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Rapid assessment of sacred groves: a biodiversity assessment tool for ground level practitioners

Shivam Trivedi [1], Erach Bharucha [2] & Rahul Mungikar [3]

[1,2] Bharati Vidyapeeth Institute of Environment Education and Research, Bharati Vidyapeeth University, Dhankawadi, Pune, Maharashtra 411043, India
[3] Bombay Natural History Society, Hornbill House, Dr. Salim Ali Chowk, Opposite Lion Gate, Shaheed Bhagat Singh Road, Mumbai, Maharashtra 400001, India
[1] trivedi.shivam07@gmail.com, [2] erach.bharucha@bvieer.edu.in (corresponding author), [3] r.mungikar@bnhs.org

Abstract: Sacred groves in the Western Ghats are culturally preserved patches of forests that are rich in diversity owing to protection by several generations of local people, providing excellent examples of community based conservation. Sacred groves harbour local populations, preserve genetic resources and serve as reference sites and corridors between protected areas. They are considered to be cornerstones of biodiversity conservation, but are insufficient in scale and number to significantly address many aspects of the management of landscapes and biodiversity. We studied 13 sacred groves in Pune District that are at present outside the protected areas of the northern Western Ghats, where we employed a simple and rapid biodiversity assessment technique that can be replicated by frontline foresters, local residents and Biodiversity Management Committees (BMCs). Integrating these sacred sites into the conservation network through local support can improve the efficiency for the existing protected area network in this ecologically fragile region.

Keywords: Hotspecks, prioritisation, rapid assessment technique, sacred groves, Western Ghats.

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Author Details: Mr. Shivam Trivedi is a research scholar at the Bharati Vidyapeeth Institute of Environment Education and Research pursuing his PhD research under the guidance of Dr. Erach Bharucha. He has been actively working in the field of biodiversity, nature and landscape conservation for past one decade. He is also a member of the International Education for Sustainable Development Expert Net Committee. Dr. Erach Bharucha is a surgeon by profession and a biodiversity and landscape conservation expert by passion. He has been active in the fields of wildlife and nature conservation over the past five decades. He has studied the Indian national parks, wildlife sanctuaries and tribal cultures of India extensively. He was also the first Chairman of the Maharashtra State Biodiversity Board. Dr. Rahul Mungikar is presently associated with the Bombay Natural History Society, Mumbai as Assistant Director (Policy Cell). He worked for the Maharashtra State Biodiversity Board for five years. His expertise is in implementation of the Biological Diversity Act, 2002, plant taxonomy and ecology and biodiversity monitoring. He has done extensive work in the sacred groves of Maharashtra.

Author Contribution: ST - Identification of hotspecks (sacred groves) from secondary database, designing and finalising of the rapid assessment technique (methodology), field surveys and data collection, data analysis, data interpretation and revision of paper. EB - Concept of the entire research work, designing and finalising of the rapid assessment technique (methodology), data analysis, data interpretation and revision of paper. RM - Designing and finalising of rapid assessment technique (methodology), data analysis, data interpretation and revision of paper.

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INTRODUCTION

Sacred groves are forest patches that are managed by local people according to traditions (Bhagwat et al. 2005) extending back several generations (Ormsby & Bhagwat 2010). Groves in the northern Western Ghats are typically small patches of forest dedicated to local, often animistic, deities (Vipat & Bharucha 2014). They exist with a matrix of varied forms of land use, and are of high biological value (Boraiah et al. 2003; Khumbongmayum et al. 2005). Sacred groves are found in various types of forests ranging from evergreen and semi-evergreen to deciduous (Gadgil & Vartak 1976), and since they typically represent old growth forest communities (Upadhaya et al. 2003) they can serve as reservoirs of genetic diversity for surrounding forests, making them key to efforts to restore degraded areas (Ministry of Environment, Forest and Climate Change 2010). Human disturbance is minimal within sacred groves since they are traditionally not used for collecting resources or grazing cattle (Parthasarathy et al. 2008), but there are impacts from land use around the groves and from local factors such as tourism, roads, mines, dams and neo-urbanization (Pandey 1999; Bhagwat & Rutte 2006). Currently several sacred groves are under high levels of biotic pressure and are losing their biological richness. Threats that play an important role in destroying the biodiversity of groves include industrial projects, mining, unsustainable forest resource use, excessive tourism and infrastructure development projects (Bharucha 2006).

