# Policy to On-ground Action: Evaluating a Conflict Policy Guideline for Leopards in India Policy to On-ground Action: Evaluating a Conflict Policy Guideline for Leopards in India

**Article** *in* Journal of International Wildlife Law and Policy · September 2020

DOI: 10.1080/13880292.2020.1818428



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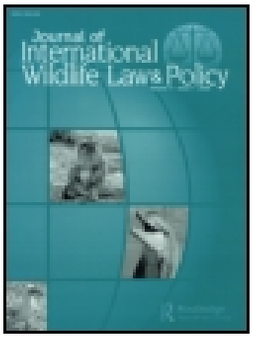

Journal of International Wildlife Law & Policy

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/uwlp20

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**To cite this article:** Sanjay Gubbi , Aparna Kolekar & Vijaya Kumara (2020): Policy to On-ground Action: Evaluating a Conflict Policy Guideline for Leopards in India, Journal of International Wildlife Law & Policy, DOI: 10.1080/13880292.2020.1818428

**To link to this article:** https://doi.org/10.1080/13880292.2020.1818428

Published online: 24 Sep 2020.

JOURNAL OF INTERNATIONAL WILDLIFE LAW & POLICY
https://doi.org/10.1080/13880292.2020.1818428

Routledge
Taylor & Francis Group



# Policy to On-ground Action: Evaluating a Conflict Policy Guideline for Leopards in India

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**ABSTRACT**

Amongst the large carnivores, the leopard *Panthera pardus* is a highly adaptable, elastic species. Because of these ecological traits, it comes into direct conflict with people, posing serious consequences to the lives of those affected, thus impeding larger conservation goals. In India, one of the key mitigation strategies towards leopard conflict includes capture and translocation of individual leopards. In response to severe conflict, a policy guideline was brought out in 2011 by the government that discouraged capture and translocation of leopards. In this study we evaluate the impact of these guidelines and responses of the field managers towards them. A total of 357 leopards were captured in Karnataka state during 2009–2016. The data collected on these captures indicates that since the government guidelines were issued, leopard captures have increased by 9.67 per year, and monthly translocations increased threefold. Captured animals were translocated mostly to protected areas (85.5%), taken to captivity (10.8%), and a few resulted in capture mortality (3.8%). A total of eight primary reasons were listed for capture of leopards, with livestock depredation (38.1%) being the main reason. Questionnaire surveys revealed that 64% of the managers were unaware of the presence of the guidelines, and only 1.9% followed them. The guidelines make a set of thoughtful suggestions to reduce conflict, but large-scale improvement is required by bringing in field-level managers, communities, media personnel, and other stakeholders while developing such policies. Similarly, targeted outreach and capacity building is mandatory to raise awareness and for effective implementation of the guidelines.

## 1. Introduction

One of the serious challenges to the conservation of large carnivores is their direct conflict and negative relationships with humans. They are highly prone to conflict due to their diet, wide-ranging behavior, and other ecological reasons (Madhusudan & Mishra 2003). Such conflict is also

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rooted in poor policy implementation, and sociopolitical and economic grounds. As such, understanding the social and policy context is critical to human–wildlife conflict mitigation (Manfredo & Dayer 2004; Peterson et al. 2008; Baruch-Mordo et al. 2009; Dickman 2010).

The leopard (*Panthera pardus*) is a habitat generalist with the widest distribution of all Panthera cats (Stein & Hayssen 2013). It can also survive on varied diet, giving it high ecological flexibility. Despite these ecological traits, the population of some of the subspecies has declined by >70% of its historical range (Jacobson et al. 2016, p. 10). Though they are wide-ranging, leopard populations are deteriorating due to habitat loss, poaching, vehicular collisions, retaliatory killing, and other causes across their distribution range (Jacobson et al. 2016, p. 17). They are also hunted legally in some countries (CITES 2019). The leopard has been recently uplisted as "vulnerable" by the International Union for Conservation of Nature (Stein et al. 2020).

