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Local Community Attitudes toward Forests Outside Protected Areas in India. Impact of Legal Awareness, Trust, and Participation.

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ABSTRACT. The success of long-term sustainable management of natural resources depends on local people's support. Assessing local people's attitudes, taking into account their needs, and respecting their opinions should become a management priority. In India, in the last 20 years, community needs and aspirations in forest management were handled through Joint Forest Management with varying degrees of success. Recently, the Forest Rights Act (2006) was passed to recognize and vest forest rights in forest dwelling communities. This major policy development is still in implementation, but little is known about how this devolution process will affect people's attitudes toward forests. In this paper, we analyze associations between attitudes toward state controlled forests (Reserved Forests) and (i) awareness about the Forest Right Act, (ii) attitudes toward the State Forest Department, and (iii) participation in forest management groups of mostly tribal forest dwellers in the district of Kodagu (Karnataka). We collected information with a structured questionnaire among 247 villagers living under three different land tenure and management regimes: (1) private coffee plantations, (2) Reserved Forest, and (3) National Park. The results of the multivariate analyses show that people are more likely to appreciate Reserved Forests if they have more knowledge about the Forest Rights Act and if they have positive attitudes toward the State Forest Department. A sobering result in our sample is that participation in formal forest management groups is negatively associated to attitudes toward Reserved Forests, suggesting the Joint Forest Management model doesn't necessarily help the transition from coercion to consent. Increasing local people awareness about their rights and improving their relations with the formal forest stewards remain priorities for sustainable forest management to emerge in India.

Key Words: *anthropology; attitudes; forest dwellers; Forest Rights Act; Kodagu; Reserved Forests; Western Ghats*

INTRODUCTION

Researchers have studied local resident's attitudes toward protected areas, especially in developing countries, under the assumption that sustainable, more responsible, and long-term management of forest resources depends on local people's support (Triguero-Mas et al. 2010). From this research we know that individual, household, and community socioeconomic characteristics such as age, length of residency, ethnicity, gender, affluence, schooling, land ownership, household size, occupation, and geographical proximity can partially determine attitudes toward protected areas

(Infield and Namara 2001, Mehta and Heinen 2001, Heinen and Shrivastava 2009, Shibia 2010), although determinants often prove to be case-specific.

Attitudes toward the protected area staff and the perceptions of management practices also affect people's attitudes (Ormsby and Kaplin 2005, Allendorf 2007). For example, conflicts with managers due to resource extraction, strict rules on forest resources use, and access (Heinen and Shrivastava 2009, Shibia 2010), rude behavior (Ormsby and Kaplin 2005), or harassment by park rangers (Infield and Namara 2001) generate

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negative attitudes toward protected areas. Fear of resettlement and lack of job provision have the same impact (Allendorf 2007).

A low level of awareness regarding conservation issues and protected area management practices can also be associated with negative (Fiallo and Jacobson 1995) or ambivalent attitudes (Ormsby and Kaplin 2005) toward protected areas. However, higher level of awareness on regulations can be associated to negative conservation attitudes (Heinen and Shrivastava 2009). The lack of involvement of the local community in the decision making processes and in forest management groups are also important determinants of negative attitudes toward protected areas (Silori 2007).

People are more likely to appreciate protected areas if benefits gained from them offset the associated costs (Ormsby and Kaplin 2005). Benefits can be obtained through resource extraction, employment, development, or tourism (Allendorf 2007), but can also be noneconomic, such as recreation and aesthetics (Allendorf et al. 2007, Silori 2007). Local costs created by protected areas include human and wildlife conflicts, land pressure, loss of resources, and forfeited economic opportunities (Infield and Namara 2001, Heinen and Shrivastava 2009, Shibia 2010), and can determine overall negative attitudes.

Although there is a large body of research analyzing local residents' attitudes toward protected areas, the analysis of attitudes toward other, less restricted categories of protection is scant. For example, the establishment of reserved forests in India has affected tribal communities' livelihoods since colonial times (Guha 1983), but we know next to nothing about local residents' attitudes toward reserved forests. Under such tenure and management regimes, the interactions between formal management by state agencies and farmers' practices result in the creation of "domestic forests" (Michon et al. 2007), a model differing from classic forestry models in terms of structure and function but also in terms of management techniques and objectives.

Objectives of the study

This study aims to (1) assess attitudes toward reserved forests by people living under different types of tenure and management regimes, i.e., private coffee plantations, reserved forests, and

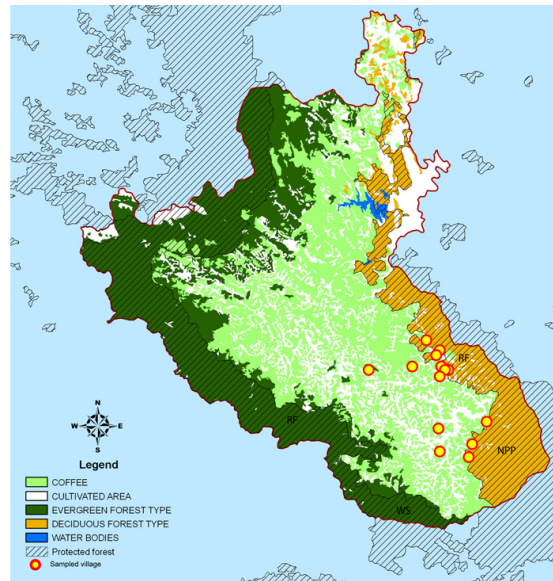
protected areas, and discern the main factors that influence these attitudes, (2) assess the level of knowledge about the latest policy changes and determine whether knowledge is associated with attitudes toward reserved forests, and (3) understand the link between people's participation in forest management groups and the attitudes toward reserved forests.

