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Sacred forests of India: a strong tradition of community-based natural resource management

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THEMATIC SECTION
Community-based natural resource management (CBNRM): designing the next generation (Part 2)

SUMMARY

Sacred forests represent an important long-held tradition of conserving specific land areas that have cultural, and often religious, significance. India, with its diversity of cultures and traditions, has over 100 000 sacred forests. Many of these groves are forest fragments in agricultural landscapes. In most cases, community members are at least aware of these fragments, if not actively involved in their protection and management. This review focuses on the Western Ghats in southern India and Meghalaya state in north-eastern India, both international biodiversity hotspots. In addition to the cultural significance of sacred forests, a number of studies have suggested that they are important refuges for conservation of biological diversity, including medicinal plants, within highly anthropogenic landscapes. Whilst sacred groves have been successful conservation areas, current threats to these forests are numerous, ranging from pressures for use of timber and other forest products to clearing for agriculture or general changes in cultural traditions. A variety of arrangements exist for ownership and management of sacred forests, making it necessary to identify solutions on a case-by-case basis. Support for the continued practice of the tradition of sacred forest protection is needed in order to provide a culturally sensitive model for community-based natural resource management.

Keywords: community-based conservation, customary conservation, ecosystem services, protected areas, sacred groves, traditional conservation practices

INTRODUCTION

Sacred forests around the world represent a traditional form of community-based conservation. Sacred forests, also sometimes referred to as sacred groves, are sites that have cultural or spiritual significance to the people who live around them. There is a wide variation in the size of sacred forests. Some of them are small fragments of forest less than one hectare, and others are more extensive, spanning several hundred

hectares (Ntiamao-Baidu 1995; Malhotra *et al.* 2007). Sacred forests have been protected around the world for a variety of reasons, including for religious practices or ceremonies, as burial grounds and for their watershed value (Lebbie & Freudenberg 1996; Chandran & Hughes 1997; Greene 2002; Blench 2004; Malhotra *et al.* 2007). These areas are known to provide ecosystem services, such as erosion control and maintenance of high water quality (Tiwari *et al.* 1998).

India has the highest concentration of sacred forests in the world. Estimates suggest that there might be between 100 000 and 150 000 sacred forests around the country (Malhotra *et al.* 2007). These community-protected forests are often associated with or believed to house a god or gods, and are typically named after deities (Chandrakanth *et al.* 2004). Globally, sacred forests often have associated myths and taboos on the use of specific plants and hunting of certain species of animals within the area. These traditions can serve a conservation role because some of the sacred forest fragments represent the sole remaining forests and the last remaining locations with potential for conservation of flora and fauna. For example, church forests in Ethiopia protect some of the last remaining fragments of tropical afro-montane forests (Aerts *et al.* 2006), while sacred forests on the south-east coast of India are the only remnants of dry evergreen forest habitat (Ramanujam & Kadamban 2001; Ramanujam & Praveen Kumar Cyril 2003; Mani & Parthasarathy 2005).

One region in India, the Western Ghats (Fig. 1), not only has a very high number of sacred forests (Kushalappa & Bhagwat 2001), it is also recognized globally as a 'biodiversity hotspot,' meaning that it simultaneously has a high concentration of unique species and is under extreme resource use pressure (Myers *et al.* 2000). The Kodagu district of the Western Ghats alone contains over 1200 sacred groves (Boraiah *et al.* 2003). Yet, in the Western Ghats region, it is estimated that only 7% of the original vegetation now remains (Myers *et al.* 2000). Although sacred forests are often small fragments, they may be the only remaining reservoirs of biological diversity outside protected areas (PAs). They may also represent important traditions that are being lost as new generations do not continue oral histories and cultural practices. In addition, sacred forests conserve habitats that are not represented within the current PA system (Bhagwat & Rutte 2006) and may serve as refugia for endemic species (Jamir & Pandey 2003). These are reported to be relict forests and may be the only remaining climax vegetation of an area,

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Figure 1 Map of India, showing the location of the Western Ghats.

although many are now disturbed as a result of human actions (Khiewtam & Ramakrishnan 1989; Tiwari *et al.* 1998).

Globally, conservation biologists and resource managers are starting to take note of sacred forests as potential storehouses of biodiversity (for example Castro 1990; Lebbie & Freudenberg 1996; Ramakrishnan 2003; Bhagwat & Rutte 2006; Sheridan & Nyamweru 2007). For example, many threatened plants in Meghalaya, a state in north-eastern India, are known to be confined to sacred forests which are remnants of climax vegetation (Khan *et al.* 1997). Yet these sites typically have no legal protection; they are managed and protected by local residents. For instance, in the Western Ghats of India, there is confusion over the ownership of sacred forests with a history of three separate government departments claiming their ownership (Garcia & Pascal 2006).

