Journal for Nature Conservation 20 (2012) 56–61

Contents lists available at ScienceDirect

Journal for Nature Conservation

journal homepage: www.elsevier.de/jnc

India's biodiversity hotspot under anthropogenic pressure: A case study of Nilgiri Biosphere Reserve

Nagarajan Baskaran[a], Uthirapathi Anbarasan[a], Govindasamy Agoramoorthy[b,c,*]

[a] Asian Nature Conservation Foundation, Indian Institute of Science, Bangalore 560012, India
[b] Gujarat Institute of Desert Ecology, PO Box 83, Bhuj 370001, India
[c] College of Environmental Sciences, Tajen University, Yanpu, Pingtung 907, Taiwan

ARTICLE INFO

Article history:
Received 8 October 2010
Received in revised form 26 May 2011
Accepted 10 August 2011

Keywords:
Biodiversity hotspot
Biotic pressure
Overgrazing
Woodcutting
Conservation
Management

ABSTRACT

This paper presents data on the impact of biotic pressure in terms of grazing by livestock and wood cutting by humans on the plant community in the Nilgiri Biosphere Reserve of India. Grass, and herbaceous plant biomass, number of cattle dung piles, number of woody stems available and damaged by human activities and weed biomass were assessed at different proximity along transects radiating from village-forest boundary to forest interior to measure the ecological impact of livestock grazing and fire wood collection. The grass biomass was positively correlated to overgrazing indicating the adverse effect on natural vegetation by cattle. Woodcutting was intense along the forest boundary and significantly declined as distance increased. Similarly, weed biomass and number of thorny species declined positively with proximity from village-forest boundary and the weed biomass was significantly higher in the pastoral sites compared to residential sites. The results suggest that human impact adversely affects natural vegetation and promotes weed proliferation in forest areas adjoining human settlements in the ecologically important Nilgiri Biosphere Reserve. Continued anthropogenic pressure could cause reduction in fodder availability to large herbivores like elephants, which in turn leads to an increase in human–elephant conflict.

Introduction

Anthropogenic pressures are known to influence natural ecosystems worldwide. Field studies have shown prolonged grazing by livestock on vegetation resulting in profound ecosystem changes, including altered structure and composition as well as changes in the physical and chemical properties of top soil. The obvious changes were reported in the under-story composition with reduction or removal of shrubs and herbaceous perennials (Hoffman & Cowling 1990, 1991; Moolman & Cowling 1994; Stuart-Hill 1992; Yates et al. 2000a).

Trampling by livestock can also lead to significant reduction in litter and soil crust cover, water infiltration, and soil micro-climate. Such changes in soil structure were reported to reduce regeneration of dominant tree species in the woodland forest (Yates et al. 2000b). Furthermore, studies have shown weed invasion prevalence in fragments grazed by livestock for longer periods (Abensperg-Traun et al. 1998).

India's tropical forests are threatened by severe overgrazing by livestock, forest fire, woodcutting, encroachment and agriculture (Arjunan et al. 2005; Jha & Singh 1990; Kodandapani et al. 2008; Madhusudan 2004; Sen et al. 2008; Silori & Mishra 2001). Such impacts have degraded natural forests that are becoming unsuitable for large mammals, especially herbivores. As a result, managing such degraded forests is increasingly becoming a conservation nightmare (Agoramoorthy 2010). For example, India's Nilgiri Biosphere Reserve, which is one among the 25 global hotspots of biodiversity with diverse endemic fauna and flora, has been facing severe man-made ecological disturbances (Desai & Baskaran 1996; Silori & Mishra 1995, 2001).

Data on the impact of anthropogenic factors affecting the natural forests of southern India are limited. In this paper, we present quantitative data on the impact of overgrazing by livestock on the biomass of grass and herbaceous plants and woodcutting by humans on the density of woody stem in Mudumalai Wildlife Sanctuary (presently a Tiger Reserve) and adjoining Nilgiri North Forest Division of Tamil Nadu state, which is part of the Nilgiri Biosphere Reserve of India.

Study area

Mudumalai Wildlife Sanctuary (area 321 km^2) is one of the major protected areas within the Nilgiri Biosphere Reserve (area

* Corresponding author at: College of Environmental Sciences, Tajen University, Yanpu, Pingtung 907, Taiwan. Tel.: +886 916752019.
E-mail addresses: agoram@mail.tajen.edu.tw, agoram@mail.nsysu.edu.tw (G. Agoramoorthy).

