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Full Length Research Paper

A study of the potentials of traditional natural resources management for biodiversity conservation

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Social taboos exist in invariably all cultures throughout the world, and represent a class of informal institutions, where traditional, religiously governed norms or taboo system define the human behaviour. These taboos remain the prime factor guiding their conduct towards the exploitation of the natural resources. However, the singular role played by these informal systems of taboo in conservation of biodiversity has not been given its due importance. The present paper attempts to render forth the salient aspect of conservation borne out of the taboo system in practice surrounding the sacred natural sites, principally the sacred forests, in the state of Uttarakhand, central Himalaya. The study brings forth the fact that although the potential of traditional natural resources management for biodiversity conservation vis a vis the institution of taboo within the state remains enormous, the sustainability of these practices however is seriously threatened. In fact, the dilution of the traditional beliefs and associated taboos, principally borne out of the western type education, along with social and economic factors, underpinning traditional natural resources management practices were found to be the greatest threat to the sustainability of these practices. There is thus an urgent need to investigate local perceptions of forest space and landscape, biodiversity conservation and traditional beliefs, and their significance for natural resources management, towards understanding the changing values of local people in relation to traditional protected areas, such as sacred forests.

Key words: Conservation, culture, informal institutions, sacred forests, social taboos, traditional knowledge-based systems.

INTRODUCTION

The term 'Taboo' is derived from the Polynesian word 'tapu', and is defined as a 'prohibition or a ban'. Social taboos represent good examples of informal institutions (North, 1990), which are based on cultural norms that do not depend on government for either promulgation or enforcement (Posner and Rasmusen, 1999). Institutions are here defined as the rules and norms that structure human interaction, including their enforcement characteristics and sanctioning mechanisms (North, 1990), and include any form of shared constraint that human beings devise to shape their daily interactions and transactions. Such institutions are decentralized and self-enforced by a community, where no external authority is available to guarantee that social actors will abide to rules and procedures (Knight, 1992). Formal institutions, in contrast, are rules that human beings devise, such as written rules, laws and constitutions and are highly associated with the structural complexity of industrialized nations and their division of labour (North, 1990). The traditional natural resources management are infact shaped around the local rules and regulations (Ntiamoa-Baidu, 1995; Abayie, 1998), most often enshrined in religious or cultural beliefs and superstitions, and enforced by taboos, which dare not be infringed upon, and thus making the whole exercise, an effective one.

Informal institutions, such as taboos, have largely been neglected in conservation designs, where park protection has been the major approach for protecting biodiversity (McNeely, 1993), and thus it is strongly believed that the same could play an active role in nature conservation

(Murphree, 1994). In fact, very often, it has been observed that social taboos may be highly adaptive from an ecological perspective and which contributes to biodiversity conservation (Colding and Folke, 2001); that it often applies to certain sets of natural resources that are particularly vulnerable to overexploitation (Colding and Folke, 2001).

Anthropologists have ascribed various social functions to taboos: (i) They function to distinguish between sacred and profane entities in a culture (Durkheim, 1915); (ii) Relate to animist and magical belief systems (Frazer, 1922); (iii) Serve psychological ends (Malinowski, 1922); and even (iv) Serve ecological adaptations (Rappaport, 1968). Infact, it may be difficult to distinguish among ecological, social, or religious origins and functions of taboos (Colding and Folke, 2001). Taboo often apply to certain sets of natural resources, which are particularly vulnerable to overexploitation, and thus the imposition of temporal taboos regulates access to resource(s) on either a sporadic, weekly, monthly or even seasonal basis (Colding and Folke, 2001).

The efficacy of the social taboos becomes all the more conspicuous, when one encounters yet another traditional institution, the institution of sacred natural sites. For example, when a sacred forest cover located above the precincts of the village, is zealously guarded, with taboo not to infringe upon or make resource use from it, and thus the perennial water flow (with its source being the conspicuous sacred forest lying above) and its associated benefits for the very sustenance of the village folks, need not be exemplified further. In fact, amongst most ethnic groups, there exist beliefs that regard the majority of water bodies as abode of deities, and thus taboo against making recurrent visits to the source of the same (read the sacred forests) were effective in protecting these sources, especially those that served as potable water sources for a community or group of communities, with major examples being offered by the sacred forests of Hariyali Devi, Madhkeshwar, Maanthaat, Shyama Devi, Jal Devi, etc (Table 1). Infact, defilement of the water remains one of the greatest sins, as per the religious scripts, brought forth by the natives. And hence, the present study delves into the social taboo system in practice surrounding the sacred natural sites.