This paper provides a review of sacred forests as a form of community-based natural resource management (CBNRM), with a particular focus on the sacred forests of India. We give specific attention to the Western Ghats region of southern India and Meghalaya state in north-eastern India. Both these regions have a high concentration of sacred forests, and have also been identified as key areas for biodiversity conservation owing to their high species diversity and high levels of endemism (Khan *et al.* 1997). Based on an extensive review of published studies on sacred forests, we suggest that these forests can serve a valuable function in protection of both biological and cultural resources whilst providing a tangible model for CBNRM. A large number of studies on sacred forests have been published over the last decade; by synthesizing the research to date on the sacred forests of India,

this review aims to help the conservation community and policy-makers to (1) acknowledge the value of sacred forests and (2) consider the needs for future study and action to avoid the loss of these important community-conserved areas.

SACRED GROVES AS COMMUNITY-CONSERVED AREAS

Recently, the international conservation community has taken interest in both the conservation value of sacred forests (see for example Wild & McLeod 2008; and the International Union for Conservation of Nature (IUCN) World Commission on Protected Areas (WCPA) Specialist Group on Cultural and Spiritual Values URL <http://www.csvpa.org/>) and the historical and future roles of communities in the conservation of sacred forests (for example Berkes 2009). The potential role of faith communities in conservation is also receiving attention (for example Dudley *et al.* 2009).

Sacred forests across the world are conserved primarily for spiritual reasons. Harming the forest is forbidden by tradition and it is typically believed that any alteration of the forest, such as cutting wood for construction or firewood, hunting animals or other forms of resource extraction, will result in negative consequences to the person taking the resources (Gadgil & Vartak 1976; Chandrakanth *et al.* 1990; Barre *et al.* 2009). According to Chandrakanth *et al.* (2004, p. 105), resource extraction from a sacred forest in India was perceived as a serious offence and 'traditional people believed that the punishment for such crimes would be to be reborn as urchins for thousands of years'. At Mawphlang sacred grove in Meghalaya, several residents recalled events when outsiders tried to harvest trees from the sacred grove but then fell ill (A. A. Ormsby, unpublished data). Thus, belief in the negative consequences of actions that harm sacred groves serves as a method of maintaining the grove and keeping it intact and preserved.

CBNRM has been suggested as a way to ensure that conservation projects are effective (Western *et al.* 1994). Subsequently, CBNRM has been criticized for not truly and authentically involving communities, or by still having expatriate control of projects (for example see Leach *et al.* 1999). The participation continuum developed by Pretty *et al.* (1995) offers a useful method of measuring how authentically communities are involved in a project, ranging from manipulative participation to self-mobilization. Applying the model of sacred forests in India to this continuum, it is evident that these are a true example of self-initiated community participation. As Berkes (2004, p. 625) pointed out, 'If local common property institutions are consistent with conservation objectives, as in the case of traditional sacred areas, that is an ideal situation'.

SACRED GROVES AS A TRADITIONAL CONSERVATION PRACTICE

It is believed that the sacred grove conservation tradition in India began around the same time as the start of settled

Table 1 Examples of terminology for sacred forests in different regions of India.

<i>Location</i>	<i>Name for sacred groves</i>	<i>Reference</i>
Bihar	<i>Sarnas</i>	Chandrashekara and Sankar (1998)
Himachal Pradesh	<i>Dev van</i>	Khumbongmayum <i>et al.</i> (2004)
Karnataka	<i>Devarakadu</i>	Kalam (1996); Chandran and Hughes (1997); Chandrashekara and Sankar (1998); Chandrakanth <i>et al.</i> (2004)
Kerala	<i>Kavu</i>	Chandran and Hughes (1997); Chandrashekara and Sankar (1998)
Madhya Pradesh	<i>Dev van</i>	Chandrashekara and Sankar (1998)
Maharashtra	<i>Devrai, Devrahati or Dev van</i>	Chandrashekara and Sankar (1998); Chandran (1998); Khumbongmayum <i>et al.</i> (2004)
Manipur	<i>Lai Umang</i>	Khumbongmayum <i>et al.</i> (2004)
Meghalaya	Khasi terms are <i>Law Kyntang</i> or <i>Law Lyngdoh</i> . Jaintia terms are <i>Khlaw U Blei</i> or <i>Khloo Blai</i> . Garo term is <i>Asong Khosi</i> .	Jamir <i>et al.</i> (2006); B. K. Tiwari (personal communication 2009)
Rajasthan	<i>Oran</i>	Chandrashekara and Sankar (1998)
Tamil Nadu and Kerala	<i>Sarpa Kavu or Kavu</i>	Chandrashekara and Sankar (1998)
Uttara Kannada (northern Karnataka)	<i>Kans</i>	Chandran and Hughes (1997); Gokhale (2004)

