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# The production of human-wildlife conflict: a political animal geography of encounter

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## Abstract

This study examines how transformations of a regional rural economy have produced new geographies of encounter between agricultural communities, their livestock, and carnivores surrounding Bandipur National Park in Karnataka, India. We analyze state discourses of human-wildlife conflict alongside the perspectives of rural agricultural communities about changes in human-wildlife interactions. Our study shows how state narratives about human-wildlife conflict mask more foundational changes in the livelihood strategies of agricultural villages in response both to park management and regional economic transformations, and how these changes are inherently woven into the production of new geographies of human-wildlife encounter. Our results suggest declining tolerance for injury and death of cattle by carnivores represents the cumulative impacts of a transformation of the livestock economy and more aggressive protected area management strategies. This research also suggests how political ecology can maintain its commitments to social justice while becoming more attuned to animals as political actors.

Keywords: Human-wildlife conflict; Human-wildlife interactions; Conservation conflicts; More-than-human geographies; Political animal geography; India

## 1. Introduction

There is growing concern amongst conservationists and government officials in India that tolerance by rural communities for living with large wildlife is in decline. State and non-state actors often attribute this to lifestyle and cultural transformations, despite long histories of humans sharing space wildlife (Madhusudan 2003; Madhusudan & Mishra 2003; Velho et al. 2012). In this article we question this discursive framing. Instead, we ask: what are the socioeconomic and historical conditions that account for why tolerance

for living with wildlife might decline in a region with a long history of human-wildlife interaction? To address this question, we develop a political animal geography of human-wildlife encounter through the practice of multispecies political ecology (Ogden et al 2008; Sundberg 2011; Srinivasan 2016; van Dooren et al 2016). We take an expanded view of the kinds of actors that together produce ‘more-than-human’ geographies, landscapes co-produced through the entanglements of human and non-human life (Whatmore 2006; Sundberg 2011; Collard 2012; Lorimer 2012). Our study region focuses on a set of villages on the fringes of Bandipur National Park (Bandipura), in Karnataka, India (Figure 1). Our research reveals the multiscalar, economic, and distinctly geographic transformations underlying what both state conservation actors and local agriculturalists describe as an unfolding human-wildlife conflict ‘crisis.’

Political ecology, as a shared field of practice engaged in studying the social and political dimensions of human relations within their lived environments, is a well-suited lens for unpacking this discourse of crisis (Neumann 1992; Robbins 2012). Combining data obtained from multispecies qualitative research, livestock censuses, and close readings of conservation management plans, we show why the narrative put forward by actors within the Indian Forest Department about declining tolerance for living with large carnivores masks both ruptures in a regional agrarian economy and the production of new geographies of wildlife encounter—the spaces where species meet (Haraway 2008; Govindrajan 2015). This paper responds to calls for developing more explicitly political animal geography scholarship, attendant to the broader economic and regional forces underpinning the politics of human-animal encounter often missing in various threads of human geography scholarship (Srinivasan 2016; Hovorka 2018).

Despite the passing of over a decade since Hobson (2006) first suggested the need for a more adequate accounting of animals as political subjects, as Srinivasan (2016) notes, there are still only a limited number studies that tackle the question of animals as expressly political agents in contested geographies (for instance, Bullard and Morris 2003; Sundberg 2011; Collard and Dempsey 2013; Srinivasan 2013; Emel and Neo 2015). Political animal geography aims to overcome the “serious lacuna” of adequate accountings of politics

within the geographic sub-discipline of animal geography on the one hand, and the persistent lack of attention in political geography to animals as actors, rather objects only to be acted upon, on the other (Srinivasan 2016: 77). A close examination of the politics underpinning discursive formations of ‘human-wildlife conflict’ as a stable category of human-animal interactions provides an important opportunity to leverage political animal geography’s theoretical insights through careful attention to the empirical case of human-wildlife interactions around Bandipura. In particular, we draw on the tools and practices of political ecology in order to put forward an argument to address questions of the political while also giving close consideration to the position of animals in geographies of contestation. We do this through a multispecies accounting of the impact of livestock predation by carnivores on community livelihoods in an agrarian landscape of important conservation value.

This study is therefore positioned as a political animal geography of human-wildlife encounter. It employs a political ecology framework to highlight the political and economic linkages operating across scales of analysis in co-producing changing geographies of encounters between cattle and carnivores. In doing so, this study draws out the value in attending both to the subjectivities of actors within institutions of power engaged in the everyday practice of conservation, as well as animals themselves as agential subjects enrolled in political contestations (Srinivasan 2014). In the next section, we describe the study area’s geography. We then review approaches to human-wildlife conflict as a specific framing of human-animal interaction in the biodiversity conservation literature, followed by a more in-depth engagement with the intervention this paper makes to ongoing theoretical debates in developing political animal geography as an important area of research. After describing our research methods, we move on to our empirical findings, followed by a discussion of the particular merits a multispecies political ecology research approach brings to disentangling discourses of human-wildlife conflict. We conclude with a discussion of how the strengths of fine-grained analyses at the heart of doing political ecology make important contributions to the field of political geography, and how doing so reinforces the merits of advancing political animal geography as a field of research. This includes presenting a global assessment of other locations in which the findings of our

study may be relevant in geographies with similar human and animal populations densities in close proximity to protected areas.

## **2. Study area**

This study's primary geographical focus is centered on six villages situated along the Northeastern border of Bandipura within the park's buffer zone along its Kundakere Range boundary (Figure 1). The study villages fall within the administrative division of Gundlupet Taluk (a minor administrative unit), located within Chamarajanagar District. Covering a core area of 872.24 km<sup>2</sup> and a buffer 'eco-sensitive zone' of 597.45 km<sup>2</sup> (inclusive of 123 villages), Bandipur National Park was first designated by the Maharajah of Mysore as Venugopala Wildlife Park in 1935 (90 km<sup>2</sup>) and was expanded and notified as one of the first Tiger Reserves in India in 1974 (Narain et al 2005; Bandipura Management Plan 2015). Prior to its designation as a National Park, Bandipura was actively managed for forestry operations and as a royal hunting ground for the Mysore Maharajah during the British Raj (Bandipura Management Plan 2015). Bandipura is a critical part of a larger inter-state protected area complex (Figure 1). This broader landscape is one of the most critical tiger and elephant habitats in India, with the largest breeding population of tigers and Asian elephants found anywhere in the world (Karanth et al. 2011; Bandipura Management Plan 2015; Jathanna et al. 2015). This area is classified as part of Bandipur's eco-sensitive zone (or buffer zone), with legal restrictions in place related to economic activities, land use, construction, and infrastructure development (MoEF 2012; Bandipura Management Plan 2015). The construction of new buildings for commercial tourism, for instance, is prohibited within this zone. The local population, however, must also seek approval of a local eco-sensitive zone committee prior to building or improving their homes.