Biodiversity-rich sacred groves have been termed 'hotspecks', small areas ranging from five to a few hundred square meters with high species concentrations that can be located within or outside of protected area boundaries (Cherian 2000). Hotspecks, if preserved, can act as potential transit sites for species movement between protected areas (Mgumia & Oba 2003). Certain taxa easily adapt to living in relatively small specialized habitats. A majority of these hotspecks are either privately owned, or belong to the local community, hence declaring them as protected areas as per the Forest Conservation Act, 1980 is impossible as local communities have their traditional rights over these landscape elements. Attempting to provide legal protection to such areas demotivates local conservation efforts and leads to conflicts between the Forest Department and local people (Chandrakanth et al. 2004). Thus there is a need to develop a sustainable management strategy so that is sensitive to the needs of local people so that hotspecks are conserved without infringing on the traditional rights of the local communities.

STUDY AREA

The study area is located in the Western Ghats within Pune District, Maharashtra (Fig. 1). The Western Ghats of Maharashtra harbour a variety of endemic flora and fauna (Ministry of Environment & Forest 2010) and cover an area of 58,400km^2 (Zunjarrao et al. 2015). The area contains a national park (Chandoli) and five Wildlife Sanctuaries (Kalsubai, Bhimashankar, Phansad, Koyna and Radhanagri) in Maharashtra, and is contiguous with Purna Wildlife Sanctuary in Gujarat and Mhadei Wildlife Sanctuary in Goa (Table 1).

MATERIALS AND METHODS

A survey of relevant literature provided a list of 274 sacred groves of more than one hectare in area in the Western Ghats of Maharashtra (Deshmukh et al. 1998). Of these, 114 groves were identified within Pune District, from which 13 were chosen for ground surveys intended to develop a model for other sites by training frontline forest staff, non-governmental organizations and local residents. These 13 sacred groves are representatives of geographical and forest conditions of sacred groves throughout the district, where forests range from moist deciduous semi-evergreen to evergreen. While the sample size is small, the intention was to provide a proof-of-concept for further surveys to assess the biodiversity of sacred groves (Fig. 2).

Rapid Assessment Techniques (RATs) have been designed for various types of biodiversity conservation assessments in the past (Lu et al. 2012). Existing RATs were reviewed in order to arrive at a RAT that is appropriate for the assessment of hotspecks in the Western Ghats.

A set of parameters such as size and shape of the hotspeck, forest structure and condition, faunal richness, special ecological features, land tenure and various types of ecological threats were included. The size and shape is an important parameter as a hotspeck with a small area and irregular shape has a higher edge effect compared to a hotspeck with a relatively larger area and regular shape (Ranta et al. 1998). A survey based on forest structure (Whitmore 1990) and status, presence of shrubs, lianas, herbs, snags and climbers, height of trees, canopy cover and detritus thickness has been used for evaluation through a fixed scoring system (Givnish 1998). The density of trees and their girth are included using the 'nearest individual' method (Hopkins & Skellam 1954). In assessing the faunal diversity

