

**A study on the relation between dispersal requirements of
cross-pollinated host trees and dominance hierarchy in bird
guilds visiting such trees in the tourism zone of BRT Tiger
Reserve**

Draft Final Report

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&
Conservator of Forests,
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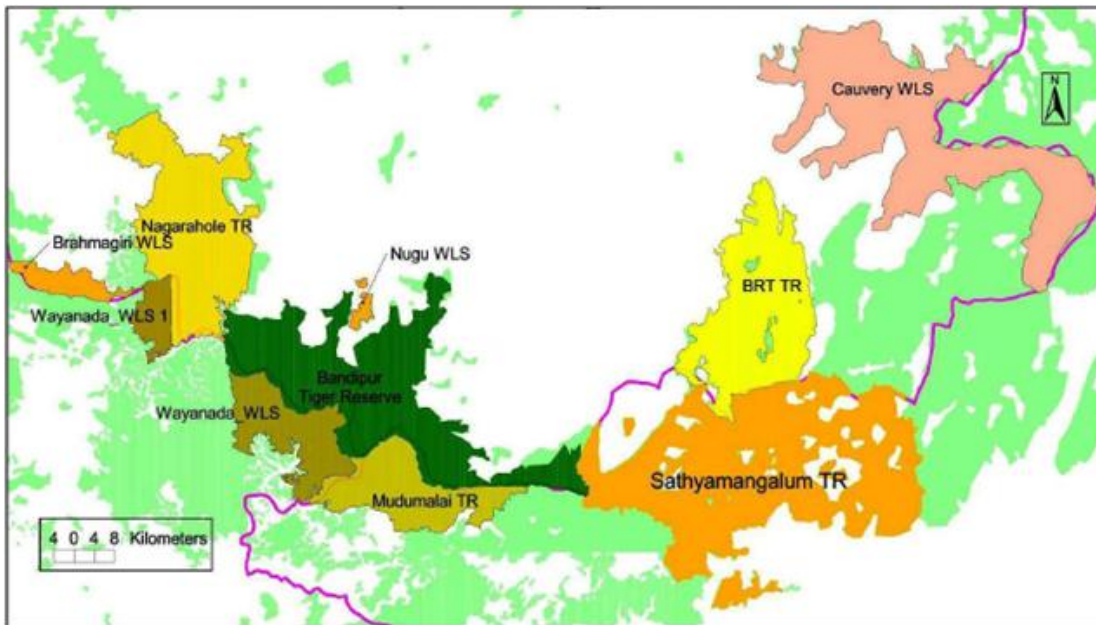
TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION	1
1.1 About the Study Area – Tourism Zone of the BRT Tiger Reserve	1
1.1.1 Location.....	1
1.1.2 Climate and Vegetation	3
1.1.3 Values of the Reserve	3
1.2 Background of the Project	6
1.3 Objectives/Deliverables of the Project	7
1.4 Duration of the Project	7
CHAPTER 2: INTRODUCTION TO THE TARGET SPECIES	8
2.1 The Species.....	8
2.1.1 <i>Bombax ceiba</i>	8
2.1.2 <i>Butea monosperma</i>	8
2.1.3 <i>Erythrina variegata</i>	8
CHAPTER 3: INTRODUCTION TO POLLINATORS & DOMINANCE HIERARCHY	9
3.1 Pollinators	9
3.2 Dominance Hierarchy.....	10
CHAPTER 4: STUDYING THE DOMINANCE HIERARCHIES ON FLOWERING TREE	11
4.1 Selecting Methodology	11
4.2 Study Methodology.....	11
4.2.1 Focal Sampling	11
4.2.2 Time of Day and Weather Conditions.....	11
4.2.3 Data Collection.....	12
4.3 Results.....	12
4.3.1 Calculating Dominance	12
4.3.2 Comparing time spent on tree and that on its flowers.....	16
4.3.3 Community Structure of the tree species.....	17
APPENDIX A: BIBLIOGRAPHY / RESOURCES ON THE INTERNET	21

