



Human resettlement and tiger conservation – Socio-economic assessment of pastoralists reveals a rare conservation opportunity in a human-dominated landscape



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ABSTRACT

Resettlement of people for conservation is a contentious issue, but remains an important policy for conserving species like tigers which require vast, inviolate habitats. Recommendations to resettle communities should ideally be supported with careful evaluation of the needs of wildlife, socio-economic characteristics of dependent communities and their attitudes, and we present one such case study. Using a semi-structured questionnaire survey of 158 households across a gradient of tiger occupancy, we found overwhelming preference for resettlement among pastoralist Gujjars and hence an unexpected conservation opportunity to expand inviolate areas for tigers in the western Terai Arc Landscape. The main 'push factors' identified were declining forest productivity adversely affecting incomes and lack of access to education and health facilities. Thus, our findings represent a rare instance where excessive extraction of natural resources, recognized to be detrimental for biodiversity, is also the primary driver for resettlement. The desire for resettlement was also re-enforced by losses of livestock to diseases (72.7%) and carnivores (25.1%), which was uncompensated in 89% of the cases, and positive experiences from previously resettled households. Demand for resettlement was uniformly strong regardless of local tiger occupancy, but we suggest that funding for resettlement be prioritized for households in high tiger occupancy areas, given higher livestock depredation and possibilities for conflict. Our findings, therefore, represent a novel landscape-level conservation strategy that takes account of socio-economic circumstances across a gradient of predator pressure, and could build a constituency for tiger conservation among local communities consistent with national and global objectives.

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1. Introduction

Conserving large carnivores has become a global priority, owing to the alarming decline in geographic ranges and population sizes. Despite their high existential value with international audiences (Macdonald, 2001), conserving them at the local scale is often fraught with challenges given the diverse costs associated with their presence (Macdonald et al., 2010). Tigers (*Panthera tigris*) typify the challenges associated with large carnivore conservation as they require vast home ranges to satisfy their requirements for food and undisturbed breeding refuges (Karanth, 2003). Therefore, securing and strengthening protected areas or breeding sources in exclusion of anthropogenic disturbances, while ensuring that the

larger landscape matrix is permeable to movement of tigers between the embedded source sites have become the cornerstones of tiger conservation (Walston et al., 2010; Wikramanayake et al., 2011).

Creating a "permeable landscape matrix" is hugely challenging in policy terms because tigers can inflict considerable economic and human losses on poverty-stricken communities such as traditional pastoralists (Little et al., 2008; McPeak and Barrett, 2001). Various options have been discussed including compensation payments for losses, 'coexistence payments' and perhaps most controversially, resettling communities outside tiger range (Dickman et al., 2011; Rastogi et al., 2012). However, prioritizing these conservation alternatives and successfully implementing them is contingent upon local acceptance of these actions (Cowling et al., 2004). Particularly for conserving tigers, which inhabit some of the poorest and most populous nations (Dinerstein et al., 2006), integrating social considerations for conservation planning assumes critical importance (Cowling and Wilhelm-Rechman, 2007; Knight et al., 2008).

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In India, which harbours the largest population of tigers worldwide, ‘inviolable’ protected areas maintained in exclusion of human-use is recognized as the central component of tiger conservation policy (Karanth, 2003; Rastogi et al., 2012). However, this approach has been highly contentious as it has necessitated the physical displacement of 100,000–600,000 people (Lasgorceix and Kothari, 2009), and often imposed diverse socio-economic costs on the displaced communities (Rangarajan and Shahabuddin, 2006; Agrawal and Redford, 2009). Owing to poor execution and little follow-up to the long-term rehabilitation process, severe impoverishment and destitution has been documented in some cases (Kabra, 2009). Furthermore, documented case studies remain rare with respect to benefits to the resettled communities (Karanth, 2007) and recovery of wildlife in the vacated habitats (Harihar et al., 2009). Consequently, practitioners are often hesitant to recommend this approach (Chatty and Colchester, 2003; Sanderson and Redford, 2003; Rangarajan and Shahabuddin, 2006).

Creation of state-controlled protected areas also excludes the participation of the local communities and often adversely impacts traditional livelihoods based on natural resources (Saberwal et al., 2001). This exclusionary model has led to complex historical, legal, management and livelihood issues for communities and has been manifested in widely reported antagonism, and is also seen as one of the reasons behind local extermination of tigers from Sariska Tiger Reserve in 2004 (reviewed in Rastogi et al., 2012). Following this local extinction event, the Prime Minister of India commissioned a task force with a mandate to review existing conservation practices and suggest a new model that shares the concerns of conservationists with the public at large. The task force proposed a dual strategy of managing tiger breeding areas as inviolate and other tiger-occupied areas with co-existence practices (Narain et al., 2005). This consequently led to the amendment of the Wild Life (Protection) Act (WPA) in 2006 which, incorporating issues highlighted in the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA), reiterates the need for a combination of approaches that include the identification of “core or critical tiger habitats” which are to be kept ‘inviolable’, and also areas of ‘co-existence’ in the larger landscape. While “voluntary relocation” of human settlements is mandated from inviolate areas, it also specifies that rights of local people are to be respected in the entire process and there has been considerable debate on the means of implementing these measures in a manner that reconciles conservation and livelihood imperatives of locals within tiger landscapes (Sekhsaria, 2007).