Direct conflicts between leopards and humans include livestock predation, human injuries, and occasional human deaths that have serious consequences on the lives of those affected. Apart from the direct losses, there is a range of opportunity costs such as those incurred to avail government ex-gratia payment, and indirect serious impacts such as disruption of livelihoods and food security and diminished psychological well-being (Ogra 2008; Dickman 2010; Barua et al. 2013; Harihar et al. 2014), making affected communities hostile to wildlife conservation and highly antagonistic towards government personnel (Treves et al. 2006, p. 384; Gubbi 2010).

In India, leopard conflict incidences specifically catch the attention of the media (Bhatia et al. 2013), in part because of the graphic nature of these real-time incidences, but also because of the widespread prevalence of human–leopard conflict.

The current carnivore conflict mitigation strategies adopted by the government in India includes payment of ex-gratia to affected individuals, capture and translocation as a non-lethal tool, and occasional lethal methods to remove problem animals when human safety is at risk. However, inadequate and delayed ex-gratia payments, bureaucratic red tape, and serious loss to affected communities exert enormous pressure on authorities to adopt quicker solutions, especially regarding leopards. These solutions, on most occasions, have entailed capturing and translocating leopards, which has been strongly discouraged due to increased conflict situations in response to translocations (Athreya et al. 2011).

Hence, in April 2011, operational guidelines were brought out by the central Ministry of Environment and Forests regarding human–leopard conflict and best practices to handle conflict situations. The aim of the guidelines was to reduce conflict with leopards, discourage translocation of

leopards, and suggest improved ways of handling of emergency conflict situations. Inputs for the guidelines were provided by a few biologists and forest officials, three state governments, a central government institute, one NGO, two veterinarians, and two journalists (MOEF 2011).

Policies related to wildlife and nature conservation brought out by the central government are to be mandatorily implemented by the states. Such policies are often implemented under unfounded assumptions that they have measurable conservation effects. Therefore, understanding the effectiveness of such policies in the greater interest of science and through actual on-ground application is both critical and highly beneficial to conservation (Treves et al. 2006, p. 386). Such an evaluation would not only provide an efficient, scientific-based monitoring framework for conservation policies—it would inherently identify any issues with those policies, which would inform any necessary adaptive management measures.

Hence, key objectives of this study carried out in the southern Indian state of Karnataka were to understand:

1. spatial and temporal distribution of leopard capture and translocation pre- and post-implementation of the leopard conflict guidelines;
2. reasons and outcomes of leopard captures pre- and post-implementation of the policy guidelines;
3. if capture and translocation of leopards had been reduced post-guidelines; and
4. the response of field managers towards the policy guidelines regarding leopard conflict.

## 2. Materials and Methods

### *2.1. Study Area*

The southern Indian state of Karnataka is spread over an area of 191,791 $km^2$ and has a human population of 61.1 million (MHA 2011) and a livestock population of 29 million (Gov't of Karnataka 2012). The state harbors 39 protected areas (PAs) spread over 9,718.9 $km^2$ and 20,300 $km^2$ of forests under the legal category called reserved/state/minor forests. These forests are interspersed within larger human-dense landscapes. The state harbors a variety of leopard habitats, including dry deciduous, moist deciduous, evergreen, semi-evergreen, scrub forests, and rocky outcrops (Gov't of Karnataka 2000). The state has a positive history of wildlife conservation and is an important area for leopard conservation (Gubbi et al. 2017). This study considers the entire state of Karnataka, including all PAs, all legal categories of forests, other leopard habitats, and human-dense areas.

### 2.2. Methods

We used newspaper reports from 10 major local, regional, and national dailies in both English and the vernacular language, Kannada, as well as governmental records for the period January 2009 through December 2016. From those data sources we collated information regarding capture of leopards from various areas in the state, reasons for capture, location of release, sex of the captured animal, and other information. The details obtained from the government about capture and releases were compared with newspaper reports to refine the dataset.

All leopard capture and release locations were mapped using ArcGIS (ver. 10.1, Esri CA) to derive a spatial map (Figure 1). This helped in understanding if the leopards were translocated to PAs or other forests, their distance of translocations, and other similar information. This also showed whether there were any preferred areas of release. The policy guidelines suggested that if the capture and translocation was unavoidable or accidental, the leopards must be released in the nearby vicinity of captures. Therefore, it was useful to understand the location of release to assess the impact of the policy guidelines on the release site and distance.