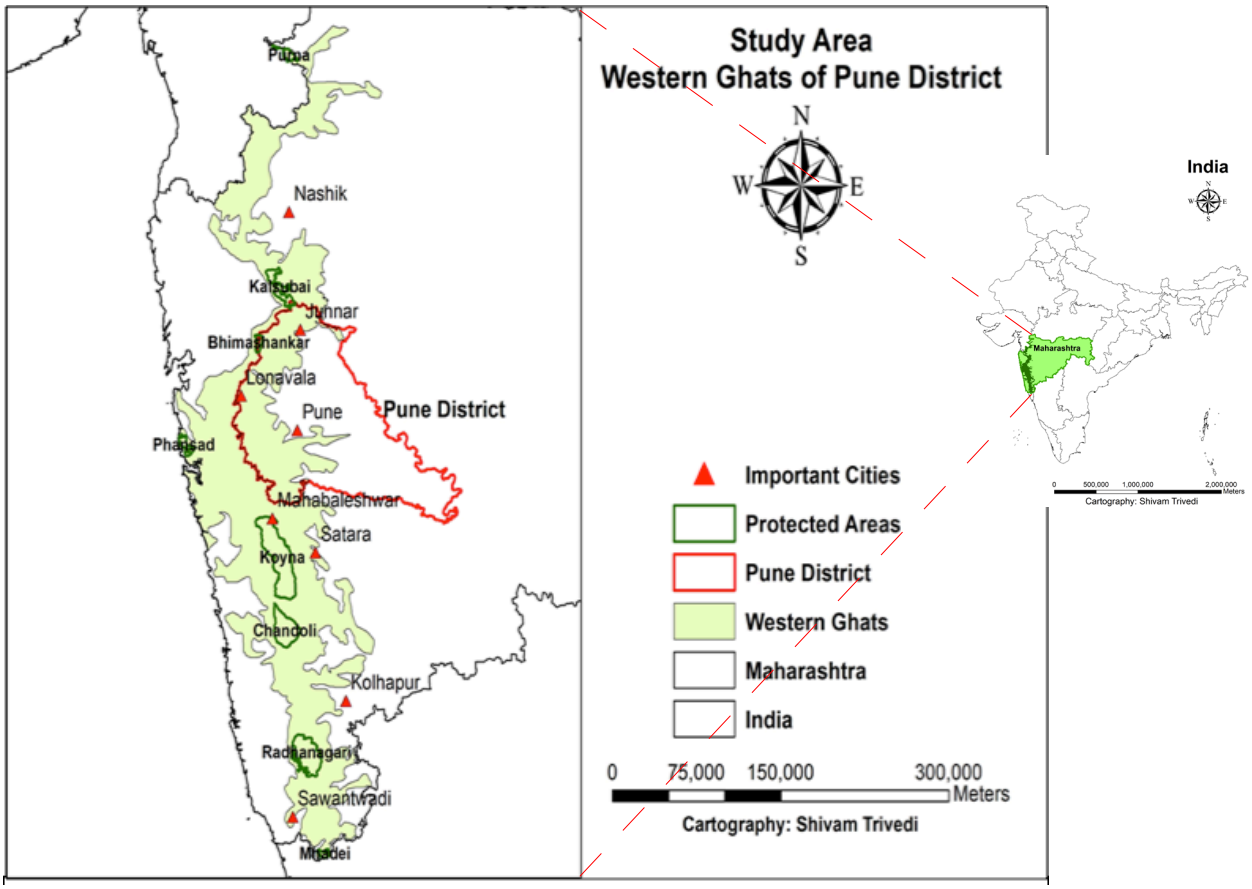

Figure 1. Map of the study area - The Western Ghats of Maharashtra (Protected Area Source: Wildlife Trust of India)

a mammal survey was done using reconnaissance technique (Plumptre 2000). Avifaunal survey was done through species inventory technique (Hill 2005). Reptile and amphibian survey was done through visual encountered survey and timed searches (Adams et al. 1998). Butterfly diversity was observed through encounters during the survey. Special features such as presence of medicinal plants, water bodies, streams, unique features ecological/topographical, nesting and roosting sites of avifauna, areas of exceptional beauty and presence of keystone species were recorded during site visits. These findings were further corroborated with a detailed proforma and expert knowledge survey to obtain information from local people. The surrounding land use is an important aspect to assess the long-term sustainable conservation potential of each area (Ricketts 2001). This is linked to evaluating threats to the site. A key parameter of biodiversity valuation is its local and surrounding land tenure. This is an important parameter as the ownership of the site and its surrounding area predicts the potential land use change that may occur in the near future (Ormsby 2011). Such changes in land use are frequently due to economic drivers. Speculation by land prospectors for urbanization is a major driver of accelerated land use change in the Western Ghats of Maharashtra.

The other set of parameters include various types of gradually increasing cultural threats such as clearing of land for agriculture expansion and grazing, forest fires, felling and lopping of trees and their branches for wood ash cultivation of crops which are traditional cultural uses of the landscape (Davidar et al. 2007; Anitha et al. 2009). The more important dramatic threats arise from rapid sale of land, development of roads and transportation, powerlines, mining, wind mills, industries, neo-urbanization and tourism (Padhye et al. 2006; Subramanian et al. 2011; Mehta & Kulkarni 2012). The threats are identified through site visits, local information and use of satellite images. These are categorized as reversible or irreversible threats. Irreversible threats include mining because mining sites cannot be restored to its former ecological status for decades as the biodiversity is highly site specific and does not tolerate change in the habitat. At the other end of the spectrum threats from certain traditional cultural land use changes can be reversed through

