



USE OF TEA PLANTATION BY WILD MAMMALS IN TAMIL NADU, INDIA

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Abstract

Wild mammals that live in the fragmented primary forests in Western Ghats often leave the fragment due to resource shortages and use the nearby tea plantation either to forage or as a corridor to connect other fragments, during which time human-wildlife conflict is inevitable. Hence, understanding the need of wild mammals using the tea plantations is essential to minimize this conflict. We researched the use of tea plantations by wild mammals between October 2011 and January 2012 in Kolacamby, Nilgiris District, Tamil Nadu, India. Walks were made to determine the relative abundance of wild mammals inside the plantation. Scats of sloth bear (*Melursus urisnus*), tiger (*Panthera tigris*), and leopard (*Panthera pardus*) found inside the plantation were analyzed to determine food habit. In addition, workers were informally interviewed about man-wildlife conflict. All major carnivores of the Western Ghats ecosystem were recorded in the area. Despite the richness of the fauna in the fragments, minimal human-wildlife conflict was reported.

Key words: habitat use, human-wildlife conflict, Kolacamby, mammals, tea plantation

Introduction

The Western Ghats in southern India have been recognized as a hotspot of biodiversity (Mayers *et al.*, 2000); however, conversion of forests into agriculture land has already caused considerable loss of primary forests and landscapes (Menon & Bawa, 1997). As a result, remaining primary forests are now found in a fragmented state (Kumar *et al.*, 1995) either surrounded by human habitation or plantation. Wild animals that live in the primary forest often come out due to resource shortages or to

move to other forest areas. In these circumstances, human-wildlife conflict is inevitable (Akhtar & Chauhan, 2006; Bargali *et al.*, 2005; Chauhan, 2003, 2004, 2005a,b; Mishra, 1997; Rajpurohit, 1996; Saberwal *et al.*, 1994; Schultz, 1986; Singh, 2006; Vijayan & Pati, 2001). Many conflicts are due to large, often endangered, animals such as elephant, tiger, sloth bear, leopard, while species of lesser conservation concern are also involved (e.g., nilgai, wild boar, jackal).

In the Nilgiri Hill ranges, Kolakamby plateau is an example of a landscape where such conflict is common. On this plateau, several of land is cultivated primarily for tea by private and government owners. Large tracts of contiguous primary forests were cleared for such plantations during 1880s and still some forest patches exist under the management of the Forest Department of Tamil Nadu. Wild mammals from the nearby forest areas frequently use tea plantations. Since the plantation area has many human settlements human-wildlife animal is inevitable. Kumara *et al.* (2004) pioneered the study of wild animals in tea plantations in Valparai and we made a similar assessment to understand the use of tea plantations by wild mammals in Kolacamby, Nilgiris District, Tamil Nadu, India during October 2011 to January 2012.

Materials and Methods

Study area: A privately owned tea plantation, located between 76°44'54.24''E and 11°17'9.6''N was selected near Kolacamby village, in Nilgiris District, Tamil Nadu (Fig. 1). The tea, *Camellia sinensis* (Theaceae), plantation is surrounded by primary forest on all the sides. The study area comes under Lousiana division (46.54 ha), Bhavani division (48.56 ha), and Muthanadu division (36.42 ha). Approximately 200 workers are currently working in the area. Both the sexes work in the factories, however, only women collect tea leaves. Leaf collection starts at 0800 h and ends at 1600 h with an hour break for lunch during 1200 h to 1300 h half an hour before the cease of both morning and evening session, collected leaves are weighed and loaded to the factory. Workers move in groups and work very closely in an organized manner while collecting leaves during work hours. Workers move separately only on their way home as their settlements are in different direction. Several perennial streams passed through the estate from adjacent forest areas. Dense vegetation is characterized by pioneer species; *Mangifera indica* (Anacardiaceae), *Mallotus tetracoccus* (Euphorbiaceae), *Ficus hispida* (Moraceae), *Macaranga peltata* (Euphorbiaceae), *Persea macrantha* (Lauraceae) and weeds; *Lantana camara* (Verbenaceae) and *Eupatorium* sp. (Asteraceae).