agriculture (Hughes & Chandran 1998). The motivation behind keeping patches of forest may have been the ecological services that such patches provide. These include soil conservation, maintaining watersheds and provision of forest products. The communities may have protected groves in honour of pagan gods, animistic deities or ancestral spirits (Kosambi 1962). In India, many of these original gods, deities and spirits underwent transformation over the years into mainstream gods and goddesses, although the tradition of conserving patches of forest has been maintained until today (Chandrakanth *et al.* 2004). Traditional forest conservation practices are seen in current society in various forms. For example in Udaipur district (Rajasthan, north-west India), the sprinkling of saffron water around a piece of land is a common practice (Gandhi 1997). The attempts of the local forest department to conserve an area of forest at a site near Udaipur were largely unsuccessful because of persistent transgressions by local people. Frustrated, the forest officers decided to sprinkle saffron water around the site, in accordance with the local tradition. This was greeted with enthusiasm by the local people and, since then, they have respected the boundaries of the conservation area (Gandhi 1997).

Today, there are a variety of arrangements for sacred forest ownership and management. Chandrashekara and Sankar (1998) noted that management of sacred groves in Kerala (India), was undertaken by individual families, groups of families or statutory agencies for temple management. Chandrakanth *et al.* (2004) studied sacred groves in Kodagu (India) and noted two types of management systems, either family-owned or community-managed. Tiwari *et al.* (1998) observed that the sacred groves in Meghalaya (India) were managed by a committee from the community which was chaired by a community priest who performed the ceremonies associated with the forest. The local names for sacred forests vary by region in India (Table 1).

CONSERVATION VALUE OF SACRED FORESTS

As a result of the long-term conservation of forest patches by communities who consider them to be sacred, relict patches of once extensive forest have been preserved (Gadgil & Vartak 1976). Sacred forests have consistently been found to have higher species diversity than surrounding areas and, in some cases, even more than government-protected areas in similar regions. Sacred forests also contain a high diversity of medicinally important plants. In a study of five sacred groves in Kodagu (Karnataka, India), Boraiah *et al.* (2003) found that 60% of the regenerating species (136 of 241 species) were medicinally important.

Sacred forests cover a wide variety of habitats and protect many species in landscapes outside PAs (Bhagwat & Rutte 2006). For example, sacred forests in coastal parts of Karnataka (India) protect swamps inhabited by a species of nutmeg, *Myristica fatua*. Surveys suggest that this species is exclusively found in coastal swamps and is outside the boundaries of PAs in the region, all of which cover mountain habitat (Chandran & Mesta 2001). In addition, the species *Myristica magnifica* and *Pinanga dicksoni* are now mainly confined to a *Myristica* swamp in a sacred grove (*kan*) of Uttara Kannada in northern Karnataka (Chandran 1998). In southern Karnataka, in the Kodagu district of the Western Ghats, sacred forests were found to protect threatened tree species such as *Actinodaphne lawsonii*, *Hopea ponga*, *Madhuca neriifolia* and *Syzygium zeylanicum*, which are not found within PAs (Bhagwat *et al.* 2005a).

Ecological theory states that patches of forest that are fragmented lose species and have low biodiversity, suggesting that such patches have limited value for biodiversity conservation (Hill & Curran 2001). However, a network of patches is known to support higher biodiversity than a single patch alone (Tabarelli & Gascon 2005). Furthermore, if the patches are connected by corridors, they can potentially

support an even higher number of species (Wadley & Colfer 2004). In the Kodagu district in the southern part of Karnataka state, more than 1200 sacred forests form an informal network of reserves with one forest grove for every 300 hectares of land (Bhagwat *et al.* 2005b). Interspersed between these patches are coffee plantations which support trees kept in plantations for shade. The conservation of sacred groves is integrated within the surrounding landscape matrix because the presence of trees in coffee agroforestry in Kodagu has been helpful in protecting forest-dwelling biodiversity within groves. The tree-covered nature of the landscape matrix means that ecological boundaries between the patches and surrounding plantations are indistinct and thus the patches are not as fragmented (Bhagwat *et al.* 2005b). Protection and active management of trees (for example, replanting of native species when old shade trees die out) requires support from local communities, particularly coffee planters. Whilst the local communities respect the 'spiritual fence' around sacred forests, it is necessary that they also realize the importance of keeping native trees in their own plantations near sacred forests, rather than replacing native trees with fast-growing exotics such as *Grevillea robusta* (Garcia *et al.* 2010).