Forest policy in India

In India, the area recorded as forest in government records is divided between village forests, protected forests, reserved forests, and unclassed forests. In this paper we focus on the reserved forests, defined as "an area so constituted under the provisions of the Indian Forest Act ..., having full degree of protection. In Reserved Forests, all activities are prohibited unless permitted" (Forest Survey of India 2009:xvii). Reserved forests were first created by the Indian Forest Act of 1878. Reservation, i.e., declaring an area into a reserved forest, was a long and complex process, requiring the identification, recording, or compensation of all pre-existing rights over the proposed reserved forest. It is through this process, or rather its shortcomings, that forest rights were curtailed by the colonial regime and later by the independent republic (Saravanan 2009), as recognized by the preamble of the Forest Rights Act (Government of India 2007). Protected areas, i.e., wildlife sanctuaries or national parks, are normally delineated by the state governments from within reserved forests, but not necessarily (Government of India 1972), and have a higher level of protection than other recorded forest areas.

With the goal to alleviate increasingly emerging conflicts between multiple actors over the forest use rights (Rishi 2007), India introduced the concept of participatory management in its National Forest Policy (Government of India 1988). The Joint Forest Management guidelines define how local communities could be involved in Forest Management outside protected areas (Government of India 1990). Those guidelines specify that responsibilities, benefits, control, and decision making authority over forests are to be shared between local user groups and governmental agencies (Berkes 2008, Bhattacharya et al. 2010). However, the power given to the communities involved in Joint Forest Management is limited, participation inadequate, the common property rights ill defined, and the Forest Department retains

Fig. 1. Study area. The map shows the location of the study villages (circles) in the district of Kodagu (Karnataka), the vegetation cover obtained from remote sensing, and the boundaries of the state controlled forests (WS = Wildlife Sanctuary, NNP = Nagarahole National Park, and RF = Reserved Forests). Source: K. M. Nanaya, French Institute of Pondicherry.



substantial control (Behera and Engel 2006, Bhattacharya et al. 2010).

In 2006 the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act was established (Government of India 2007). The Forest Rights Act asserts traditional rights over forest resources and forest lands to the tribal populations and other traditional forest dwellers and gives substantial power to the local government, the “gram sabha” or village assembly (Sathyapalan 2010). The Act bestows traditional community rights to ownership and access to collect and use minor forest produce, products of water bodies, and rights to grazing. It also gives rights over disputed land, recognizes ownership of land by forest dwellers, and among others, grants right of settlement.

Despite some negative critiques (Saravanan 2009), researchers argue that the Forest Rights Act might help alleviate poverty because it provides rights over state land to forest dwellers (Springate-Baginski et al. 2009) impoverished by the enclosures of the communal or open access land

(Robbins et al. 2009). However the distribution of private individual title deeds, specifically land rights, has taken precedence over community or group rights, which is seen as a deviation from the spirit of the Act (Upadhyay 2008).

Study site

The study was conducted in the district of Kodagu, State of Karnataka. Kodagu is located on the slopes of the Western Ghats, a biodiversity hotspot (Myers et al. 2000). The district has extensive state controlled forests surrounding a complex mosaic of multistoreyed, coffee-based agroforests and rice paddies (Fig. 1; Garcia et al. 2009).

Kodagu’s population includes Scheduled Tribes (8.41%) and Scheduled Castes (12.29%). The main tribal communities are Yerava, Betta Kurubas, and Jenu Kurubas (Government of India 2001). These forest dwelling communities used to practice shifting cultivation, collection of forest products, and hunting (Richter 1870, Laval 2008). Nowadays, having lost most access to forest resources, they

either cultivate land, generally without legal rights, or engage in wage labor in the coffee plantations or for the Forest Department (Menon et al. 2009). However, some of them, like the Jenu Kurubas, sustain their livelihood by selling honey and other minor forest products to government sponsored societies (Bawa et al. 2007).

Management regimes, land tenure systems, and resource use rights

Reserved forests cover 1260 km² or 30% of Kodagu (IMFN 2010) and are managed by the territorial division of the Karnataka Forest Department. The original management objective in reserved forests was timber production, although today the main management objective is conservation. The rights of the locals vary from one reserved forest to the other, based on what was recorded during the reservation process. In general, local people have, if not de jure, at least de facto rights to firewood collection and cattle grazing. Only the Karnataka Forest Department and contractors or lessees have the right to collect minor forest products and timber for commercialization (Shrinidhi and Lele 2001). Joint Forest Management is targeted at degraded zones of the reserved forests with the aim of restoring them with the participation of the people. In return, villagers get a share of the benefits from forest resources and various other incentives funded by the government or outside agencies (Laval 2008). Figure 2 is a schematic representation of the social-ecological system in the study area, highlighting the major tenure and management regimes, stakeholders, institutions, and interactions between them.