Data collection: To enumerate the wild animals using the tea plantation, the boundary path of

the tea plantation was treated as transect and walked thrice in a month. Walks were made in the morning (between 0600 and 0900 h), midday-1 (between >0900 h and 1200 h), midday-2 (between >1200 h and 1600 h), and in the evening (between 1600 and 1900 h) from October 2011 to January 2012 in clear weather condition. All the wild mammals sighted, number of individuals sighted, sex (if possible), age (if possible), and activity were recorded. The data were used to determine the relative abundance of the different species. On many occasions, observations were made on several mammalian species for longer durations.

Scats of tiger, leopard, and sloth bear were also collected to identify the food habits. Scat collection and analysis of sloth bear followed methods used by Gokula *et al.* (1995), Baskaran *et al.* (1997), and Joshi *et al.* (1997). Scats were weighed. Samples were soaked in water for 10–15 h, and then washed in running water to remove mud and other matter using 0.7 and 0.4 mm sieves. Scat samples were analyzed manually by separating components (such as ants, termites, and fruits) in the scats. A dissecting microscope was used to identify food items when needed. All inseparable, unidentifiable crushed matter, including parts of insects and fruits, was considered waste and discarded. Scat composition was quantified by both frequency of occurrence and percent dry weight of each food item. In addition to quantifying each item by species, we grouped into animal matter and plant matter.

Scats of the tigers and leopards are much larger and deposited on the grassy strips at the center and on sides of forest roads. On the other hand the group living dholes deposit their smaller scats in clusters on bare soil along the road wheel-track making them easily distinguishable from the two felids (Johnsingh, 1983; Karanth & Sunquist, 1995). Tiger and leopard scats were separated using supplementary evidence such as difference in quantity, number of constrictions, distance between two constrictions and diameter of the scat and sometimes the presence of tracks (Karanth & Sunquist, 1995). After identification a portion of the scat containing adequate amount of prey remains such as hair and other undigested body parts were collected. Scats were subsequently washed in a stream through a fine (< 1mm) nylon sieve (Cunningham *et al.*, 1999). The

sieved prey remains, grass and soil were sun dried in thin paper bags for three days to avoid fungal growth. The dried scat samples were then labeled and stored. Because hair passes undigested through the gut it was the primary source of information for identifying the prey species (Karanth & Sunquist, 1995; Mukherjee *et al.*, 1994a, b; Sunquist, 1981). The prey identification protocol was based on general appearance of the hair, color, relative length, relative width, texture, basal configuration, cortex pigmentation, medullary width and patterns as described by earlier workers (Karanth & Sunquist, 1995; Putman, 1984; Sujai, 2004).

Additional information on human–animal conflict was gathered from the local people through personal interviews. All the two hundred workers were interviewed and their perceptions about wild animals were recorded. Workers who had sustained injuries in animal-encounter inside the tea plantation were identified and a detail of the encounter was recorded.

Results and Discussion

All major carnivores of the Western Ghats ecosystem, including tiger, leopard, dhole, jackal, and smaller cats, such as jungle cat (*Felis chaus*), were recorded (Table 1).

Table 1: Number of encounters and relative abundance of large carnivores in the area ($n=93$)

Wild mammal	No. of encounters	Relative abundance
Tiger	3	0.03
Leopard	3	0.03
Jackal	1	0.01
Smaller cat	15	0.14
Gaur	36	0.34
Mouse deer	1	0.01
Barking deer	3	0.03
Sloth Bear	12	0.11
Wild boar	9	0.09
Porcupine	10	0.10
Common mongoose	12	0.11
Total	105	1.00

Although pugmarks and scats of tigers were seen frequently in the adjacent forests, their presence was rare inside the estate. Only on three occasions, tiger and leopard were encountered. However, smaller cats were frequently sighted inside the estate. The relative abundance of smaller cats were high (0.16) compared to leopards (0.03) and tiger (0.03). Jackal (0.01) was sighted only once inside the plantation. Direct sightings of smaller cats were comparatively high, but they move very quickly and thus identification was not possible for many of the occasions. Among other large mammals; gaur, *Bos gaurus* was observed with the highest relative abundance (0.34) followed by sloth bear, *Melursus urisnus* (0.11). Wild pig, *Sus scrofa* (0.09), mouse deer, *Tragulus meminna* (0.01), and porcupine, and *Hystrix indica* (0.10). Among small carnivores, common mongoose, *Herpestes edwardsai* was less common (0.11).