BIODIVERSITY IN SACRED FORESTS

Many sacred forests in India have been studied, primarily to measure their species richness, with a general focus on plant species. Jamir and Pandey (2003) measured plant species diversity of three sacred forests in Meghalaya and found a total of 395 species, 14% of which were endemic. Tiwari *et al.* (1998) studied 79 sacred forests in Meghalaya, ranging from 0.01 to 900 hectares in size, and found that the species diversity was much higher than in disturbed forests. Upadhaya *et al.* (2003) studied two sacred forests in Meghalaya and found that the groves had high species richness and represented high diversity forest. Khan *et al.* (1997) surveyed the botanical literature for Meghalaya and realized that 4% of species (133 species) were found only in sacred groves. They advocate for systematic botanical surveys, predicting that this would lead to the discovery of new species, as well as an inventory of the number, size and distribution of sacred groves. In addition, Khan *et al.* (1997) recommend that sacred groves should be included within the legal PA network.

Also in the north-east of India, the sacred groves of Manipur have been found to contain abundant medicinal plants (Khumbongmayum *et al.* 2005a, 2006). Khumbongmayum *et al.* (2004, 2005b) inventoried 166 sacred groves in Manipur, ranging in size from a few trees to 40 hectares, and identified a number of species of sacred plants that were found within forest groves. Most groves, as in other areas of India, did not have demarcated boundaries. Dash (2005) and Arora (2006) studied the Kabi sacred grove in North Sikkim. This grove, measuring 3 km², was found to have 241 species of plants (Dash 2005). Dash (2005), however, observed that the size of the grove was decreasing due to anthropogenic pressures and recommended that the state government collaborate with

the local community to strengthen the management of the grove. Conversely, Arora (2006) noted that the groves rely on socioreligious fencing for their continued conservation, which is rejuvenated by regular rituals that are required to maintain the practices of social fencing. Therefore, a combination of approaches may be necessary to maintain the integrity of sacred groves.

THREATS TO SACRED FORESTS

There are several key threats that have led to the reduction in size or lack of protection of sacred forests in India (Chandrakanth *et al.* 2004; Khan *et al.* 2008; Wild & McLeod 2008). Historic forest policy in many cases took away local rights to the forests (Gokhale 2004) and in some cases gave forest concessions to companies. In many cases, the process of the Indian Government nationalizing forests has taken away community land rights to sacred forests (Chandrakanth *et al.* 2004).

There is a great demand to use the natural resources within the sacred forests. Coffee from the Kodagu area is a major export from the state of Karnataka. There has been encroachment on numerous sacred groves to grow coffee (Chandrakanth *et al.* 2004). Furthermore, the legal ownership of many sacred groves is also uncertain (Chandrakanth *et al.* 2004). In Kodagu, for example, the sacred groves are owned by the forest department and managed by village temple committees. However, historically, ownership of sacred groves has been ambiguous, with forest department and revenue department being entrusted with management at different periods. As a result, management has not been consistent and this has led to confusion about the groves' status among local stakeholders. Chandrakanth *et al.* (2004) argued that sacred groves should not be allowed to be classified as State Reserve Forests. This would take management control away from community members. Furthermore, people are not motivated to conserve land that does not belong to them (Hardin 1968); government ownership can cause alienation of local people from their groves.

Cultural change over time has led to weakening of sacred forest protection and traditions. Sacred forests in the Kodagu region of South India are disappearing due to commercial agriculture, changing beliefs and weak property rights systems (Chandrakanth *et al.* 2004). Younger generations are losing interest in the sacred grove traditions. Agricultural labourers and timber harvesters from outside the region do not share local beliefs. Changes in religious traditions and belief systems have also led to a weakening of the protection and conservation of sacred forests. In some cases, Hinduism has subsumed the sacred forests that were established for older folk deities, yet the groves are still maintained while Hindu gods are worshipped. This may involve Hindu temples being built within the sacred forests (Bhagwat & Rutte 2006). The removal or use of wood from the forests for religious purposes is allowed (Kalam 1996; Tiwari *et al.* 1998). According to Chandran and Hughes (1997, p. 416), 'In Uttara Kannada,

the deities of the groves were not, and in many cases still are not, the characteristic gods of Hindu devotion such as Shiva, Vishnu, Parvati, Lakshmi, Ganapati, etc., but pre-Brahmin deities, mostly indistinct beings that may be represented aniconically'. Furthermore, 'The local deities to whom the sacred groves were dedicated have been in many cases identified with, or absorbed into, the great gods of the pantheon. . .' (Chandran & Hughes 1997, p. 420). Chandran and Hughes (1997) further contended that 'These have often resulted in the erection of temple buildings and the diminution of the groves. There is also a tendency to relax the rules protecting the groves as the center of ritual moves away from the trees and toward the temple building' (p. 420). Sanskritization, a term used to refer to the replacement of local folk deities with Hindu deities in sacred forests, often results in temples being built within forests (Bhagwat & Rutte 2006).