Rajiv Gandhi Nagarhole National Park (644 km²) is located on the western part of the district and is managed by the Wildlife Division of the Karnataka Forest Department. It contains mostly deciduous forests and about 14% is covered with teak (*Tectona grandis*) plantations established before the park was created (Mahanty 2002). The park is under strict protection, all human activity, excluding tourism, is prohibited (Shrinidhi and Lele 2001). There are however settlements of tribal and nontribal communities within its boundaries (DeFries et al. 2010). The Nagarhole National Park has a conflict-ridden history with many resettlements or “voluntary relocations” to the forest fringes in the rehabilitation zones of the park. Relocations have been accompanied by denial of forest access to the inhabitants (Mahanty 2002). Because sharing

benefits from forests is not allowed in protected areas, Joint Forest Management is not applicable. Instead, to provide compensation for the loss of access to land and resources and to keep people outside the park, the Karnataka Forest Department engages in Eco-development (Laval 2008).

Privately owned coffee plantations fall under 39 different types of tenure rights (Uthappa 2004). They used to be covered by forests before the development of large-scale coffee cultivation. Now, coffee has taken over the landscape; the area under coffee doubled between 1977 and 1997, and represents 29% of the district area (Garcia et al. 2009).

MATERIALS AND METHODS

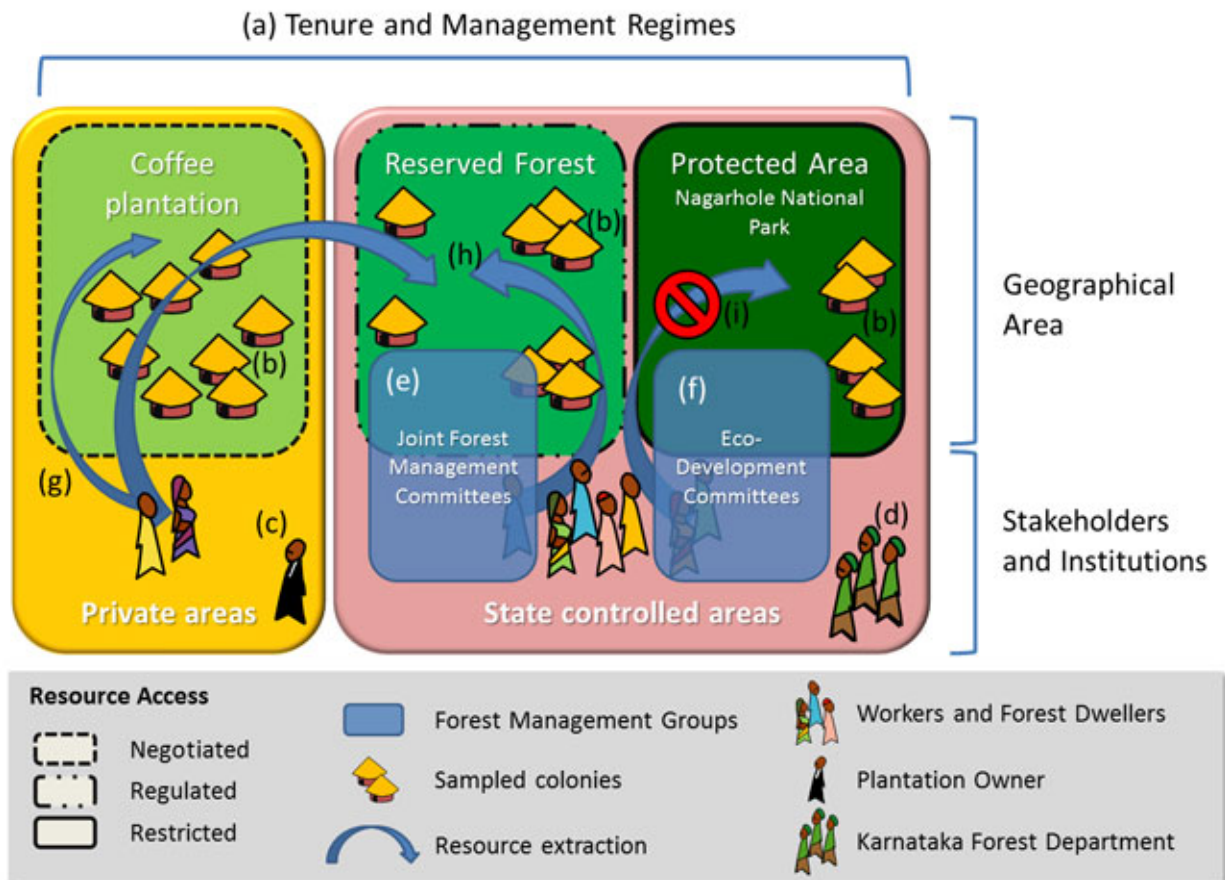
Sampling

Fieldwork was carried out between November 2008 and April 2010. Out of 154 colonies located in Virajpet Taluk (Government of India 2001), we selected 20, representing the different types of tenure and management regimes present in the area: four inside the national park, eight inside reserved forests, and eight in the coffee plantations (Figs. 1 and 2). Criteria for the selection of colonies included theoretical and logistical considerations. Based on the colony’s accessibility and on informants’ willingness to participate, we either (a) interviewed all the adult population, i.e., 87 individuals from 5 colonies located in reserved forests, or (b) randomly selected a set of households and an adult in each household to answer survey questions, i.e., 160 individuals from 15 colonies located in coffee plantations, reserved forests, and Nagarhole National Park. Our total sample included 247 adults.