The ‘sacred natural site’ here is defined as a reserved space, established by a community, a group of people or an individual, following the conventions based on specific phenomena and requiring the respect of engagements taken at this place in order to satisfy the spiritual, cultural and socio-political needs while focusing on the harmony and wellbeing of the native community, as well as of the whole humanity (Kamga-Kamdem, 2008). The above definition most appropriately brings forth the salient aspect of the ‘institution of sacred sites’, that is, the mode of its establishment, the people entitled to this purpose, the beneficiaries, the very objectives of establishment, and the management rules that govern, principally the resource use from the sacred forests.

MATERIALS AND METHODS

The knowledge based-systems methodology for acquisition of local ecological knowledge suggested by Sinclair and Walker (1999) was adapted, involving knowledge collection from a small sample of deliberately chosen individuals, thought to be knowledgeable by other villagers about the domain of interest. The knowledge was collected through repeated, structured (questionnaire-based) interviews, with information being sought as regards the location of sacred natural sites (SNS), features related, local perception about the sacredness of the SNS, and management (inclusive of caste dynamics). Priorly, the informants were given a brief background of the subject area of interest (viz., the concept of the sacred natural sites), in their native tongues, as and when required, so that the requisite information could be gathered. Since the domain of study, that is taboo system surrounding the sacred sites was governed by dominant castes, principally Brahmins and the Rajputs, with lower castes relegated to carrying out profunctionary functions/tasks, it was inevitable that interviews be conducted across the different class of people, so that an overall picture of the taboo system could emerge, and hence, efforts were made to interview a minimum of 6 - 8 persons across the class/caste divide per site/village, and thus, altogether 168 sacred natural sites (henceforth SNS), including 75 sacred forests, 74 sacred groves, 10 water bodies and 9 pastures, and extending across the nine hilly districts of the state were covered for the study of existent taboo system (Figures 1 and 2), and a total of 1262 informants interviewed. However, for myriad reasons (say, in most of the sites, the population was wholly constituted of one, or at times only two castes-Brahmins and the Rajputs, and hence, in such cases, the resource management specialists-the leaders and the wise people, that is, mostly the elderly folks were consulted.

RESULTS AND DISCUSSION

Traditional natural resources management system in practice in Uttarakhand, can be classified into the following broad categories: (i) Protection of particular ecosystems or habitats (such as sacred groves and forests); (ii) Protection of particular animals or plant species (as totem or tabooed species); and (iii) Regulation of the exploitation of particular natural resource (such as a closed season for resource harvesting). However, the taboo system surrounding the sacred natural sites has been dealt as per classification of social taboos (Colding and Folke, 2001), principally into (i) Segment taboos, (ii) Temporal taboos, (iii) Method taboos, (iv) Life history taboos, (v) Specific-species taboos.

Segment taboos

The following group of taboo applies when a cultural group bans the utilization of particular species for specific time periods for human individuals of a particular age, sex, or social status (Colding and Folke, 2001). Thus, certain segments of a human population may be

Table 1. Some of the selected sacred natural sites with conservational value[#] (Negi, 2010).