The villages found within the eco-sensitive zone along the Kundakare boundary are largely dependent on a combination of irrigated and non-irrigated agriculture and agricultural labor, off-farm labor, dairy production, and dung collection for their livelihoods (Appendix 3.1). The six primary study villages of Jakkahalli, Kaniyanapura, Kundakere, Lokkere,

Mangala, and Yelachatti have populations ranging from 167 (40 households) in Lakkere to 2,142 (552 households) in Kundakere as of the last Census of India (2011). Chamarajanagar District is the 3rd poorest District in Karnataka, making it one of the more economically marginalized regions in southern India (Appendix 3.1; Census of India 2011). The economic precarity of households in the study region means the financial impact incurred through the damage and destruction of agricultural crops and livestock by wildlife can be significant, even if occurrences are only intermittent (Karanth et al 2013a). Within this article's broader study region, Karanth et al. (2013a) found that 15% of households experience livestock loss around Bandipura, primarily to leopards (62 percent) and tigers (37 percent). At the time of their study, average estimated income loss was Rs 2,190 (USD ~\$33) and 70 percent of households reported loss to authorities (Karanth et al. 2013a). Approximately 75 percent of primary income earners by household in this region earn less than 5,000 Rs (USD ~75) per month (SECC 2011; Appendix Table 1).

### **3. Theoretical approach**

This paper makes two primary theoretical interventions. First, we contribute to the growing interdisciplinary field of human-wildlife interaction studies through a critical examination of how the discourse of human-wildlife conflict put forth by state actors in Bandipura masks more complex accountings of the economic and political processes co-producing multispecies relations within a critical conservation landscape. The second theoretical intervention this article makes is in response to the call for political geography to more explicitly consider the role of animals in broader political processes (Hobson 2007; Srinivasan 2016). In this section, we first engage with the interdisciplinary literature on human-wildlife interactions, followed by a closer examination of how a multispecies political ecology approach to examining human-wildlife encounter can contribute to politicizing animal geographies.

#### **3.1. Disentangling the discourse of human-wildlife conflict**

A steadily accumulating body of scholarship seeks to understand the proximate and ultimate drivers of what are commonly referred to in these literatures as human-wildlife

conflicts (HWC) (Treves & Karanth 2003; Madden 2004; Inskip & Zimmerman 2009; Carter et al. 2017; Karanth and Kudalkar 2017). The term ‘human-wildlife conflict’ itself has been extensively critiqued for its inherently negative positioning of interactions between humans and wildlife that can also be positive or neutral, and for obscuring whom or what may actually be at the center of conflicts (Peterson et al. 2010; Redpath et al. 2015). Nevertheless, the majority of conservation literature examining human-wildlife interactions remains focused on examining the negative economic, biological, and local-scale impacts of these interactions on both human livelihoods and wildlife populations (Madden 2008; Madden & McQuinn 2014). There are a diversity of disciplinary engagements with the study of human-wildlife interactions and the concept of HWC, and significant variations between and across disciplines in how the terminology of HWC is employed, analyzed, and critiqued. It is beyond the scope of this paper to consider these here, but a number of comprehensive reviews have considered the variety of approaches and analytical frameworks employed in investigating HWC as a particular framing of negative human-wildlife interaction (see Peterson et al. 2010; Young et al. 2010; Madden & McQuinn 2014; Redpath et al. 2015; Torres et al. 2018).

Within the field of biodiversity conservation (itself an interdisciplinary area of research), research on human-wildlife interactions typically analyzes socioeconomic variables alongside data and social perspectives on these interactions employing statistical analysis of social surveys (Echeverri et al. 2018). Many HWC studies suggest that animals such as large and medium sized-carnivores or herbivorous megafauna (>45 kg) come into conflict with humans because they compete for similar resources in overlapping spaces, leading to conflicts over access and use of resources (Macdonald et al. 2010; Valeix et al. 2012; Madden and McQuinn 2014). Despite the generalizability of this phenomenon worldwide (Treves & Karanth 2003; Inskip & Zimmerman 2009), it is now broadly acknowledged that sources of sustained conflicts between humans and animals are generally more complex than interspecies conflicts over resource use (Manfredo & Dayer 2004; Treves et al. 2006; Baruch-Mordo et al. 2009; Madden & McQuinn 2014; Rastogi et al. 2014; Carter & Linnell 2016; Jampel 2016; Massé 2016). Research on the particularities of place, culture, and society in shaping human-wildlife dynamics make clear that successful

interventions for reducing HWC are place and context-specific, and often have little to do with the animals themselves (Madden 2004; Ogra 2008; Baruch-Mordo et al. 2009; Drury et al. 2011; Madden & McQuinn 2014; Rastogi et al. 2014; Redpath et al. 2015; Rust et al. 2016; Karanth and Surendhra 2018).

While the term human-wildlife conflict is suggestive of direct contestations between humans and wildlife, the vast majority of what is referred to as HWC in the literature are examples how animals become enrolled in conflicts between different human actors or groups (Norgrove & Hulme 2006; Adams and Hutton 2007; Dickman 2010; Peterson et al. 2010; Collard 2012; Mariki 2015; Jampel 2016; Pooley et al 2017). As Redpath et al. (2015: 224) explain, “in the majority of cases human–wildlife conflicts are between conservation and other human interests. In these cases, we suggest that it may be more productive to stop hiding behind the wildlife and be clear that those who are defending the conservation objectives are the antagonists.” For instance, political ecology scholarship has demonstrated how wildlife can become symbols of oppression by the state, recasting conflicts between marginalized people and state actors into conflicts between people and the wildlife that state agencies aim to protect (Holmes 2007; 2014; Benjaminsen et al. 2013; Massé 2016; Margulies 2018). Understanding the roles of politics, bureaucratic processes, and law enforcement is essential for contextualizing and analyzing the complexities of power relations enmeshed in producing wildlife conservation conflicts; and further, demands greater attention to agencies of power as research subjects (Madden 2008; Dickman 2010; Madden & McQuinn 2014; Karanth and Kudalkar 2017).

To date, however, political ecology studies of human-wildlife interaction have paid less attention to the perspectives of actors situated within agencies of power involved in enforcing conservation practice, the kinds of actors that make up institutions within “the state.” More nuanced attention to these actors and their situated perspectives and worldviews might lead to the development of what Robbins (2003) suggests could be an “everyday political ecology of the state” (644). This paper therefore makes a valuable intervention in studies of human-wildlife conflicts by paying closer attention to the discursive practices of the state actors tasked with managing and protecting wildlife. At the



same time, political ecology studies of conservation conflicts involving wildlife have tended to focus on those individuals and communities harmed by conservation's practice as their central research subjects, and much less on the kinds of non-human lives central to these entanglements (especially beyond the commodified form; but see Collard 2012; Jampel 2016). It is the omission of the latter that we turn to next.

### 3.2. Bringing in the animal

The second theoretical intervention of this paper aligns with recent debates within the pages of this journal on the position of the non-human in political ecology studies of conservation (Srinivasan and Kasturirangan 2016; 2017; Menon and Karthik 2016). This debate centers around whether political ecology, in consistently levelling critiques at conservation practices rather than the broader development agendas through which conservation has emerged, fails to attend to the many kinds of lives (human as well as non-human) that often suffer as a result of uneven development (Srinivasan and Kasturirangan 2016; 2017; Menon and Karthik 2016). What concerns Srinivasan and Kasturirangan (2017) is that this anthropocentrism in political ecology seems to have produced the outcome that “conservation, and nonhuman life more generally, thus become scapegoats in conflicts between different human groups” (87). In sum, their concern is that political ecology eschews the politics of the animal in theorizing justice.