Questionnaire

We conducted a structured questionnaire with open- and closed-ended questions. Questionnaire design was based on five-month long qualitative data collection, which included ethnographic data and inputs from field observation and key informants’ interviews. The questionnaire was pretested and adjusted to suit the situation in the field. All the interviews were conducted with translators fluent both in English and Kannada, the official language in Karnataka, and the questions were always framed identically.

Fig. 2. Outline of the social-ecological system. We identified three tenure and management regimes (a) in the landscape: coffee plantations, reserved forests, and protected areas. In each of these three tenure and management regimes, workers and forest dwellers have their habitations, in small hamlets called colonies (b). Rights over the resources are controlled by the owner in the coffee plantation (c), and by the Karnataka Forest Department in the reserved forests and protected areas (d). Some of the workers and forest dwellers are part of forest management groups, called Joint Forest Management Committees (e) in reserved forests and Eco-Development Committees (f) in the protected area. For the workers, access to the resources, i.e., fuel wood, of the coffee plantation can be negotiated with the owner although persons not employed in the plantation are generally excluded (g). Access to the resources, i.e., fuel wood, nontimber forest products, is regulated in the reserve forest (h) and restricted (no legal access) in the national park (i). As a result, with the exception of the fuel wood for the workers, the reserved forest is the only accessible source of forest goods to the local communities.



The questionnaire had three sections. The first part included demographic and socioeconomic questions: informant's age, education, caste, gender, income, household size, ownership of durables and livestock, and access to land for cultivation. Most of the respondents did not have a regular salary. Thus, to obtain information on income, we asked for the amount earned in the two weeks prior to the interview. Community proximity to a forested area, regardless of tenure and management regime, was also noted, classifying the settlements into three spatial categories: inside a forest, on a forest border, and far from a forest, i.e., > 1km away from a forest border.

The second part included questions on attitudes toward reserved forests. Following Ajzen and Fishbein (1980), we defined an attitude as a psychological tendency of humans to evaluate attitude objects by favor or disfavor. In our case, the attitude object is the reserved forest, so we asked respondents "Do you like or dislike reserved forests?" We rated their attitude with a two-point scale (like or dislike) assuming that in answering the question, respondents evaluate the attributes to the reserved forest based on their beliefs and express this evaluation in their overall attitude. This section of the survey also contained inquires on perception of the Karnataka Forest Department. Specifically, we asked informants "Are you happy with the management of the forest by the Karnataka Forest Department?" Individual perception was assessed by using a 5-point rating scale: not happy at all (0), not very happy (1), indifferent (2), a little happy (3), very happy (4).

In the third set of the questions, to assess the level of knowledge about the Forest Rights Act, we asked informants about each right granted by the Act: (i) individual property rights; (ii) intellectual property rights; (iii) access to and control over communal forest land; (iv) access to and control over forest products; (v) right to protect communal forest land; (vi) right to compensation after displacement; and (vii) knowledge about the provisions of land for facilities, i.e., schools and hospitals. Moreover, information on participation in forest management groups was obtained by asking: "In how many groups/associations do you regularly participate?" and "Which one of those groups has activities oriented to conservation of forest and responsible use of natural resources?"

Statistical analysis

A regression model was built to understand and predict factors associated with attitudes toward reserved forests. Considering previous research results, first, we hypothesized that higher knowledge of people's rights would be associated to positive attitudes toward reserved forests (H1). We expected people who were aware of all the benefits that the Forest Rights Act can provide to value forests more than those who were not. Second, we hypothesized that a good relationship and trust between forest dwellers and the Karnataka Forest Department would be associated with higher appreciation of the Reserved Forests (H2). Third, we expected participation in forest management related groups to be associated with positive attitudes toward the reserved forests (H3).

We used a discrete choice probit model, a regression based on maximum likelihood estimation, for the analysis. Because we expected people living in similar types of settlements to share similar attitudes, the model was clustered by the location of settlements in different tenure and management regimes. We conducted likelihood-ratio chi square tests to assess significant differences among groups of people living under different tenure and management regimes. Statistical analysis was carried out with STATA 9.1 software.

Dependent variable

The attitude toward reserved forest is a Boolean variable ("0" for dislike and "1" for like).

Independent variables

We generated three independent variables: (i) Forest Rights Act knowledge, (ii) attitude toward Karnataka Forest Department, and (iii) participation in forest management groups. The variable Forest Rights Act knowledge was generated by adding Boolean variables created for each of the seven forest rights mentioned by respondent. Because only 19 respondents knew more than two rights, we collapsed this variable into three categories: where "0" meant absence of knowledge about the Forest Rights Act, "1" knowledge of one right, and "2" knowledge of two or more rights. The variable attitude toward Karnataka Forest Department was generated directly from the score of the corresponding question (values range from 0 to 4). In regressions, we included the information on

attitudes toward Karnataka Forest Department as a set of dummy variables, each one indicating a different level of satisfaction with Karnataka Forest Department. We created a Boolean variable for participation in forest management groups, taking the value “1” for participation in one or more forest management groups and “0” otherwise.