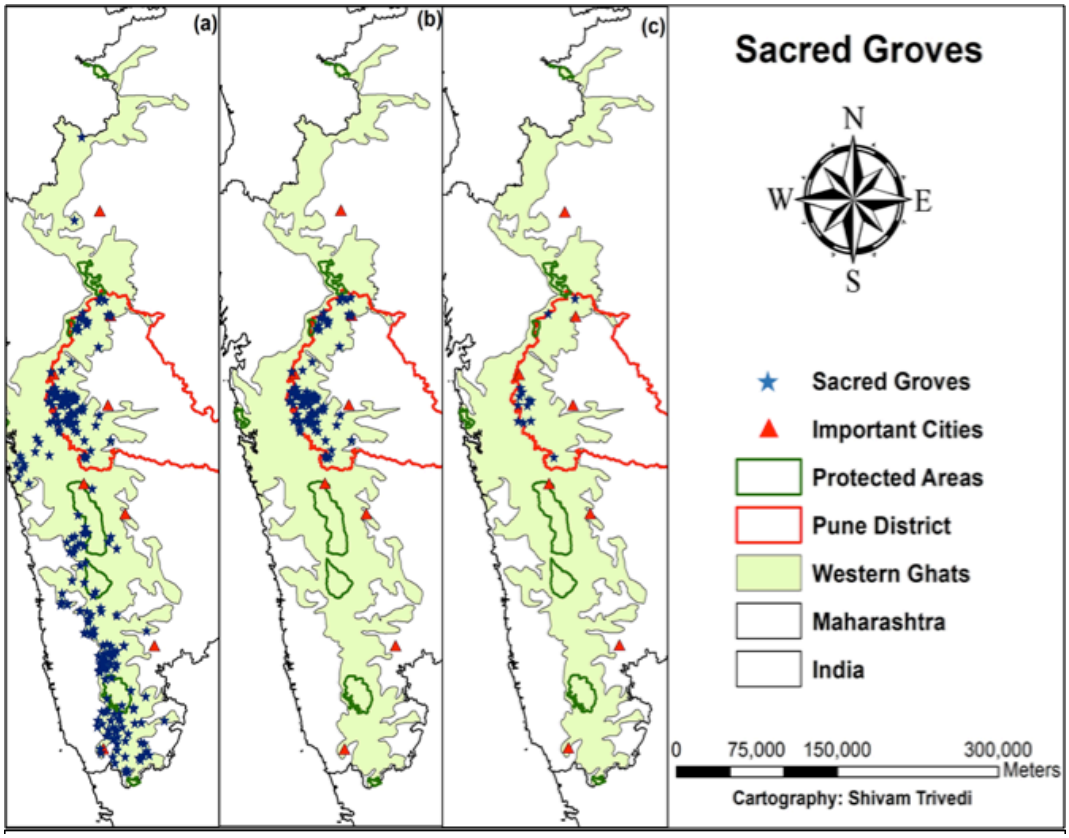

Figure 2. Map of biodiversity hotspecks (sacred groves): (a) Sacred groves of Western Ghats - Maharashtra; (b) Sacred groves of Western Ghats - Pune District; (c) Sacred groves identified for groung survey. (Protect area source: Wildlife Trust of India)

eco-development and by providing income generation alternatives for local people.

A set of questions was designed for conducting semi-structured interviews with the local people. Interviews are an important part of the RAT as it covers all aspects of the survey and helps fill the missing gaps in information of the field survey (Ervin 2003b).

All these parameters were quantified based on a scoring system with a score from 0 to 10 score (2.5 - poor, 5 - fair, 7.5 – good, 10 - very good). This scoring system has been used for assessing the management effectiveness evaluation (MEE) carried out for the protected areas and tiger reserves in India (Mathur et al. 2011). The scores obtained for each parameter were entered in an excel spreadsheet and a database was created. The scores obtained for each parameter for an individual hotspeck were averaged and the results were then depicted graphically. A prioritization matrix was designed where in the 13 sacred groves were grouped into four classes i.e., 0–2.5 (low), 2.5–5 (moderate), 5–7.5 (significant) and 7.5–10 (high) based on the final scores of biodiversity and threats generated in the graph. This prioritization matrix consisted 16 different categories of prioritization.

This tool developed for assessing the biodiversity rich 'hotspecks' is modified from the Rapid Assessment and Prioritisation of Protected Area Management (RAPPAM) technique (Ervin 2003a; Getzner et al. 2012). This is a tool developed for WWF's 'Forest for Life' programme that promotes viable networks of protected areas in the world (Ervin 2003a; Getzner et al. 2012). It is simplified to be used by the practitioners such as ground level forest department staff and the local BMCs under the provisions of the Biological Diversity Act, 2002 (National Biodiversity Authority India 2002).

RESULTS

The scores obtained for sacred groves were depicted graphically. Sacred groves were arranged from north to south and it was observed that the biodiversity and threats are site specific. Geographical conditions do not have a major influence on the biodiversity and threat values (Fig. 3). Both the biodiversity values and threat values showed a negative relation and are