CHAPTER 1: INTRODUCTION

1.1 About the Study Area – Tourism Zone of the BRT Tiger Reserve

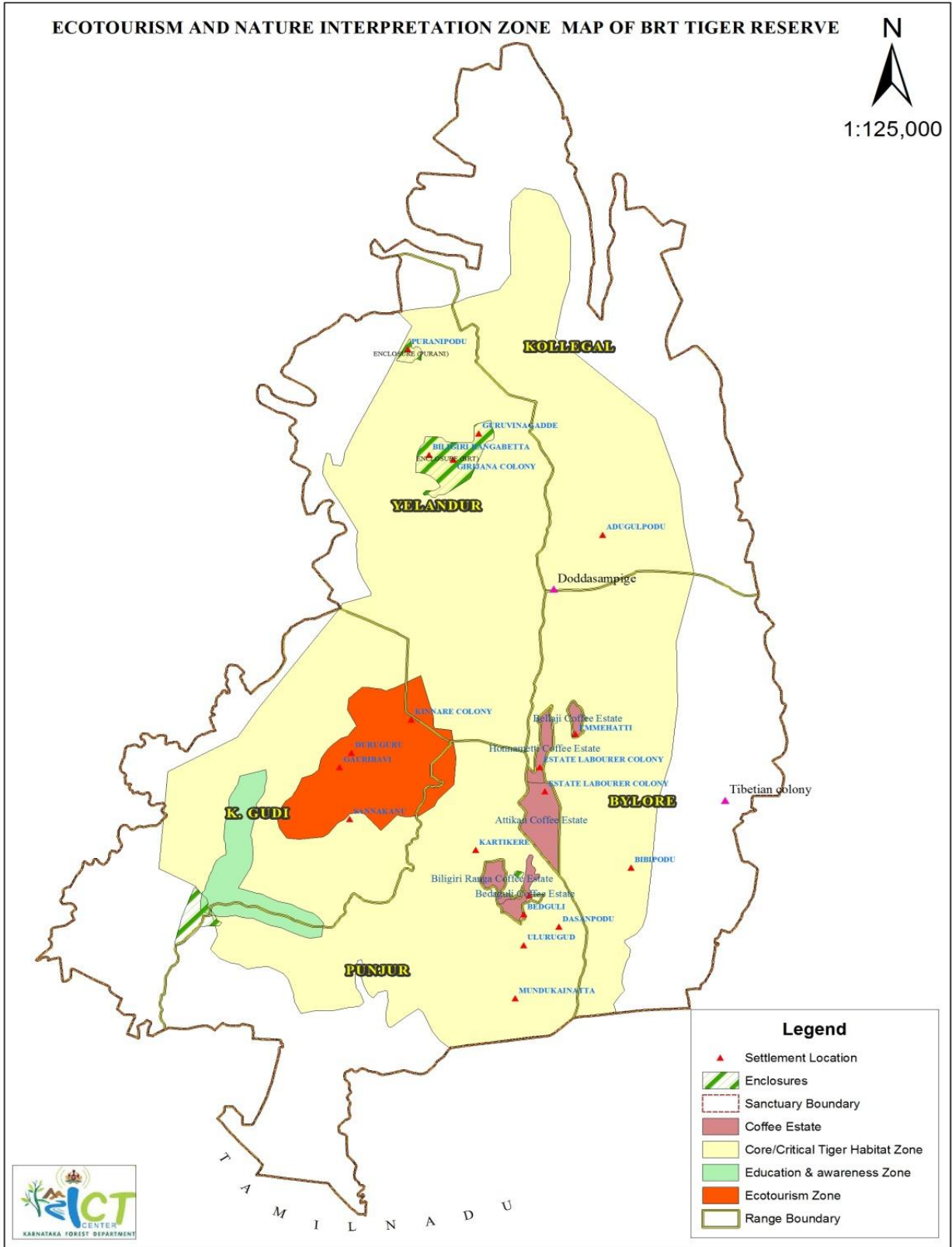
The Biligirirangan Hills, commonly called B R Hills, is a hill range situated in South-Eastern Karnataka, at its border with Tamil Nadu. The site was declared a Tiger Reserve in December 2010, known as Biligiri Ranganathaswamy Temple Tiger Reserve. The sanctuary derives its name Biligiri from the white rock face that constitutes the major hill crowned with the temple of Lord Rangaswamy, or from the white mist and the silver clouds that cover these hills for a greater part of the year.



Map 1 - Landscape map of BRT Tiger Reserve.

1.1.1 Location:

The hills are in the Yelandur and Kollegal Taluks of Chamarajanagar District of Karnataka. The hills are contiguous with the Sathyamangalam Wildlife Sanctuary to the South. Biogeographically, the sanctuary is unique. It is located between 11° and 12° N and the ridges of the hills run in the north-south direction. It is a projection of the Western Ghats in a north-easterly direction and meets the splintered hills of the Eastern Ghats at 78° E. This unique extension of Western Ghats constitutes a live bridge between the Eastern and Western Ghats with the sanctuary located almost in the middle of this bridge.



Map 2 – The study area, the tourism zone of BRT Tiger Reserve.

1.1.2 Climate and Vegetation:

The sanctuary, around 35 km long North-South and around 15 km wide East-West is spread over an area of 574 km², with a wide variation in mean temperature (9 °C to 16 °C minimum and 20 °C to 38 °C maximum) and annual rainfall (600 mm at the base and 3000 mm at the top of the hills). The hill ranges, within the sanctuary rise as high as 1200 m above the basal plateau of 600 m and run North-South in two ridges. The wide range of climatic conditions along with the altitude variations within the small area of the sanctuary have translated it into a highly heterogeneous mosaic of habitats such that we find almost all major forest vegetation types – scrub, deciduous, riparian, evergreen, sholas and grasslands.

According to Champion and Seth's classification (1968), the major forests of the area can be broadly classified into the following sub-types:

1. Tropical Evergreen Forests
2. Southern Tropical Semi-evergreen Forests
3. South Indian Moist Deciduous Forest
4. Southern Tropical Dry Deciduous Forests
5. Montane Wet Temperate Forests