Control variables

Control variables included in the analysis encompassed individual and household socioeconomic attributes that, according to the literature, influence the association between our dependent and independent variables. These were age, education, tribal origin, gender, household size, average income, ownership of durables, i.e., mobiles phones and motorbikes, access to land for cultivation, livestock ownership, i.e., chickens, goats, pigs, and cows, and community distance to a forest.

Potential biases and limitations

The estimated coefficients might be affected by (1) differences in sampling, (2) measurement error, (3) omitted variables bias, and (4) reverse causality. First, not all informants were selected following the same protocol. In some colonies we interviewed all the adult population whereas in others we proceeded with a random selection. Measuring errors can occur because of sampling differences, affecting the values of the independent variables and the magnitude of the marginal effects in the regression. To avoid over-interpreting our results, we focus the discussion on the direction of the marginal effects in the analysis rather than on the magnitude of the estimated regression coefficients.

Second, a Boolean variable does not capture all the dimensions of the people’s appreciation of the reserved forest and thus, our model is inaccurate and limited. Third, variables not included in our study design could affect the outcome of the regression. For example, benefits and costs created by protected areas strongly influence attitudes (Heinen and Shrivastava 2009, Shibia 2010). Unfortunately, these data were neither collected nor available from other sources and thus we could not incorporate them in our model.

Last, a causality effect could not be inferred from the overall regression model. We did not have convincing instrumental variables to control for the

endogeneity of our independent variables, i.e., Forest Rights Act knowledge, attitude toward the Karnataka Forest Department, and participation in forest management groups. Relationships between the dependent variable, attitudes toward reserved forests, and the independent variables are only associative.

We observed a high percentage of reserved forest appreciation. This could be because of complacency bias, a ubiquitous systematic error whereby respondents tend to answer what they think is expected from them.

RESULTS

Attitudes toward reserved forests

Most of the respondents (89%) expressed a positive attitude toward reserved forests. Although the inhabitants of coffee plantations more frequently expressed positive attitudes toward the reserved forests (0.94 ± 0.24 SD) than reserved forests dwellers (0.87 ± 0.34 SD), these differences were not statistically significant ($G^2 = 2.6173$, $p = 0.270$).

Independent variables

Forest Rights Act knowledge

Average Forest Rights Act knowledge was low (Table 1). The lowest knowledge score was found among the inhabitants of the coffee plantations (0.07 ± 0.26 SD) and the highest among the Nagarhole National Park dwellers (0.26 ± 0.44 SD). Forest Rights Act knowledge significantly differed between people living in coffee plantations and all others ($G^2 = 8.7529$, $p = 0.013$, $G^2 = 6.6478$, $p = 0.036$), whereas the knowledge of respondents from the Nagarhole National Park and the Reserved Forest did not differ ($p = 0.902$; Table 1).

Attitudes toward Karnataka Forest Department

A high proportion (42.51%) of informants stated that they were very happy with the Karnataka Forest Department, but the Nagarhole National Park dwellers reported the lowest (62.23%) levels of satisfaction (Table 1). There were statistically significant differences in attitudes toward the Karnataka Forest Department between inhabitants of the national park and all others ($G^2 = 32.4260$, p

Table 1. Summary statistics of the variables included in the multivariate regression analysis (N = 247). Frequency distributions are listed for all the variables. For the attitudes toward reserved forests (dependent variable), Forest Rights Act knowledge, attitudes toward Karnataka Forest Department, and participation in forest management groups (independent variables) table shows comparisons within three land tenure and management regimes analyzed by likelihood-ratio chi2 tests (G2). Asterisks denote statistically significant relation * at 10%; ** at 5%; *** at 1%.

Variable name	Variable description	Total sample N=247	Land tenure and management regimes		
			Coffee plantations N=69 (27.94%)	Reserved Forests N=133 (53.85%)	National Park N=45 (18.22%)
Attitudes toward reserved forest	Respondent likes reserved forest	89%	94%	87%	89%
Knowledge about Forest Rights Act	No knowledge (0)	81.38%	92.75%	77.44%	75.76%
	One right (1)	5.67%	1.45%	7.52%	6.67%
	More than one right (2)	12.96%	5.80***%	15.04%	17.78***%
Attitudes toward Karnataka Forest Department	Not happy at all (0)	20.24%	14.49%	14.29%	46.67%
	Not very happy (1)	8.10%	4.35%	7.52%	15.56%
	Indifferent (2)	10.93%	8.70%	9.77%	17.78%
	A little happy (3)	18.22%	18.84%	21.80%	6.67%
	Very happy (4)	42.51%	53.62%	46.62***%	13.33***%
Participation in Forest Management Groups	Respondent participates in FMG	14%	0***	24%***	4%*
Age	In years	37.98(±15.30)	37.06 (±14.46)	38.38 (±15.80)	37.24 (±15.24)
Education	No formal education (0)	48.99%	42.86%	45.11%	67.39%
	1 to 4 grades (1)	17.00%	24.29%	15.04%	13.04%
	5 to 11 grades (2)	32.39%	28.57%	39.10%	19.57%
	12 grades (3)	1.62%	4.29%	0.75%	0.00%
Tribal origin	Respondent belongs to Scheduled Tribe	90%	75%	94%	100%

