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Ecological importance of relic forest patches – from species to ecosystem

Rajasri Ray, M.D.Subash Chandran and T.V.Ramachandra

Energy & Wetlands Research Group, Centre for Ecological Sciences,

Indian Institute of Science

Bangalore – 560 012, INDIA

Tel: 91-80- 22933099/22933503 (extn 107)

Fax: 91-80-23601428/23600085/23600683[CES-TVR]

E-mail: rajasri@ces.iisc.ernet.in; mds@ces.iisc.ernet.in; cestvr@ces.iisc.ernet.in

<http://ces.iisc.ernet.in/energy>

Relic forest patches are often integral part of socio-religious life in rural India. These patches popularly known as sacred grove, are usually characterized by having assemblage of native species, regional and local endemics and provision for various ecosystem services. Ecological characteristics of the sacred groves are governed by their surroundings as well as human interaction with the system. The different nature of this interaction leads to varied ecological profile of the grove system which could be observed in both micro and macro level i.e. from species to ecosystem. This presentation deals with various examples drawn from sacred groves of central Western Ghats to illustrate the phenomena and contemporary issues challenging the age old tradition.

Keywords: Relic forests, Western Ghats, Sacred groves, ecosystems

Introduction

Forest ecosystem plays a pivotal role in shaping up human civilization through different means among which religious or cultural association has major role. The protection of forest / forest patch from

cultural perspective has often lead to long lasting contribution to the community associated with it, a fact which has been acknowledged widely only recently. From biological point of view, the culturally protected forest/forest patches

(popularly known as Sacred groves/forests) supposed to be native / primary vegetation of the area as human intervention is minimum due to religious or social taboos, thus any alteration is least expected. However, the notion of representation of original vegetation or relics of the past is a subject of local management and peoples' attitude towards the system.

Identification and demarcation of relic forests is a difficult task in view of rapidly changing land use pattern in the region. Without having any prior information on its ecological characters or any other mode of documentation the task seems to be a strenuous one to demarcate the patch from surrounding full grown forest or other land use types. Often, the patch itself is disturbed at various levels leading to confusion to reveal its true characteristics. Therefore, local traditional knowledge, historical documents and scientific expertise are prerequisite for this type of work. Present day relic patches are heterogeneous in their distribution and size. Their distribution ranges from heavily modified landscape to forested area and similarly they could be cluster of trees to few hundred hectares of land. It is their diverse spatial extent and surroundings which influence ecological characteristics of the relic patches. Although the small patches do not have much deterministic role in major ecological functions, they are effective enough to maintain the integrity at species level. On the other hand, large patches because of their dimensions influence local ecosystem functions to certain extent along with conservation of biological diversity. A wide range of interaction can be studied at both micro and macro level ranging from species to ecosystem leading to understand the complex natural processes at different scales.

Uttara Kannada, one of the forest dominated districts in Karnataka state is bestowed with relic

forests of different magnitude. The ecological history of the region corresponds with the origin and distribution of the relic forests in the area (Chandran 2005, Chandran et al 2010). Relic forests have been identified from the evergreen forest area, Myristica swamp even from agricultural landscape. Studies have already pointed out their importance in local biodiversity conservation however, their ecological and ecosystem dynamics are yet to be explored in detail. The current paper presents a brief overview of the importance of these relic forest patches at species and ecosystem level citing examples from central Western Ghats region to illustrate the phenomena and contemporary issues challenging the age old tradition.

Relic forests as shelter for species

Relic forests, at species level conserve a good number of rare, endangered and unique species because of the presence of amiable microclimate (Table 1). These species, due to their sensitivity towards environment usually have restricted distribution which makes them prone to extinction if there would be any drastic change in their habitat. Similarly, a good number of relic taxa or primitive species have been reported from these patches indicating their once dominant distribution in the area which have been lost in course of time due to environmental change, anthropogenic intervention or geological phenomena (Chandran et al.2008, Chandran et al.2010).

In agricultural landscape, relic patches are smaller in size than their counterparts in forested area and are facing more threats. Although, individual level contribution seems to be not so promising but collectively they can set an example of regional species conservation at landscape level (Ray and Ramachandra 2010, Ray 2011).

Table 1. Distribution of relic taxa in Central Western Ghats region, Uttara Kannada

Relic taxa	Location	Reference
<i>Myristica fatua</i> var. <i>magnifica</i>	Kathalekan, Uttara Kannada	Chandran et al. 2010
<i>Gymnacranthera canarica</i>		
<i>Semecarpus kathalekanensis</i>		
<i>Palaquium ellipticum</i>		
<i>Dipterocarpus indicus</i>	Kathalekan, Karikan	
<i>Syzygium travancoricum</i>	Kathalekan, Mattigar, Aralihonda	Chandran et al. 2010, Ray 2011, 2012

