

Effect of Rural Biomass Extraction on Bird Communities in Sariska Tiger Reserve

Raman Kumar and Ghazala Shahabuddin

Forests are extensively used by rural people for subsistence in the tropics. Biomass extraction (like grazing, fuelwood collection and collection of non-timber forest produce) is arguably the most widespread form of anthropogenic pressure in developing countries like India. Persistent extraction may alter forest structure and composition, which in turn may affect the resident forest fauna. Our knowledge about the ecological impacts of forest resource extraction is quite deficient, especially in the case of tropical dry forests, which form nearly half of the world's tropical forests. We undertook a study to investigate the effects of extractive activities on forest biodiversity. We focussed on birds as they may be sensitive to habitat alteration by human activities.

The study was carried out in Sariska Tiger Reserve that covers 866 sq. km. of dry deciduous forests in northwest India. The reserve, although earmarked for tiger conservation, has many human settlements located within its core and also around its periphery. The resident people are primarily livestock herders who earn their livelihood by selling milk. They use the forests extensively to graze their buffaloes and goats, and commonly lop trees for fodder and fuelwood.

We selected thirty locations spanning the reserve's core,

facing varying levels of disturbance, measured on the basis of degree of lopping, number of trails, and presence of livestock dung. Based on these disturbance indices, the locations were classified into 17 disturbed and 13 undisturbed sites. At these locations, we recorded the structure of the vegetation components (trees, shrubs and ground flora) and conducted periodic surveys for birds from March to May 2005, coinciding with most birds' breeding season.

We found that bird species diversity declined in disturbed areas, even though the net number of birds was similar. The effects of extraction on vegetation structure, mainly canopy cover, tree density, and tree height, changed bird community composition. More than half of the 48 bird species recorded were affected directly or indirectly by human-caused changes in habitat. Eight species were found to be very sensitive to disturbance, and emerged as reliable indicators of undisturbed areas. Insectivorous birds like Tickell's blue flycatcher and White-browed fantail appeared to be most affected by changes in the forest resulting from extraction. Such birds may disappear locally under sustained habitat degradation.

Certain inherently rare birds like Brown fish owl and Crested serpent eagle, which were restricted to tracts along perennial

springs, are also at risk. Conversely, four birds that were evidently encouraged by disturbance (e.g. Laughing dove and Indian robin) were hardy species that adapt well to human activities.

Our study demonstrates that even low levels of chronic biomass extraction may lead to changes in forest condition resulting in the local extinction of certain bird species. This underscores the need for inviolate areas for conserving a wide spectrum of species. At the same time, sustainable alternatives to forest-based livelihoods need to be explored urgently. To formulate such strategies it would be necessary to find out how much extraction can be sustained in forests without compromising the aims of conservation.

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How Natural Resources Agency Personnel View Black-tailed Prairie Dogs

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Black-tailed prairie dog management is one of the most conflict-laden wildlife issues in the United States today. To resolve this problem, one must find common ground among stakeholders. As a step towards doing this, we surveyed one key stakeholder group: government agents responsible for managing prairie dogs. Our mail survey assessed their values, attitudes, and knowledge about prairie dogs.

Black-tailed prairie dog colonies once spread across the western Great Plains. The area originally occupied by prairie dogs declined to a mere 1-2% of its historical size within 100 years. Livestock ranchers tend to believe that rodents are pests. Current threats to these animals include poisoning, shooting, sylvatic plague, and habitat loss. Despite the long-held belief that prairie dogs out-compete cattle for forage, recent studies have shown that well-managed livestock operations and prairie dogs can be compatible. Though ranchers want to eliminate or at least control them, conservationists want to recover and protect prairie dogs. Prairie dogs are 'keystone' species, whose activities, such as burrowing and vegetation clipping, create rich habitat patches that attract a diversity of wildlife. Some animals

eat prairie dogs and others use their burrows for shelter, for example.

Attitudes vary from extreme dislike of to intense support for prairie dogs. The values, attitudes, and knowledge of various stakeholders likely exert a strong influence over policy related to prairie dogs — especially the attitudes of agency personnel directly responsible for their management. Public land managers, wildlife officials, and agriculture field agents can have broad discretion in policy development and implementation. A better understanding of agency personnel perspectives can provide insights into agency behaviour.