We recorded retaliatory killing of leopards, which was divided into two sub-groups as direct killing (lynched by mob) and indirect killing (poisoning, shot, electrocution, and killed through explosives). This was recorded in order to understand if the policy guidelines helped in reducing retaliatory killings of leopards.

We then conducted telephonic interviews through a structured questionnaire of all the forest department managers who manage forest divisions (Deputy Conservator of Forests and an Assistant Conservator of Forests). The interviews were done in order to understand the field managers' perspectives and proposed solutions regarding human–leopard conflict, as well as to understand the effectiveness of the guidelines issued by the central ministry. The managers we interviewed are primarily responsible for managing conflict situations, disbursement of ex-gratia, and other issues related to wildlife conflict. We did not interview managers who are currently not responsible for management of forestland, or those officers from the forest department appointed to other government agencies who do not directly deal with forest or wildlife management issues.

The key questions we asked the managers were: (1) if leopard conflict is present in their area; (2) what should be the responses towards human–leopard conflict situations; (3) if she/he is aware of the central ministry's guidelines regarding leopards; (4) if she/he uses the guidelines; and (5) if not, why?

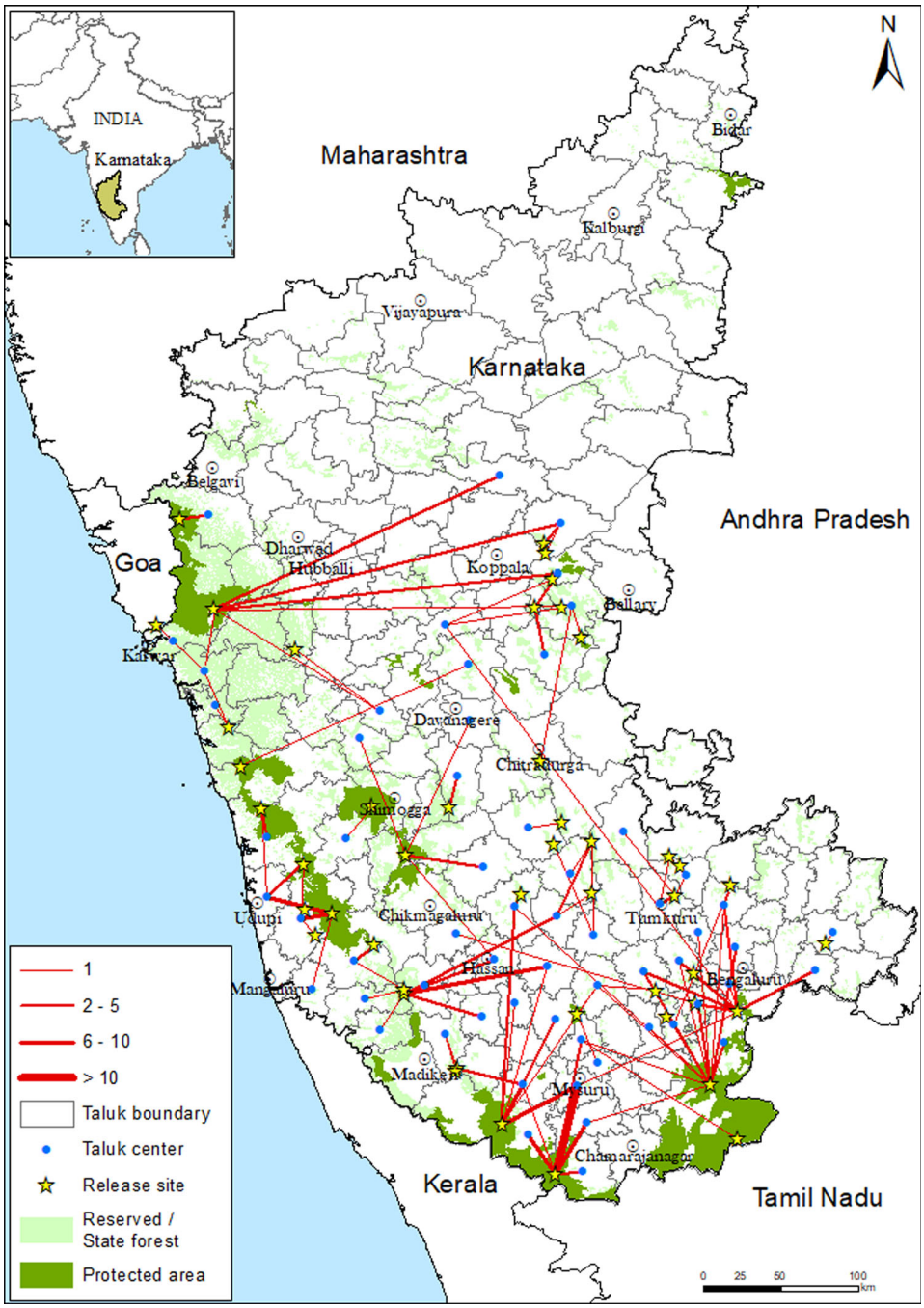


**Figure 1.** Leopard capture and release locations in Karnataka during 2009–2016.

We made distinct categories grouping the various responses of managers towards human–leopard conflict, central ministry guidelines, and their opinions on how to handle conflict. These responses were categorised to help in data analysis.