In this paper, we present the case study of pastoralist Gujjars residing in the western Terai Arc Landscape (TAL) – a global priority tiger conservation landscape (Dinerstein et al., 2006), and evaluate the potential for co-existence and relocation as policy options. Specifically, we investigate how Gujjars residing in forests with limited access to basic amenities such as electricity, education and medical relief, fare across a gradient of potential predation risk to their livestock holdings (indexed by tiger occupancy) in terms of their livelihoods, livestock losses and preferences towards improving their well-being. Recent landscape-wide occupancy surveys have revealed that while anthropogenic disturbances have a negative influence on tiger occupancy, Gujjars reside in forests across the entire gradient of tiger occupancy (Harihar and Pandav, 2012). Existing information suggests that this co-occurrence is expected to adversely impact these pastoralists through heightened costs of depredation, although the impact on the sustainability of their lifestyle would depend on their livestock ownership (Lybbert et al., 2004), income levels (McPeak and Barrett, 2001), family size (which would determine per capita wealth distribution) and predation pressure (Suryawanshi et al., 2013). Such an assessment is critical to prioritizing areas where co-existence needs to be promoted (low tiger occupancy, benefits outweigh the costs to the

community), or voluntary resettlement is necessary (high tiger occupancy, costs exceed the benefits for the community).

Our key objectives were to (a) assess the livelihoods of the forest-dwelling pastoralist Gujjars, (b) document the number and nature of livestock losses and identify the correlates of livestock depredation, and finally (c) assess the preferences of Gujjars towards interventions required to improve their well-being. We used a systematic design to ensure adequate representation of households across the gradient of tiger occupancy and gathered data using semi-structured questionnaire interviews for assessing the socio-economic profiles of Gujjars across the ~7000 km² landscape.

2. Methods

2.1. Study area

Our study area within the western TAL was defined by 57 large geographic grid cells (each of 166.5 km²) initially demarcated by Harihar and Pandav (2012) to estimate the occupancy of tigers. The overall land use matrix consists of protected areas (Rajaji National Park (RNP) and Corbett Tiger Reserve (CTR)) and multiple-use forests, bordered by agriculture and horticulture along the northern and southern edges (Fig. 1). These foothill forests face tremendous pressures for natural resources from around 6.9 million people inhabiting this area.

Gujjars inhabit forests across the western TAL in a range of tiger occupancy and are issued permits to cut grass and lop branches off trees for leaves to provide fodder to their livestock holdings (primarily consisting of buffaloes). Historically Gujjars practiced transhumance with their livestock, between the foothills forests (the study area) during winter months and alpine meadows of the Himalayas in summer. However, in recent years, socio-political changes have led to a cessation of their altitudinal migration resulting in them residing year-round in these foothill forests (Gooch, 2009). This has led to deterioration in the state of these forests and negative impacts on the native wildlife (Edgaonkar, 1995; Johnsingh et al., 2004; Harihar and Pandav, 2012).

The first efforts to resettle the Gujjars outside the forests were initiated after the formation of RNP in 1984 under the provisions of WPA (1972) and, in total, 1125 Gujjar families have been resettled in two sites (Pathri and Gaidikhata) created by clearing exotic monoculture plantations at an average cost of USD 360 per household, which included the provision of agricultural land, built houses/land for building a house and cattle shed (Mishra et al., 2007). The resettled Gujjars have adopted an agro-pastoralist lifestyle and gained access to amenities such as education, medical services, veterinary care for their livestock and rural up-liftment schemes sponsored by the federal and state governments. The resettlement has also resulted in significant recovery of wildlife populations in the vacated habitats, as evidenced by a marked increase in the population performance (fawn: female ratio) of chital (*Axis axis*) and steady increase in the population of tigers (Harihar et al., 2009, 2011).

The recent assessment of this priority tiger conservation landscape (Harihar and Pandav, 2012) reveals that the study region consists of a gradient of tiger occupancy (ψ) which we reclassify to represent three Tiger Occupancy Categories (TOCs). The ‘high’ TOC (ψ ranging from 0.91 to 1.0) was further characterized by evidences of breeding and spanned parts of the two protected areas (CTR and eastern RNP) and adjacent multiple-use forests, making them ‘core or critical tiger habitats’ within which, under current government policy, resettlement of Gujjars may constitute the favoured policy. The medium (0.51–0.9) and low (0–0.5, corresponding to encounter of no more than one tiger sign per cell) TOCs

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