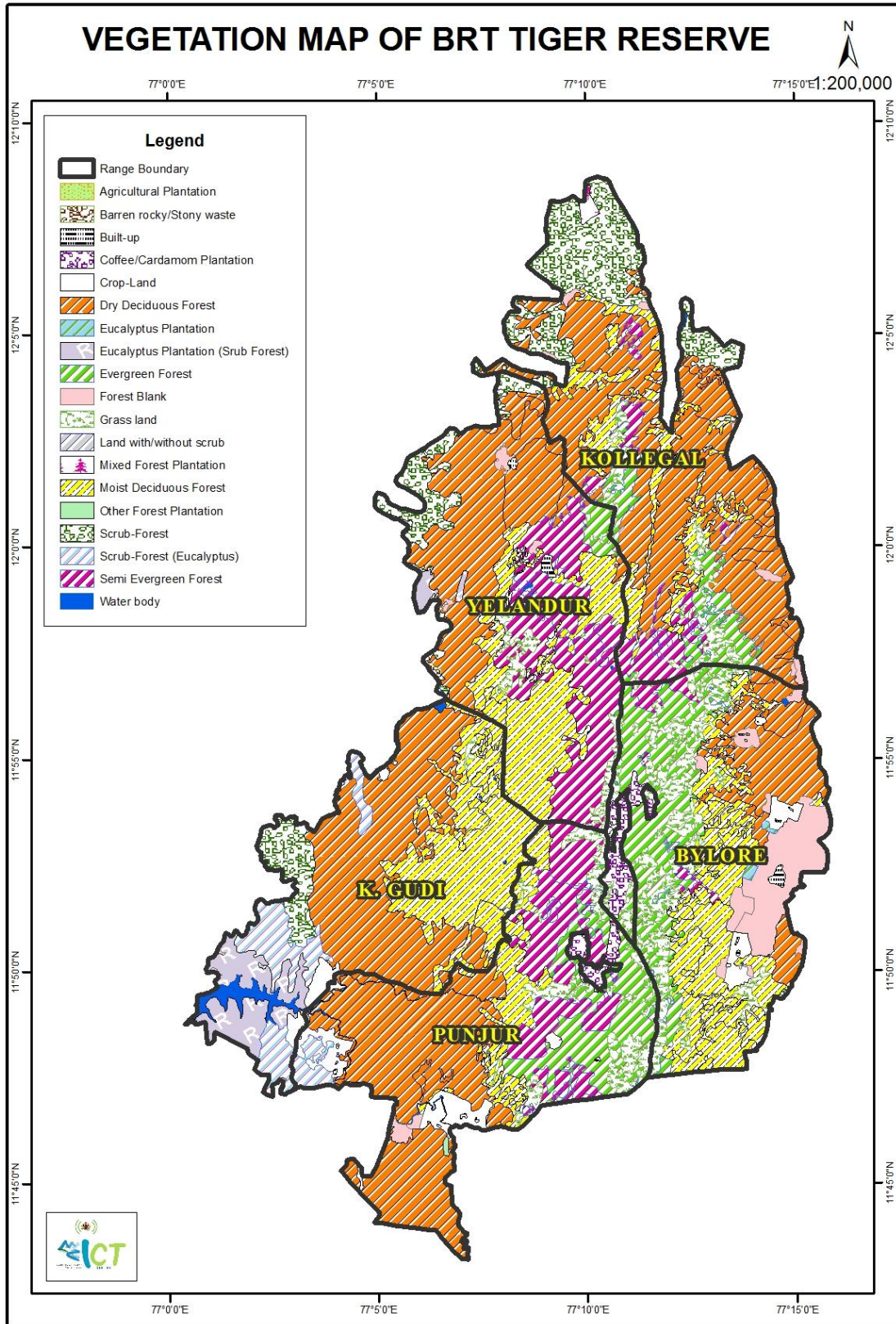
The forests range from scrub forests at lower elevations, degraded by over-use, to the tall deciduous forests typical of the ecoregion, to stunted shola forests and montane grasslands at the highest elevations, which exceed 1800 meters. The scrub vegetation type of forest is a home for *Adina cordifolia*, *Zizyphus* spp., *Embllica officinalis*, *Chloroxylon* spp. and *Acacia* spp. The moist deciduous part includes *Terminalia paniculata*, *Terminalia tomentosa*, *Terminalia bellerica*. The semi-evergreen part includes *Kydia calycina*, *Michelia champaca*, *Syzigium cuminii*. The rare variety plants like *Lillium nilagiricance* and *Remusatea vivipara* grown in this area. The Soliga tribals are accustomed to use more than 300 herbs for the treatment of various ailments.

All these types of vegetation form a very good habitat in terms of shelter and food availability. Tree savannas, shrub savannas and woodland savannas are major habitat for wild animals in terms of grass and leaf fodder availability. During pinch period, animals augment their nutrition through fruits and barks.

1.1.3 Values of the Reserve:

1.1.3.1 Ecological Value –

Entire protected area along with adjoining areas of Sathyamangalam and Mudumalai tiger reserves, Kollegal Wildlife Sanctuary and Cauvery Wildlife Sanctuary forms a unique chunk of biogeographical zone which acts as a live bridge between the Western Ghats and the Eastern Ghats.



Map 3 – Different vegetation types of BRT Tiger Reserve.