District	S. No	Sacred natural site	Nature	Area (ha)	Floral diversity	Dominant species
Pithoragarh	1	Brijkang, Ralam	Pasture	60	74	*Picrorhiza kurrooa*, *Juniperus communis*
	2	Raghunath, Tola	Forest	5	*	*Abies pindrow*
	3	Suraj Kund, Milam	Water body	40	78	*Rhododendron anthopogon, Danthonia* sp.
	4	Bhujani, Martoli	Forest	12	-	*Betula utilis*, *Rhododendron campanulatum*
	5	Dharmbun Sem, Laspa	Pasture	105	73	*Dactylorhiza hatagirea, Carum carvi*
	6	Hya Roshey, Napalchhu	Pasture	40	42	*Euphrasia himalayica*, *Cicerbita violoides, Polygonum viviparum*, *Bupleurum* sp., *Potentilla cuneifolia, P. atrisanguinea*
	7	Dhan ki kheti, Jyolingkong	Pasture	145	[34]	*Euphrasia himalayica*, *Polygonum viviparum*, *Potentilla argyrophylla*
	8	Nigalfu, Sipu	Pasture	120	[37]	*Betula utilis*, *Juniperus communis*, *Aster stracheyi*, *Euphrasia himalayica*, *Potentilla cuneifolia, P. argyrophylla, Geranium grevilleanum*
	9	Bombasing, Tedang	Forest	5	-	*Abies pindrow, Betula utilis, Pinus wallichiana.*
	10	Sangfa Fu, Baun	Pasture	20	48	*Juniperus communis*, *Rhododendron anthopogon*
	11	Kokila Devi, Kanaar	Forest	> 20 sq km	73	*Betula alnoides, Cedrus deodara, Celtis australis, Lyonia ovalifolia, Myrica esculenta, Pinus roxburghii, Quercus leucotrichophora, Q. semecarpiflora, Rhododendron arboreum, R. campanulatum, Taxus baccata*
	12	Hokara Devi, Hokra	Forest	5-6	-	*Q. leucotrochophora, Q. dilatata, Alnus nepaulensis, Aesculus indica, Pinus wallichiana,*
	13	Thal Kedar	Forest	15	-	*Q. leucotrochophora, Q. dilatata, Myrica nagi, Rhododendron arboreum*
	14	Lateshwar	Forest	4-5	-	*Quercus leucotrichophora*
	15	Dhawaj	Forest	15	-	*Q. leucotrochophora, Q. dilatata, Myrica nagi, Rhododendron arboreum*
	16	Ghandhura	Forest	20	-	*Q. leucotrochophora, Rhododendron arboreum, Q. semecarpifolia, Thamnocalamus* sp. *Syzygium* sp.
	17	Syangse gabla	Forest	3-4	-	*Abies pindrow*
	18	Nakuleshwar	Forest	3-4	-	*Quercus leucotrichophora*
	19	Jagatnath	Forest	4-5	-	*Diploknema* sp., *Ficus* sp,
	20	Nagarjuna	Forest	2	-	*Acacia* sp.
	21	Jal Devi	Forest	2	-	*Quercus leucotrichophora, Myrica esculenta, Rhododendron arboreum*
Champawat	22	Byandhura	Forest	5 sq km	-	Tropical mixed forest
	23	Mallareshwar	Forest	-	-	*Cedrus deodara*, *Pinus roxburghii*, *Myrica esculenta*, *Rhododendron arboreum*
	24	Gorakhnath	Forest	5 sq km	-	*Quercus leucotrichophora*, *Q. semecarpifolia*, *Q. glauca*, *Symplocus chinensis*, *Lyonia ovalifolia*, *Cedrus deodara*, *Myrica esculenta*, *Pyrus pashia*, *Rhododendron arboreum*
Almora	25	Vishnu	Forest	16	-	*Cedrus deodara*, *Quercus semecarpifolia*, *Q. leucotrichophora*, *Aesculus indica*, *Ficus* spp., *Myrica esculenta*, *Rhododendron arboreum*
	26	Shihyayi/ Shyama Devi	Forest	5-6	-	*Quercus semecarpifolia*, *Q. leucotrichophora*, *Aesculus indica*, *Myrica esculenta*, *Rhododendron arboreum*
	27	Aeri Dhura	Forest	8-10	-	*Quercus leucotrichophora*, *Myrica esculenta*, *Rhododendron arboreum*

Table 1. Contd.

District	S. No	Sacred natural site	Nature	Area (ha)	Floral diversity	Dominant species
Almora	28	Anyar Bunga Aeri	Forest	10-12	-	*Quercus semecarpifolia*, *Q. leucotrichophora*, *Aesculus indica*, *Myrica esculenta*, *Rhododendron arboreum*, *Anyar, Alnus nepaulensis*.
	29	Sidh Baba	Forest	10-12	-	*Rhododendron arboreum*, Myrica esculenta, Anyar, *Quercus leucotrichophora*, *Q. semecarpifolia*, *Aesculus indica*
Dehradun	30	Thatyur	Forest	67.2	-	*Cedrus deodara*, *Myrica esculenta*, *Rhododendron arboreum*, *Quercus leucotrichophora*, *Q. floribunda*, *Q. semecarpifolia*
	31	Maanthaat	Forest	15	-	*Cedrus deodara*
	32	Danda Ka Deorana		20	-	*Cedrus deodara*
Uttarkashi	33	Kamleshwar Mahadev	Forest	10 sq. km	-	*Pinus roxburghii*, *Quercus leucotrichophora*, *Q. floribunda*, *Cedrus deodara*, *Pinus excelsa*, *Rhododendron arboreum*, *Myrica esculenta*, *Celtis australis*
	34	Madhkeshwar	Forest	15 sq. km	-	*Cedrus deodara*
	35	Bhadrakali	Forest	10	-	*Cedrus deodara*
Tehri Garhwal	36	Sem Mukhim Naag	Forest	60	-	*Quercus leucotrichophora*, *Q. floribunda*, *Q. semecarpifolia*, *Rhododendron arboreum*
Pauri Garhwal	37	Ulkhagarhi	Forest	5 sq. km	-	*Quercus leucotrichophora*, *Q. floribunda*, *Rhododendron arboreum*, *Myrica esculenta*
	38	Tarkeshwar	Forest	5 sq. km	343	*Cedrus deodara*, *Quercus leucotrichophora*, *Q. floribunda*, *Q. semecarpifolia*, *Myrica esculenta*
Rudraprayag	39	Hariyali Devi	Forest	5 sq. kms	-	*Quercus semecarpifolia*, *Q. leucotrichophora*, *Aesculus indica*, *Myrica esculenta*, *Rhododendron arboreum*, *Celtis australis*

Conservational value- principally in terms of biodiversity content; providing the only refuge for the wild faunal spp., or as the only source of water. *Diversity assessment has not been attempted.

temporarily proscribed from the gathering and/or consumption of species. Anthropologists often refer to such taboos as specific food taboos (Rea, 1981). Segment taboos frequently pertain to pregnant women, children, menstruating females, and parents of newborns. Cultural perceptions, customs, and superstitious beliefs of human health risks are frequently related to such taboos (Osemeobo, 1994). Thus, segment taboos are often related to totemic beliefs, which reflect cognitive and linguistic categories, useful to the natives of these cultures (Posey, 1992). Additionally, few anthropologists have hypothesized that segment taboos may also serve as strategic responses to avoid game depletion (Ross, 1978; Hames and Vickers, 1982).