We designed our survey to measure similarities and differences among and between national, state, tribal, and local government officials, and also between those who manage wildlife and those who manage public lands, such as employees of the Departments of Interior or Agriculture. We asked respondents their gender, age, education level, years worked in current job, residence type (rural or urban), and if they had ever lived on a ranch or farm. Some questions tested respondents' prairie dog knowledge.

Survey respondents who scored higher on the knowledge



Photo: Richard P. Reading

scale held more positive attitudes toward prairie dogs. Generally, people from rural areas displayed more negative attitudes than did people from towns and cities. Respondents whose families farmed or ranched provided more negative responses than those whose families did not. People working in agricultural professions held more negative attitudes towards prairie dogs than did land managers and people working in wildlife fields. People working locally displayed more negative attitudes than individuals working at the state or national level.

Respondents from all groups strongly valued wildlife. They agreed that prairie dog management should focus on financial incentives to citizens for protecting prairie dogs, implementing

conservation on public lands, and controlling populations that exceed certain sizes. Knowledge about these shared values could serve as a foundation for improved relationships. Collaboration between agencies could start with projects that advance conservation on public land and promote incentive programmes while also improving attitudes about prairie dogs. Successful initial collaborative efforts might then help agencies productively tackle more controversial management issues, such as promoting conservation on private land and supporting strict protection with the Endangered Species Act listing. We hope this study helps agencies with currently competing prairie dog-management goals and forges more cooperative relationships.

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Fire and Sub-tropical Deciduous Forests of India

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Fire plays an important role in tropical deciduous forests across the globe. Most fires are deliberately or accidentally set by people. Records of natural lightning-caused fires in tropical deciduous forests exist, but are rare. My colleagues and I have conducted a series of experimental and observational studies on fire and its effects on vegetation in sub-tropical deciduous forests of central and south India. We have monitored the patterns of tree diversity and size-class distribution in forests that represent varying disturbance histories: secondary forests, plantations, and long-undisturbed deciduous forests.

We examined the effects of fire on diversity and stature of seedlings and juvenile trees. Effects on seedling diversity were simple: seedlings either survived fires, or were killed, with more seedlings surviving in plots protected from fire after 2 years of fire exclusion. The effects of fire on diversity of juvenile trees were less straightforward. The effects were mediated by a greater proliferation of resprouted shoots, or ramets, in repeatedly burnt forest areas. In plots that were burnt, species composition was biased in favour of those species that could resprout, and these at times produced hundreds of shoots within a small area. Plots protected from fire, on the other hand, had a lower density of ramets. Our study

also showed that the relative height growth of juvenile trees and seedlings was adversely affected by fires. Plant growth was stunted, and we hypothesized that this would have a strong effect on the future development of the forest canopy and the understory light environment in these deciduous forest ecosystems. We also found that as little as two years of fire-exclusion was sufficient to have a positive impact on the diversity of seedlings and juvenile trees.

Fire eliminated an entire functional group of plants, those that allocated relatively less biomass to roots than to shoots. Examples of these plants included several species of *Gardenia*, and *Stereospermum suaveolens*. Biomass allocation in these plants contrasts with allocation by fire-tolerant species such as *Madhuca indica*, *Diospyros melanoxylon*, and *Terminalia bellerica*. We also found that many seedlings died back even when they were not exposed to fire. They died back to the ground in response to drought and sprouted from buried vegetative buds following the onset of the rains. Such seedling die-back followed by successful sprouting suggests that many tree species could be pre-adapted to fire at the seedling stage, sprouting after being burnt to the ground. However, juvenile trees do not show a similar ability to die back in response to

drought and sprout, and thus may not be pre-adapted to withstand fires, which top-killed juvenile trees even as tall as 1 metre.

Fire can have important effects on forest structure and diversity in deciduous forests. It is equally important to understand the role of fire in altering ecosystem functioning. For example, research focusing on soil moisture and nutrient dynamics in relation to fire might enhance our understanding of conservation needs in Indian deciduous forests. Deciduous forest plants exhibit an exceptional diversity of structure-function relationship. Plants demonstrate a variety of drought tolerance and drought avoidance strategies, and utilize a range of mechanisms to minimize water loss. Thus the conservation of deciduous forests will not only protect the integrity of species composition but also ensure the maintenance of mechanistic diversity, which is the origin of the diversity of plant functional groups.

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Photos: Ghazala Shahabuddin