Dietary composition of the sloth bear has been studied based on frequency of occurrence and percent weight of different food items in scats (Gokula *et al.*, 1995; Baskaran *et al.*, 1997; Desai *et al.*, 1997) as well as through direct observations of feeding behavior (Joshi *et al.*, 1997). Sloth bears have morphological adaptations to feed on insects but, like other bear species, they are opportunistic omnivores and their diets varies seasonally and geographically (Joshi *et al.*, 1997). As in other studies, sloth bears consumed both animal and plant matter, with variation probably related to food availability in different seasons (Laurie & Seidensticker, 1977; Baskaran, 1990; Gokula *et al.*, 1995; Baskaran *et al.*, 1997; Joshi *et al.*, 1997). In total, 50 scats of sloth bear were analyzed. Percent dry weight of food items found in the scats varied. Animal matters were more abundant during the months of November and December, while plant matters dominated the diet in October and January (Tables 2–4). *Lantana camara*, *Ficus* sp., *Coffea arabica* (Rubiaceae) were found in the scats of sloth bear and of which *Lantana* and *Ficus* sp. dominated most of the scats. Besides fruits, fibers (unidentified) were also often recorded in scats (Tables 2–4). In the animal matters, ants were very frequent, but the presence of honey bee was very meager (Table 5). We found that insects and fruits of *Lantana camara* and *Ficus* were the most frequently encountered food items in scats as reported by others (Baskaran,

1990; Davidar, 1983; Gokula *et al.*, 1995; Gopal, 1991; Joshi *et al.*, 1997).

Table 2: Percent dry weight of plant and animal matter found in the scats of sloth bear.

Month	No. of scats analyzed	Animal matter	Plant matter
Oct 2011	6	80%	20%
Nov 2011	3	33.3%	66.6%
Dec 2011	5	-	100%
Jan 2012	36	51.30%	48.69%

Table 3: Percent dry weight of plant matter found in the scats of sloth bear.

Month	No. of scats analyzed	Plant species	%
Oct 2011	6	<i>Lantana camara</i>	100
Nov 2011	3	<i>Lantana camara</i>	50
		Fibers	50
Dec 2011	5	Fibers	60
		<i>Lantana camara</i>	20
		<i>Ficus sp.</i>	20
Jan 2012	36	<i>Lantana camara</i>	83
		<i>Coffea arabica</i>	4.5
		<i>Rubus sp.</i>	1.5
		Fibers	11

Table 4: Percent dry weight of animal matter found in the scats of Sloth Bear

Month	No. of scats analyzed	Animal species	%
Oct 2011	6	Ants	91.6
		Ant's Pupae	8.4
Nov 2011	3	Ants	100
Dec 2011	5	-	-
Jan 2012	36	Ants	95.5
		Honey bee	4.5

Sambar (*Cervus unicolor*) is a major prey species for leopards and tigers in mature forests (Fox & Johnsingh 1975) and the same may be true in the present study as hairs of sambar were predominantly found in the scats of leopard and tiger although the sample size was very low (Table 5). No species of wild animal was found spending the whole day inside the plantation however, animals were frequently observed during the early morning and late evening hours (Fig. 2). No animals were found in the tea plantation during the hottest hours of the day. The presence of open grass patches between the tea plantation and the nearby streams provides a very good foraging

opportunity to the herbivore animals. On the other hand, presence of fruits of *Lantana sp.*, *Ficus sp.*, and *Rubus sp.* in and around the plantation attract the sloth bear. A forest usually has a good crown cover. Because of the low penetration of light through such a canopy, the forests do not offer much grass for grazers. On the other hand, a tea plantation is almost totally open, with largely spaced oak trees. Because of the high elevation, medium temperature, and high rainfall, effusive grass grows in all open spaces, including roadsides. This provides excellent grazing grounds and attracts grazers from the nearby forests. Large herbivores such as gaurs were observed to visit the estate grasslands only after dusk and they always returned to the forests before sunrise. Small mammals, such as porcupine and mongooses, were probably residents in the estate, using rocks and tree holes near stream vegetation as shelters.