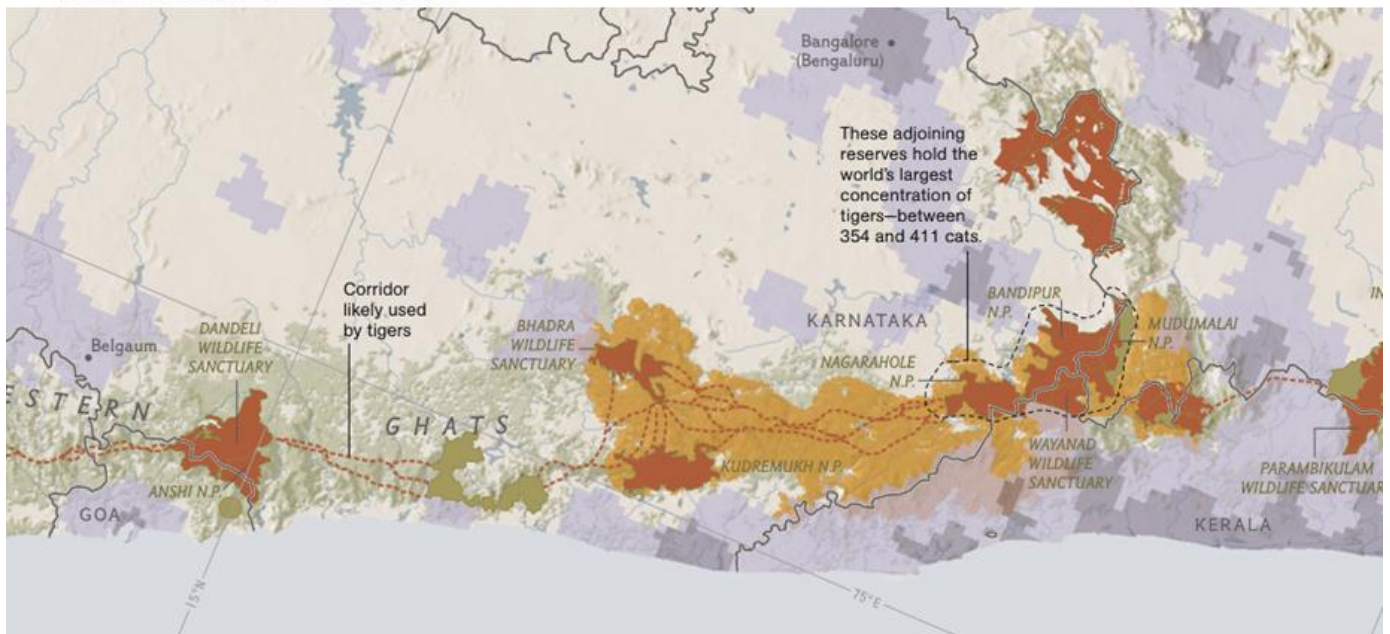
Since the hills range links the Western Ghats and the Eastern Ghats, they allow animals to move between the Ghats and facilitate gene flow between populations of species in these areas. Thus, this sanctuary serves as an important biological bridge for the biota of the entire Deccan plateau. The biota of BRT sanctuary is predominantly of Western Ghats in nature, with significant proportion of Eastern elements as well.

The landscape complex around the BRT Tiger Reserve has tiger occupancy in 11,100 km² with an estimated tiger population of about 382 (354 - 411) tigers, constituting the single largest tiger population in the world (Jhala, Qureshi, Gopal, & Sinha, 2011). Connection to wider tiger landscape together with good biomass density makes the BRT tiger reserve a potential habitat to support a good tiger population.

The most conspicuous mammals in the BR Hills are the herds of wild Elephants (*Elephas maximus*). The forests are well known for Gaurs (*Bos gaurus*), the largest bovines. It is a good place for small and large mammals. There are about 26 species of mammals recorded in the sanctuary. The other mammals include Sambar (*Rusa unicolor*), Chital (*Axis axis*), the shy Barking Deer (*Muntiacus muntjac*), which are quite common here, and the rare Four-Horned Antelope (*Tetracerus quadricornis*). Carnivores include Tigers (*Panthera tigris*), Leopards (*Panthera pardus*), Asiatic Wild Dogs (*Cuon alpinus*), many lesser cats, civets and Sloth Bears (*Melursus ursinus*). Around 280 species of birds have been recorded in the reserve. The reserve harbors a good diversity of butterflies, insects, spiders, amphibians and snakes. A recently discovered species is a Microhylid frog (*Microhyla sholigari*), named after Soligas.

Vital corridors

India has roughly half the world's tigers. Many of them live along the Western Ghats mountains, where there is evidence that tigers are finding corridors between protected areas, vital to prevent inbreeding and maintain their range.



Map 4 – The tiger landscape of which BRT is an integral part.

1.1.3.2 Economic Value –

The Soligas collect a limited amount of honey, Indian Gooseberry (*Phyllanthus emblica*) fruits and lichens from the forest. The honey is processed with help of the Forest Department and sold at various outlets. The ecotourism services provided by the Forest Department, Jungle Lodges & Resorts (a government undertaking), and some private homestays also contribute to local economy. In addition to that, the Soligas have been using various species of plants for medicinal purposes.

1.1.3.3 People & Cultural Value –

For hundreds of years, this region has been the home for the semi-nomadic Soliga tribe. The forest regions of Yelandur, Chamrajanagar and Kollegal, including the hilly tracts and foothills of Biligirirangan and Male Mahadeshwara in the southern part of Karnataka, are inhabited by nearly twenty thousand Soliga tribal people. The Soligas inhabiting this range were nature worshippers originally.

The hills are famous for the temple of Lord Ranganatha or Lord Venkatesha which is situated on the highest peak of the hill range, on the 'white cliff' which gives the hill its name. The local form of the deity is called Biligiriranga and is depicted in a unique standing position. The local tribes present a large pair of slippers measuring 1-foot (0.30 m) and 9 inches, made up of skin, to the Ranganathaswamy once in two years.

There is another point of holy reverence in the forests of the reserve. It is a gigantic Champak (*Michelia champaca*) known as "Doddasampige". It stands to the east of the riverbank, of the river Bhargavi (a tributary of the Cauvery). It is said to be around 600-800 years old, and measures about 43 m in height and about 20 m in girth. The tree is compared to Lord Shiva, who is having a braid. The "Doddasampige" has been the God of the Soligas, who perform fire dance surrounding the tree on the eve of Maha Shivarathri festival. The tree bears usual flowers of both reddish and yellowish color during April. On the east side of the platform there are more than 100 lingams, which are worshipped. This tree symbolizes the tribals' relation with nature. (Biligiriranga Hills, n.d.)