### 2.2.1. Statistical Analyses

We used a chi-square test to test the independence of attributes within contingency tables and to test the equality of proportions within frequency tables (for temporal variations in captures, translocations, and retaliatory killing of leopards). The comparison of means between two (normal) populations was carried out using the Student's *t* test (captures, translocation, and distance of translocation of leopards pre- and post-implementation of guidelines). Linear regression analysis was carried out to investigate the annual trends in leopard captures and translocations, with captures and translocations as study variables and time as the sole covariate.

## 2.3. Results

### 2.3.1. Leopard Captures and Translocation

A total of 357 adult leopards have been captured by the authorities in the state during the study period (Table 1). Though leopards were captured in 23 of the 30 administrative districts of the state, a majority (79%) of the captures occurred in the following eight districts: Mysore, Udupi, Hassan, Tumkur, Ramanagara, Bellary, Koppala, and Mandya (Figure 2). The highest number of captures occurred during the years 2015 and 2016 (40.9%). The annual figures of leopard captures revealed an increasing (linear) trend with an annual increase of 9.67 per year (SD 0.4478, $p = <0.001$; $R^2 = 0.9852$) with no intercept.

The final outcome of the captures was available for 314 of the 357 leopard captures. Of these captured leopards for which information was available, 85.4% (n = 268) were translocated to other forests with the highest number of translocations during 2016 (n = 55, Table 1), 10.8% (n = 34) were taken to captivity, and 3.8% (n = 12) resulted in capture mortality.

**Table 1.** Number of leopards captured, translocated, and killed in retaliatory actions in Karnataka, India during 2009–2016.

| | | | Retaliatory killing | |
|---|---|---|---|---|
| Year | Leopards captured | Leopards translocated | Direct+ | Indirect* |
| 2009 | 21 | 15 | 3 | 0 |
| 2010 | 13 | 6 | 1 | 0 |
| 2011 | 32 | 21 | 2 | 5 |
| 2012 | 45 | 36 | 0 | 0 |
| 2013 | 46 | 41 | 1 | 1 |
| 2014 | 54 | 40 | 0 | 5 |
| 2015 | 73 | 54 | 3 | 2 |
| 2016 | 73 | 55 | 1 | 5 |
| Total | 357 | 268 | 11 | 18 |

+Lynched by mob.
*Poisoning, shot, electrocution, and killed through explosives.