Table 5: Percent dry weight of prey matters found in the scats of tiger and leopard

Month	No of scats analyzed	Animal matter	Plant matter
Tiger			
Oct 2011	-	-	-
Nov 2011	1	Sambar (100 %)	-
Dec 2011	-	-	-
Jan 2012	1	Sambar (100 %)	-
Leopard			
Oct 2011	1	Sambar (100%)	-
Nov 2011	2	Sambar (100%)	-
Dec 2011	1	Black-napped hare (14%) Sambar (86%)	-
Jan 2012	1	Wildboar (86%)	Grass (14%)

Among the wild animals, no reports of tigers and leopard attacking workers were evident however, six workers were mauled by sloth bear during the last ten years. As animals were largely seen inside the plantation during the early morning and late evening hours of a day, workers had a very limited opportunity to encounter with wild animal. All the six cases happened in the early hours when workers went alone for some other purposes outside the

plantation. Most of the time while working, workers move in groups and work very nearby and thus rate of encounter with animals is infrequent. These observations indicate that the human-animal conflict was minimal inside the plantation. The only negative impact of wild mammals for planters was the damage done to the root systems of plants because of digging by sloth bears, wild pigs, and porcupines.

The tea plantations of Kolacamby were used effectively by as many as 11 species of wild mammals either as foraging grounds or as a corridor to connect other natural forest. Wild mammals frequented the tea plantations largely during the early morning and late evening. Although minimal, man-bear conflict was found outside the tea plantations.

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PLATE 8

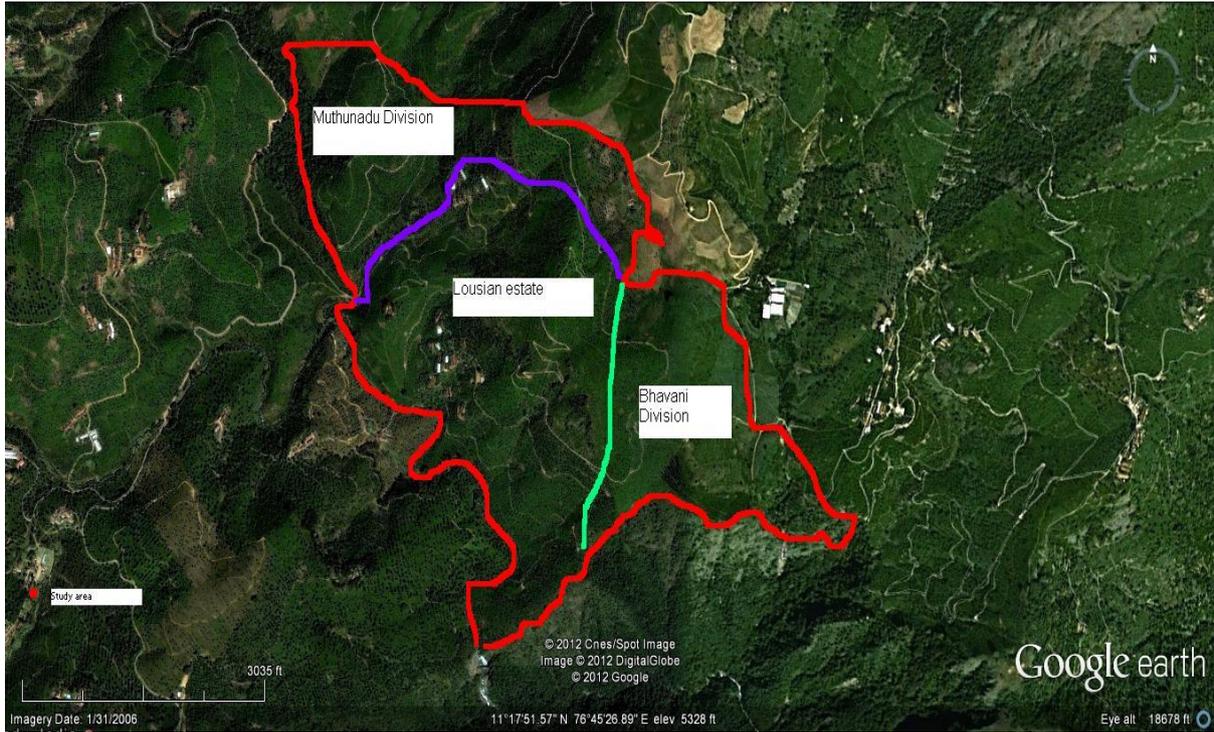


Figure 1: A map of the study area.

