

Conservation through conversation: a collaborative corridor restoration initiative in the Biligiri Rangaswamy Temple Tiger Reserve, Karnataka, India

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Wildlife corridors are critical in maintaining ecological processes and wildlife management, but they are fragmented and degraded due to various land-use practices. It is crucial to restore wildlife corridors through participation of communities/institutions of the landscape. Ironically, however, most of the proposed conservation plans are devoid of them in conservation and policy-making. Therefore, valuing the onus of people and their inputs to restore and manage wildlife corridors would be a practical strategy. We are addressing this 'restoration initiative' in the Biligiri Rangaswamy Temple Tiger Reserve, Karnataka, India by integrating knowledge from social and ecological sciences. The preliminary result indicates that, people and institutions from the landscape are willing to support the restoration efforts. This initiative would emerge as one of the successful, action-oriented and policy-driven projects in this landscape.

Keywords: Human–wildlife conflict, restoration, stakeholder, Wildlife corridor.

FRAGMENTATION of wildlife habitat affects population viability of species by disrupting their dispersal, recolonization, genetic exchange, and also seasonal and unusual migration¹. The viability of such fragmented populations exists only if there is some chance of colonization in fragments through connectivity with other fragments or contiguous forests through 'corridors'². Therefore, at a time of unprecedented forest destruction and frequent incidences of human–wildlife conflict (HWC), the conservation of wildlife corridors is crucial to maintain ecological processes, maintain biodiversity and for the safe movement of wildlife. In the recent past conversion of private land to forestland has begun in order to widen, expand and improve the quality of the corridors and their networks³. However, most of the wildlife corridors fall across human-dominated landscapes/private ownership, but the 'wildlife' tag made people to ignore as it belongs to the Forest Department. Even though people are living and sharing the same space and resources with wildlife, they believed that, restoration of corridor is responsibility of forest managers. Therefore, generating socio-ecolo-

gical baseline data on wildlife corridors, involving local community institutions and their traditional ecological knowledge in corridor restoration could be part of developing a conservation plan. This integrated initiative would improve the perception about wildlife conservation, facilitate the safe movement of wildlife, and reduce HWC.

The change in land-use practices that suit humans is the major source of ecological, social and economic problems associated with wildlife corridors. Ironically, most of the proposed conservation plans are devoid of participation of people/institutions from the landscape in the preparation of such plans⁴. In most cases policy decisions by the Forest Department ignore association of local community with nature as well as livelihood resources. These types of decisions often become the eye of the storm, leading villagers to vent their disapproval through destructive actions on the forests⁵. Therefore, valuing the onus of people and their inputs to restore and manage wildlife corridors would be a practical strategy. In addition, people from the landscape are close observers and are aware about wildlife given their immense traditional ecological knowledge. Thus, to achieve action-oriented and policy-driven conservation research such as corridor restoration, the first step is to initiate dialogue with local stakeholders and institutions.

In this study, we have devised suitable framework to restore the Edeyhalli–Doddasampige wildlife corridor (ED corridor), which is one of the critical wildlife corridors in Biligiri Rangaswamy Temple (BRT) Tiger Reserve. The corridor connects few other protected areas embedded in the Mysore–Nilgiri landscape; Malai Mahadeswara Hills (MM Hills) Wildlife Sanctuary and Sathyamangalam Tiger Reserve³. The dimension of the ED corridor is 0.5 km in length and 2.0 km in width³. An indigenous tribal community, Soligas and few non-tribal communities are dependent on the ED corridor landscape for their livelihood. Fuelwood collection, livestock grazing and invasive species like *Lantana camara* have severely affected the habitat quality of the corridor. Irrespective of anthropogenic disturbances, this mosaic of forest-corridor landscape is inhabited by 15 mammal species, of which eight large (Asian elephant, *Elephas maximus*; Bengal tiger, *Panthera tigris*; Indian gaur, *Bos gaurus*; Indian leopard, *Panthera pardus*; Wild pig, *Sus scrofa*; Sambar deer, *Rusa unicolor*; Sloth bear, *Ursus ursinus* and spotted deer, *Axis axis*), five medium-sized (four-horned antelope, *Tetracerus quadricornis*; Indian hare, *Lepus nigricollis*; Indian muntjac, *Muntiacus muntjak*; Indian spotted chevrotain, *Moschiola indica* and wild dog, *Cuon alpinus*) and two small mammal species (Indian crested porcupine, *Hystrix indica* and small Indian civet, *Viverricula indica*) are using this corridor regularly⁶.