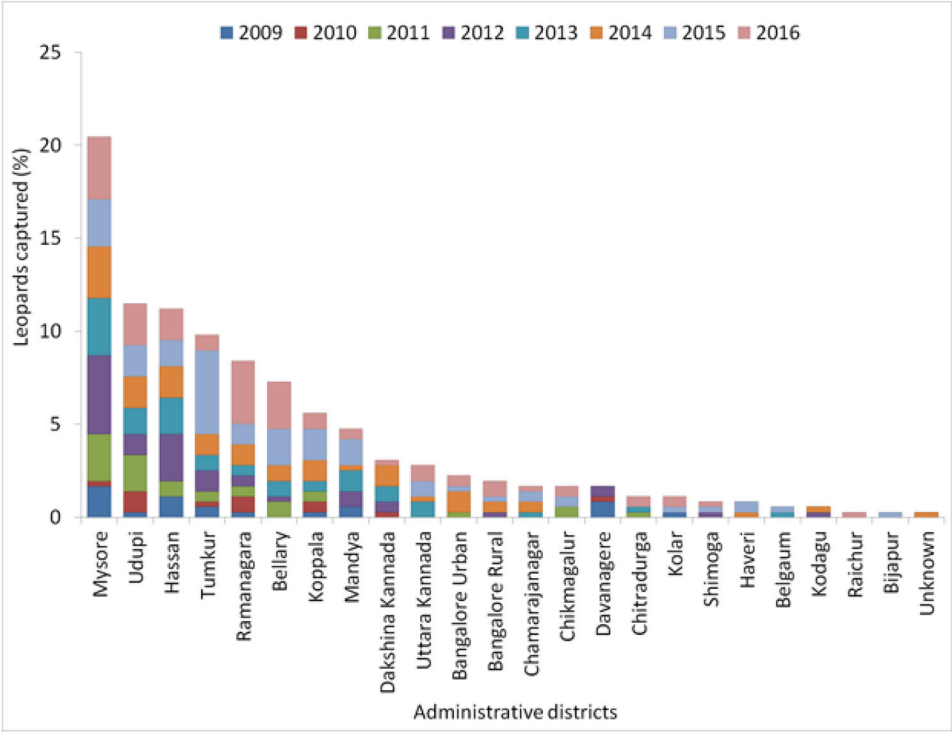


**Figure 2.** Leopards captured in various districts of Karnataka state during 2009–2016.

### *2.3.2. Release Sites of Translocated Leopards*

Of the 268 leopards that were translocated, many were translocated to PAs (n = 160, 59.7%) and some to reserved/state/minor forests (n = 80, 29.8%) (Figure 1), and information was unavailable about the release sites in 10.5% (n = 28) of the translocations.

Within the PA category, the highest number of translocations occurred into Bandipur Tiger Reserve (n = 36, 22.5%), followed by Nagarahole Tiger Reserve (n = 33, 20.6%), and Cauvery Wildlife Sanctuary (n = 24, 15%). Of the 80 leopards that were translocated to reserved/state/minor forests, most releases were to Kemphole Reserved Forest (n = 13, 16.2%), followed by Devaryanadurga State Forest (n = 6, 7.5%), and then Bukkapatna State Forest (n = 4, 5%) (Figure 1). The mean Euclidean distance to which leopards were translocated is 56.65 km (2.04–307.2 km, SD 47.009).

The annual figures of leopards translocated revealed an increasing (linear) trend with an annual increase of 7.3382 (SD 0.4054, $p = <0.001$, $R^2 = 0.9791$) with no intercept. There were no significant variations, across months, in the monthly captures ($\chi^2 = 1.7787$, df = 11, $p = >0.05$) or translocations ($\chi^2 = 2.0624$, df = 11, $p = >0.05$), depicting no seasonality in the average number of captures and translocation of leopards (Figure 3).