Table 1. Protected areas within the study area

Sno	Name of protected area	Type of protected area	Key features, floral and faunal diversity
1	Purna	Wildlife Sanctuary	The floral diversity consists of 131 tree species, 38 shrub species, 78 climber species, 250 herb species along with 13 orchid species, two partial parasites, five fern species and 47 grass species. The faunal diversity consists of 3,000 insect species, 60 amphibian and reptile species, over 150 bird species and 30 mammal species.
2	Kalsubai	Wildlife Sanctuary	Kalsubai is the highest mountain in Maharashtra. The commonly seen floral species are *Terminalia chebula, Memecylon umbellatum*, *Olea diocia*, *Syzygium cumini*, *Actinodaphne angustifolia*, *Bridelia retusa, Ficus glomerata, Terminalia tomentosa*, *Macaranga pultala*, *Cassia fistula, Actinodaphne hookeri, Diospyros montana, Albizzia procera, Trema orientalis, Memecylon umbellatum and Phyllanthus emblica.*
3	Bhimashankar	Wildlife Sanctuary	Named after the lord Bhimashankar, the area was declared as Wildlife Sanctuary in 1985. The sanctuary harbors 529 faunal species from 12 faunal groups. Faunal species such as Giant Squirrel, Leopard, Jackal, Striped Hyena, Indian Pangolin, Wild Boar, etc., are found in the sanctuary. Bhimashankar is the only home of *Parapsilorhynchus elongatus* an endangered fish species. Apart from this three scorpion species endemic to Western Ghats are found in Bhimashankar Wildlife Sanctuary. An Important Bird Area (IBA).
4	Phansad	Wildlife Sanctuary	Coastal protected area with evergreen and semi evergreen forest, grasslands and small rocky plateaus.
5	Koyna	Wildlife Sanctuary	Threatened tree species such as Narkya Mappia foetida. Tiger, Gaur, Indian Wild Dog, Sloth Bear, Sambar, Barking Deer, Mouse Deer, Indian Giant Squirrel and Common otter are some of the important mammals found here. The sanctuary is also home to the Indian Python, Beddome's Keelback, Indian Chameleon, Banded Gecko and Dwarf Gecko among reptiles and endemic amphibians such as the Koyana Toad, *Indotyphlus*, a caecilian, Wrinkled Frog and Bombay Frog.
6	Chandoli	National Park	Named after the village Chandoli, the park was notified as Wildlife Sanctuary in 1985 and was upgraded to National Park in 2004. A total of 415 species over 13 faunal groups have been recorded. The faunal diversity includes the Endangered *Panthera tigris* Tiger, *Panthera pardus* Leopard, *Bos gaurus* Gaur, *Melursus ursinus* Sloth Bear, *Ratufa indica* Giant Squirrel, *Manis crassicaudata* Pangolin, etc.
7	Radhanagari	Wildlife Sanctuary	Radhanagari Wildlife Sanctuary was earlier known as Dajipur Wildlife Sanctuary and was renamed in 1985 and the area of the sanctuary was increased. A total of 481 species under 11 faunal groups have been recorded. The sanctuary harbors a good population of Bison. There have been sightings of Leopard and Tiger in the sanctuary. Species such as Ceylon Frogmouth, Yellow-browed Bulbul, Dusky Eagle-owl, Great Pied Hornbill, Black Bulbul, Speckled Piculet, and Malabar Crested Lark are commonly seen here. The vegetation includes several threatened and endemic tree species such as *Mappia Foetida, Turpunia malbarica, Euphorbia longna, Elaeocarpus tectorium* and *Harpullia arborea*.
8	Mhadei	Wildlife Sanctuary	Located in Sanguem Taluka of North Goa District, the sanctuary covers an area of 208km^2. The man attraction of visitors is the presence of tiger. Faunal diversity consists of Tiger, Black Panther, Indian Gaur, Barking Deer, Sambar, Rudy Mangoose, Small Indian Civet Cat, Jungle Cat, Wild Dog, Wild Boar, Flying Squirrel, Bonnet Macaque, Common Langur, Pangolin and Slender Loris are the commonly seen mammals. A list of 255 avifaunal species have been recorded from the sanctuary. A variety of reptiles and amphibians are also seen in this sanctuary.

(Trivedi 2006; Kanade et al. 2008; Ministry of Environment, Forest and Climate Change 2010; Jadhav & Patti 2012a,b)