We argue a multispecies research approach (Ogden et al. 2008; Braun and Whatmore 2010; van Dooren et al. 2016)—by taking seriously and attuning to the role of non-humans as subjects in the co-production of entangled environments—helps to overcome this shortcoming. And further, that employing multispecies research methodologies can actually distill, rather than dilute, political ecology's commitment to social justice for communities dispossessed or disenfranchised by conservation (Mann 2009; Fleming 2017). The turn towards multispecies modes of inquiry in social research has opened up productive avenues for exploring the complexities of human-wildlife relations and encounters across diverse assemblages of human and non-human species (Haraway 2010; Ogden et al 2008; Collard 2012; Kirksey & Helmreich 2010; Kirksey et al. 2014). In the context of this study, many forms of human-animal encounter characterized as HWC are

mediated by intermediary species. As Massé (2016) notes, the relations between domestic animals, humans, and wildlife remains under-theorized in political ecology studies of conservation conflicts. This study therefore contributes to that effort, demonstrating new opportunities for applying political ecology's theoretical and analytical strengths to better understand the interwoven social worlds of humans, wild and domestic animals, and state institutional actors.

A multispecies turn can expand our intellectual field of vision more attuned to the complex entanglements of humans, different kinds of animals, and the state in the production of uneven geographies, and therefore help develop a political animal geography of human-wildlife encounter. As we will show, paying closer attention to the shifting geographies of cattle helps to reveal the more foundational sources of inequality produced through the assemblages of actors, processes and socioeconomic dynamics that shape our co-constituted environments. Turning our research focus to cattle as subjects central to our study will also highlight how new geographies of encounter produce increased exposure to risk for both cattle and carnivores. Raising up these problematics need not diminish the seriousness or primary focus of political ecology in tackling issues of social justice, but can strengthen these political commitments through more sensitively considering the different kinds of animals enrolled in enactments of injustice (Hovorka 2018).

#### **4. Methods**

This study's findings are drawn from data collected in the study region between October 2015-May 2016. Secondary data sources informing this study include livestock and human census data (2003-2013). Karnataka Forest Department management plans and documents were examined for historical background information, as well as for discursive analysis to better understand institutional perspectives on human-wildlife conflict. Participant and non-participant observation, and key-informant, semi-structured interviews were conducted with villagers living <5 km from Bandipura's border within a designated Eco-sensitive zone (n=30). An additional five focus groups in four of the study villages were also conducted with village elders (average focus group size, ~5). The subject of interviews

and focus groups concentrated on participant experiences of living with wildlife and changes they have observed over time in wildlife populations and their management, perspectives on human-wildlife coexistence, livelihood strategy changes, and how they cope with HWC. Participant and non-participant observation offered in-depth opportunities to more deeply contextualize the socio-political complexities of HWC and tolerance for living with wildlife in the study site. This included activities such as observing farmers and graziers with their cattle, walking farmer's fields while conducting interviews, visiting sites of livestock depredation, and observing discussions and conflicts between Bandipura staff and villagers. These kinds of 'go-along' interview techniques offered insights that helped to ground the research questions and participant responses in their everyday practices, experiences, and activities, revealing nuance and complexity that is often lost in larger, hypothesis-driven survey method-based studies (Carpiano 2009; Drury et al. 2011).

Additional interviews were conducted with non-governmental organization staff (n=8), and Bandipura Forest Department officials and staff (n=20). Interviews with Bandipura and NGO staff focused on management strategies for coping with human-wildlife conflicts, perspectives on the proximate and ultimate causes of HWC, their perceptions in changes in HWC over time, and their beliefs about the future role of protected areas and wildlife conservation more broadly. All interviews with Bandipura staff within Bandipur National Park itself were conducted in May 2016 by the first author as per the written permission of the Chief Wildlife Warden of the Karnataka State Forest Department.

Interviews were also conducted with five coffee plantation owners in the region, as well as three local government veterinarians. Interviews with coffee plantation owners were conducted to understand changes in regional labor demographics and the declining demand for cattle dung, while interviews with veterinarians helped enrich our understanding of the drivers of ongoing changes in cattle demography in the region.

All research was conducted in accordance with University of Maryland Baltimore County IRB approval (#Y15EE10197). Given the sensitivity of the subject matter and to ensure participants felt they could speak candidly about potentially sensitive topics and illegal activities, all interviews with both Bandipura staff and villagers were conducted under

conditions of strict anonymity. Verbal free prior and informed consent was obtained to avoid collecting any form of written documentation potentially linking interviewee responses to identifiable individuals. The first author conducted all fieldwork and interviews for this study. Interviews were conducted in the language most comfortable to the participants with a research assistant fluent in Kannada, Tamil, and English. The same research assistant was employed for the duration of this research effort in order to maintain continuity in the approach with interview participants, as well as to build participant trust and rapport, as many interviewees were interviewed multiple times to generate a deeper understanding of their experiences, perspectives, and opinions. The average interview time across all interviews was approximately 60 minutes, and interviews ranged from 30 minutes to 180 minutes based on the convenience and interest of the interviewee.

## **5. Seeing human-wildlife conflict like a state**

In 2006, the written management directives of Bandipura (and all Tiger Reserves in India) were changed to delineate the “core” area of the park (872.24 km<sup>2</sup>) as a strict conservation space “inviolable” for wildlife. This took place through an amendment to the 1973 Wildlife Protection Act in order to strengthen exclusionary conservation enforcement inside Tiger Reserves (Narain et al 2005; Wildlife Protection Act 2006). A triangulation of Bandipura staff and villager interviews, management documents, and non-participant observation suggests that stricter enforcement of Bandipura as an exclusionary space for wildlife has increased steadily over the past 10 years—reflective of the global re-emergence of ‘top-down’ and increasingly militarized and authoritative protected area management as a response to the perceived failures of Community Based Natural Resource Management (CBNRM) programs beginning in the early 2000s (Brockington 2002; Hutton et al. 2005; Dressler et al. 2010; Duffy 2014) .

There has been a concerted effort by Bandipura management to clearly demarcate the park boundaries, as well as create physical barriers surrounding Bandipura. These types of barriers include fences made of used railway track, large trenches (known as Elephant

Proof Trenches, or EPTs), and electric fencing. Interviews with park staff confirmed that such techniques were seen as dual deterrents to the passage of wild animals in one direction (especially elephants), and humans and livestock in another. While both villagers and park staff agreed that railway fencing was generally effective at reducing crop losses due to elephants, other forms of barriers, such as electric fences and EPTs, were seen as less effective deterrents, requiring constant maintenance for their continued efficacy. Bandipura staff admitted this kind of constant maintenance was not always feasible or conducted. ‘Walk-alongs’ with villagers along the park border demonstrated that the maintenance of boundaries and fences was highly inconsistent across Bandipura ranges, with many EPTs serving only as a demarcation of the park boundary. Many EPTs in fact, had become de facto walking pathways both for villagers and their livestock moving in and out of Bandipura. While there was congruence between villagers and Bandipura staff about increasing exclusionary management enforcement, personal observations of illicit activity inside the park (livestock grazing, collection of non-timber forest products) also made clear that this was not systematic across Bandipur ranges. Bandipura staff often gave multiple, varying perspectives on whether this was an accepted practice or not, with one officer stating "no, there is absolutely no grazing inside the park," while later commenting in a second interview, "we cannot keep them [villagers] out entirely, especially during the dry season [when there is less available fodder for grazing animals], because it would become a law and order issue...we would have riots if we did not let them in. We could not control them [villagers] and it would be dangerous for us [the Forest Department].”