The tourism area is in Kyathadevarayana Gudi range of the reserve, with a mixed forest, consisting of trees from dry deciduous and moist deciduous habitats, with many riparian patches. It is an area of about 13 sq km.

1.2 Background of the Project

Pollination is the transfer of pollen grains from the stamens in flowers to the ovule-bearing organs or to the ovules themselves. When the egg cell in an ovule of a flower is fertilized by a sperm cell from pollen originating on a different plant individual, the process is called cross-pollination (heterogamy). And, guild is a group of species that exploit the same resources.

The cross-pollinated trees require dispersal of nectar from individual trees to the other conspecifics. When trees are flowering and fruiting, many different species of birds visit the trees, for the nectar, for

the insects that come for the nectar, and in the other case, for fruits. These birds help in cross-pollination and in dispersal of the seeds.

There are dominance relationships in the bird communities visiting the trees, wherein one species may dominate another species and may be dominated by third species. For the trees' benefit, the species which can disperse the pollens and the seeds more effectively should be more dominant in the respective cases.

This study aims to verify the above hypothesis, and understand the dispersal, which can further help in understanding the forest structure in the region.

1.3 Objectives/Deliverables of the Project

The objectives of the project are to –

- i. To find out the distribution of the three tree species cross-pollinated by birds.
- ii. To study the dominance ranking in the birds visiting the trees during flowering seasons.
- iii. To study the state of seed dispersal after the fruiting season.

1.4 Duration of the Project

The project work spanned a period of two years. Data collection started in Nov 2013 and continued till May 2015.

CHAPTER 2: INTRODUCTION TO THE TARGET SPECIES

2.1 The Species

2.1.1 *Bombax ceiba*:

It is a lofty (20-25m) deciduous tree with a straight trunk and a buttressed base. It gets large crimson flowers, and calyx is smooth and cup shaped. The fruit is ovoid, with short stalk, black when ripe. The tree can be identified in field by tiers of whorled branches covered with conical prickles when young, and the leaves with 5-7 lance-shaped leaflets. It is leafless from December to March. Flowers appear from January to March, and fruits from April-May. The tree is widespread in the subcontinent.

2.1.2 *Butea monosperma*:

It is a small or medium (15-20m) deciduous tree with a crooked trunk and large irregular branches. It is a frost hardy and drought resistant species. The bark has a light brown or grey color, and exudes a sticky red juice which hardens into a gum. The tree gets bright orange flowers, which contrast with jet black velvety calyces. It is reported to be fertilized by babblers, sunbirds and other birds visiting its flowers. Parakeets and animals have been reported to eat its fruits. The tree can be identified in field by its crooked trunk, bright orange clustered flowers, pods with single seeds and large, leathery trifoliolate leaves. It is leafless from February to April. Flower buds appear in January, flowers burst open in February-March, and pods ripen in May-June. The tree is widespread in the subcontinent.

2.1.3 *Erythrina variegata*:

It is a medium-sized (25-30m) tree with a straight trunk. It is a hardy species, with rapid growth. It has a thin bark with longitudinal whitish cracks, which peel off in papery flakes. Variety of birds – Starlings, Babblers, Drongos, Tailor birds, Bulbuls, Sunbirds have been reported to contribute to pollination. The tree can be identified in field by branchlets having small black conical prickles, calyx, with 5-toothed tip, split to the base and leaves of 3 leaflets, the terminal leaflet being the largest. The tree gets bright scarlet flowers in long clusters at the end of branchlets. It gets flowers from February-May and fruits from May-July. It is found in Eastern India, Sunderbans, Andaman and Nicobar Islands and Western Ghats.

(Sahni, 2000) (Neginhal, 2004) (Neginhal, Golden Trees Greenspaces And Urban Forestry, 2006)
(Neginhal, Forest Trees Of The Western Ghats, 2011)

CHAPTER 3: INTRODUCTION TO POLLINATORS & DOMINANCE HIERARCHY

3.1 Pollinators

Pollinators are the living organisms, insects, birds, mammals, which act as agents of pollination by carrying pollen from one flower to another. A lots of studies have been carried out about pollinators of various floral species all over the world.

(Morton, 1979) studied the pollination of *Erythrina fusca* by the Orchard Oriole (*Icterus spurius*) referring to the relationship as a coevolved behavioral manipulation.

(Thompson, n.d.) compared bat abundance and diversity, and the patterns of pollen movement of a bat-pollinated tree, between continuous forest sites and sites surrounded by fragmented forest and pasture.

(Wester, 2010) reported Cape Rock Elephant-shrew (*Elephantulus edwardii*) as an additional pollinator, after rodent pollination was reported in the Pagoda Lily (*Whiteheadia bifolia*) in South Africa.

(Khanduri, 2011) reported *Bombax ceiba* and *Erythrina stricta* to be bird-pollinated, and the birds visiting flowers included Black Drongo (*Dicrurus adsimilis*), Red-whiskered Bulbul (*Pycnonotus jocosus*) and Common Babbler (*Turdoides caudatus*). (Raju, Rao, & Rangaiah, 2005) had reported fourteen bird species as an efficient pollinator for this species form Eastern Ghats forests, and different bird species were found to have different times of visiting during day time from 0600 to 1800 hours.