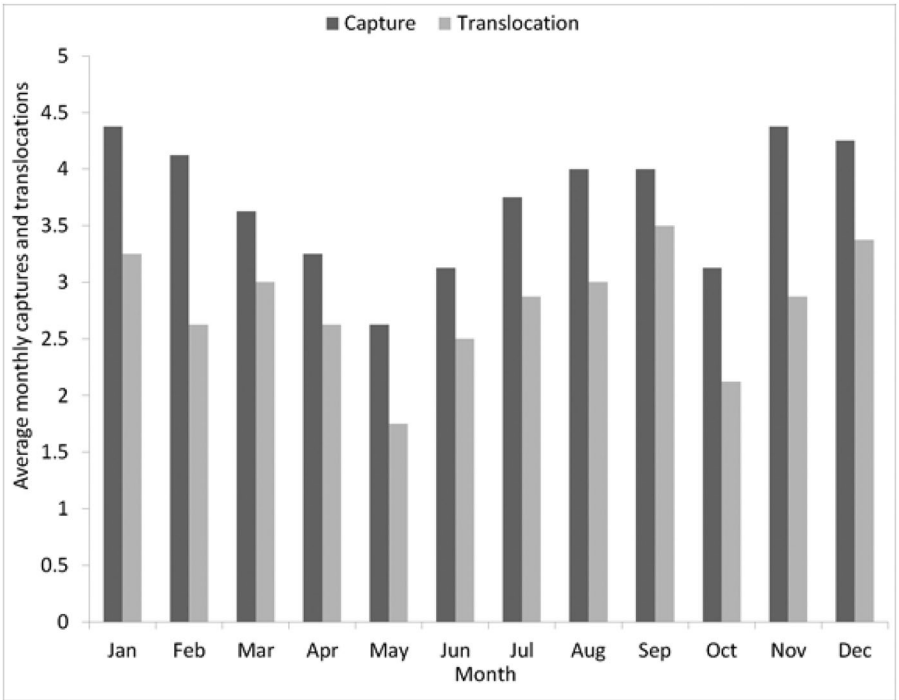


**Figure 3.** Seasonality in the average number of captures and translocation of leopards in Karnataka southern India during 2009–2016.

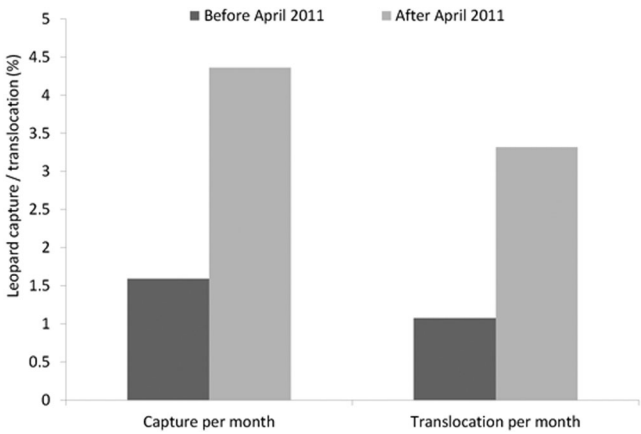


**Figure 4.** Number of leopards captured and translocated per month before and after the guidelines were brought out in April 2011.

### *2.3.3. Captures, Translocation, and Policy Guidelines*

Following the issuance of the human–leopard conflict policy guidelines, leopard captures per month increased more than threefold (from 1.5357 to 4.6176, t = -6.351, df = 94, $p < 0.001$). Similarly, there was a threefold increase in the number of leopards translocated per month (from 1.0357 to 3.5147, t = -5.8398, df = 94, $p < 0.001$) (Figure 4).

The mean Euclidean distance of translocation before the guidelines were issued was 56.83 km (2.89-228.6 km, SD 56.8), and it was 56.63 km (2.05–307.2 km, SD 45.8) after the guidelines were issued with no significant change in the mean translocation distance (t = 0.0212, df = 235, $p = 0.98831$).

#### 2.3.4. Retaliatory Killing

A total of 29 leopards were reported to be killed in retaliation in different parts of the state, and one leopard was put down by the authorities due to conflict incidences (Table 1). The chi-square test, based on a suitably merged 2*2 contingency table, revealed an increase in retaliatory killing of leopards, especially post-issuance of the guidelines ($\chi^2$ = 4.02114, df = 1, $p < 0.05$).

#### 2.3.5. Reasons for Capture

A total of eight primary reasons were listed for capture and translocation of leopards: (1) livestock depredation (38.1%); (2) anxiety caused due to leopard sightings in human habitations (13.7%); (3) leopards entering human dwelling (10.9%); (4) leopards captured as they were rescued from snares and traps set for catching other wildlife, and leopards caught in farm fences (8.7%); (5) leopards rescued and translocated from wells (7%); (6) human injuries (4.5%); and (7) human death (2%). Reported capture and translocation for other reasons was 3.9%, and reasons for capture were not reported in 11.2% of the incidences.

#### 2.3.6. Understanding Management of Human–Leopard Conflict

We conducted questionnaire surveys of 52 forest department managers from 53 forest administrative districts (one manager was in charge of two separate divisions). Of the interviewees, 28% (n = 14) of the respondents were managers of PAs.