Changes in the society's structure and composition, as well as economic status and religious values, pose another challenge. In Meghalaya, tribal religion and culture has been replaced by Christianity. Tiwari *et al.* (1998) interviewed residents near 79 sacred groves, and 95% of respondents attributed degradation of the grove to this change in religious beliefs. In Kodagu, increasing urbanization has caused dilution of religious and cultural values, often leading to desecration of sacred groves (Kalam 1996). In some cases, the neighbouring landowners have encroached upon groves to expand their plantations. Urbanization has also led to movement of rural dwellers to cities. At the same time, immigrant plantation workers have settled in the district as permanent residents. The immigrants often do not share the same cultural and spiritual values that local people have concerning sacred groves. In some cases, this has led to further desecration of sacred groves owing to forest clearance for immigrant settlements (Bon 2000). Whilst it may not be possible to reverse the immigration pattern, it may be possible to establish certain safeguards against desecration of sacred groves. This is where the local communities and government representatives need to operate together.

MANAGEMENT OF SACRED FORESTS

Although currently under threat, sacred forests represent a strong tradition of CBNRM that has existed for hundreds of years. There is no one answer for a specific approach to sacred forest management globally due to the challenges posed by a wide variety of land rights and management systems. These include family-owned and managed forests, community-owned and/or managed forests, as well as those owned and/or managed by the government, meaning that 'one size fits all' management solutions are unlikely to succeed.

Government and international conservation policy should support traditional institutions of sacred forest management, whether at the family, community or even regional level. Given that each sacred site has its own history of protection and formation, the form that this support should take is unclear. However, what is clear is that one general policy, such

as designating sacred forests as formal government-managed protected areas, will not work for all sacred forests. As Dudley *et al.* (2009, p. 568) noted, 'Bringing a sacred natural site into a national protected-area system can increase protection for the site, but may compromise some of its spiritual values or even its conservation values'.

In some cases, outside support for sacred forest conservation is needed. For example, in the case of the sacred groves of Meghalaya, Tiwari *et al.* (1998) called for external intervention. There are cases in other countries where such external intervention has been successful. For instance, at Tafi Atome Monkey Sanctuary, a sacred forest in Ghana, community members elicited the support of an Accra-based non-governmental organization to develop ecotourism to the site and support sacred grove conservation traditions (Ormsby & Edelman 2010). When the sacred monkeys at the Boabeng-Fiema Monkey Sanctuary (Ghana) were threatened by religious leaders who supported monkey hunting to undermine traditional belief systems, the community asked for government support for a hunting ban, which was successful (Fargey 1992; Saj *et al.* 2006; Ormsby 2011).

In order to counter the current threats posed to sacred forests due to religious and cultural changes as well as by natural resource pressures, a renewal of community traditions is needed. Local residents must continue to be involved in forest management (Bhagwat *et al.* 2005a). This may come through revival of past ceremonies related to a grove, or through awareness campaigns and education programmes highlighting the ecological and spiritual benefits of the forests (Chandrashekhara & Sankar 1998). The community tradition of protecting sacred forests provides an example of a way to achieve landscape-level conservation that is implemented and maintained at a local level.

For effective conservation of sacred forests, it is important to consider and respect community values behind such conservation. This approach to conservation is very different to that of maintaining formal PA networks. Whilst formal protection is bound by legal framework, informal conservation traditions are governed by customs and taboos (Colding & Folke 2001; Barre *et al.* 2009). An approach that is sensitive to local peoples' traditions, such as sacred forest conservation, is likely to work better than an approach that alienates local people. Recognizing and incorporating such traditions is important for successful conservation programmes.

CONCLUSIONS

Sacred forests present an alternative view of conservation that is led by norms and taboos rather than formal legal frameworks. They protect a wide variety of habitats and hold considerable potential for biodiversity conservation. Such sites offer protection to habitats and species that are excluded from formal PAs, and this approach to conservation has greater acceptance among local people. However, sacred forests face a number of challenges that need to be addressed. Greater sensitivity towards these conservation traditions is necessary.

For effective conservation management of sacred forests, their importance must be established in international fora in order to attract conservation funding. Sacred forests are not just cultural monuments, they are conservation areas that can provide a culturally-sensitive model for CBNRM.