Therefore to widen the existing corridor, around 25.5 acres of private land adjacent to it was purchased from

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local farmers by the Wildlife Trust of India (WTI) along with its international partner organizations – the International Fund for Animal Welfare (IFAW) and US Fish and Wildlife Services (USFWS) in 2007 and handed over to the Karnataka Forest Department⁷. The Collective Corridor Conservation Framework was developed to achieve the twin goals of the project – ecological and social well-being. Three major processes have to be initiated and strengthened, viz. corridor restoration, involvement of grass-roots organizations and creation of sustainable livelihoods for local people. Corridor restoration efforts could take care of habitat quality and support safe wildlife movement and reduce crop depredation, and in turn people's livelihood will be secured. Providing sustainable livelihood options for local people will maintain and enhance their resource endowments and household income, which in turn could reduce pressure on the forest landscape. Finally, the support and inputs, both in terms of rigorous and evidence-based research and action from grass-root organizations (such as SAS – Soliga Abhiruddi Sangha; EDC – Eco-development Committee; CCC – Corridor Conservation Committee and LAMPS – Large-sized Adivasi Multipurpose cooperative Society), and conservation agencies (such as Ashoka Trust for Research in Ecology and the Environment (ATREE)) will strengthen the corridor conservation efforts and reduce HWC in this area.

An interdisciplinary approach was adopted to address and understand this type of initiative⁸. We have started this restoration initiative by integrating knowledge from social and ecological sciences. Initially we have assessed the quality of the corridor and the adjacent habitats through seasonal vegetation and animal survey, followed by focus group discussions and informal interviews/meetings with people, local community institutions and forest managers from the landscape⁶. Conversation with different stakeholders gave us an opportunity to understand suitable, site-specific issues and ideas for community restoration initiatives. A total of around 400 families reside in six villages located around the corridor. Majority of the households are Soligas, and few other local communities. Though we found some cultural differences between the communities, we did not find any major socio-economic differences in the context of dominance and decision making. In the corridor landscape, approximately 12% of Soliga income and 7% of non-Soliga income was generated through collection of non-timber forest products (NTFPs), fuelwood and livestock grazing. Around 90% of the conflict incidences were crop depredation and particularly by Asian elephants. Around 4000 Tibetans were also living in 22 camps/villages across 3000 acres of cleared forest land adjacent to the corridor area.

Since vegetation cover is a major constituent of land that supports terrestrial plants, animals and human beings for their sustenance and existence⁹, the assisted vegeta-

tion restoration methods were explored to improve the green cover and plant species enrichment in 25.5 acres of degraded area adjacent to the corridor. Through vegetation assessment, we have recorded 92 tree species, of which 10 turned out to be important NTFPs, 9 fuelwood tree species and 13 tree species were identified as important food resource for elephants. Ten suitable native plant species were identified for vegetation enrichment based on their important value index¹⁰, ecological importance and recommendation by the community. Their observation and our research prioritized some of the similar plant species for restoration. For example, *Anogeissus latifolia* and *Terminalia crenulata* (dominant trees), *Dalbergia lanceolaria* and *Albizia odoratissima* (timber trees), *Phyllanthus indofischeri* and *Terminalia bellirica* (NTFP trees), *Pterocarpus marsupium* (nectar source for honey bees), *Acacia chundra*, *Hardwickia binata* and *Bambusa arundinacea* (food reserve for elephants).