Of the interviewed managers, 62.3% (n = 33) responded that there was leopard conflict in the areas they managed. Only 34.6% (n = 18) of the respondents were aware of the presence of the MOEF guidelines, and only 1.9% (n = 1) of the total respondents said they were following the guidelines. Few (25%, n = 8) of the managers where human–leopard conflict was present were aware of the central ministry guidelines on managing conflict.

The answers to the utility of the guidelines were categorized into five broad responses regarding the non-usage of the guidelines. Many managers (65.4%, n = 34) were unaware of the existence of the guidelines; few (19.2%, n = 10) responded that there was no conflict in their area so they

**Table 2.** Various solutions put forth by field managers to alleviate human–leopard conflict.

| Proposed solution to conflict | % Responses (first option) | % Responses (second option) | % Responses (third option) |
|---|---|---|---|
| 1. Capture and translocate | 30.77 | 21.15 | 5.77 |
| 2. Scaring | 19.23 | 3.85 | 0.00 |
| 3. Awareness | 13.46 | 0.00 | 0.00 |
| 4. Ex-gratia | 13.46 | 9.62 | 0.00 |
| 5. Haven't faced it, hence no opinion | 13.46 | 0.00 | 0.00 |
| 6. Manage crowd | 1.92 | 0.00 | 0.00 |
| 7. No thumb rule | 1.92 | 0.00 | 0.00 |
| 8. Place cage and pacify | 1.92 | 3.85 | 0.00 |
| 9. Stop cattle grazing | 1.92 | 0.00 | 0.00 |
| 10. Wait and watch | 1.92 | 0.00 | 0.00 |
| 11. Solar fencing around hamlets inside forests | 0.00 | 1.92 | 0.00 |
| 12. Man-eaters should be eliminated | 0.00 | 1.92 | 0.00 |
| 13. Population management through culling | 0.00 | 1.92 | 0.00 |
| 14. No need to capture as there is contiguous forests | 0.00 | 1.92 | 0.00 |
| 15. Stop destruction of habitats | 0.00 | 1.92 | 0.00 |
| 16. Treatment in case of human injuries | 0.00 | 0.00 | 1.92 |

did not use the guidelines; and some (5.8%, n = 3) felt that the guidelines were very theoretical. Other respondents (9.3%, n = 6) provided other reasons for not using the guidelines.

In response to solutions to human–leopard conflict, few managers (30.8%) opted for capture and translocation as their first option as a conflict mitigation tool (Table 2).

## 3. Discussion

Our dataset provides the first ever state-wide figures in the country on leopard captures and translocation over a large temporal period. It is evident from the threefold increase in both captures and translocations that the guidelines have not had the desired impact. They have also had no impact on the distance of translocation, which is still nearly identical to the pre-guidelines distance. A disturbing trend is the increase in retaliatory killing of leopards, especially after the policy guidelines were issued.

Livestock depredation is known to be a principal cause of human–carnivore conflict the world over (Sillero-Zubiri & Laurenson 2001). And Karnataka—where >38% of this study's leopard captures were related to livestock depredation—seems to be no exception. High levels of leopard captures were made because leopards were seen in human habitations (>13%) reflect the lower tolerance and lower social carrying capacity for a large carnivore such as the leopard.

The sighting of leopards in or near human habitations is perceived as a threat and a potential attack on people and livestock. The presence of large

carnivores possibly reduces quality of life and results in public pressure followed by governmental action. Carnivores evoke a phobia in humans, and the perceived danger or harm that the animal represents is an important aspect of negative community perceptions towards them (Kaltenborn et al. 2006; Johansson & Karlsson 2011). Fear of animals can reduce human interest in their conservation (Johansson et al. 2012), which seems to result in a higher tendency towards capture and translocation in the study area. On that account, it is important to note that the mere publishing of guidelines may not bring the desired conservation results. As seen in other areas, potentially dangerous large carnivores can survive in human-dense landscapes only if there is local acceptance (Enserink & Vogel 2006; Hazzah et al. 2009). Thus improving local acceptance of leopards is critical to their conservation and to achieving a reduction in captures and translocation.