Many Bandipura staff and management described feeling that increasing enforcement of territorial exclusion, in addition to being legally mandated, is necessary because of changing relations between local communities and wildlife. Park management frequently lamented what they perceived as changes in how local people treated wildlife. For example, a Bandipura staff member explained: “Before, they lived peacefully with the animals. If an elephant came to their field, it was a blessing from Ganesha [a Hindu deity with the head of an elephant].” Another similarly argued, “Now they all want modern things, TV, phones, Facebook; they want an easy life. They have things now I don’t even have.” In agreement, another stated, “In the olden days it was their duty to go and watch their fields at night, sit

in the Machan [watchtowers used to traditionally guard crops from crop raiding]. Earlier, the male of the family would watch the fields at night, now nobody goes.” Similar explanations among Forest Department staff across the broader tri-state conservation complex indicate this is a predominant narrative espoused by Forest Department staff across state lines. Speaking of a recent incident in 2016 in which a tiger was poisoned as a form of retaliatory killing, a Bandipura officer said, “They used to understand that animals have to eat...if we let them [local people] inside the park now there would be no tigers left to protect. We must respect the farmer, but we must also respect the animal. Nobody speaks for the animal, so who will protect it but us?”

This narrative of an inverse relationship between development and economic advancement on the one hand, and tolerance for wildlife on the other, was consistently repeated by park managers, though less so by lower level park staff such as the adivasi<sup>1</sup> (original inhabitants) day-laborers contracted to work in anti-poaching camps and other physically demanding jobs such as guarding and habitat maintenance. Lower-level staff are typically from the villages surrounding Bandipura and hired on a seasonal basis, unlike higher management who are assigned to work in Bandipura through the State Forest Department bureaucracy or Central Government Indian Forest Service. These lower-level staff more often blamed increasing wildlife populations for heightened human-wildlife conflicts. These discourses, however, ran counter to the day-to-day lived experiences and encounters with wildlife described by villagers and observed during fieldwork. Instead, their narratives pointed to a more calculated economic formulation, described next, exacerbated by long-held frustrations with a slow bureaucratic enforcement agency that many residents feel holds little regard for their well-being or perspectives on managing wildlife conflicts through non-authoritarian mechanisms.

## **6. Of coffee, dung, and dairy: changing ‘scrub’ and ‘hybrid’ cattle economies**

Prior research around Bandipura has shown how distant economic forces have impacted the quality of conservation habitat of Bandipura, where to date, many people have relied on the sale of cattle dung for their livelihood (Madhusudan 2005). The majority of dung collected in villages bordering Bandipura is gathered in the morning from cowsheds or

pens at night, to be dried, stacked, stored, and later sold by the sack to trucks at approximately 30-40 Rs/sack (~\$0.45 USD). Madhusudan (2005) demonstrated how global coffee commodity prices influenced the demand for dung collected by villagers living alongside Bandipura for sale to nearby coffee growing regions of South India. Increasing coffee prices led to a greater demand for dung and therefore a rapid increase in the number of cattle that were being grazed inside Bandipura in the 1990s and early 2000s (Madhusudan 2005).

However, interviews with coffee plantation owners in the region suggest that stagnating coffee prices, increasing costs of labor, and a declining supply of day laborers interested in plantation work are leading to declining profitability of coffee as a commodity crop in the region (and see Robbins et al. in review). From 2008 to 2015, the average rate for daily wage laborers on coffee plantations in Karnataka and Kerala more than tripled, from 79. to 248 Rs in Karnataka and 98 to 301 Rs in Kerala (International Coffee Organization 2016). Coffee plantation owners indicated that the increasing costs of labor meant that despite their preference for using cow dung as fertilizer, it had become more cost effective to apply synthetic spray fertilizers as it required fewer laborers to do so. While there is still demand for cattle dung from the villages outside of Bandipura for use as fertilizer on coffee plantations, there has been a significant decline in the population of cattle raised and kept for dung collection in the past ten years in Gundlupet Taluk (-28 percent) and Chamarajanagar District (-23 percent) as a result of these changes in the regional coffee economy (Figure 2; Appendix Table 2).

At the same time, there has been a shift not just in the number of cattle kept in the fringe villages around Bandipura in the past ten years, but more specifically in the breeds of cattle owned. Livestock census data, observational notes, and interview data reveal a general and marked pattern of decline in ownership of 'scrub cattle' and increased ownership of 'hybrid cattle' in villages surrounding Bandipura since Madhusudan's (2005) study was conducted. 'Scrub cattle' is a generic term referring to native, low-maintenance cattle breeds that have historically subsisted through extensive grazing practices within Bandipura. It is this type of cow that is raised for its dung production. 'Hybrid cattle' refer to several breeds of

European dairy cattle crossed with Indian cattle breeds. Hybrid cattle produce significantly more milk than scrub cows, representing an important form of daily income for many villagers. At the same time, hybrid cattle cost substantially more both to purchase as well as maintain in comparison to scrub cattle. Interviews with local cattle owners make clear that hybrid cows are more difficult to maintain, require additional veterinary visits and medical treatments compared to scrub cattle, are more sensitive to the region's high summer temperatures, and incur higher maintenance costs in terms of their feed and nutritional requirements when compared to scrub cattle. Figure 3 summarizes some of the key differences between these types of cattle, their economic value, and attendant grazing practices.

By 2012, ownership of scrub cattle in Gundlupet Taluk declined 40.6 percent from 2003 ownership levels, with a corresponding increase in hybrid cattle ownership of 85.5 percent from 2003 levels (Livestock of India Census 2003; 2008; 2012). In the six study villages where in-depth interviews and focus groups were conducted, there was a 58.9 percent increase in hybrid cattle ownership and a 34.9 percent decline in scrub cattle ownership between 2008 and 2013 (Livestock of India Census 2008; 2012). While there has been a slight increase in the total cattle population in Gundlupet Taluk of 4.7 percent during the same period (the most recent livestock census for which data is available was conducted in 2012), interviews with farmers and local government veterinarians indicate that the total cattle population is now steadily declining overall as a result of the shift towards hybrid cattle ownership (Livestock of India Census 2003; 2008; 2012; Appendix Table 2).

Despite the perceived negative attributes of hybrid cattle species, recent changes in the labor market, coupled with increasing enforcement of exclusionary park management, have pushed farmers and pastoralists towards raising a limited number of field-grazed and/or stall-fed hybrid (dairy) cows instead of maintaining larger herds of extensively-grazed scrub (dung) cattle (Figure 3). The changes in labor demographics take two primary forms. First, the relatively recent growth in domestic wildlife tourism in India has led to new, though limited, opportunities for off-farm daily wage labor in the tourism sector for



villagers living near Bandipura, including work in wildlife resorts and as tourism guides. However, the number of people finding work in this sector is still minimal (Karanth & DeFries 2011; participant interviews). As of 2010, only 270 people were directly employed in the Bandipura wildlife tourism sector (Karanth & DeFries 2011). Qualitatively, many village interviewees said they were not interested in the work that was available at wildlife tourism hotels and resorts because of insufficient wages. As a result, migrant workers from Central and Northeast India often took up these positions. Secondly, the practice of grazing large herds of scrub cattle in Bandipura is tightly bound to traditional economic relationships between specific social castes and adivasi communities. Historically, cattle owners would pay Soliga adivasis (a specific adivasi community) to graze their cattle inside Bandipura. Increasing restrictions on park access imposed by park management has resulted in a sharp decline in the number of laborers interested in herding cattle and other livestock inside the park. According to one owner of a previously large herd of cattle, "it no longer makes sense to own so many cows when we cannot get anyone to take them into the forest for us. The [Forest] Department is now strict about this and people are afraid to take cattle inside [Bandipura] now."

