

Project Update: September 2007

A preliminary study was carried out in Kalakad Mundanthurai Tiger Reserve in an active tea plantation to understand the dispersal constraints and how seed shadow of native tree species reaches the tea plantation from the surrounding forest. Our empirical data reveals that birds (>17%) and bats (03%) adapted seed are the major colonizers into the tea plantation. Most of the edge species (light demanding species) seeds are the major contribution to soil seed bank (Fig 3). Within the tea plantation 10m and 70m away from forest does not shows any significant difference in species diversity (Fig 2). Overall preliminary study from active tea plantation reveals that there may not be major dispersal constraints, but once seed reaches to tea bushes, lot of seed mortality were observed. We don't know whether such mortality is due to seed viability or other external factors such as light and edaphic factors. In my next phase after the monsoons I would focus on understanding the viability of dispersed seeds and its germination constraints (from secondary dispersal predation to germination level *insitu* and *exsitu*).

Key words: Soil seed bank, Gradients, Forest tea edge, inside forest, frugivores birds and fruit bats.

2. Introduction

The current study was carried to understand active and abandoned tea plantation seed dispersal from surrounding forest to inside tea plantation. We selected one active tea plantation and one abandoned tea plantation (Lat. 8°29'05"N & Long. 77°28'46"E) both falls within the protected area to understand the native species regeneration and its constraints. I was investigating the objective on how far does the seed shadow of native tree species reaches the tea plantation from the surrounding forest?

3. Study area

Study was carried out Kalakad Mundanthurai Tiger Reserve (KMTR), southern India. Elevation ranges between the 1000 to 1400m and receives over 3500mm of rain from both southwest and northeast monsoons. January to May and September are the dry seasons and the rest of the months experience a minimum of 100mm rainfall. Temperature does not vary much over the seasons. Mean annual temperature is 24⁰ C with mean maximum temperature at the site ranges from 17⁰ to 28⁰ C and minimum temperature from 14⁰ to 19⁰ C (Ganesh *et al.* 1996, Ganesh & Davidar, 1997).



Photo1: Abandoned tea plantation, which is mat of tea bushes grown more than 10m heights native species area suppressed by tea plants.

4. Methods and materials

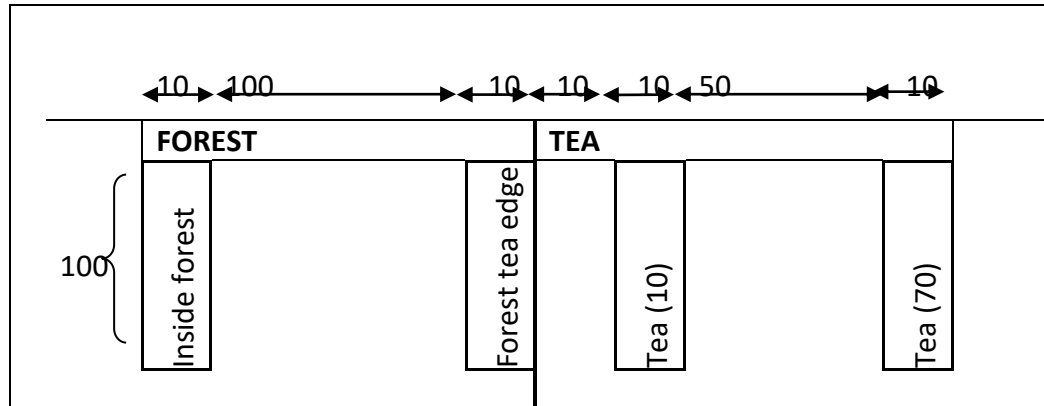


Fig.1- Schematic diagram which I carried out in active Tea and adjacent forest to seed input using the natural perch and without perch point.

Study site divided into four directions (north, south, east and west), each direction will be divided into minimum 3 to 5 sampling points, which will be 100m apart each other. Each sampling site again divided into 4 parallel gradients (Fig.1) each gradient will 100X10m transact. Inside forest (110 m away from forest tea edge plot), Forest tea edge (which is edge of surrounding forest) and Tea plantation again divided into two one gradient 10m away from forest tea edge, and another 70m away from forest tea edge to understand the seed input from adjacent forest in different distance.

5. Results and discussion

Seed density per square meter in forest tea edge is significantly higher than interior forest (Fig.2). This is due to most of the mass fruiting species such as *Elaeocarpus munrronii*, *E serratus*, *Litsea sp* and *Acronychia sp.*, were edge species and dominated in forest tea edge and were major contributor to the seed source (Fig.3). Forest floor inside the forest had low seed density because most of the primary species (*Myristica sp.*, *Cullenia exarillata*, *Palaquium ellipticum* and *Callophyllum sp.*) fruits are bigger in size and more prone to pre and post dispersal seed predations. They do not fruit every year and seeds don't have dormancy.