In the present case study, this taboo relates to the complete banning of the lower castes, the Harijans from not just the resource exploitation, but also from entering into the sacrosanct zones or the sacred natural sites that is, mostly the sacred forests, and the water bodies. This apart, the other most conspicuous extension of the taboo, and the most commonly ascribed, is the ban extended to the partruting and the menstruating females, who irrespective of the caste, are banned from entering into the restricted zones. The issue of menstrual blood in traditional beliefs has been treated extensively in anthropology as a source of potent force (Douglas, 1966). It may be conjectured that women, who were considered to be the most frequent users of water, were prohibited from entering the vicinity of rivers when they were menstruating to prevent degradation or defilement of the sacred water.

In most communities rivers provided the main source of

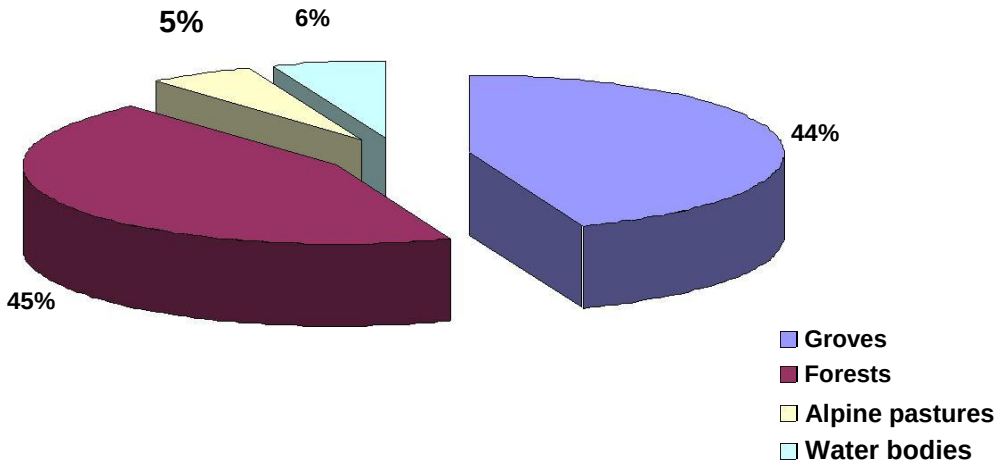

Figure 1. The percentage distribution of the sacred natural sites (SNS, N= 168) across the State of Uttarakhand.

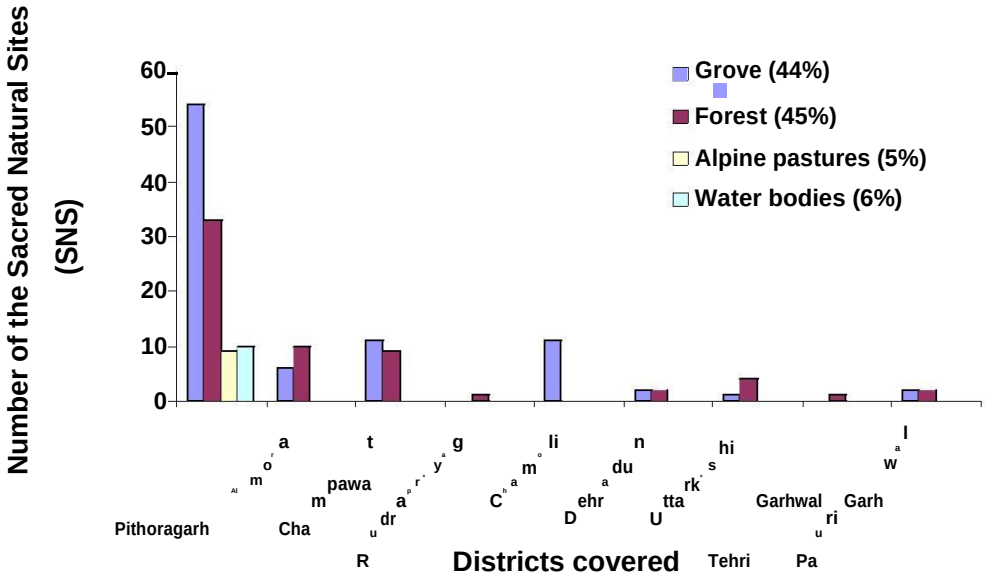

Figure 2. The relative distribution of the sacred natural sites across the State of Uttarakhand.