Floral displays, including anthesis, elaborate floral designs and aggregation of brightly colored flowers into showy inflorescences, in flowering plant function by attracting animal pollinators promote pollen dispersal and cross-pollination (Faegri & Van Der Pijl, 1980) (Fenster, Armbruster, Wilson, Dusash, & Thomson, 2004)).

(Bhattacharya & Mandal, 2000) also mentioned that different types of birds visit *Bombax ceiba* flowers during daytime, and subsequently help in pollen dispersal and pollination when stigmas remain receptive.

(Faegri & Van Der Pijl, 1980) mentioned that a critical observation on the flowers of *B. ceiba* suggests that the birds visit these flowers only for collecting nectar and stored water.

(Rangaiah, Raju, & Rao, 2004) reported that in *E. variegata* var. *orientalis*, the inflorescences are oriented horizontally and the flowers occur in the distal half, providing a standing place for flower-probing birds, as also reported by (Baker, Bawa, Frankie, & Opler, 1983) for palaeotropical *Erythrina* species which are pollinated by passerine birds. The flowers are bigger than insect pollinated flowers, have red corolla and lack odour. The stamens and stigma are positioned in such a way that the probing birds contact them with their breast and head. Nectar is copiously produced and well protected in the keel petals. All these floral characteristics conform to ornithophilous pollination syndrome according to (Faegri & Van Der Pijl, 1980).

The flowers are quite attractive to bird visitors in the leafless state during the flowering period. In the flower, the standard petal stands in an upright position and is the most conspicuous part of the flower; it is this which attracts bird-visitors by its colour. The red colour of the flower serves as an excellent signal of high calorific reward for bird-visitors (Raven, 1972).

3.2 Dominance Hierarchy

Dominance relationships and hierarchies have remained the focus of a lot of interest in the studies dealing with social interactions of conspecifics. Studies on dominance relationships have been done over various classes of fauna, fish to mammals to birds.

(Wittemyer & Getz, 2007) studied hierarchical dominance structure and social organization in African Elephants (*Loxodonta africana*).

Dominance hierarchy formation in freely behaving Crayfish was studied by (Herberholz, Issa, & Donald, 2001).

(Frafjord, 1993) studied dominance relations in captive arctic foxes (*Alopex lagopus*) in Svalbard.

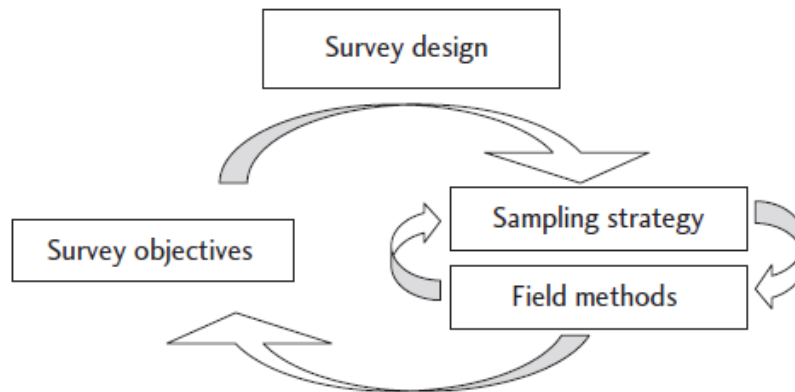
(Mulder, Williams, & Cooke, 1995) studied relationship between brood size and social dominance during the brood-rearing period in Lesser Snow Geese (*Anserc aerulescens caerulescens*).

(French & Smith, 2005) studied importance of body size in determining dominance hierarchies among diverse tropical frugivores.

CHAPTER 4: STUDYING THE DOMINANCE HIERARCHIES ON FLOWERING TREE

4.1 Selecting Methodology

(Gregory, Gibbons, & Donald, 2004) suggested that although survey design can be seen as a linear process, there should be a strong feedback loop in which the sampling strategies and feedback loops operating in survey design between the survey objectives, sampling strategy, and field methods.



4.2 Study Methodology

4.2.1 Focal Sampling

(Altmann, 1974) defined the term Focal-Animal Sampling to refer to any sampling method in which (i) all occurrences of specified (inter)actions of an individual, or specified group of individuals, are recorded during each sample period, and (ii) a record is made of the length of each sample period and, for each focal individual, the amount of time during the sample that it is actually in view. Once chosen, a focal individual is followed to whatever extent possible during each of his sample periods.

Focal sampling technique was selected to be used on trees and flowers. All the tree specimens for the 3 target species within 2 km from the base were noted and 4 tree specimens for each of the 3 species were randomly selected.

Focal sampling was done as Tree Focals, where whole tree was the focal point and birds coming to the whole tree were recorded, and as Flower Focals, where 2 flowers were selected on one of the selected trees and birds coming to those flowers were recorded.

4.2.2 Time of Day and Weather Conditions

The trees were observed whole day with half an hour breaks between the one hour focal sessions.

Adverse weather conditions such as low cloud, high winds, rainfall and even very high temperatures can affect results by directly affecting bird activity, or by reducing the chances of actually seeing or hearing the birds, or by reducing the attention levels towards counting. (Bibby, Jones, & Marsden, 1998)

In order to reduce bias, sampling was carried out under adequate weather only.

4.2.3 Data Collection

- The following format was used to collect the data:

Date	Time Block	Bird Spp	No.	In Time (min)	In Time (s)	Out Time (min)	Out Time (s)	Time Spent (min)
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NOTE I – No flowering occurred in *Butea monosperma* in the winter spanning 2013-14, no buds had appeared, even till mid-April 2014.

