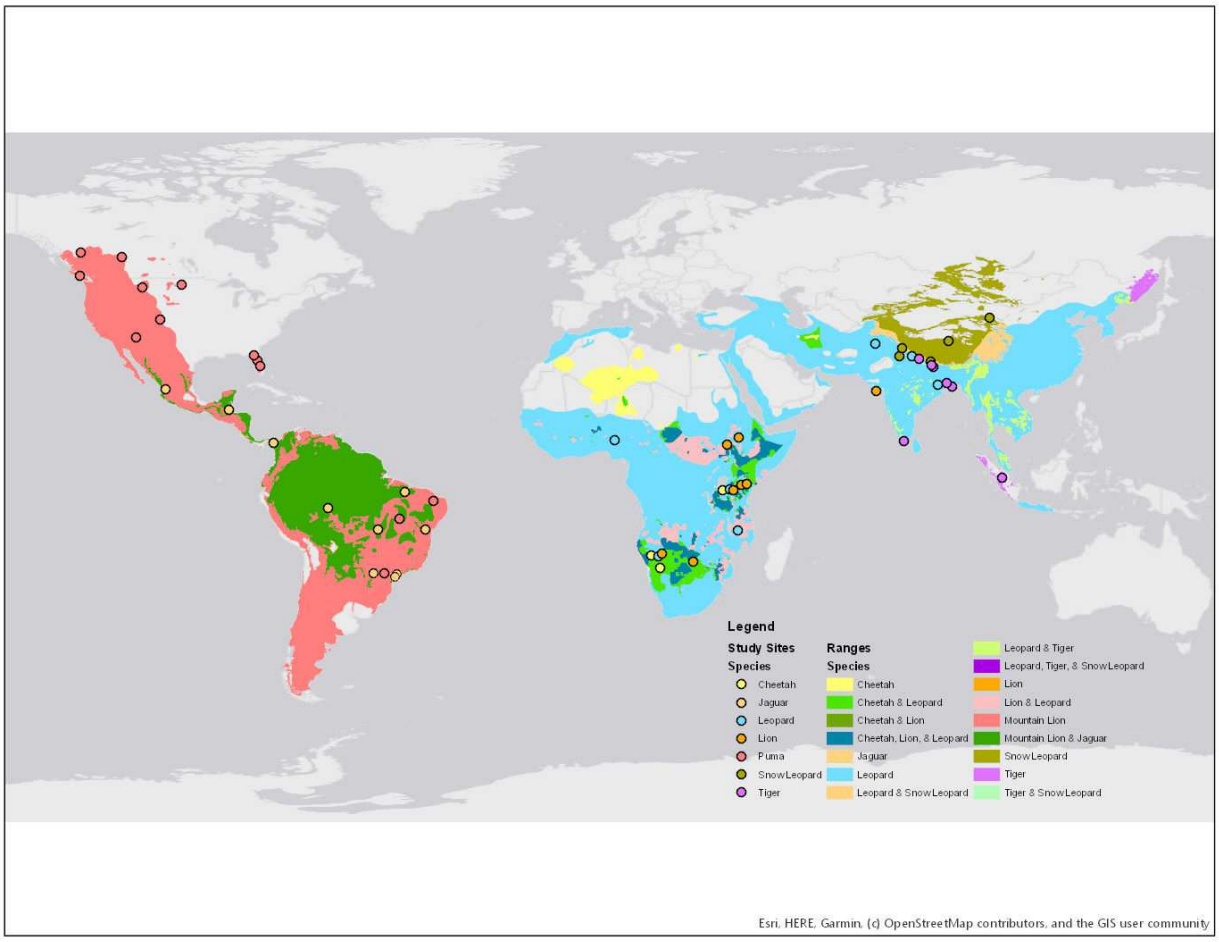


Figure 2. **Distribution of big cat ranges and study locations.** Global distribution of big cat species described by various color overlays, locations of our included articles indicated by dots.

