

EFFECTS OF LANDUSE CHANGE AND FOREST FRAGMENTATION ON THE BIODIVERSITY AND ECOSYSTEM FUNCTIONING IN THE TROPICAL LOWLANDS OF SRI LANKA

Habitat disturbance caused by the rapid expansion of agriculture and anthropogenic land use severely impact native forest biota. Resulting changes in the environment include altered biotic community composition and ecosystem functions. The present study examines the effects of land use change and forest fragmentation on biodiversity and ecosystem functioning in Sri Lanka using community data. This study was conducted in the lowland wet zone, the most species-rich zone of Sri Lanka, but which has been severely affected due to logging and conversion to agriculture and home gardens. Throughout this research, selected modified land use types; old selectively logged forest, monoculture plantations, home gardens and forest fragments, are compared with primary forests to evaluate the effects of habitat disturbance. Amphibians, butterflies and Scarabaeinae dung beetles were chosen as focal taxa in this study because they are known to be among the best indicators of habitat disturbance due to their sensitivity to habitat changes and cost efficiency of sampling. While providing background information to Sri Lanka's conservation history at the study sites, the first part of the study examines effects of anthropogenic land use and selective logging by surveying the diversity and community composition of amphibians and butterflies in primary forest and across the chosen land use types. I found that amphibians, specially endemics and direct developing species were more susceptible to habitat modification than butterflies in the lowland wet zone landscape. The environmental determinants of the communities indicated that structural variables of the habitats were more important for amphibians, while butterflies communities were more responsive to climatic

variables. In the next stage, I include a taxonomic update, distribution maps, and a photographic guide to the Sri Lankan Scarabaeinae beetles, including potentially new species and new records for Sri Lanka. The reference collection, established from island wide sampling and verified with type specimens, was used to identify specimens gathered during ecological data collection. Analysis of species distributions revealed that dung beetle diversity was correlated with the mammal diversity across the bioclimatic zones of the island. Finally, I report the diversity and abundance of Scarabaeinae beetles in multiple land use areas over a wide geographic range and twenty forest fragments in the lowland wet zone. I found that diversity and abundance negatively responded to anthropogenic land use in tea plantations and home gardens, primarily through altered abundance and community composition; total species richness was less affected. Communities in more than 70% of forest fragments were significantly different from the primary forest and those differences were best explained by fragment area, area to edge ratio and some abiotic and structural environmental variables (*i.e.* soil temperature, soil pH, maturity of the forest indicated by DBH profile). I relate dung beetle species richness and abundance to ecosystem functioning by studying dung removal across the same gradient of land-use change, and then discuss how disturbances can affect dung removal service and nutrient recycling. Dung removal was negatively affected by land use change, primarily through altered abundance and functional group diversity. Further, I discuss the importance of restoring nutrient enrichment of soil through dung removal, and the potential economic benefits for agriculture. This research provides the most coherent picture to date of how amphibians, butterflies, and mostly Scarabaeinae dung beetles are affected by land use change and forest fragmentation in Sri Lanka, and how ecosystem functioning of dung beetles is influenced by habitat modification. In addition, the study surmounts some of the hurdles to tropical conservation research by

supplementing the limited knowledge on ecological effects of habitat disturbance in South Asia specifically by highlighting an ecologically little known country in the region. The research findings can be used to make scientifically informed recommendations for the conservation of pristine forests and management of anthropogenic land use areas to increase their conservation value.

This is an iconic study as TERN was created through this work.