(con'd)

Gender	Male (1) / Female (0)	0.59 (± 0.49)	0.48 (±0.50)	0.67 (±0.47)	0.51 (±0.51)
Household size	Number of heads	5.00 (± 2.35)	4.54 (±1.93)	5.35 (±2.68)	4.69 (±1.66)
Average income for two week period	In thousand Indian Rupees = 22 US\$	3.39 (± 2.79)	3.56 (±2.58)	3.14 (±2.66)	3.84 (±3.41)
Ownership of durables - motorbikes and mobiles	In thousand Indian Rupees	1.24 (± 3.29)	1.84 (±3.79)	1.24 (±3.50)	0.35 (±0.75)
Access to land for cultivation	In acres	1.66 (± 2.17)	0.58 (±1.14)	2.07 (±2.25)	2.13 (±2.57)
Livestock ownership: chickens, goats, pigs, and cows	Average bodyweight in kg	318.54 (± 909.80)	43.36 (±167.68)	466.12 (±1111.99)	304.21 (±830.62)
Community distance to a forest	Inside (1)	71.66%	49.28%	96.24%	33.33%
	On border (2)	14.17%	0.00%	3.76%	66.67%
	More than 1 km away (3)	14.17%	50.72%	0.00%	0.00%

Note: To determine differences within dependent and independent variables under three land tenure and management regimes we ran likelihood-ratio χ^2 tests comparing two by two data subsets. There are no significant differences within attitudes toward reserved forests under different land tenure and management regimes.

= 0.000, $G^2 = 34.4862$, $p = 0.000$), but not between those of the reserved forest and the plantations ($p = 0.834$; Table 1).

Participation in forest management groups

Participation in forest management groups was low (13.8%; Table 1). The highest participation was found within the reserved forests (0.24 ± 0.43 SD). Out of 45 respondents living inside Nagarhole National Park, only two (0.04 ± 0.21 SD) reported participation. The inhabitants of the coffee plantations were not involved in any such group. These differences were significant (Table 1).

Multivariate analysis

To understand the effect of different management regimes, we compared two models: with and without clustering by different land tenure and management regimes, i.e., coffee plantations, reserved forests, and national park. The model with clustering assumes that individuals living in the same location are interdependent, but unrelated with individuals residing in other land tenure and management regimes, whereas the model without clustering does not assume any similarity between individuals living under the same management or tenure regime. Table 2 shows the results of probit regressions that estimate the marginal probability increase of liking the reserved forest when a categorical variable, e.g., Forest Rights Act knowledge, changed by one unit above its mean value.

Table 2. Probit models with and without clustering by tenure and management regimes (coffee plantations, reserved forest, national park) explain factors that are associated with the attitudes toward reserved forests (N = 247). Coefficients represent change in marginal probability and + or - sign shows direction of association. Asterisks denote level of significance: * at 10%; ** at 5%; *** at 1%. Robust standard errors are in parentheses. Parameter pseudo R² is a measure of goodness of fit.

		With clustering	No clustering
Dependent variable			
Attitudes toward reserved forests			
Independent Variables			
Knowledge about Forest Rights Act [H1]		0.054 (0.030)*	0.054 (0.029)*
Attitudes toward Karnataka Forest Department [H2]:			
	0 (not happy at all)	-0.160 (0.067)***	-0.160 (0.074)***
	1 (not very happy)	-0.163 (0.102)**	-0.163 (0.111)**
	2 (indifferent)	-0.125 (0.086)**	-0.125 (0.082)**
	3 (a little happy)	-0.045 (0.048)	-0.045 (0.046)
Participation in Forest Management Groups [H3]		-0.049 (0.007)***	-0.049 (0.053)
Control variables			
Individual level	Age	-0.001 (< 0.0001)**	-0.001 (0.001)*
	Education	0.020 (0.021)	0.020 (0.016)
	Tribal origin	-0.036 (0.022)	-0.036 (0.029)
	Gender	-0.004 (0.028)	-0.004 (0.024)
Household level	Household size	0.012 (0.006)*	0.012 (0.006)**
	Average income for two weeks period	-0.004 (0.004)	-0.004 (0.004)
	Ownership of durables	0.009 (0.005)*	0.009 (0.005)
	Access to land for cultivation	0.005 (0.006)	0.005 (0.005)
	Livestock ownership	-0.00004 (< 0.0001)***	-0.00004 (< 0.0001)***
Community level	Community distance to a forest		
	1 (Inside)	0.033 (0.039)	0.033 (0.057)
	2 (On the boarder)	0.052 (0.008)***	0.052 (0.023)
N = 247		Pseudo R ² = 0.2707	Pseudo R ² = 0.2707

We found a statistically significant and positive association among Forest Rights Act knowledge and overall attitudes toward reserved forests. The increase of the knowledge score over the mean of 0.32 was associated with a 5.37% increase in the probability of expressing positive attitudes toward the reserved forest (p = 0.088). There was no change when clustering was omitted.