Ecosystem services from relic forest

The association of relic forests with local livelihood is manifold. Apart from cultural and religious link, they play pivotal role in major livelihood centric factors e.g. water availability, crop pattern, resource utilization etc. Relic forests in highland areas have immense role in groundwater recharge which benefits people in downstream hamlets. A comparative assessment between two watersheds with and without relic sacred forest in Uttara Kannada has found that relic forest with its characteristic old growth forest composition and higher soil moisture retention influence groundwater recharge in downstream area (Fig. 1). The yearlong availability of ground water in the area has an impact on local livelihood as reflected in selection of high value horticultural crop (areca, coconut, vanilla etc.) for cultivation

and high profit from it. On the contrary, in non-sacred site, the secondary forest with its specific deciduous and disturbance tolerant species composition and disturbed interior doesn't have any role in soil moisture conservation therefore have lesser impact on downstream locality. The scarcity of water compelled people to adopt different strategy for survival as evidenced through dominance of rainfed crops in the area (Table 2). On the other hand, relic patches in agricultural landscape play a different role in water conservation as observed by the presence of seasonal or perennial water bodies. When perennial water bodies have human utility seasonal water bodies provide favourable microclimate for diverse group of organisms thus provide shelter in a highly altered landscape.

Fig. 1. Groundwater monitoring data from study sites (Jan 2009-May 2010)

(Sambegadde = non-sacred site hamlet, Karikan = Sacred site: comparative study on sacred and non-sacred forests, Honavar Taluk, Uttara Kannada)

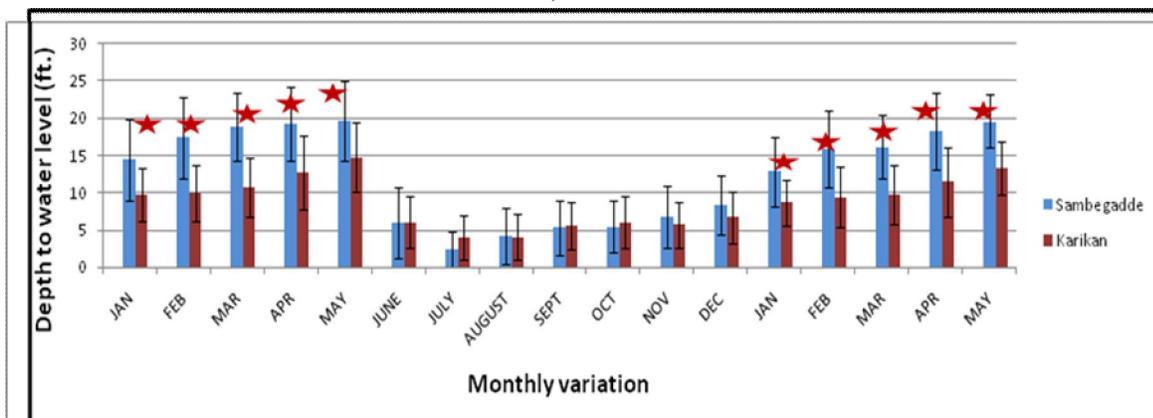


Table 2. Land use pattern in sacred and non-sacred forest sites (comparative study on sacred and non-sacred forests, Honavar Taluk, Uttara Kannada)

	Bangarmakki (sacred site) (ha)	Sambegadde (non-sacred site) (ha)
Areca Nut (<i>Areca catechu</i>) garden	20.123	10.491
Paddy (<i>Oryza sativa</i>)	0.111	25.398
Sugarcane (<i>Saccharum officinarum</i>)		0.082
Ragi (<i>Eleusine coracana</i>)		0.044
Total cultivated land	20.234	36.015

Apart from water and species conservation, the importance of relic forest can be felt in much broader scale e.g. carbon sequestration, plant – animal interaction. A fairly protected forest patch of ~2 ha. can sequester 148.73 tC/ha with a rate of 1.29 tC/ha/yr comparable to other reported studies in tropical forest areas (Ray et al. 2012). The comparatively undisturbed nature of the forest protects both old and new growth woody species which collectively promote sequestration capacity of the stock. Similarly, another study on relic *Myristica* swamps found that, in comparison to non-swamp stream forest, relic patches have an average of 174.76 tC/ha storage of carbon in comparison to 131.66 tC/ha storage carbon in non-swamp forest (Chandran et al 2010). Although scientific studies are rare, plant-animal interaction in terms of pollination, seed dispersal and germination has been reported from relic forest patches with emphasis on their conservation significance (Punde 2007).

Threats and Conservation Challenges –

This biologically unique is however not free from danger, especially in today's' rapid changing landscape scenario. The threat could be natural or manmade but it affects the system at various level the consequences of which are beyond our control

once it will cross the threshold. Some major threats are habitat fragmentation, negligence, conflict of interest and ineffective restoration/improvement strategies. It is our poor understanding of the complex ecological processes and proper estimation of the ecosystem benefits which often lead to their destruction. To improve the scenario, thorough understandings of the complex ecosystem dynamics as well as its socio-religious association with community life both are important from conservation and management point of view.

Conservation activities on relic forest patches are mostly implemented by Government agencies, NGOs and sometimes by communities. However community participation is often activated by extra mural support which has serious problem in long term sustainability due to financial limitation. The problem could be mitigated to some extent by awareness generation and transfer of custodianship so to raise the interest among people to safeguard its future for their own benefit. Often simple protection measures are effective enough to keep the relic patch in good condition even in altered landscape without any external heavy funding (Ray et al 2012). The need of the hour is awareness and active participation of stakeholders

from all level to save these representatives of ancient world in our time period.

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