1617-1381/$ – see front matter © 2011 Elsevier GmbH. All rights reserved.
doi:10.1016/j.jnc.2011.08.004

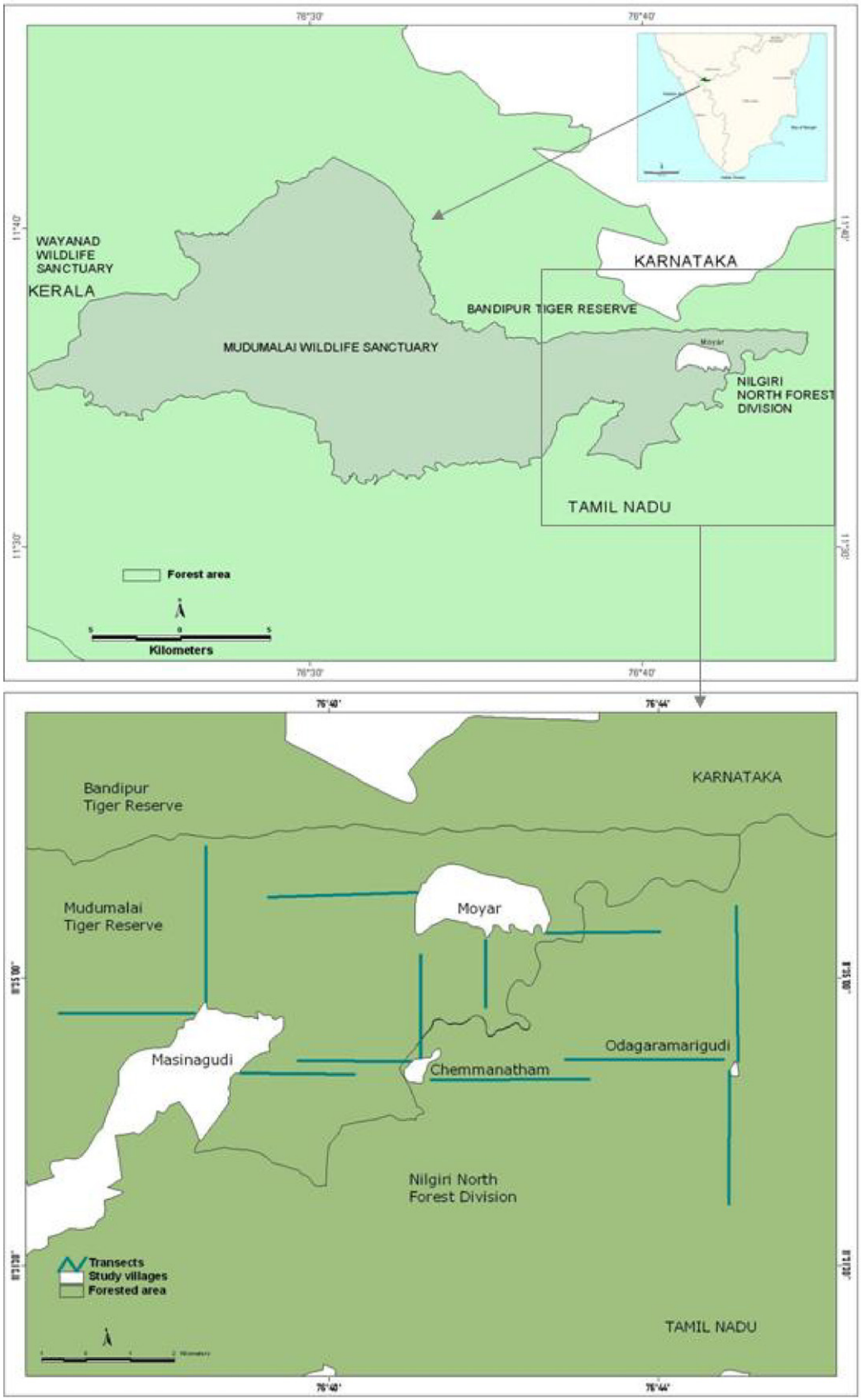

Fig. 1. Map of Mudumalai Wildlife Sanctuary and its adjoining forest in the Nilgiri Biosphere Reserve, India.