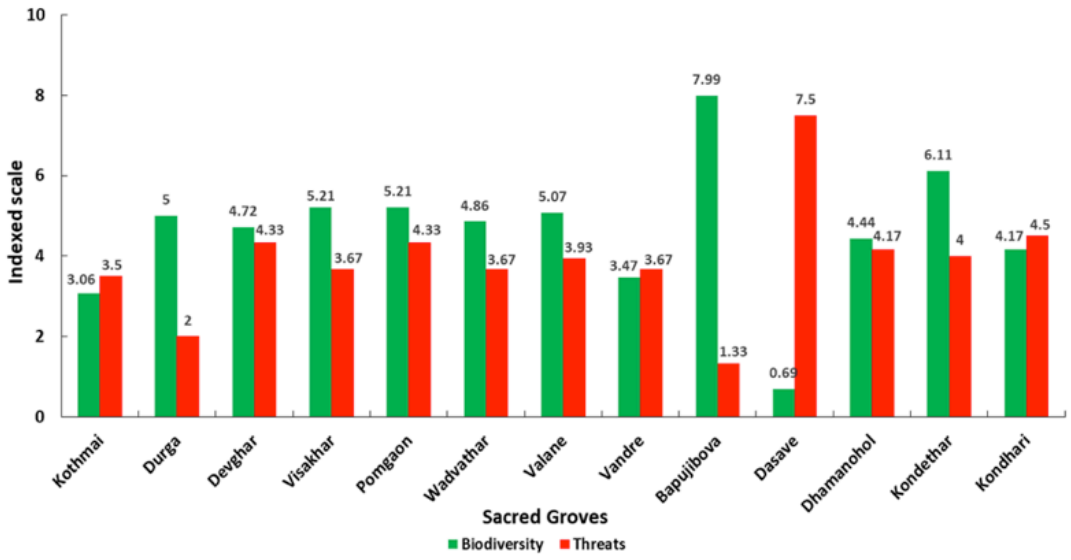

Figure 3. Graph showing north–south arrangement of the sacred groves and the biodiversity and threats scoring

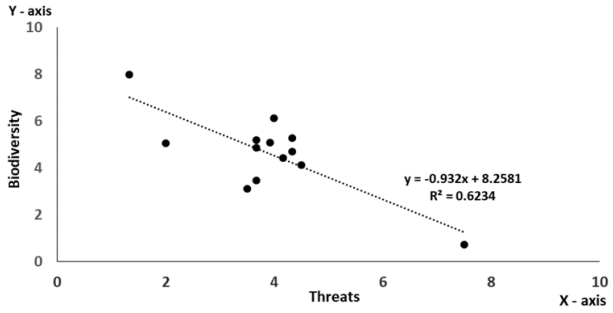

Figure 4. Scatter plot graph of threats over biodiversity

inversely proportional. An increase or decrease in the threat values has an effect on the biodiversity values of the sacred groves (Fig. 4). Further the final scores of biodiversity and threat values for each sacred grove were plotted in the prioritization matrix. Among the 16 categories of prioritization in the matrix seven sacred groves were observed in moderate biodiversity and moderate threat, four sacred groves in significant biodiversity and moderate threat, one sacred grove in high biodiversity and low threat and one sacred grove in low biodiversity high threat categories (refer to figs. 3 & 4, Tables 2 & 3).

DISCUSSION

The 'Rapid Assessment Technique' developed for this study is modified from 'Rapid Assessment and Prioritisation of Protected Area Management' (RAPPM). It is also known as Rapid Ecological Assessment, or 'Biorap' which is a technique used for assessing various ecosystems such as terrestrial, marine and fresh water ecosystems (Margules & Redhead 1995; Sayre et al. 1999). This RAT is usually used for areas where only a small amount of data, or no information is available (Patrick et al. 2014). The RAPPM methodology is widely used as it includes all the elements of international frameworks such as context, planning, inputs, process, outputs and outcomes developed by the World Commission on Protected Areas (WCPA; Goodman 2003; Leverington et al. 2010). The main purpose of the RAPPAM methodology is to increase and improve the conservation of protected areas both of individual sites and the protected area system (Nepali 2006).

Table 2. Prioritisation matrix framework

	Biodiversity				
Threats	Prioritisation matrix	High (7.5–10)	Significant (5–7.5)	Moderate (2.5–5)	Low (0–2.5)
	High (7.5–10)	HB & HT	SB & HT	MB & HT	LB & HT
	Significant (5–7.5)	HB & ST	SB & ST	MB & ST	LB & ST
	Moderate (2.5–5)	HB & MT	SB & MT	MB & MT	LB & MT
	Low (0–2.5)	HB & LT	SB & LT	MB & LT	LB & LT

HB: High biodiversity, SB: Significant biodiversity, MB: Moderate biodiversity, LB: Low biodiversity, HT: High threat, ST: Significant threat, MT: Moderate threat and LT: Low threat

The RAPPAM questionnaire is also an important part of the tool as it covers all the aspects of the international evaluation framework developed by the WCPA (Nchor & Ogogo 2012). The questionnaire is divided into seven sets of which the first set deals with the basic information about the Protected Areas including the management objectives and activities. The second set of questions deals with the various types of threats prevailing in the protected areas. The remaining set of questions deal with the context, inputs, processes, outputs and results (Veenvliet & Sovinc 2009).