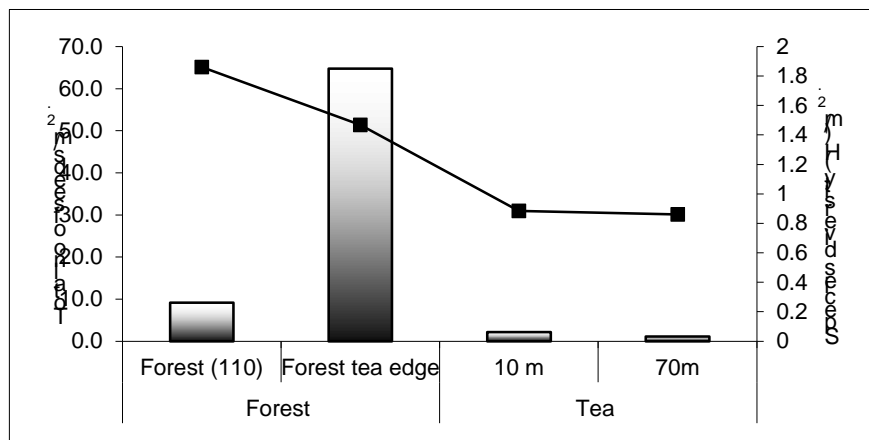


Fig. 2- Density and diversity of soil seed bank per square meter across the gradients in active tea plantation and surrounding forest.

Shannon diversity (H') calculated based on seeds available in the forest floor was significantly low from forest to tea plantation (2 –1.4 from <0.2 respectively) gradient. Most of edge /secondary species are contributing to the seed available in floor of tea plantation. Most of the bird dispersed seed are major constituent in tea plantation in different distances (10m and 70m away from forest).

Compared with surrounding forest and tea plantations had more seeds dispersed by birds and bats (Fig.4) than by mechanical (means wind or dehiscent) (Fig.3).

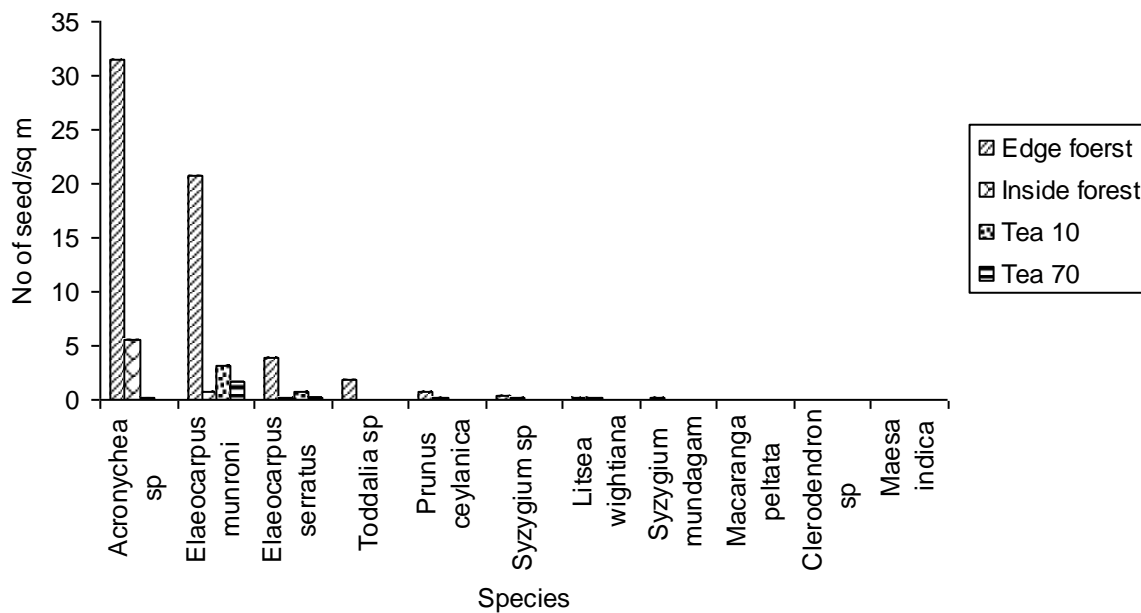


Fig. 3- Species abundance across the gradients in soil seed bank active tea plantation and surrounding forest.