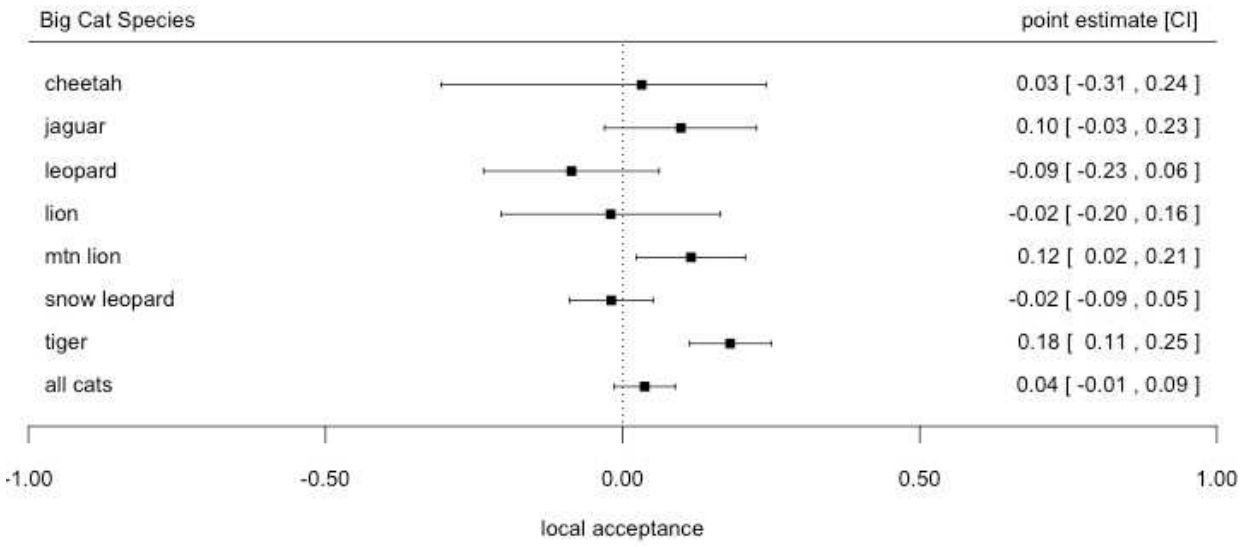


Figure 3. **Acceptance scores** – positive (negative) values indicate positive (negative) attitudes of locals towards big cat species. Squares indicate point estimates (mean response on a normalized -1 to +1 scale) and bars represent 95% confidence intervals around mean acceptance scores [sample sizes are found in table 1.]

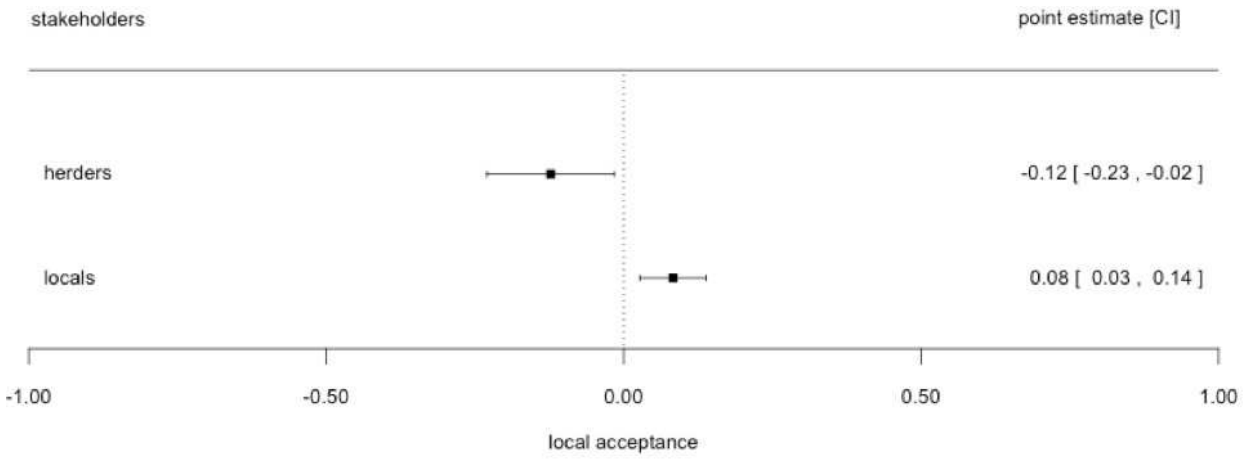


Figure 4. **Acceptance scores** – positive (negative) values indicate positive (negative) attitudes of herders and non-herders towards big cat species. Squares indicate point estimates (mean response on a normalized -1 to +1 scale) and bars represent 95% confidence intervals around mean acceptance scores. [n=1,300 for herders and 12,308 for non-herders].

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

438

439 Table 1. Study species, number of articles used in the review, respondent size per species, and the
440 types of questions asked within the articles. The number of times each question were asked per
441 species is in parentheses.

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