The opportunity to shift from ownership of a large number of scrub cattle to the ownership of a few hybrid dairy cows is limited to those owning sufficient land on which to graze hybrid cows and grow food for them, which largely excludes the region's population of adivasis and marginalized castes. Many small adivasi villages dot the fringes of Bandipura, where people live in government-built homes with small plots of land for subsistence agriculture. For instance, the population of Kaniyanapura village is predominately made up of Soliga adivasis, where approximately 85 percent of the village population is classified as a member of a Scheduled Tribe (Census of India 2011). Between 2008 and 2013, while the village population of scrub cows declined from 256 to 101, not a single family had acquired a hybrid cow. As one Soliga adivasi interviewee from Kaniyanapura explained, "For these [hybrid] cows you need a lot of money for their medicines and the doctor, and also you must be able to graze them in your field, and grow food for them....we don't have the land for that...we can't afford that." Conversely, in the study village of Kundakere,

where there are few adivasi inhabitants (~3 percent; Census of India 2011), the population of scrub cattle declined from 796 to 306 between 2008 and 2013, but the hybrid cattle population rose from 175 to 359. As an owner of hybrid cattle explained, "We are able to feed our hybrid cows on the food we grow and keep them inside the cowshed...these hybrid cows cannot be grazed inside the forest." A summary of these livestock demographic shifts in relation to protected area management and the regional labor markets is described in Figure 4.

## **7. Towards a political animal geography**

### 7.1 New spaces of human-wildlife encounter

As a result of shifting economic arrangements, changes in livestock demographics, and resultant grazing practices described above, the geographies of human-wildlife encounter have changed. While Madhusudan's (2005) study of the dung economy was instructive for identifying how global economic forces can translate into locally observed ecological impacts, our results indicate that there is a complex constellation of economic, social, and political forces mediating livestock rearing practices, and in turn negative human-wildlife interactions, in the villages bordering Bandipura. Whereas previously scrub cattle would be grazed inside Bandipura, hybrid cattle, due to their biological sensitivity and economic value, are not, and are instead left to graze on fallow fields or in cowsheds next to, or often attached to farmer's homes. As one farmer explained:

"Before, my cows would go into the forest [Bandipura] to graze. And maybe sometime a calf might get lifted [eaten] by a tiger...it made me sad, but a tiger also has to eat. But now I only own two hybrid cows, and yesterday I left them to graze in my field, and I hear a sound. I run over to find that a tiger has come into my field and killed one. That cow was worth 30,000 Rs (~460 USD), and I got 50 Rupees a day in milk I sold (~0.75 USD). The Forest Department won't pay proper compensation. I might apply for compensation and if I get anything I might get 3,000 (~46 USD), but they usually never pay anything at all. That isn't enough. So I am angry. What am I to do?"

This quote highlights the complex entanglements between humans, different cattle breeds, large carnivores, and the geographies of encounter between them, mediated through economic and demographic transformations (both human and bovine). Similar scenarios were described by many village interlocutors, with multiple instances of cattle killing also documented during the course of fieldwork. This situation has led to the commonly heard refrain: "we keep our cattle outside the park, now you [the Karnataka Forest Department] keep your animals inside." Because most hybrid cows are kept in cowsheds attached to people's homes, many interviewees described cattle or other livestock attacks now happening at night within villages themselves, rather than within the forest. The perceived changes in the spatial context of wildlife attacks on livestock were interpreted by villagers as a breach of an unwritten social contract between themselves and wild animals, where it was considered more acceptable and tolerable to have livestock attacked "inside the forest" rather than in close proximity to one's home.

These results indicate that the shifting relations between people and animals around Bandipura are the product of increasing precarity and changes in the agrarian economy, increased enforcement of exclusionary wildlife management law, and changes in livestock demographics resultant from these economic and management transformations. Our results suggest that recapitulating narratives about declines in cultural tolerance and the negative impacts of modernity on rural peasants put forward by state actors distract from the more pressing need to grapple with the economic decision-making of rural agrarian populations struggling to meet their aspirations under unfavorable economic conditions. The results of changes in the cattle economy have produced a distinctly new economic and biogeographic arrangement through which humans, cattle, and large carnivores interact on the fringes of Bandipura. As noted above, ownership and maintenance of hybrid cows is largely predicated on owning an amount of land sufficient to raise enough food to feed them, which excludes many people in the region. These arrangements further preference landowners who are able to take on the debt required to invest in irrigation systems in order to grow food and fodder year-round because of the region's extended dry season. While wildlife and eco-tourism are often promoted as a potentially valuable form of employment that might offset the economic costs of wildlife conservation for local communities, this has

not come to fruition in villages around Bandipura, where (as of 2011) proportionally only 0.0002 of the total employable population of Chamarajanagar have found employment in the industry (Karanth & DeFries 2011). Our more recent qualitative research suggests these numbers have not increased substantially. As such, there are limited opportunities for growth in this economic sector, leaving many people struggling to find forms of stable employment, while the dung economy has also declined significantly. Many villagers, in particular adivasis, continue to work as daily wage-laborers for the Forest Department in Bandipura. However, this employment comes without any job security or assurance of continued availability of employment, is typically seasonal, low paying, and often dangerous.

There are legal mechanisms in place for filing for compensation for livestock losses due to wildlife with the Karnataka Forest Department, but most interviewees were exasperated at the length of time it took to file and receive compensation when an animal was killed by a tiger or leopard, with most interviewees suggesting ~6-12 months as an average length of time from filing to receiving compensation, if any was received at all. Compensation rates also are far below the value of the domestic animals killed, particularly for more expensive hybrid cattle (Figure 3.2). Similar issues of insufficient compensation have been documented across India (Karanth et al. in press) and in other geographic contexts such as Mozambique (Massé 2016). Despite an increase from 3500 to 10000 Rupees (~50 and 150 USD) in the maximum allowable compensation for cattle depredation beginning in 2014 in Karnataka (Karnataka State Forest Department 2014), villagers were not aware of anyone who had received these levels of compensation, and payments by breed type can vary significantly and inconsistently (Karanth et al. in press). Many people simply did not attempt to file for compensation as a result of this lengthy process, as well as out of fear of abuse at the hands of Bandipura staff. Moreover, the amount of time, travel, and expenses (including at times substantial bribes paid to Bandipura staff), often made the potential monetary benefits of filing for compensation negligible. Livestock insurance schemes have met with promising success in other parts of India, potentially representing a more useful approach than one-time payouts that are insufficient to replace animals lost in wildlife

attacks and do not account for their daily contribution to household income through dung or milk sales (Mishra et al. 2003).

While the primary factors mediating wildlife tolerance in this study were economic forces, our results also suggest that it would be overly simplistic to blame insufficient compensation paid to livestock owners for declining tolerance to such attacks, or to think that improved compensation processes alone would eliminate conflict. While Karanth et al. (2013a) found that household exposure to livestock loss around Bandipura was lower (15%) compared to crop loss (73%), this does not proportionally capture the longer-term economic impacts livestock loss can produce. It is necessary to understand the logic motivating changes in tolerance for wildlife in response to the detrimental economic impacts that have emerged through the transformation of the livestock economy around Bandipur. When a livestock owner shifts from owning dozens of scrub cattle to the losses suffered when they lose one of just a few hybrid cattle, the economic damage of such a loss is not only significantly greater, but also compounding. Extensively grazed cattle spread the risk of damage inflicted by wildlife across a large herd, versus concentrating risk in one animal that is more expensive to replace. Additionally, the individual animals themselves represent significantly different economic livelihood forms. The scrub cattle economy enables stockpiling of dung that can then be sold when money is needed, therefore value can be stored both in the form of cattle as well as in their dung. Conversely, the milk produced by hybrid cattle must be sold immediately to produce value. For many farmers, the daily milk produced by a hybrid cow cannot be immediately replaced through another income stream if their cow is killed, nor are they likely able to afford to purchase a new cow immediately. Thus, even if current compensatory mechanisms functioned without bureaucratic delay and were unhindered by petty corruption (as interviews with both Bandipura staff and villagers indicate they are), they would still likely be insufficient for addressing the longer-term impacts of wildlife conflict resulting from the rapid changes in the region's livestock economy.