NOTE II – The flowering in the other two species in both seasons was relatively weak as compared with previous years, as untimely rains shed many of the buds, before they could blossom. As a result, the fruiting had been very poor.

4.3 Results

4.3.1 Calculating Dominance

i. *Bombax ceiba*

a. Flower Focals

The table below gives the average time spent by these bird species on a flower of *Bombax ceiba* after an instance of arriving at the flower and before leaving the flower.

Species	Time (in sec)	Avg. time spent by bird species	
		Species	Time (in sec)
Ashy Drongo	127.115	Jungle Myna	187.284
Black-hooded Oriole	134.933	Lesser Hill Myna	90.000
Chestnut-tailed Starling	190.477	Plum-headed Parakeet	118.462
Gold-fronted Leafbird	93.200	Spangled Drongo	471.952
Indian Golden Oriole	141.167	Vernal Hanging Parrot	170.833
Greater Racket-tailed Drongo	160.250	White-bellied Drongo	108.667
Indian Blackbird	103.000		

The total time spent by all the species of birds was taken. The dominance factor for each species was counted by calculating the percentage of the total time (as calculated above) that species account for.

The dominance of the birds (based on the percentage of time a particular bird spent on the flowers of this tree) is as given below:

Birds	Dominance Factor
Lesser Hill Myna, Golden-fronted Leafbird	1
White-bellied Drongo, Plum-headed Parakeet	1.22
Ashy Drongo, Black-hooded Oriole, Indian Golden Oriole	1.44
Greater Racket-Tailed Drongo	1.67
Vernal Hanging Parrot, Jungle Myna	1.89
Chestnut-tailed Starling	2.11
Spangled Drongo	5

Spangled Drongo spent 5 times more time on the flowers of *Bombax ceiba* than Lesser Hill Myna and the same with Golden-fronted Leafbird.

b. Tree Focals

The table below gives the average time spent by these bird species on a tree of *Bombax ceiba* after an instance of arriving at the tree and before leaving the tree.

Species	Time (in sec)	Avg. time spent by bird species	
		Species	Time (in sec)
Ashy Drongo	114.800	Jungle Myna	178.962
Black-hooded Oriole	202.882	Lesser Hill Myna	90.000
Chestnut-tailed Starling	141.755	Red-vented Bulbul	164.551
Gold-fronted Leafbird	103.267	Red-whiskered Bulbul	110.857
Indian Golden Oriole	239.667	Spangled Drongo	450.700
Greater Racket-tailed Drongo	154.500	Vernal Hanging Parrot	277.000
Great Tit	88.500	White-bellied Drongo	120.000
Indian Blackbird	81.000		

The dominance of the birds (based on the percentage of time a particular bird spent on the tree) is as given below:

Birds	Dominance Factor
Indian Blackbird	1
Great Tit, Lesser Hill Myna, Golden-fronted Leafbird, Red-whiskered Bulbul	1.4
Ashy Drongo, White-bellied Drongo, Plum-headed Parakeet	1.8
Greater Racket-tailed Drongo, Red-vented Bulbul	2.2
Black-hooded Oriole	3
Jungle Myna, Indian Golden Oriole, Chestnut-tailed Starling	3.4
Vernal Hanging Parrot	3.8
Spangled Drongo	6.6

ii. *Erythrina variegata*

a. Flower Focals

The table below gives the average time spent by these bird species on a flower of *Erythrina variegata* after an instance of arriving at the flower and before leaving the flower.

Species	Time (in sec)	Avg. time spent by bird species	
		Species	Time (in sec)
Ashy Drongo	105.411	Jungle Myna	96.323
Black-hooded Oriole	95.098	Lesser Hill Myna	142.667
Chestnut-tailed Starling	69.965	Plum-headed Parakeet	208.938
Gold-fronted Leafbird	85.872	Spangled Drongo	402.182
Indian Golden Oriole	100.306	Vernal Hanging Parrot	130.438
Greater Racket-tailed Drongo	128.000	White-bellied Drongo	121.636
Indian Blackbird	38.000		

The dominance of the birds (based on the percentage of time a particular bird spent on the flowers of this tree) is as given below:

Birds	Dominance Factor
Chestnut-tailed Starling, Golden-fronted Leafbird	1
Black-hooded Oriole, Jungle Myna, Indian Golden Oriole	1.2
Ashy Drongo	1.4
White-bellied Drongo, Greater Racket-tailed Drongo, Vernal Hanging Parrot	1.7
Lesser Hill Myna	1.9
Plum-headed Parakeet	2.8
Spangled Drongo	5.2

b. Tree Focals

The table below gives the average time spent by these bird species on a tree of *Erythrina variegata* after an instance of arriving at the tree and before leaving the tree.

Species	Time (in sec)	Avg. time spent by bird species	
		Species	Time (in sec)
Ashy Drongo	162.286	Plum-headed Parakeet	202.000
Black-hooded Oriole	158.182	Red-vented Bulbul	206.614
Chestnut-tailed Starling	346.139	Red-whiskered Bulbul	141.889
Gold-fronted Leafbird	102.417	Spangled Drongo	259.083
Indian Golden Oriole	275.800	Vernal Hanging Parrot	291.462
Great Tit	357.900	White-bellied Drongo	211.000
Jungle Myna	335.165		

The dominance of the birds (based on the percentage of time a particular bird spent on the tree) is as given below:

