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Beyond compensation: Integrating local communities' livelihood choices in large carnivore conservation

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ABSTRACT

Conserving biodiversity in human-dominated regions of the world is complex, particularly in case of large carnivores where perceived conflicts exist with economic development, expanding human populations and livelihoods. Using a systematic 'bottom-up' consultative framework, based on a choice modelling approach that accounts for heterogeneity in the population, we explore alternative strategies that meet conservation and human development goals. Focusing on the Gujjars, a pastoralist community in northern India our research identifies the community's preferred government support measures to encourage coexistence with tigers. We find that direct losses from predation are secondary concerns compared to development measures despite these losses being comparable to other tiger landscapes. Further we found that almost all sampled households (283/292) preferred resettlement over any form of coexistence, with positive preferences for larger land-sizes, the immediate and permanent transfer of property rights, a government-built house and the potential to generate a living from agro-pastoralism. As resettlement would avoid conflict with tigers and lead to habitat and prey recovery, it follows that tiger conservation and human development goals could be best realized by securing vast areas of inviolate tiger habitat through community resettlement to acceptable locations away from tiger habitat. Although Gujjars in our case study prefer resettlement as the way forward, we highlight the need for a responsive policy and institutional framework that can accommodate local needs and ensure there are adequate opportunities for the creation of sustainable livelihoods within tiger habitats. More generally, we show how different outcomes for tigers and humans can be explored empirically to generate better outcomes for carnivores and people at a landscape scale.

1. Introduction

Reversing the worldwide decline in large carnivore populations is one of the biggest contemporary challenges facing biodiversity conservation (Ripple et al., 2014; Treves and Bruskotter, 2014). Considered a classic "market failure" (Nelson, 2009; Nelson et al., 2010), global high value species such as the tiger *Panthera tigris* impose diverse and pervasive costs on local communities in poor countries and regions that include loss of human life and livestock and associated opportunity costs (Barua et al., 2013; Dickman et al., 2011; Inskip and Zimmermann, 2009; Macdonald et al., 2010). With a rapidly increasing human population and intense competition for resources, conservationists and policy makers are divided about the best approach to conserve these species (Creel et al., 2013; Dickman et al., 2011; Packer et al., 2013).

Displacement of local people to create 'inviolate' reserves is highly controversial, and has been strongly criticized on the grounds of both fairness and cost (Agarwal and Redford, 2009; Brockington and Igoe, 2006; Cernea and Schmidt-Soltau, 2006; Lasgorceix and Kothari, 2009; Rangarajan and Shahabuddin, 2006). Nevertheless, it can lead to more favourable outcomes for carnivore conservation (Packer et al., 2013; Walston et al., 2010) as coexistence requires sustained engagement with local communities (Wikramanayake et al., 2011). However achieving this relies upon intensive management regimes, resilient governance arrangements and sustainable financing to maintain the cost of coexistence to acceptable levels (Dickman et al., 2011; Garnett et al., 2011; Leader-Williams and Albon, 1988; Walston et al., 2010), none of which are easy to guarantee in the context of a developing country (Smith et al., 2003).

In the field of systematic conservation planning it has proven difficult to incorporate more complex human dimensions of this

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debate, with fairly crude and arbitrary measures of welfare changes such as 'lost production' or threats to livelihoods being used in a narrow policy framework (Ban and Klein, 2009; Margules and Pressey, 2000; Wilson et al., 2007). As a consequence, the deeper concerns and more strategic aspirations of local people are inadequately captured and solutions tend to favour outcomes that have underestimated human well-being (Di Minin et al., 2013; Knight et al., 2008). Therefore, there is a pressing need for research that reconciles ecological requirements of carnivores with the preferences, priorities and aspirations of people and their communities to create sustainable landscape-level policies for large carnivores.

In this study we develop such an approach for the western Terai Arc Landscape (TAL) in northern India, a global priority Tiger Conservation Landscape (Sanderson et al., 2006). In this region, as in much of India, there is a rather contentious history of conflict over tiger conservation (reviewed in Rastogi et al., 2012), with early conservation efforts to save the dwindling tiger population focused on the establishment of inviolate tiger reserves where people were excluded. Initially hailed a success (Panwar, 1982), the credibility of this antagonistic policy was further undermined by the emergence of large scale tiger poaching that extirpated populations from Sariska and Panna Tiger Reserves in 2004 and 2005, respectively (Narain et al., 2005). Following this debacle the Indian Government proposed a strategy that envisions a managed tiger landscape comprising "core or critical tiger habitats" free of human presence ('inviolate') and "areas of coexistence" where local communities reside in a landscape permeable to tiger movement. Adoption of this more inclusive strategy was facilitated by the incorporation of elements within the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act as amendments to the Wildlife (Protection) Act in 2006.