We agree with Madhusudan (2005) that the practice of extensive overgrazing of scrub cattle inside Bandipura in response to high demand by the coffee industry for dung was

likely detrimental to wild herbivore populations through reducing the quality of grazing space inside Bandipura. However, the more recent shift away from these practices in response to stronger enforcement of Bandipura as “inviolable” for wildlife may also produce unintended consequences that may be detrimental to the long-term health of large carnivore populations. Livestock damage by tigers and leopards continues to incite negative responses by villagers through forms of everyday resistance to state authority such as retaliatory killing, snare setting, or other forms of inflicting injury on large felids and their habitat, such as setting wildfires (cf. Holmes 2007). It remains to be seen how a recent effort to assist farmers filing for compensation in villages along Bandipura might reduce or unexpectedly produce new forms of tension between villagers and Forest Department authorities (Footnote 2).<sup>2</sup>

## 7.2 Where political animal geography and political ecology meet

As Robbins (2003) argued, political geography and political ecology have much to offer one another in approaching the study of contested environments. Through examining the case of human-wildlife encounter in Bandipura, we would argue in agreement with Srinivasan (2016) and Hobson (2007) that the same can be said for political animal geography, and the various strands of political ecology that take more expanded approaches to whom or what might act politically (Sundberg 2011; Collard 2012; Lorimer 2012; Margulies and Bersaglio 2018). While our study is the result of intensive fieldwork within a confined geographical area, contextualizing our findings through broader regional political economic processes leads to a more complex assessment of what forces are involved in co-producing new kinds of human-wildlife geographies. This is where a political ecology approach to the study of human-animal relations excels. But we also show how closer attention to agents of the state, and their discursive framings of human-wildlife conflict is vital for understanding the dynamics of power shaping the politics and spaces of human-wildlife encounter. It would be insufficient and intellectually unsound to dismiss the perspectives of Forest Department bureaucrats as illegitimate or misinformed. Rather, we should understand these discursive practices as articulations of the state apparatus’ agenda of territorial separation as a project of development. This articulation of a wildlife ‘crisis’ with a presumed spatial fix –separating and demarcating human space from wildlife

space—helps the state to manage conservation spaces in ways that respond to development’s excesses while still producing new spaces of capital development. For instance, protected areas act as critical spaces beyond the reach of extractive activities, such as industrial mining or deforestation (Mascia and Pailler 2011). At the same time, conservation produces new spaces of development for both private and public actors and institutions through activities such as wildlife safari tourism, natural capital investment, and carbon trading programs (Büscher and Fletcher 2015; Barua 2016). The everyday practice of conservation management in Bandipura is not ad hoc, however; it emerges in relation to federal and state level policies and laws governing forests and nature in the State of India. This is where political geography’s emphasis on institutions, policy, territoriality, and state actors is so vital to developing a truly political animal geography. We admit that our study leans more heavily on the armature of political ecology than political geography in crafting our arguments, and that more research at the level of state and federal Indian wildlife and forest law would further enrich an understanding of how the Indian state mobilizes conservation and for what purposes. Nevertheless, we believe this research demonstrates some fruitful cross-pollination of both subfields.

There are also research tools that can aid in addressing differences in the analytical and scalar purviews of political geography and political ecology. By way of example, the results of our study may also apply to human-wildlife interactions in the broader context of tropical regions near protected areas with cattle densities similar to the study area. Figure 5 highlights inhabited regions of the global tropics, ranked in terms of similarity to the study region’s protected area coverage and cattle population density using a global similarity analysis tool ([www.umbc.globe.edu](http://www.umbc.globe.edu)). This analysis offers a spatially explicit format enabling political ecology to ‘look up’ as Robbins (2002) suggests, casting our line of sight beyond our local research sites to identify thematic and empirical linkages operating across regional and global scales (Margulies et al. 2016).

Inskip and Zimmerman (2009) mapped the global patterning of livestock density in relation to locations with evidence of human-felid conflicts. Figure 5 is more specific, focusing on where negative interactions between the local cattle economy and protected area

management might arise under conditions similar to those of our study. It is important here to note Figure 5 is not a predictive model, but the output of an interactive visual tool for assessing similar geographies given a specific set of socio-environmental parameters. This analysis may be beneficial to other researchers working in different geographies along similar thematic axes. For example, pastoral communities in many places in West and East Africa are shifting towards more sedentary management of livestock populations in regions with robust carnivore populations in response to land privatization pressures and historical grazing areas being enclosed for wildlife conservation and tourism (Lamprey and Reid 2004; Reid et al. 2010; Niamir-Fuller et al. 2012). Our findings may be relevant in these locations where grazing systems are in transition in response to land privatization and protected area management pressures. Figure 5 speaks to the ways in which political geography's more expansive analytical scope can be generative for 'scaling up' political ecology research that takes place at fine-scales of analysis. At the same time, our research highlights the persistent value of employing inductive, in-depth qualitative research methods, more attuned to the particularities of animal geographies. If political geography can help political ecology to 'look up', political ecology can help ground political geography in the everyday interactions of people and animals within their lived environments.

### 7.3 Political animal geography in practice

The results of this article reveal a distinctly different perspective about declining tolerance for large felids among livestock owners compared to the narrative put forward by park managers and staff, suggesting alternative pathways for what might be done to improve human-wildlife relations. There is urgency for doing so, as retaliatory killings of large carnivores continue to threaten their populations in this conservation landscape. We therefore see critical geographic implications in our findings that suggest intervention opportunities for improving human-wildlife relations in agrarian communities. As noted above, because hybrid cows are typically kept in a farmer's field or cowshed close to or attached to the farmer's home, the proximity of wildlife encounter between livestock and large felids in relation to human habitations may be shifting in response to these livestock



demographic changes. Where interview data suggests cattle lifting was most likely to occur inside or along Bandipura's border in earlier years, it is increasingly occurring within or near the domestic sphere of village and family life, potentially drawing large carnivores into the human built environment. This would represent a fine-scale shift in where wildlife attacks happen, and the need to examine questions of livestock-wildlife encounter attendant to these geographical differences. At the same time, it also potentially presents a practical opportunity for reducing livestock attacks, as the construction of more secure cowsheds could lead to an overall reduction of livestock predation compared to when cattle were more frequently grazed inside the forest and susceptible to carnivore depredation. Our results therefore point to possible opportunities for reducing the economic costs of these new and emerging human-cattle-carnivore geographic arrangements, and at the same time reducing incidents of both carnivore and cattle death.