References

- Aerts, R., Van Overtveld, K., Haile, M., Hermy, M., Deckers, J. & Muys, B. (2006) Species composition and diversity of small afro-montane forest fragments in northern Ethiopia. *Plant Ecology* 187: 127–42.
- Arora, V. (2006) The forest of symbols embodied in the Tholung sacred landscape of North Sikkim, India. *Conservation and Society* 4(1): 55–83.
- Barre, R.Y., Grant, M. & Draper, D. (2009) The role of taboos in conservation of sacred groves in Ghana's Tallensi-Nabdam district. *Social and Cultural Geography* 10(1): 25–39.
- Berkes, F. (2004) Rethinking community-based conservation. *Conservation Biology* 18 (3): 621–630.
- Berkes, F. (2009) Community conserved areas: policy issues in historic and contemporary context. *Conservation Letters* 2: 19–24.
- Bhagwat, S.A. & Rutte, C. (2006) Sacred groves: potential for biodiversity management. *Frontiers in Ecology and the Environment* 4(10): 519–524.
- Bhagwat, S.A., Kushalappa, C.G., Williams, P.H. & Brown, N.D. (2005a) The role of informal protected areas in maintaining biodiversity in the Western Ghats of India. *Ecology and Society* 10(1): 8.
- Bhagwat, S.A., Kushalappa, C.G., Williams, P.H. & Brown, N.D. (2005b) A landscape approach to biodiversity conservation of sacred groves in the Western Ghats of India. *Conservation Biology* 19(6): 1853–1862.
- Blench, R. (2004) Cultural and biological interactions in the savanna woodlands of northern Ghana: sacred forests and management of trees. Paper presented at the conference Trees, Rain and Politics in Africa, Oxford University [www document]. URL <http://www.rogerblench.info/Ethnoscience%20data/Oxford%20paper%202004.pdf>
- Bon, E. (2000) An economic framework to land extensification. In: Chapter 5. The Dynamics of Land Use. *Mountain Biodiversity, Land Use Dynamics, and Traditional Ecological Knowledge*, ed. P.S. Ramakrishnan, U.M. Chandrashekhara, C. Elouard, C.Z. Guilmo, R.K. Maikhuri, K.S. Rao, S. Sankar & K.G. Saxena, pp. 79–88. Man and the Biosphere Programme. New Delhi, India: Oxford and India Book House.
- Boraiah, K.T., Vasudeva, R., Bhagwat, S.A. & Kushalappa, C.G. (2003) Do informally managed sacred groves have higher richness and regeneration of medicinal plants than state-managed reserve forests? *Current Science* 84(6): 804–808.
- Castro, P. (1990) Sacred groves and social change in Kirinyaga, Kenya. In: *Social Change and Applied Anthropology*, ed. M.S. Chaiken & A.K. Fleuret, pp. 277–289. Boulder, CO, USA: Westview Press.
- Chandrakanth, M.G., Bhat, M.G. & Accavva, M.S. (2004) Socio-economic changes and sacred groves in South India: protecting a community-based resource management institution. *Natural Resources Forum* 28: 102–111.
- Chandrakanth, M.G., Gillies, J.K., Gowramma, V. & Nagaraja, M.G. (1990) Temple forests in India's forest development. *Agroforestry Systems* 11(3): 199–211.
- Chandran, M.D.S. (1998) Shifting cultivation, sacred groves and conflicts in colonial forest policy in the Western Ghats. In: *Nature and the Orient: the Environmental History of South and Southeast Asia*, ed. R.H. Grove, V. Damodaran & S. Sangwan, pp. 674–707. Delhi, India: Oxford University Press.