drinking water (Ntiamoa-Baidu, 1995). The exclusion of women from certain religious festivals and ritualistic observances like their periodical segregation during their menstrual period appears to be due not to any assumed inferiority on their status but due to the tribals' horror of menses, which is supposed to attract evil spirits. From conservation aspect, it seems appropriate that the womenfolk, representing the dominant workforce involved in the resource exploitation (including the banks of the rivulets and rivers, example 'Latu ka gadera', explained later under the sub-heading habitat taboos), throughout the hills, this ban extending for the duration of the menstrual cycle, significantly restricts the resource withdrawal; more so, when this taboo forms the predominant class of taboo, finding expression in nearly all the SNS, solely, as well as admixed with other taboos (Figure 3).

Temporal taboos

The temporal taboos apply when a cultural group bans access to resources during certain time periods, and are thus imposed sporadically, daily, or on a weekly to seasonal basis (Colding and Folke, 2001). Taboos imposed on a weekly to monthly basis are often referred to as a "closed season", which very often coincides with

Table 2. Broad classification of taboos restricting the resource use in Uttarakhand (adapted from Colding and Folke 2001).

S/no.	Class of taboo	Example
A. Segment- Segment of population observing the taboo		
1	Scheduled castes	A common feature throughout the state of Uttarakhand, where lower castes are debarred to enter the sacred forests. Very often, this often leads to the phenomenon where the debarred caste create their own sacred groves, viz., Ratashila sacred grove in district Pithoragarh
2	Pregnant and menstruating females, women after child birth	The most common sited reason debarring the womenfolk's' entry into the sacred natural sites
3	Pubescent girls	As above
4	Particular caste	Though rare, but at times even a class of upper castes too are tabooed to enter into sacred forests, viz., Aswals, a higher caste Rajputs are debarred from entering into the Tarkeshwar sacred forest in District Pauri Garhwal
B. Temporal taboo restricting the resource use (principally from the sacred forests)		
1	Exploitation of resource on a seasonal basis	The most commonly observed resource exploitation pattern; very often the case were the sacred forest do not usually constitute the watershed
2	Exploitation of resource on an annual basis	The sacred forests of Chopakya, Jagatnath, and Jujarimal; as well as the sacred meadows of Bhadelguar, Hya Roshe, Kee Pang (all within Askote Conservation Landscape).
3	Complete ban on the resource harvesting	The sacred forests of Manthaat, Hariyali, Madhkeshwar, Tarkeshwar, Thamri kund and Hokra Devi, among others.
C. Method taboos primarily restricting the resource use, as well as providing protection		
1	All leather goods, especially the shoes	Examples include the famous Nanda Raj Jaat, and the Chipla Kedar Jaat
2	7 days prohibitory period	Examples include the sacred forests of Thamri kund, Kotgyari Devi, Dhoulinag, and Chamunda Devi.
3	3 months prohibitory period	Examples include the sacred forests of Kotgyari Devi, and Jyastha Masaani Devi.
4	Regulatory means to make use of the sacred water	Defilement of the sacred water is protected by means of certain provisions, where the locals are forbidden to procure water directly from the water body. The best examples are the Thamri kund, Muldi Bai, Syangchu kund (kund syn. Pond).
5	Hunting of wild animals on Tuesday, Friday and Saturdays	Hunting, a strict taboo on the prescribed days, viz., in case of the sacred forests of Kalsin, Tiundhar, and Devidhar.
6	Annual harvesting of fishes	During the annual *Maun festival* in Jaunsar valley in Dehradun district, the locals collectively engage themselves in a large-scale communal hunt of fish, where powder of *Timru* (*Zanthoxylum armatum*) is poured into the river in sackfuls. Poisonous affects of the powder makes the fish an easy catch. The whole exercise might be effective towards adjusting the resource harvest practices to sustain yields and thus conserve biodiversity (Gadgil et al. 1993).
D. Life history- Regulates withdrawal of vulnerable life history stages of species		
1	Exploitation of immature Brahmkamal (*Saussurea obvallata*)	Nanda Astami festival in Martoli village in Johaar valley. This aspect is rather commonly observed throughout the landscape.
2	Hunting of pregnant does	Institution of Mrigoli as practiced in Hariyali Devi Sacred forest forbids hunting of pregnant does
E. Species-specific- taboo banning the exploitation of the individual species		
1	Hunting of wild species	Fiya or Himalayan marmot (*Marmot bobak*) is a totem; Serow (*Cervus unicolor*) within the sacred forest surrounding the Thamri Kund

Table 2. Contd.