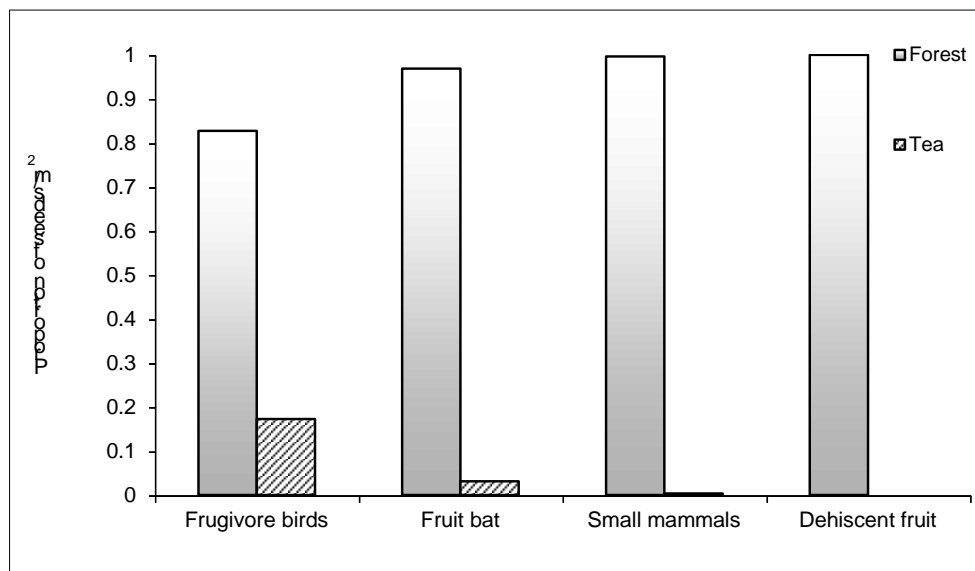


Fig. 4- Proportion of dispersers contributes to seed input from forest to tea plantation

Frugivorous birds (>17%) are the major disperser contributing to seed dispersal than the bat (<03%) compared with surrounding forest (Fig.4). This could be the reason for floor of tea plantation received bird dispersed species than bat. The species diversity (H') was not very much difference in different distance gradients in tea plantation (10m and 70m respectively).

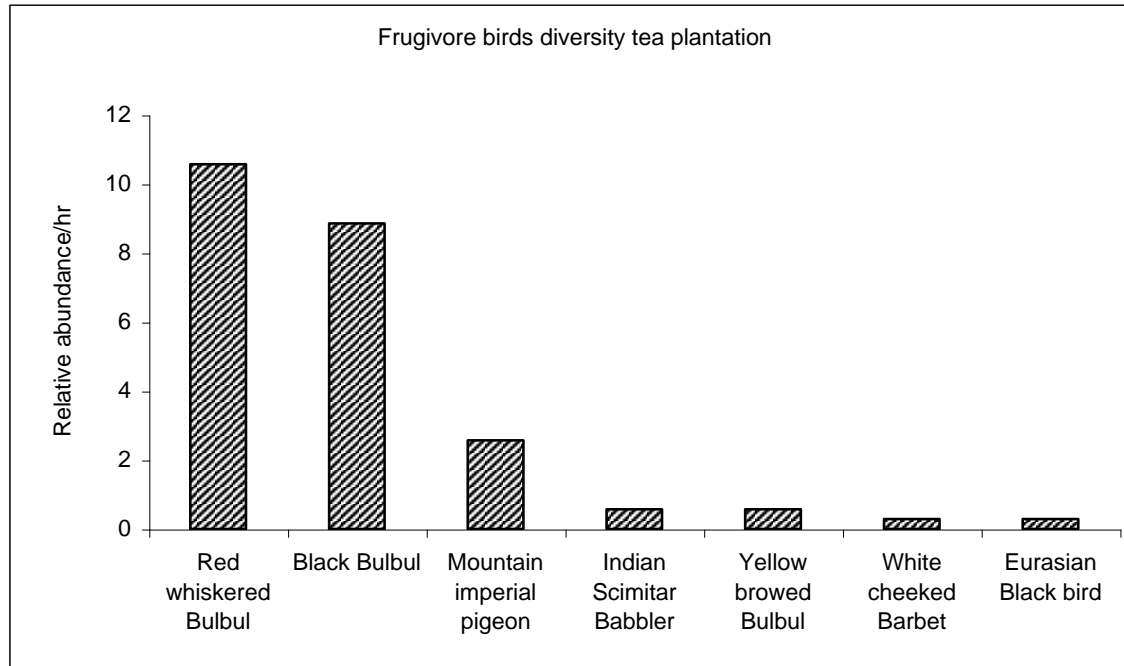


Fig. 5: Point count observation relative abundance of frugivorous birds inside tea plantations.

The relative abundance of frugivorous birds inside tea plantation shows that Red whiskered bulbul, Black bulbul and Mountain imperial pigeons are frequently used tea plantation (Fig. 5) (either tea bushes or perch or narrow corridors etc.). This might be the one reason bird dispersed seeds are finding inside tea plantation soil seed bank (Fig.4).

In the case of long abandoned Tea plantation the tea bushes become trees with dense closed canopy that obstructs the light penetration. This could be a major constraint for native colonizing species regeneration especially light demanding species such as *Macaranga peltata*, *Clerodendron sp* and *Mallotus sp*. My preliminary study from abandoned tea plantations also showed that most of the pioneer species are not colonized successfully and we only observed old pioneer species and no old growth species.

6. Reference

GANESH, T., GANESAN, R. SOUBADRA, M., DAVIDAR, P. AND BAWA, K. S. 1996. Assessment of plant biodiversity at a mid-elevation evergreen forest of Kalakad Mundanthurai Tiger Reserve, Western Ghats, India. *Current Science* 71:379-392.

GANESH, T & DAVIDAR, P. 1997. Flowering phenology and flower predation of *Cullenia exarillata* (Bombacaceae) by arboreal vertebrates in Western Ghats, India. *Journal of Tropical Ecology* 13:459-468.