With this policy background and working with the Gujjars – a forest-dwelling, pastoralist community in the tiger rich western TAL, we developed a 'willingness to accept' framework for alternative conservation measures to identify potential options that will enhance the well-being of the community and support recovery in the tiger population at the landscape scale. Specifically we explore two strategies – (a) coexistence, whereby livelihood needs of the community are sustained in return for minimizing any deleterious impacts on tigers, and (b) the creation of inviolate conservation areas through resettlement of the local Gujjar population.

2. Gujjar resettlement and tiger conservation in the western TAL

Gujjars (also called *Van Gujjars*) are a pastoralist community, based on dairy buffalo herds, who reside in the foothill forests of the western TAL. Historically, they have practiced transhumance with their livestock, between the foothill forests during the winter months and alpine meadows of the Himalayas in summer. However, socio-political changes both before and after Indian independence have affected traditional summer migration with the result that the vast majority now reside year-round in the foothill forests (Gooch, 2009). Previous ecological research has shown that reduction in grazing pressure and other practices deleterious to forest habitat such as lopping can lead to significant recovery in principal tiger prey such as the chital (*Axis axis*) and consequently in tiger density (Harihar et al., 2009). Minimizing such pressures can, therefore, help attain and further enhance the carrying capacity of tigers across a landscape that already has the potential to support 381 (313–480) (Harihar et al., 2014b).

There is a long history of resettlement in the landscape beginning with the creation of Rajaji National Park (RNP) in 1983, when several Gujjars were forced to resettle outside the forest. Conducted in two phases, around 1390 families from RNP were resettled at two sites (*Pathri* and *Gaindikhata*) at a cost of 360 USD per household (Mishra et al., 2007). In the initial resettlement plan (at *Pathri* in 1987), 0.05 ha land was allotted for the construction of a house and livestock-holding facility and additional 0.1 ha land was earmarked for raising fodder crops. Non-traditional concrete houses were provided on lands with no secure tenure and many in the community, unable to adapt, abandoned these holdings. Being non-participatory, top-down and 'forced' rather than voluntary, the first phase of resettlements met with severe opposition (Gooch, 2009; Mishra et al., 2007). In 1994, the scheme was upgraded to provide 0.02 ha land for the construction of a house of traditional style and 0.8 ha land towards agriculture at both *Pathri* and *Gaindikhata*. Although more generous than the first phase, there was little community consultation and no grazing land was provided. Consequently, resettled Gujjars sold or sent their buffaloes back to relatives remaining in the forest with no net decrease in grazing pressure in tiger habitat.

3. Choice experiments as a means to evaluate policy relevance

There have been widespread calls for a broader integrative approach to conservation under the heading of socio-ecology (Ban et al., 2013; Cowling and Wilhelm-Rechmann, 2007; Knight et al., 2008), but integrating social and economic needs and aspirations with ecological and behavioural requirements of large carnivores has proven challenging at the landscape level. To date, most modelling studies have limited the human dimension to the incorporation of estimated damage costs to livestock and related costs (e.g. Mishra et al., 2003; Zabel and Holm-Muller, 2008). However, this approach risks seriously misjudging the scale and extent of social and economic impacts and could lead to inappropriate conservation policies being adopted as it can potentially underestimate negative social, psychological costs, for example, bereavement associated with losses of both humans and livestock (e.g. Inskip et al., 2013), as well as the opportunity costs of livelihood choices that are prevented or hindered by the presence of large carnivores (e.g. Barua et al., 2013).

In this study we, therefore, eschew the conventional approach of estimating the costs of tiger coexistence as the primary socio-economic measure, and instead explore the willingness to accept alternative polices and measures that seek to conserve tigers at the landscape scale using a form of choice modelling known as choice experiments (CEs). CEs comprise survey-based methodologies, which elicit preferences of respondents in structured, hypothetical markets, where goods are described in terms of various attributes and their levels (Hanley et al., 1998). They have been widely used in environmental economics to value non-market benefits in monetary terms in the last two decades (e.g. Boxall et al., 1996; Wouter Botzen and Van Den Bergh, 2012). However, it has only recently featured in the conservation literature with application to ecotourism (Di Minin et al., 2013; Veríssimo et al., 2009), conservation flagships (Veríssimo et al., 2014a, 2014b), and natural resource conservation (Delibes-Mateos et al., 2014; Moro et al., 2013; Nielsen et al., 2014). Although the potential to deploy CEs to design wildlife conservation policy has previously been identified by Hanley et al. (2003), our study represents a novel extension of the methodology to explore the trade-off between livelihoods and conservation at a landscape scale for an endangered predator.

4. Materials and methods

Recognizing the need to offer people a range of relevant and practical choices as opposed to 'top-down solutions', we investigated coexistence and resettlement options sequentially