- Chandran, M.D.S. & Hughes, J.D. (1997) The sacred groves of south India: ecology, traditional communities and religious change. *Social Compass* 44: 413–428.
- Chandran, M.D.S. & Mesta, D. (2001) On the conservation of the *Myristica* swamps of the Western Ghats. In: *Forest Genetic Resources: Status, Threats, and Conservation Strategies*, ed. U.R. Shaanker, K.N. Ganeshaiah & K.S. Bawa, pp. 1–19. New Delhi, India: Oxford and India Book House.
- Chandrashekhara, U.M. & Sankar, S. (1998) Ecology and management of sacred groves in Kerala, India. *Forest Ecology and Management* 112(1–2): 165–177.
- Colding, J. & Folke, C. (2001) Social taboos: 'invisible' systems of local resource management and biological conservation. *Ecological Applications* 11: 584–600.
- Dash, S.S. (2005) Kabi sacred grove of North Sikkim. *Current Science* 89(3): 427–428.
- Dudley, N., Higgins-Zogib, L. & Mansourian, S. (2009) The links between protected areas, faiths, and sacred natural sites. *Conservation Biology* 23(3): 568.
- Fargey, P.J. (1992) Boabeng-Fiema Monkey Sanctuary. An example of traditional conservation in Ghana. *Oryx* 26(3): 151–156.
- Gadgil, M. & Vartak, V.D. (1976) The sacred groves of Western Ghats in India. *Economic Botany* 30: 152–160.
- Gandhi, K. (1997) Kesar Chirkav: traditional system of forest protection. Newsletter, Sevamandir, Udaipur, India [www document]. URL <http://sevamandir.org/publications.htm#newsletter>
- Garcia, C. & Pascal, J.P. (2006) Sacred forests of Kodagu: ecological value and social role. In: *Ecological Nationalisms: Nature, Livelihoods, and Identities in South Asia*, ed. G. Cederlöf & K. Sivaramakrishnan, pp. 199–229. Seattle, WA, USA and London, UK: University of Washington Press.
- Garcia, C., Bhagwat, S., Ghazoul, J., Nath, C., Nanaya, K., Kushalappa, C., Raghuramulu, Y., Nasi, R. & Vaast, P. (2010) Biodiversity conservation in agricultural landscapes: challenges and opportunities of coffee agroforests in the Western Ghats, India. *Conservation Biology* 24(2): 479–488.
- Gokhale, Y. (2004) Reviving traditional forest management in Western Ghats: study in Karnataka. *Economic and Political Weekly* July 31: 3556–3559.
- Greene, S.E. (2002) *Sacred sites and the Colonial Encounter: a History of Meaning and Memory in Ghana*. Indiana, USA: Indiana University Press.
- Hardin, G. (1968) The tragedy of the commons. *Science* 162(3859):1243–1248.
- Hill, J.L. & Curran, P.J. (2001) Species composition in fragmented forests: conservation implications of changing forest area. *Applied Geography* 21: 157–74.
- Hughes, J.D. & Chandran, M.D.S. (1998) Sacred groves around the earth: an overview. In: *Conserving the Sacred for Biodiversity Management*, ed. P.S. Ramakrishnan, K.G. Saxena & U.M. Chandrashekhara, pp. 69–86. New Delhi, India: Oxford and India Book House.
- Jamir, S.A. & Pandey, H.N. (2003) Vascular plant diversity in the sacred groves of Jaintia Hills in northeast India. *Biodiversity and Conservation* 12(7): 1497–1510.