2	Exploitation of sacred species	Kharik (*Celtis australis*), Malu (*Bauhinia vahlii*), Paiyan (*Prunus ceresoides*), Deodar (*Cedrus deodara*), Shiling (*Osmanthus fragrans*) are some of the most commonly religiously protected species in the State of Uttarakhand.
F. Habitat taboos- Restricts access and use of resources in time and space		
1	Sacred forests and groves	The sacred forests of Maanthaat, Hokra Devi, Danda Ka Deorana, Tarkeshwar, Bhujani, Bombasing and Hariyali Devi offer the best example.
2	Sacred water bodies	Thamri Kund near the township of Munsiari; Kedar Kund within Askote Conservation landscape
3	Stretch of land adjoining the river or even the agricultural field	Latu ka gadera and the small patch of land located in the village Pujeli, Uttarkashi

spawning or mating seasons of species. In Uttarakhand, as in rest of the country, many castes abstain totally from consumption of fish, poultry, and meat, and suspend all hunting as well, during the Hindu month of 'Sravana' (roughly August). And thus, temporal taboos function to reduce harvesting pressure on particular subsistence resources (Ntiamoa-Baidu, 1991). In the present case, temporal taboo extends to periodicity and regulative nature of resource exploitation, primarily from the sacred forests that primarily concerns with the collection of the litter mass (for biocompost purpose), as well as coppicing of the fodder species, which remains the predominant use of the sacred forests by the stakeholders, in the region.

However, temporal taboo is less marked overall, except in case of the sacred forests (Figure 3), since no exploitation of resources takes place from the sacred groves, borne out of their restricted size and resource availability, thereby rendering them non-economical, both in terms of time and space. In case of the sacred forests, the resource exploitation is primarily on a seasonal basis; in 35 out of the 75 sacred forests covered, followed by complete ban on resource exploitation (in 22 sites, Figure 4). Sites, where complete ban on resource exploitation is in practice, are the sacred forests, which remain the only watershed and thus the source of water for the resident population, example, the sacred forest of Maanthaat. Additionally, the harvesting is carried out on an annual basis in few of the sacred forests, which remain the only patch of green and thus the source of fodder for the villagers inhabiting below, example, the sacred forests of Chopakya, Jagatnath, and Jujarimal (Table 1 and Figure 4).

In addition, exploitation of high altitude medicinal and aromatic plants (MAPs) from the sacred alpine meadows, takes place only once in a year. However, this later temporal taboo could be debated as the MAPs exploitation are more economical, if the same is carried out at a late stage, when nearly all the MAPs have attained maturity, example, sacred meadows of Bhadelguar, Hya Roshe, Kee Pang (all within Askote Conservation Landscape, District Pithoragarh).

Method taboos

The method taboo applies when a cultural group bans the use of certain methods and techniques for the withdrawal or exploitation of the species (Colding and Folke, 2001). Invariably in all the cases of sacred forests, this relates to the precise regulation of coppicing of the major fodder species, that is, Banj (*Quercus leucotrichophora*), and the collection of the litter mass from the forests. In case of the alpine habitats, principally in case of the sacredbugyals (alpine meadows), this relates to the methodology applied towards managing the grazing pressure, viz., allowing only the Yaks and their hybrids (Jhuppu and Jomos) in case of Hya Roshe, and only the milching livestocks to graze, in case of the Putuk-Tu, both within Askote Conservation Landscape. Additionally, the Van Panchayat (village Forest Council) regularly monitors the grazing pressure and the state of the pasture to make decisions about rotating or relocating herds or even downsizing_the size of the grazing herd. Yet, other very effective means of lessening the intensity of resource use from the SNS are strict adherence to certain norms, viz., partaking measures not to eat meat, drink liquor, even certain completely prohibited eatables, such as onion, garlic (the two most commonly referred abhorred items), for a minimum of one week, before one makes a pilgrimage to SNS; the three months prohibitory period extended to each of clan members, when a death occurs in a family; and lastly the phenomenon of restricted days of hunting (Table 2).

Additionally, the method taboo could be extended to the strict norm of walking bare feet, promulgated during the annual Jaats (pilgrimage) traversing through the sensitive alpine meadows, viz., during the Nanda Astamifestival, when sacred Brahmkamal (*Saussurea obvallata*) collection is carried out; during Chipla Kedar Jaat or during the more famous Nanda Devi Raj Jaat, the devotes traverse the difficult high altitude landscape bare feet. Wearing shoes is a taboo. Obvious connotation to the significance of the practice towards conservation of the flora could be made, since bare feet are less damaging than the shoes!