Since we need to enrich 25.5 acres of degraded land, sufficient number of saplings has to be raised. So far, 5000 saplings of 10 suitable native species are being raised in decentralized community nurseries with the Soliga households next to the corridor. Inputs were also taken from forest managers to meet their requirement towards restoration efforts. The local people and their institutions, such as Village Panchayat, Tibetan Association, Parisara Premi Sangha and Raitha Sangha have participated and encouraged the restoration initiative. They understand the importance of such efforts and have initiated related activities in the landscape. In fact local village panchayat has agreed to include this 'corridor restoration' agenda in its 'Annual village action management plan'. Initially ATREE facilitates the programme; later the CCC – to be set-up with a new set of roles, rules and responsibilities for the stakeholder – will take care it. We hope that the state government shall make funds available from the Tribal Sub Plan, planting work under Gram Panchayat under MGNREGA, restoration money from CAMPA and Corporate Social Responsibility grants. BRT is one of the few tiger reserves subject to the Forest Right Act, 2006, providing community rights over forest resources. Therefore, engaging Gramasabhas in the restoration efforts under community rights is a promising example of wildlife-human co-existence zone approach.

The State Highway (SH-17A) passes through this wildlife corridor and an average of 1 vehicle/minute has been recorded on this road¹¹. This could be an additional threat to the movement of wildlife in this corridor. Therefore, we have requested the Highway Authority to put-up speed breakers and erect signboards. Since 22 Tibetan camps are located in the corridor landscape, we seek their co-operation and funding support to erect signboards. Our aim is to involve all the local stakeholders in this process, including government and private transport authorities, bus drivers, civil societies, and enable them to realize their responsibility towards corridor conservation and

management. In addition, meetings have been held with local stakeholders, which were successful and have led to the formation of the CCC with representation from all stakeholders in the landscape.

Our preliminary conversation with local stakeholders indicates that people and local institutions are willing to support such a restoration initiative in this area. In addition, the CCC will ensure monitoring and compliance with their own regulations regarding conservation of the wildlife corridor. Along with researchers, forest managers and local institutions as well as local community participation, this will emerge as one of the successful, action-oriented and policy-driven projects in this landscape. Moreover, such initiatives bring confidence among local stakeholders regarding conservation. Since nature conservation is often labelled as crisis science, associated with the socio-political dimensions¹², the interventions made through this line of research will not only improve wildlife corridors, but also maintain the ecological processes, and reduce HWC in the area. At the time of unprecedented habitat destruction, such interventions will contribute not only towards reduced emissions from deforestation and forest degradation, but also enhance carbon stocks in degraded forests¹³.

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ACKNOWLEDGEMENTS. We thank USAID India (AID-386 A-14-00011) for financial support and Karnataka Forest Department for permission to carry out fieldwork in the BRT Tiger Reserve. We also thank Soumitri Das for his encouragement, and the people and institutions of the landscape such as Village Panchayat, Parisara Premi Sangha and Soliga Abhiruddi Sanga for their active participation.

Received 30 December 2016; revised accepted 8 May 2017

doi: 10.18520/cs/v113/i07/1440-1442

Characterization of marine actinomycete having antiviral activity against cucumber mosaic virus

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Metabolite of 28 marine actinomycete isolates was assessed for antiviral activities against cucumber mosaic virus (CMV). Metabolite of one isolate (no. 21) was found most effective in controlling the CMV infection under glasshouse conditions by dual inoculation, seed treatment and spray treatment, individually. Under field conditions, treatment of cucumber seeds with the metabolite of actinomycete isolate no. 21 followed by four foliar sprays of the metabolite on cucumber plants, effectively controlled CMV infection. The morphological structures of the isolate were identical to *Streptomyces* sp. It was identified as *Streptomyces olivaceus* on the basis of 16-S ribosomal RNA gene sequencing which was in conformity with morphological, physiological and biochemical characteristics of the isolate.

Keywords: Actinomycetes, antiviral activity, characterization, CMV, *Streptomyces olivaceus*.

CROP losses due to plant infecting viruses are second only to fungal diseases, but viruses are much more difficult to control. In case of emerging infectious diseases of plants, about 47% of the diseases have been reported to be caused by viruses¹. Some virus outbreaks have been severe enough to destroy entire target plants in specific areas. Various strategies are being employed to control plant

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