Perhaps it is not just humans' direct losses but also their vulnerability that matters in these situations. Thus well-trained conflict response teams sponsored by the government or civil societies must handle emergency conflict situations when leopards come into highly human-settled areas, so unnecessary captures and translocation could be reduced.

The increase in retaliatory killing of leopards in the study area could be for various reasons. Other studies depict frustrations over large carnivore conflict mitigation and management, and a lack of empowerment leading to increased willingness to participate in illegal killing (Madden 2004; Goldman et al. 2013). This attitude also seems to be applicable to leopards in this study area, as indicated by the steady increase in indirect retaliatory killing.

Non-lethal methods are more effective in reducing problems related to large carnivores (McManus et al. 2015) and should be tailored to meet local socioeconomic and cultural contexts. In certain instances, some form of selective removal may be required, which appears to have a smaller population impact and greater public acceptance than lethal control (Treves & Naughton-Treves 2005). These options should be actively pursued to ensure the numbers of retaliatory killings are brought down.

Adopting and implementing conservation policies on-ground is the true challenge in real-world conservation. Typically, one group generates knowledge and another group implements policies. This tends to fail, especially when there is a lack of well-suited, timely outreach activities to promote the guidelines. Our questionnaire survey seems to reflect this possible weakness in the policy guidelines, as highlighted by field officers who are close to conflict realities and who interact with affected communities despite all the constraints they face. The majority of the field officers (~65%) from our study area lacked awareness of the leopard-related guidelines. Thus, involving field officers is extremely important in policy-making processes.

The guidelines failed to recognize the important roles that the media, field officers, government agency representatives, and affected communities could play in resolving human–leopard conflict. The media, for example, is critical to disseminating the guidelines' provisions to the wider community—which, in turn, plays a key role in implementing those provisions. Without the direct involvement of these key field implementers, policy implementation could have little ownership. Consequently, on-ground implementation would be largely ineffective. Similarly, these policy guidelines were devoid of critical inputs from states that experience high levels of leopard conflict.

With this background, we recommend greater inclusion of local representation, particularly in areas affected by conflict, and of state and grassroots legislators and field-level bureaucrats when forming policies related to human–wildlife conflict. However, we recognize that, in some cases, larger public acceptance and opinion may not align with conservation goals.

Managers do not see translocation as a primary solution. Interestingly, where conflict was severe, only two of the five managers elected capture and translocation as a first option to solving conflicts. There should be an appreciation that managers have thought through the process and, perhaps, opt for capture only when the social pressure is severe. So reducing social pressure through public outreach seems to be key in reducing unnecessary captures and translocations. These public outreach activities should also educate local social and political leaders against pressuring for leopard captures.

The guidelines for managing human–leopard conflict make thoughtful suggestions to reduce conflict. But the crux has been in the implementation, due to lack of consensus and outreach. Hence, there is a greater need for field-level managers to collaborate on guideline implementation and any necessary revisions. In addition, constant, long-term association with the government is extremely critical, as there will be high rates of turnover within the administrative structures. This is where long-term monitoring and adaptive management play important roles in effective policy implementation.

In a federal system such as India's, it is important to provide some flexibility in the process of policymaking to avoid unnecessary imposition of rules and guidelines. Without sufficient inputs from the states that are bound to follow the guidelines, such guidelines will likely find little acceptance.

Managing human–leopard conflict, without compromising wildlife population viability or human welfare, requires a very delicate balance of activities for leopard populations to endure, especially outside PAs. Though the reasons for conflict may be ecological, field managers will make decisions based on public opinion despite scientific data suggesting other actions.

The challenge is to make stakeholders accept ecological data, or perhaps consider alternative solutions such as social carrying capacities, especially outside PAs.

## Acknowledgements

We thank Suresh Chandra for his help in data analysis. We thank all the respondents who participated in the questionnaire survey. Karnataka Forest Department has been supportive of various aspects of our research and conservation work, for which we are grateful. The authors gratefully acknowledge Paul Boudreaux and an anonymous reviewer for the very helpful comments and suggestions.

## Funding

Funding was provided under the Kaplan Graduate Fellowship.

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