Birds	Dominance Factor
Indian Blackbird	1
Great Tit	1.67
Golden-fronted Leafbird	2.33
Red-vented Bulbul, Chestnut-tailed Starling	3
Jungle Myna, Red-whiskered Bulbul	3.67
Black-hooded Oriole, Ashy Drongo, Greater Racket-tailed Drongo, Indian Golden Oriole, Lesser Hill Myna, Vernal Hanging Parrot	4.33
White-bellied Drongo, Plum-headed Parakeet	5.67
Spangled Drongo	11.67

4.3.2 Comparing time spent on tree and that on its flowers

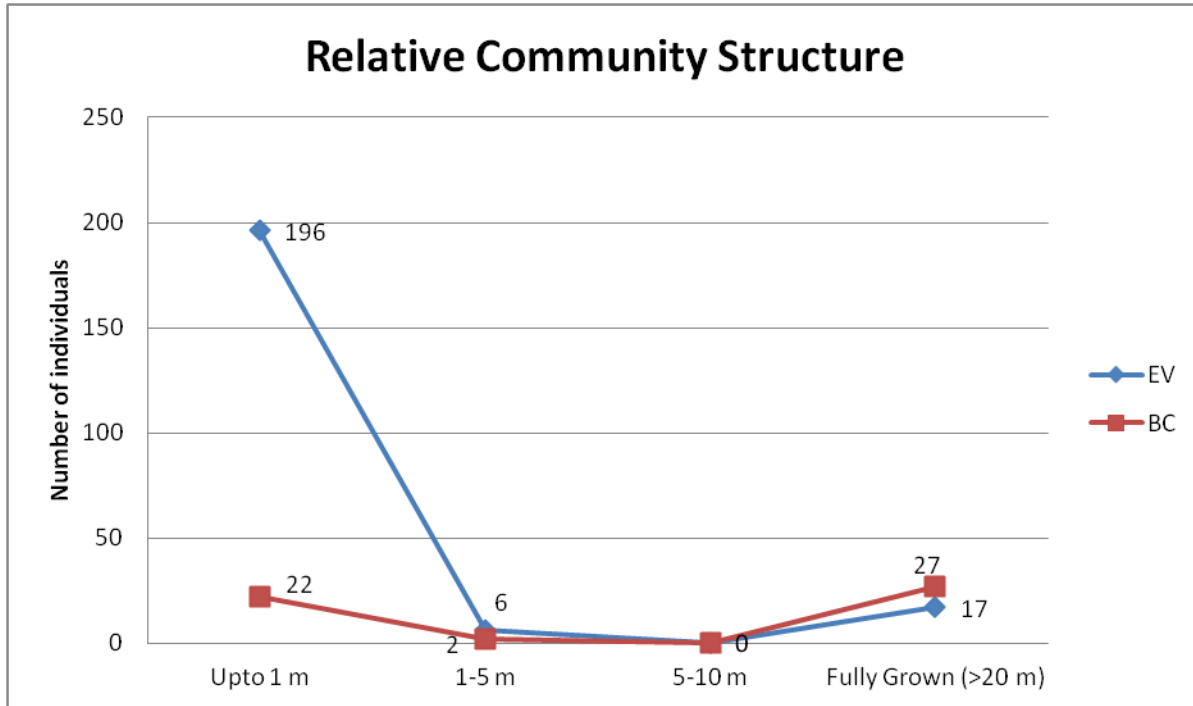
The rank lists of birds on *Bombax ceiba* trees and that of its flowers were found to be strongly correlated (correlation coefficient = 0.857197), and the correlation for the both lists for *Erythrina variegata* was even stronger (correlation coefficient = 0.935862).

The birds that were spending relatively more percentage of their time on the flowers of the tree, rather than away from the flowers were - Ashy Drongo, Greater Racket-tailed Drongo and Spangled Drongo for *Bombax ceiba*, and Plum-headed Parakeet and Spangled Drongo for *Erythrina variegata*.

The bird that were spending relatively more percentage of their time away from the flowers of the tree, rather than on the flowers were – Great Tit, Indian Golden Oriole, Red-whiskered Bulbul and Red-vented Bulbul for *Bombax ceiba*, and the same, except, Indian Golden Oriole for *Erythrina variegata*.

4.3.3 Community Structure of the tree species

The individuals of *Bombax ceiba* and *Erythrina variegata* were counted in 200 plots of 10 m x 10 m size, randomly distributed over an area of around 3 sq km from the Northern part of the Tourism Zone. This vegetation survey was carried out in April and May 2015.



The saplings of *Erythrina* spp. (Indian Coral Tree) were found in groups near the adult trees, while that of *Bombax* spp. (Silk Cotton Tree) were found single and away from the adult trees. This would have happened because of the hairy seeds of silk cotton that fly and are carried away by wind.

Also, the seedlings of Silk Cotton were found to be very few in number, but that of Indian Coral Tree were in large numbers. This pattern should be observed over years to ensure that the community structure of Silk Cotton is not affected in the forest.

Since pollination by wind affects the pollination of Silk Cotton to a large extent, it would be difficult to correlate the distribution of these trees with the home ranges of dominant bird species.

PLATES



A Jungle Myna on a flower on *Bombax ceiba*.



A Chestnut-tailed Starling on a flower on *Bombax ceiba*.



Golden-fronted Leaf Bird on a *Bombax ceiba* after the flowering season got over.



A Vernal Hanging Parrot on *Erythrina variegata* flowers.



An Ashy Drongo on flowers on *Erythrina variegata*.



An Indian Golden Oriole on flowers on *Erythrina variegata*.

APPENDIX A: BIBLIOGRAPHY / RESOURCES ON THE INTERNET

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