## **8. Conclusion**

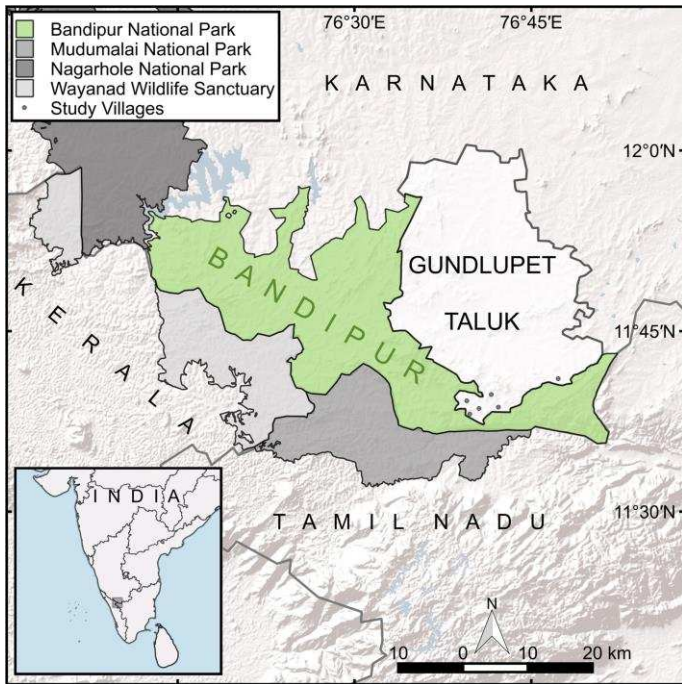
This paper describes the changing political economy of cattle-rearing practices in villages surrounding Bandipur National Park and their attendant effects on multispecies relations, inclusive of different cattle breeds, carnivores, and communities living alongside Bandipura's border. In the past ten years there has been a decline in the region's cattle dung economy due to decreasing demand from regional coffee plantations, where it was used as a high-quality fertilizer (Madhusudan 2005). At the same time, as our findings reveal, the past ten years have seen increasing enforcement of the legal statutes designating Bandipura as a protected area absent of human presence, reflective of similar dynamics in other conservation landscapes worldwide (Dressler et al. 2010; Duffy 2014). As our results suggest, the complexities of disentangling narratives of human-wildlife conflict is enriched through engaging with matters of political economy often overlooked in studies of human-wildlife conflict (Madden 2004; Redpath et al. 2015). Coffee prices set on the global commodities exchange stagnate, regional rural labor costs skyrocket as a result of the urban transition, historical labor relations are unhinged, and crackdowns on violating conservation law intensify (Figure 4). These dynamics fuel increasing tensions between human communities and large carnivores as the economic costs of cattle injury and death escalate, the result of farmers shifting from extensive cattle grazing practices to small-scale

dairy production in response to these emergent political, economic, and demographic conditions.

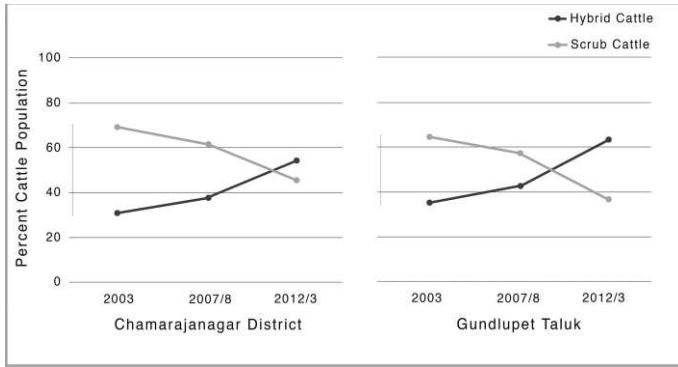
Globally, biodiversity conservation practices continue to disproportionately burden the rural poor (Adams et al 2004; Adams and Hutton 2004; Barrett et al 2011). Attuning political ecology scholarship to the biogeographies of individual species forges creative pathways for critiquing the territorializing practices of the state carried out in the name of conservation. At the same time, our research shows how approaching a critique of these practices through political animal geography can help move scholarship critical of conservation and its impacts on marginalized human communities towards a broader critique more inclusive of how particular conservation practices may also lead to unexpected impacts on non-human life as well. In this way, our research responds to recent debates regarding political ecology's over-emphasis on critiquing conservation practices and conservation's discontents, rather than critiquing the more foundational project of 'development' itself (Srinivasan and Kasturirangan 2016; 2017; Menon and Karthik 2016). This perspective can help inform reconciliatory approaches to conserving biodiversity that take the values of both human and non-human life seriously through revealing the historically situated, foundational causes of conservation conflicts rooted in uneven development. Such efforts are more necessary now than ever given the global conservation movement's recent shift towards more militarized and securitized forms (Asiyanbi 2016; Duffy 2016; Massé and Lunstrom 2016; Marijnen and Verweijen 2016).

As conservation emerges as a new site of speculative capital accumulation (Büscher and Fletcher 2015), conservation qua development may have, as in our study, detrimental impacts not just on human communities (and their domestic animals), but the wild animals that those acting in the name of conservation seek to protect. Attending to these multispecies forms of injustice need not, we argue, diminish political ecology's commitment to producing scholarship advocating for the position of those human communities most dispossessed by conservation's practice. It can, however, contribute to developing a more expansive view of justice.