The RAPPAM tool is designed for comparing the protected areas with each other at a broad level that together form the protected area system. It is used for identifying the management issues for the protected areas by assessing the strength and weaknesses in managing the biodiversity rich areas. The tool identifies the distribution of different types of threats, helps in identifying ecologically and socially important areas and thus being able to decide on the conservation priorities for individual areas so that economic and human resources can be provided on a rational basis

Table 3. Prioritisation matrix indicating the positions of sacred groves in Pune District

	Biodiversity				
Threats	Prioritisation matrix	High (7.5–10)	Significant (5–7.5)	Moderate (2.5–5)	Low (0–2.5)
	High (7.5–10)				Dasave
	Significant (5–7.5)				
	Moderate (2.5–5)		Kondethar, Pomgaon, Visakhar, Valane	Durga, Wadvathar, Devghar, Dhamanohol, Kondhari, Vandre, Kothmai	
	Low (0–2.5)	Bapujibuva			

(Leverington et al. 2008). Over the last two decades the MEE has covered a large number of protected areas in India by expert teams which has provided substantial inputs into conservation and management of protected areas. This has permitted more rational allocation of funds and manpower and capacity building for the evaluated protected areas.

This rapid assessment tool if used across the Western Ghats would provide the data necessary for creating a chain of small conserved areas using local panchayats and government initiatives through the Biodiversity Act, 2002 with support from the State Biodiversity Board, which is mandated to preserve local biological assets (National Biodiversity Authority India 2002).

CONCLUSIONS

This study has assessed 13 identified sacred groves in the Western Ghats of Pune District. The prioritization is done using the biodiversity and threat status of the sacred groves. The first aspect is the biodiversity status which identifies sites with high levels of biodiversity values. The second aspect is the threat status describing the extent of threats ranging from the highest to the lowest. This provides indicators for likely changes in landscape level management in future. Even though the results are based on ground surveys carried out in only 13 sacred groves, they are intended as a proof-of-concept on which future biodiversity assessment of sacred groves could be based.

This prioritization can be used by the relevant government department to use their limited resources based on a set of rational parameters and for local administrative bodies at village level to conserve biorich sites through the Biodiversity Act, 2002.

It is relevant here to establish that these hotspecks are of great conservation importance as they act as potential jump sites, and form a permeable matrix for several faunal species. Thus together they constitute an effective corridor system without disrupting local land use patterns.

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Appendix 1. Salient features of sacred groves surveyed