We included the information on attitudes toward Karnataka Forest Department as a set of dummy

variables. Because more than 40% of people asserted that they were very satisfied with the Karnataka Forest Department, we used this category as reference. The coefficients from this model suggest a significant decrease of positive attitudes toward reserved forests with lower levels of satisfaction and indifference about the Karnataka Forest Department. All categories exhibit the same pattern but categories 0 (not happy at all; - 0.160, p < 0.001), 1 (not very happy; - 0.163, p = 0.015), and 2 (indifferent; - 0.125, p = 0.013) show a statistically

significant association. There were no changes in the model without clustering (Table 2).

The third significant dependent variable, participation in forest management groups, had negative association with the attitude toward reserved forests (-0.049 , $p < 0.001$). However, when clustering was not applied, participation in forest management group lost association with attitudes toward reserved forests ($p = 0.268$).

Robustness analysis

To test the consistency of the results, we ran a series of probit regressions with variations in the specifications of the core model with clustering (Table 3). The core model proved to be moderately sensitive to these changes. The probability coefficients of the independent variables retained the same sign but had different significance level. The variable Forest Rights Act knowledge was the most sensitive to induced changes, whereas participation in forest management groups and attitudes toward Karnataka Forest Department showed robustness. When controlled only by household-level attributes, model variables had higher significance (model 7). When access to land for cultivation and livestock ownership was excluded from the regression, variable Forest Rights Act knowledge lost its significance (model 10). The same occurred when tribal origin was not included in the model 11.

DISCUSSION

The history of modern forestry in India is linked to the construction of the colonial state (Sivaramakrishnan 1999). Community rights to forest resources have been progressively and strategically curtailed to secure timber supply or preserve critical ecosystems, but also to industrialize India and to stir development after independence (Guha 1983, Menon 2007). The interests of the state have been prioritized over those of forest-dwelling communities (Menon 2007, Kothari 2008). Strict exclusion from national parks and wildlife sanctuaries has been enforced (Kothari 2008) leading to dispossession, evictions, and conflicts with local communities (see Lasgorceix and Kothari 2009 for details).

Menon et al. (2009) discussed the applicability of the “domestic forest” paradigm to the Western

Ghats. Unlike protected areas, reserved forests exhibit complex interplays between practices, representations, rights, and tolerances that leave room for less conflicting forms of interaction between stakeholders. Moreover, our results showed a high level of appreciation of reserved forests among local communities. Also, positive attitudes toward reserved forests were associated to Forest Rights Act knowledge and the attitudes toward Karnataka Forest Department. Last, and contrary to what is commonly thought, participation of the local people in the forest management groups was negatively associated to the attitudes toward reserved forests.

Attitudes toward reserved forests

Previous research suggests that rural local communities have a substantial level of appreciation of protected areas (Mehta and Heinen 2001, Triguero-Mas et al. 2010, but see Ite 1996, Heinen and Shrivastava 2009). Our research unraveled positive attitudes toward forests that are more accessible to the local communities than protected areas.

Attitudes toward managed forests vary within locations, probably because of different management objectives and history, levels of access to resources, and costs or benefits created through forest management (Ormsby and Kaplin 2005, Allendorf 2007, Heinen and Shrivastava 2009). We did not find statistically significant differences when comparing attitudes toward reserved forests from people living under three different land tenure and management regimes. Moreover, the overall regression model did not lose its significance when clustering by land tenure and management regimes was omitted. All these suggest that actual land tenure and the management regime under which the respondents live is not important for the appreciation of reserved forests. However, it is worth noticing that many respondents did not make the distinction between the land tenure and management regime and the ecosystem, which might confound our findings.

A socioeconomic variable that might partially explain our results is ethnicity. Ninety percent of respondents in our sample were from tribal origin, which could have a substantial effect on the results (Table 3, model 11). However, the low variability in our sample limits what can be inferred from the dataset. Similarly we have not explored the

Table 3. Robustness test: regressions of attitudes toward reserved forest (dependent variable) against attitudes toward Karnataka Forest Department, knowledge about Forest Rights Act, and participation in forest management groups (N = 247) with clustering by land tenure and management regimes. Asterisks denote level of significance * at 10%; ** at 5%; *** at 1%.