- Jamir, S.A., Upadhaya, K. & Pandey, H.N. (2006). Life form composition and stratification of montane humid forests in Meghalaya, northeast India. *Tropical Ecology* 47(2): 183–190.
- Kalam, M.A. (1996) Sacred groves in Kodagu District of Karnataka (South India): a socio-historical study. Pondy Papers in Social Sciences 21. Pondicherry, India: Institut Français de Pondicherry.
- Khan, M.L., Khumbongmayum, A.S. & Tripathi, R.S. (2008) The sacred groves and their significance in conserving biodiversity: an overview. *International Journal of Ecology and Environmental Sciences* 34(3): 277–291.
- Khan, M.L., Menon, S. & Bawa, K.S. (1997) Effectiveness of the protected area network in biodiversity conservation: a case-study of Meghalaya state. *Biodiversity and Conservation* 6: 853–868.
- Khiewtam, R.S. & Ramkrishnan, P.S. (1989) Socio-cultural studies of the sacred groves of Cherrapunji and adjoining areas in North-Eastern India. *Man in India* 69: 64–71.
- Khumbongmayum, A.D., Khan, M.L. & Tripathi, R.S. (2006). Biodiversity conservation in sacred groves of Manipur, north east India: population structure and regeneration status of woody species. *Biodiversity and Conservation* 15: 2439–2456.
- Khumbongmayum, A.D., Khan, M.L. & Tripathi, R.S. (2005a) Ethnomedicinal plants in the sacred groves of Manipur. *Indian Journal of Traditional Knowledge* 4(1): 21–32.
- Khumbongmayum, A. D., Khan, M. L. & Tripathi, R.S. (2005b) Sacred groves of Manipur, northeast India: biodiversity value, status and strategies for their conservation. *Biodiversity and Conservation* 14: 1541–1582.
- Khumbongmayum, A.D., Khan, M.L. & Tripathi, R.S. (2004) Sacred groves of Manipur: ideal centre for the conservation of biodiversity. *Current Science* 87(4): 430–433.
- Kosambi, D.D. (1962) *Myth and Reality: Studies in the Formation of Indian Culture*. Bombay, India: Popular Press.
- Kushalappa, C.G. & Bhagwat, S. (2001) Sacred groves: biodiversity, threats and conservation. In: *Forest Genetic Resources: Status, Threats, and Conservation Strategies*, ed. U.R. Shaanker, K.N. Ganeshaiyah & K.S. Bawa, pp. 21–29. Oxford, UK and New Delhi, India: IBH.
- Leach, M., Mearns, R. & Scoones, I. (1999) Environmental entitlements: dynamics and institutions in community-based natural resource management. *World Development* 27(1): 225–247.
- Lebbie, A.R. & Freudenberg, M.S. (1996) Sacred groves in Africa: forest patches in transition. In: *Forest Patches in Tropical Landscapes*, ed. J. Schelhas & R.S. Greenberg, pp. 300–324. Washington, DC, USA: Island Press.
- Malhotra, K.C., Gokhale, Y., Chatterjee, S. & Srivastava, S. (2007) *Sacred Groves in India*. New Delhi, India: Aryan Books International.
- Mani, S. & Parthasarathy, N. (2005) Biodiversity assessment of trees in five inland tropical dry evergreen forests of peninsular India. *Systematics and Biodiversity* 3: 1–12.
- Myers, N., Mittermeier, R.A., Mittermeier, C.G., da Fonseca, G.A. & Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature* 403(6772): 853–858.
- Ntiemoa-Baidu, Y. (1995) *Indigenous vs. Introduced Biodiversity Conservation Strategies: the Case of Protected Area Systems in Ghana*. Washington, DC, USA: WWF Biodiversity Support Program Volume 1, African Biodiversity Series [www document]. URL http://www.worldwildlife.org/bsp/publications/africa/indigenous_vs_eng/yaaeng.htm
- Ormsby, A. (2011) Cultural and conservation values of sacred forests in Ghana. In: *Sacred Species and Sites: Advances in Biocultural Conservation*, ed. G. Pungetti, G. Oviedo & D. Hooke (in press). Cambridge, UK: Cambridge University Press.
- Ormsby, A. & Edelman, C. (2010) Tafi Atome Monkey Sanctuary, Ghana: community-based ecotourism at a sacred site. In: *Sacred Natural Sites: Conserving Nature and Culture*, ed. R. Wild & B. Verschuren (in press). London, UK: Earthscan.
- Pretty, J.N., Guijt, I., Thompson, J. & Scoones, I. (1995) *Participatory Learning and Action: a Trainer's Guide*. London, UK: International Institute for Environment and Development.
- Ramakrishnan, P.S. (2003) Conserving the sacred: the protective impulse and the origins of modern protected areas. In: *The Full Value of Parks: from Economics to the Intangible*, ed. D. Harmon & A.D. Putney, pp. 27–41. Lanham, MD, USA: Rowman & Littlefield Publishers.
- Ramanujam, M.P. & Kadamban, D. (2001) Plant biodiversity of two tropical dry evergreen forests in the Pondicherry region of South India and the role of belief systems in their conservation. *Biodiversity and Conservation* 10: 1203–1217.
- Ramanujam, M.P. & Praveen Kumar Cyril, K. (2003). Woody species diversity of four sacred groves in the Pondicherry region of South India. *Biodiversity and Conservation* 12(2): 289–299.
- Saj, T.L., Mather, C. & Sicotte, P. (2006) Traditional taboos in biological conservation: the case of *Colobus vellerosus* at the Boabeng-Fiema Monkey Sanctuary, Central Ghana. *Social Science Information* 45(2): 285.
- Sheridan, M.J. & Nyamweru, C., eds (2007) *African Sacred Groves: Ecological Dynamics and Social Change*. Athens, OH, USA: Ohio University Press.
- Tabarelli, M. & Gascon, C. (2005) Lessons from fragmentation research: improving management and policy guidelines for biodiversity conservation. *Conservation Biology* 19: 734–39.
- Tiwari, B.K., Barik, S.K. & Tripathi, R.S. (1998) Biodiversity value, status, and strategies for conservation of sacred groves of Meghalaya, India. *Ecosystem Health* 4(1): 20–32.
- Upadhaya, K., Pandey, H.N., Law, P.S. & Tripathi, R. S. (2003) Tree diversity in sacred groves of the Jaintia hills in Meghalaya, northeast India. *Biodiversity and Conservation* 12(3): 583–597.
- Wadley, R.L. & Colfer, C.J.P. (2004) Sacred forest, hunting, and conservation in West Kalimantan, Indonesia. *Human Ecology* 32: 313–38.
- Western, D., Wright, R.M. & Strum, S.C. (1994) *Natural Connections: Perspectives in Community-based Conservation*. Washington, DC, USA: Island Press.
- Wild, R.W. & McLeod, C.M., eds (2008) *Sacred Natural Sites: Guidelines for Protected Area Managers*. Gland, Switzerland: IUCN.