Sr. no	Sacred grove (Lat. & Long.)	Salient feature
1	Kothmai (19.333904°N & 73.874078°E)	The sacred grove covers an area of approximately 31.5ha. The grove forest consists of deciduous and semi-evergreen species. There was sighting of Wild Boar *Sus scrofa cristatus* during the survey and during the interview it was found that there have been also sightings of Leopard *Panthera pardus fusca* in the grove and the surrounding forest areas. There were signs of wood logging in the sacred grove.
2	Durga (19.219986°N & 73.648744°E)	The sacred grove covers an area of approximately 14.4ha. The grove forest consists of deciduous and semi-evergreen floral species. There were sightings of Gray Langur *Semnopithecus* during the survey and from the interviews it was found that there are Wild Boar and Barking Deer *Muntiacus muntjak* found in this region with no major predator species. This is because the grove forest is fragmented from the surrounding forest area. Grazing and wood collection are the major threats to this sacred grove.
3	Devghar (18.651767°N & 73.416127°E)	The sacred grove covers an area of approximately 3.45ha. The grove forest consists of semi-evergreen to evergreen floral species. There were sightings of Indian Paradise Flycatcher *Terpsiphone paradisi* and Blue Mormon *Papilio polymnestor* which are indicators of good forest habitat. During the interviews, it was found that there have been sightings of Wild Boar, Barking Deer, Black-naped Hare *Lepus nigricollis* and Sambar *Rusa unicolor* in the surrounding forest areas. Neo-urbanisation is a major threat in the surrounding of the grove forest and other threats include grazing and collection of wood.
4	Visakhar (18.623321°N & 73.431763°E)	The sacred grove covers an area of approximately 3.88ha. The grove forest consists of semi-evergreen to evergreen floral species. During the interviews, it was found that there have been sightings of Sambar, Barking Deer and Wild Boar in the area and the major predator specie of this region is Leopard but the sightings are very rare. Neo-urbanisation, grazing and wood collection are the major threats.
5	Pomgaon (18.590171°N & 73.407927°E)	The sacred grove covers an area of approximately 4.12ha. The grove forest consists of semi-evergreen to evergreen floral species. During the survey, there was a sighting of Common Trinket *Coelognathus helena* and it was the found from the interviews that the habitat is conducive for Wild Boar, Sambar, Barking Deer, Black-naped Hare, and Leopard is a major predator of this region. The major threat to this sacred grove is neo-urbanisation, collection of grass for fodder and wood for fuel.
6	Wadvathar (18.560783°N & 73.485869°E)	The sacred grove covers an area of approximately 1.70 hectares. The grove forest consists of semi-evergreen to evergreen floral species. During the survey, there were sightings of Barking Deer and Bamboo Pit Viper *Trimeresurus gramineus*. The habitat is conducive of Wild Boar, Black-naped Hare, Sambar and Leopard as major predator. The grove forest is divided by road and there are threats like grazing, resource collection and neo-urbanisation.
7	Valane (18.554877°N & 73.508233°E)	The sacred grove covers an area of approximately 1.10ha. The grove forest consists of semi-evergreen to evergreen floral species. A part of the sacred grove has traces of secondary forest. During the survey, there were sightings of Common Bronze-back Tree Snake *Dendrelaphis tristis*, Common Iora *Aegithina tiphia*, Blue Mormon *Papilio polymnestor* and Malabar Whistling Thrush *Myophonus horsfieldii*. The habitat is suitable for faunal diversity such as Leopard, Wild Boar, Sambar and Barking Deer as found from the interviews. During the survey, it was also found that collection of resources such as Karvanda *Carissa carandas* fruit and Fishtail Palm *Caryota mitis* juice are collected from the grove forest. This grove is privately owned. Grazing and wood and other resource collection are the common threats existing in the grove forest.
8	Vandre (18.517449°N & 73.473860°E)	The sacred grove covers an area of approximately 5.72ha. The grove forest consists of semi-evergreen to evergreen floral species. During the survey, there were sightings of Bonnet Macaque *Macaca radiata*, Black-winged Kite *Elanus caeruleus* and Rat Snake *Ptyas mucosa* and during the interviews it was found that the habitat is suitable for species like Wild boar (*Sus scrofa cristatus*), Sambar, Black-naped Hare and Barking Deer. Leopard is only predator found in the region but the sightings are rare. Grazing and collection of wood were the only threats found in the sacred grove.
9	Bapujibova (18.521931°N & 73.395148°E)	The sacred grove covers an area of approximately 8.82ha. The grove forest consists of semi-evergreen to evergreen floral species. The grove forest has trees with girth size ranging from 2–6 m indicating a pristine and old forest growth. There were sightings of Barking Deer, Indian Paradise Flycatcher, Green Keelback *Macropisthodon plumbicolor* and Blue Mormon *Papilio polymnestor* which are indicator species of a good forest habitat. This sacred grove is in the interiors of the Western Ghats of Pune District and hence the threats observed were not major.
10	Dasave (18.402100°N & 73.504977°E)	This is the smallest sacred grove covering an area of approximately 0.009ha. Dasave sacred grove is completely degraded grove. The deity resides under a dead bamboo in the catchments of the dam. This sacred grove is in the center of the neo-urbanised area, i.e., Lavasa.
11	Dhamanohol (18.387590°N & 73.440985°E)	The sacred grove covers an area of approximately 2.12ha. The grove forest consists of semi-evergreen to evergreen floral species. The uniqueness about this grove is that the deity of the grove resides in the village unlike other sacred grove where the deity resides in the grove forest itself. There were droppings of Black-naped Hare sighted during the survey. There were no major threats observed in the grove other than collection of wood for fuel.
12	Kondethar (18.398466°N & 73.396706°E)	The sacred grove covers an area of approximately 2.27ha. The grove forest consists of semi-evergreen to evergreen floral species. The grove forest has trees with girth size ranging from 2–5 m indicating an old forest growth. During the survey, there were sightings of Malabar Giant Squirrel *Ratufa indica*, Asian Palm Civet *Paradoxurus hermaphroditus*, Malabar Grey Hornbill *Ocyceros griseus*, Bonnet Macaque *Macaca radiata*, Malabar Whistling Thrush, Blue Mormon and Bamboo Pit Viper. Tourism and related impacts are a major threat to the sacred grove. Recently the grove old grove temple was converted to a concrete temple by the village authorities because of the tourists visiting the sacred grove.
13	Kondhari (18.123396°N & 73.697390°E)	The sacred grove covers an area of approximately 1ha. The grove forest consists of semi-evergreen to evergreen floral species majorly dominated by evergreen floral species. There are two deities residing in the sacred grove. The forest habitat is conducive for faunal diversity such as Wild Boar, Black-naped Hare, Sambar and Barking Deer and a variety of forest birds. During the interviews, it was documented that Leopard is the prime predator specie of this region however the sightings are rare. Wood collection and grazing were the only threats observed in the sacred grove.

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