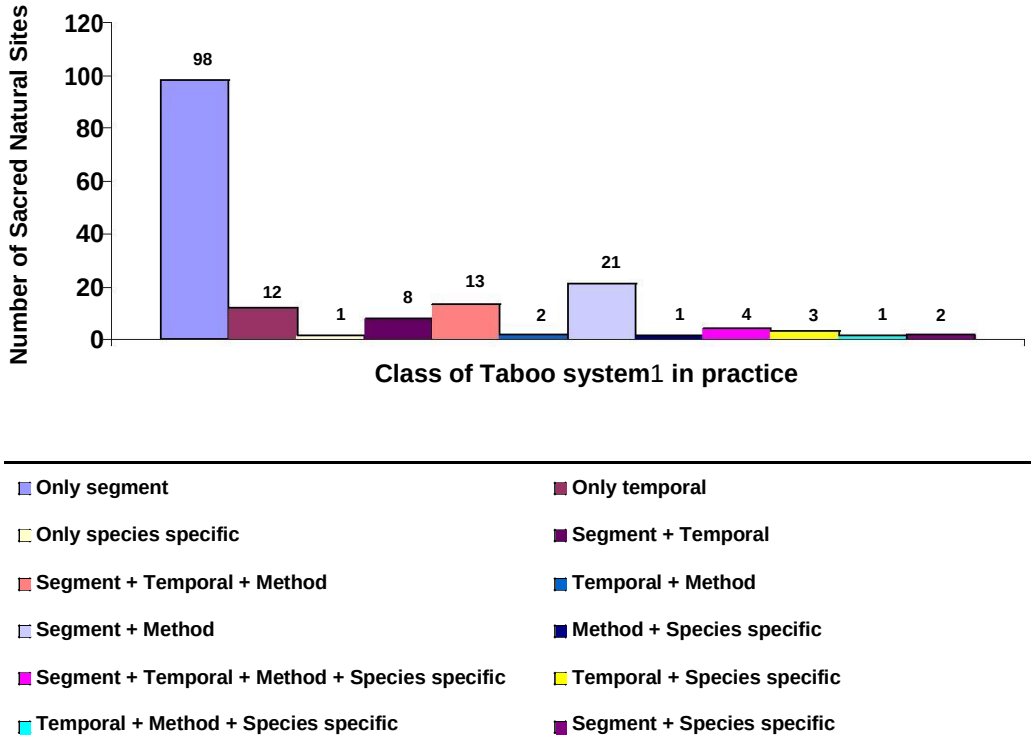

Figure 3. The preponderance of different classes of taboo system surrounding the Sacred Natural Sites.

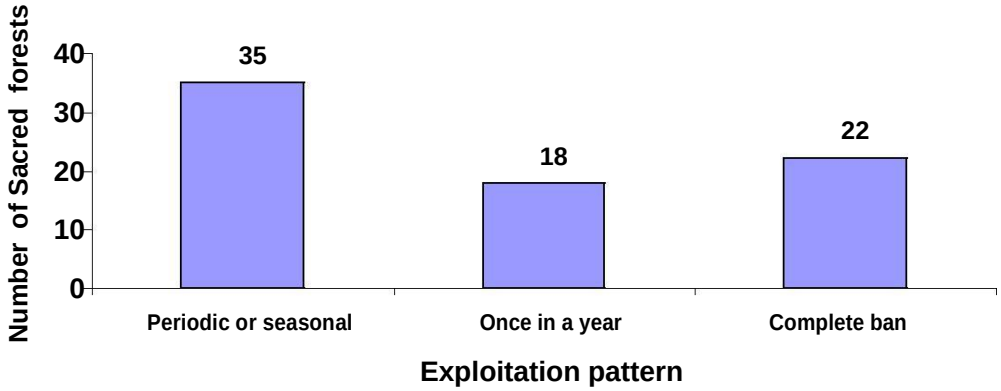

Figure 4. Temporal taboo as regards the exploitation of the resource from the sacred forests (N=75) across the State of Uttarakhand.

Life history taboos

The following category of taboos applies when a cultural group bans the use of certain vulnerable stages of a species' life history based on its age, size, sex or reproductive status (Colding and Folke, 2001). Example offered from the landscape, includes the institution of Mrigoli (Table 1), wherein the hunters do not hunt the pregnant doe, or when they are in a flock. This is more so when one of the deer has a white mark on its forehead (which is more often the case), and the same is treated as reincarnated departed soul, in all probability, of one of the village elders! Infact, the hunting is restricted to male and older animals. In this way the communities are able to ensure continued population growth of their wildlife resources.

Specific-species taboos

The following category of taboos applies when a cultural group totally bans the killing and detrimental use of

specific species in both time and space (Colding and Folke, 2001). Anthropologists often refer to such taboos as general or permanent food taboos, because they apply to all members in a community and often concern foods (Rea, 1981). Example offered from the landscape includes the complete ban on killing of *Fiya* (Himalayan marmot, *Marmot bobak*) in Vyas valley. Reasons specified for the behaviour in literature, range from species serving as religious symbols (Fargey, 1992), or representing reincarnated humans (Osemeobo, 1994). Such reasons constitute strong sentiments behind self-enforcement of the taboos. However, in the present case, the taboo is enforced out of the fear that 'the spirits will sanction violators by invoking illness upon people, or will cause the crop failure'.