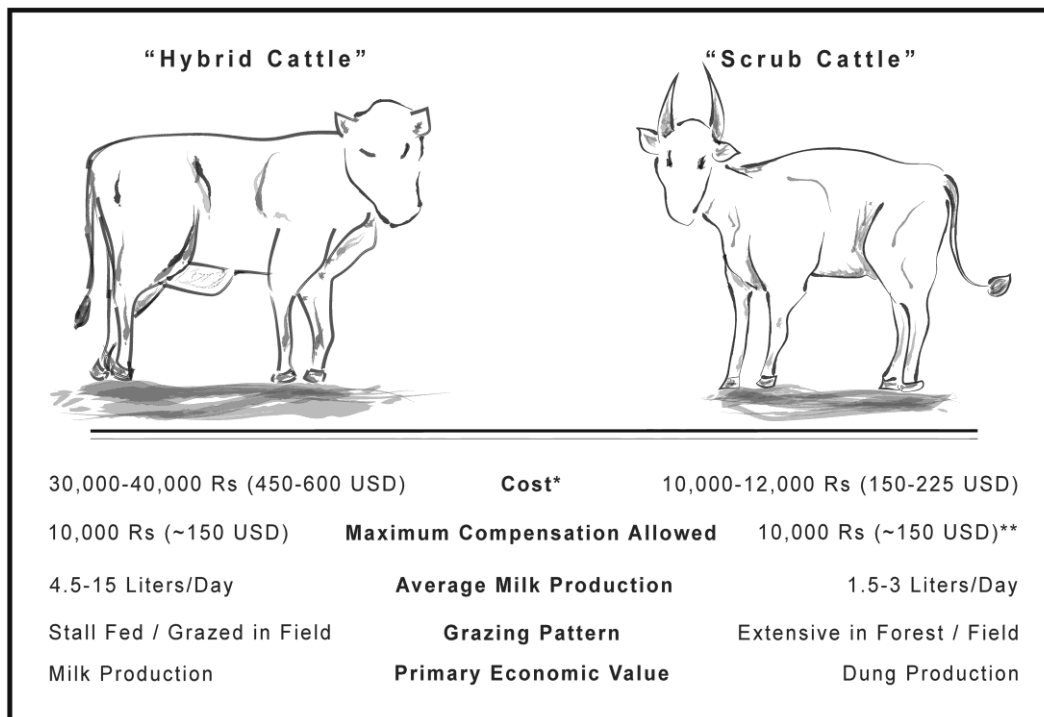
## 9. Figures



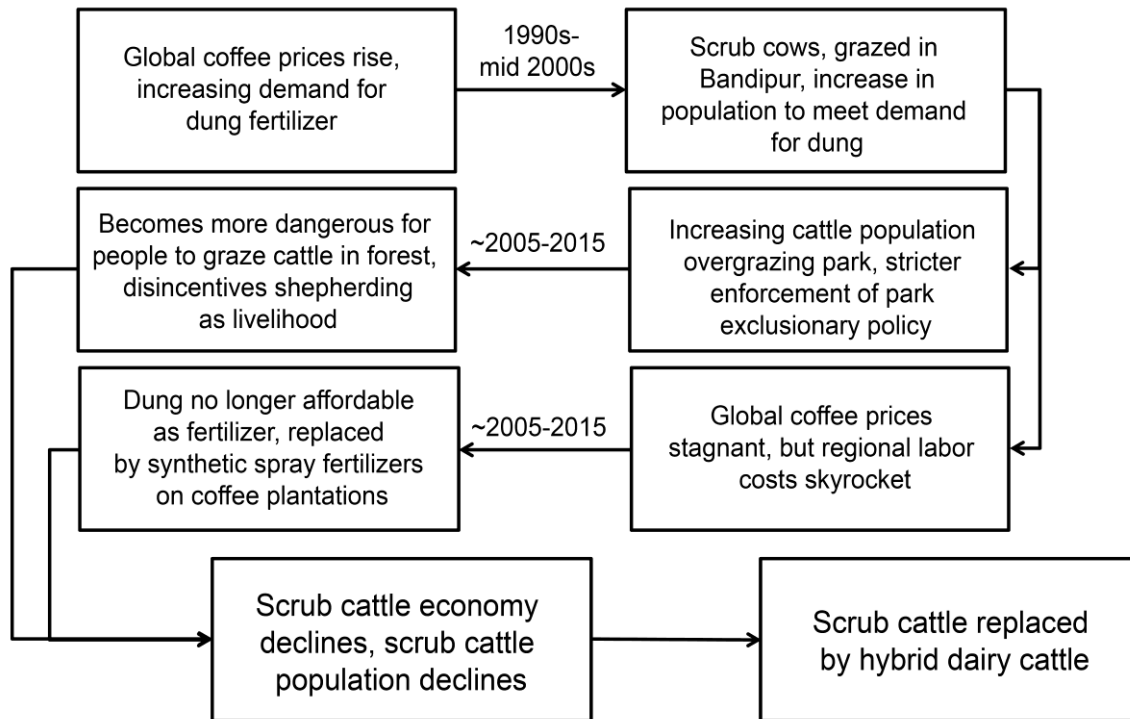
**Figure 1.** Map of study area and Bandipur National Park (also known as Bandipur Tiger Reserve) within the broader geographic context of neighboring Mudumalai National Park, Wayanad Wildlife Sanctuary, and Nagarhole National Park (light green).



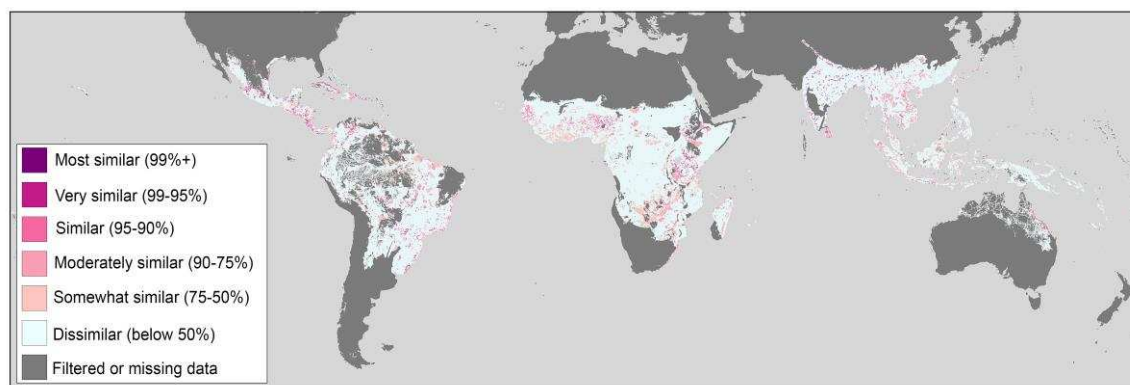
**Figure 2.** Change in percentage of hybrid and scrub cattle populations between 2003 and 2012/2013 in Chamarajanagar District, Karnataka India (left), and Gundlupet Taluk, Chamarajanagar District, Karnataka India (right). Percentages are based on the total cattle population. Data retrieved from the Indian Department of Animal Husbandry, Dairying, and the Indian Livestock Census (<http://dahd.nic.in/>).



**Figure 3.** Summary of information and statistics highlighting key differences between 'hybrid' and 'scrub' cattle raised in villages along Bandipur National Park's border. Illustrations of cattle are representative only. \*Costs indicated here represent a range based on prices paid by interviewees. \*\* In practice, 'scrub' cattle receive much less in compensation than 'hybrid' dairy cattle. While the maximum compensation allowable for all cattle in Karnataka is currently set at 10,000 Rupees, there is no official policy indicating different compensation amounts based on cattle breed.



**Figure 4.** Summary flow-chart of the changing livestock economy around Bandipur National Park in relation to changes in the regional coffee economy, protected area management enforcement, and labor demographics.



**Figure 5.** Map of global similarity analysis for 10 km<sup>2</sup> buffer zone around Bandipur National Park (1,412 km<sup>2</sup>). The similarity analysis shows areas in the world that are similar to this buffer zone region based on the percentage of the land under protected area management and cattle density. 342,730 km<sup>2</sup> of the earth's terrestrial surface (0.26%) is classified as most similar (99<sup>th</sup> percentile, 0.02%) or very similar (95<sup>th</sup> percentile, 0.24%) to our study region, and 0.77% of the earth's terrestrial surface is classified as similar (90<sup>th</sup> percentile 0.77% 1,034,895 km<sup>2</sup>). The analysis excludes uninhabited regions of the world and is constrained to tropical biomes. The analysis quantifies the differences between the case's median global variable value(s) and those of all other Globe Land Units<sup>1</sup> on the Earth's land surface that are in the filtered extent. The difference between a site and another GLU is computed as the Euclidean distance<sup>2</sup> in variable space on normalized variable values. Similarity is calculated as 1 minus the distance, resulting in an index ranging from 0 (extremely dissimilar) to 1 (most similar) that can be used to illustrate what places on Earth are alike or different, globally, from the buffer zone around Bandipur National Park. Full documentation of the similarity analysis for the study region is available at: [doi:10.7933/K14F1NNJ](https://doi.org/10.7933/K14F1NNJ).

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## 12. Endnotes

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<sup>1</sup> The term adivasi means roughly translates as “first people” or “original inhabitant” in Hindi, and also refers to the “Scheduled Tribes” of India as designated in the government census and in official statistics.

<sup>2</sup> A recent initiative called Wild Seve is now operating in the region to assist individuals in more expediently filing for compensation. The project thus far has helped file 10,000 compensation claims and nearly 6000 families have received \$230,000 in payments from the Karnataka government. <https://wildseve.org/>