Model	Knowledge about Forest Rights Act [H1]	Attitudes toward Karnataka Forest Department [H2]				Participation in Forest Management Groups [H3]	Changes made to core model with clustering (in Table 2)
		0	1	2	3		
Core Model with clustering	0.063**	-0.125***	-0.121	-0.129**	-0.053	-0.062***	No changes
[1]	0.045**	-0.118***	-0.113	-0.125**	-0.048	-0.054***	Knowledge about Forest Rights Act score range from 0 to 7 (0 = lack of knowledge, 1-7 = knowledge about 1 up to 7 rights)
[2]	0.053	-0.127***	-0.126	-0.122**	-0.053	-0.058***	Knowledge about Forest Rights Act score range from 0 to 1 ((0 = lack of knowledge, 1 = knowledge about one and more rights)
[3]	0.062**			0.02**		-0.057**	Attitudes toward Karnataka Forest Department score range from 0 to 4 (0 = not happy at all, 1 = not very happy, 2 = indifferent, 3 = a little happy, 4 = very happy)
[4]	0.064**			0.064***		-0.063**	Attitudes toward Karnataka Forest Department score range from 0 to 1 (0 = not happy at all, 1 = otherwise)
[5]	0.063*	-0.121***	-0.124	-0.126**	-0.051	-0.028***	Participation in Forest Management Groups score counting number of groups in which informant participates
[6]	0.064*	-0.12***	-0.12	-0.115**	-0.058	-0.061***	Added length of residence
[7]	0.083***	-0.174***	-0.182**	-0.22***	-0.089*	-0.082***	Included only household-level control variables
[8]	0.059*	-0.14***	-0.099	-0.141**	-0.064	-0.05***	Included only individual-level control variables
[9]	0.068**	-0.133***	-0.125	-0.139**	-0.055	-0.067***	Excluded average income and ownership of durables
[10]	0.057	-0.138***	-0.116	-0.129**	-0.06	-0.04***	Excluded access to land and livestock ownership
[11]	0.064*	-0.131***	-0.125	-0.137***	-0.059	-0.063***	Excluded tribal origin

differences between tribal groups. Future research should explore the linkages between ethnic origin (tribal and nontribal), and attitudes toward reserved forests.

Reserved forests and Forest Rights Act knowledge

Because Forest Rights Act knowledge was positively and significantly associated both to forest management group participation and education (model not shown), plausible reasons for the low level of Forest Rights Act knowledge (18.6 %) are the low level of education and the low level of participation in forest management groups in the sample. These two variables influence the ability of local populations to access the information and lay claims to forest land under the Forest Rights Act. The informants from the Nagarhole National Park and reserved forest had a higher level of Forest Rights Act knowledge compared with people from coffee plantations. However, our experience has been that this level of information leads to more confusion locally rather than clarification and positive changes of attitude.

Despite low levels of Forest Rights Act knowledge, a better knowledge of the Act increased the likelihood of exhibiting positive attitudes toward the reserved forest. This new Act can provide people with secure land tenure and legal access to the forest. Benefits gained from the rights given by the Forest Rights Act may thus overcome the costs of living close to reserved forests and positively influence people's attitudes.

Reserved forests and attitudes toward Karnataka Forest Department

Although attitudes toward Karnataka Forest Department were mostly positive, there was variation across tenure and management regimes. Negative attitudes toward the Karnataka Forest Department were associated with the tribal origin of the respondents and the proximity of their settlements to a forest (data not shown). Respondents who had the most negative attitudes toward Karnataka Forest Department were the ones living in the Nagarhole National Park. Park dwellers have been exposed not only to bans on resource extraction for their livelihoods needs, but also to loss of job opportunities and evictions to the park

fringes (Mahanty 2002). Reserved forest dwellers have the possibility to legally extract some resources and gain more benefits than the people directly under the protected area regime with a stricter conservation policy. Inhabitants (workers) of the coffee plantations do not have much contact with the Karnataka Forest Department. The three groups reported increasing degrees of satisfaction with the Karnataka Forest Department management. This indicates that increased interactions with the managing institution translate into increased possibilities of conflict.

Reserved forests and participation in forest management groups

Contrary to our predictions, there was a negative association between attitudes toward reserved forest and participation in forest management groups. Moreover, participation in forest management groups was not associated to positive attitudes toward reserved forests when clustering was not applied. The negative association might indicate that there are deep power structures incorporated in those groups, and all voices cannot be heard properly. Previous studies in the area (Laval 2008) documented high levels of frustration and discontent among the participants of the formal forest management committees. Being a member of such committees was understood as a burden, without any long-lasting benefit. Enforced participation thus leads to lowering the appreciation toward forests. Researchers notice that local elite gain all the benefits when new managing groups are formed and the structure of society is reflected in the functioning of those groups especially affected by inequities of class and caste (Agarwal 2001, Berkes 2008). Powerless, marginalized people are part of the management in theory, but not in practice. Participatory exclusions of certain powerless groups, especially women, are not rare (Agarwal 2001). Our multivariate analysis also showed that participation in forest management groups is significantly associated with male individuals.

Participation has been seen as a panacea for resolution of conflicts between different forest users (Rishi 2007) and for negotiating the access to resources. However, we found participation negatively associated to the attitudes toward the forest and its official stewards.

CONCLUSIONS

A combination of different factors, policies, and institutional settings, connected to forest use and access, influences attitudes toward reserved forests in our study. Our results suggest that increasing local awareness and knowledge about rights along with improving relationships between the local community and forest stewards has to be a priority for the sustainable management of reserved forests.

Effects of (imposed) participation and inclusion in forest management practices have to be elaborated in future research because findings of this study indicate contradictory effects of participation on attitudes toward reserved forests. It is not clear whether attitudes toward reserved forests lead to sustainable behavior, or what is the conservation value of these domestic forests compared to protected areas. Furthermore, future research is needed to monitor if the Forest Rights Act effectively fits the needs of the low-income, forest-dependent population and what are the further implications of this policy. However, without proper implementation and transparency, the Forest Rights Act will not have all its power and long-term effects. These issues should be addressed both at the state and local level.

Responses to this article can be read online at:
<http://www.ecologyandsociety.org/vol16/iss3/art10/responses/>

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