Of particular interest are the taboos imposed on some keystone related plant species, such as Deodar (*Cedrus deodara*), Paiyan (*Prunus ceresoides*), Shiling (*Osmanthus fragrans*), Ratpa (*Rhododendron campanulatum*), Bil (*Juniperus communis*) and Raga (*Cupressus torulosa*), along with the most commonly noted species Peepal (*Ficus religiosa*) and Bargad (*F. benghalensis*). It is important to take note of the fact that in invariably all the cases, these species play pivotal role in the conservation or sustenance of the ecosystem, at large. For example, Ratpa (*Rhododendron campanulatum*) as well as Bil (*Juniperus communis*) provide refuge as well as breeding space for two of the most endangered species, Musk deer (*Moschus chrysogaster chrysogaster*) and the Monal pheasant (*Lophophorus impejanus*).

Habitat taboos

The following category of taboos applies, when a cultural group regulates both access to and use of resources from particular habitats in space and time (Colding and Folke, 2001). This taboo, in the present case, obviously extends to each of the SNS covered. A forest, part of a forest, a rivulet, or pond may never be subjugated to harvesting, hunting, fishing or any other kind of resource use, often being protected by religious taboos and considered sacred to community members. Example from the landscape includes the stretch of land on both the banks of the Latu ka gadera, the small rivulet which runs along the sacred grove of Latu, near Van village, remains a taboo, and hence no agriculture is practiced within the zone. Similarly, a small patch of land measuring around 50 by 5 m located within the prime agricultural field in the village Pujeli, Uttarkashi is not cultivated. These smaller or larger sacred areas, inclusive of all the SNS, encompass a number of ecological services, including the maintenance of biological diversity (Table 2), provision of habitat for threatened species, regulation of local hydrological cycles, prevention of soil erosion, pollination of crops, and preservation of locally adapted crop varieties, and serving as wind and fire brakes (Gadgil, 1987). One of the prime examples is offered by the sacred forest site, the Thamri kund, where one can easily sight the herd of serow (*Cervus unicolor*), as well as other wild animals, who come to drink the water at the site. This little lake located at a height of around 3000 m amsl, is held very sacred, not just by the locals of the surrounding villages, but by the populace of the adjoining township of Munsiari. As per one locals, 'No one is allowed to defile the waters, not even drink directly from it!'

In summary, as and when the above-mentioned class of taboos is transgressed, an expiation ceremony has got to be undergone. A breach of the law would bring on the entire society divine wrath. Invariably, however, the social taboos need enforcement mechanisms to be effective (North, 1990). The informal institutions like social taboos are self-enforced by the community (North, 1990; Posner and Rasmusen, 1999), the self-enforcement being principally borne out of the fear of religious sanctions and social conventions (Osemeobo, 1994). The precise monitoring of compliance of norms surrounding the resource use from the sacred natural sites, and else, is furthermore facilitated due to the closeness of family members and strong kinship ties (North, 1990). Furthermore, sanctions against violations of taboos may be determined and meted out by chiefs and leaders. Such sanctions include monetary fines, payment in cattle (Ntiamoa-Baidu, 1991), or even 'sacrificing a goat or a sheep', as is the usual case in most of the sacred sites encountered. This charge is sufficiently deterrent to scare people from infringing or breaking the taboos.

Conclusion

The institution of sacred natural sites, along with the strict norms and taboos that relates to resource utilization, invariably relates to the sustainable resource management practices (Dorm et al., 1991; Hagan, 1998). Temporal taboos, and perhaps segment taboos, may promote local conservation of subsistence resources. In summary, taboos contribute to the conservation of habitats, and of biodiversity, both temporally and spatially, as is explicit from Tables 1 and 2. However, a much clearer under-standing of spiritual and mystical beliefs, and the related local institutions associated with traditional natural resources management, is needed. Such an assessment would provide valuable insights into the changing values of local people in relation to the protection of forests and other natural resources.

Collaborative research involving anthropologists and natural scientists may help explain the scientific and social value of beliefs related to traditional natural resources management in the study area. This may enhance the acceptability of these traditions, many of which have conservation potential. Needless to

emphasize, there is an urgent need to set forth specific guidelines to safeguard the sacred areas and promote the traditional knowledge of conservation, namely: The revitalization and enforcement of traditional education; The delineation of boundaries; The improvement of relevant knowledge and their official recognition through a legal status (Dorm-Adzobu and Ampadu-Agyei, 1995; McWilliam, 2001). It is urgently felt that traditional knowledge-based systems that is, the local belief systems should be made inclusive part of developmental programmes, for the simple reason that the local populace could relate themselves to the same.

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