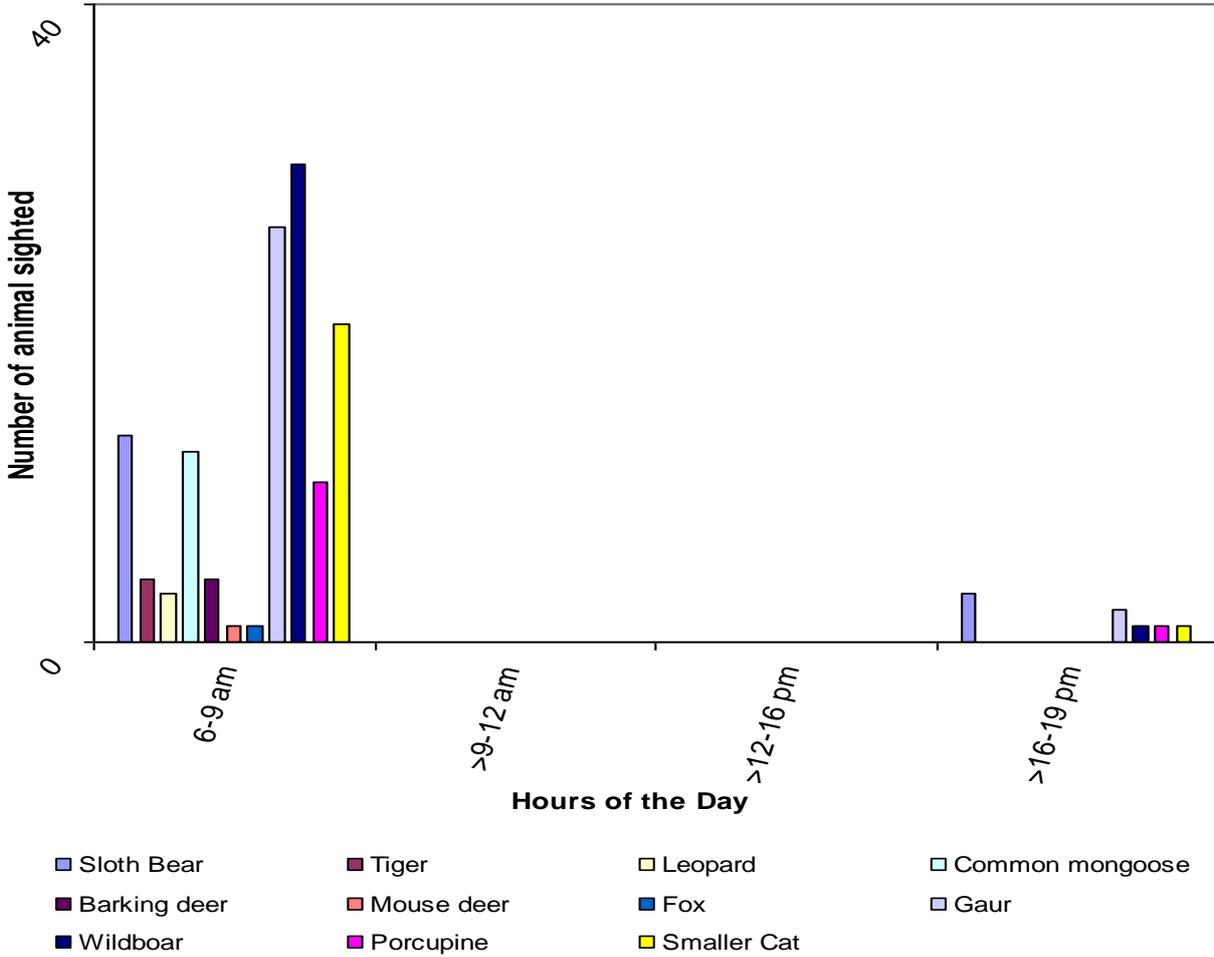


Figure 2: Sightings of wild mammals in the tea plantation during the study (number of herds is represented for gaur)