

# **Mid-term progress report of survey of mammals in Kodaikanal Wildlife Sanctuary**



by

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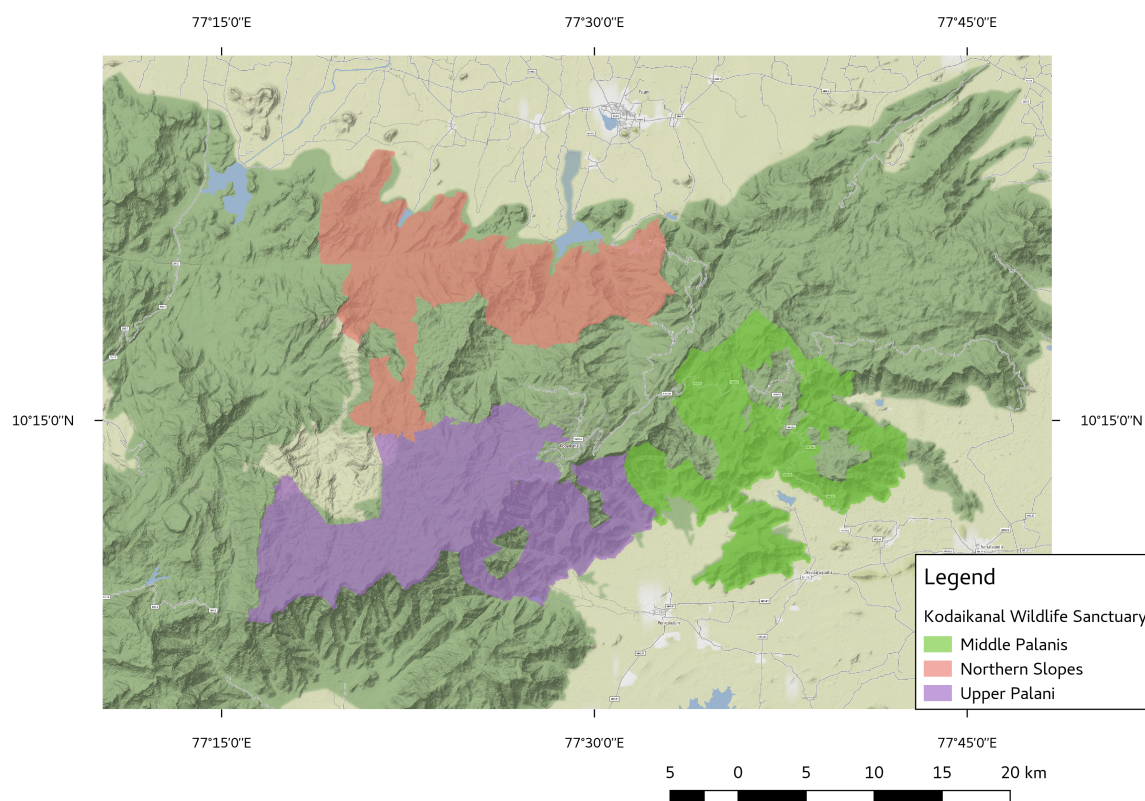
**Foundation of Ecological, Research, Advocacy and Learning**

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## Introduction

The Palani Hills are an eastern spur of the Western Ghats, a region recognized as one of the top hotspots for biodiversity in the world. Spanning an area of 2068 km<sup>2</sup>, altitudes ranging from 400 – 2500m and rainfall levels from 600 – 2000mm, The Palanis are home to immensely diverse habitats, flora and fauna. These include endangered species endemic to the Western Ghats such as the Nilgiri tahr (*Nilgiritragus hylocrius*), grizzled giant squirrel (*Ratufa macroura*), dhole [*Cuon alpinus*] and numerous others. These hills also form vital watersheds that supply water and other crucial resources to millions of people living in the plains surrounding them.

In 2009, an area a little of around 609 km<sup>2</sup> was formally designated by the government as the Kodaikanal Wildlife Sanctuary (KWS; Fig. 1). There is, however, little or no data available about the forests and its residents. In addition, rapid development of the area has resulted in undue pressures on the forest and exacerbated human-animal conflict.



**Figure 1** Map of the Kodaikanal Wildlife Sanctuary illustrating its three major regions

To begin to remedy this, a study was conducted in 2016 to try and ascertain the actual scale and nature of human animal interactions on the fringes of the sanctuary and this has already proven extremely eye opening. In order to fully comprehend the findings of the wildlife-human interface, we need to better understand the status and distribution of the wild animals that inhabit the Palanis. Thus a baseline estimate of mammal presence distribution and abundance was proposed to be followed by a camera trap survey to capture the movements of large mammalian predators.

## Goals

The goals of this project were to:

1. Establish baseline estimates of the presence, distribution, and abundance of mammals in the Kodaikanal Wildlife Sanctuary. These baseline estimates would complement information on conflict between wildlife and people inhabiting areas adjoining KWS that has been collected by a study that began in October 2016.
2. Density estimates of large (>10kg) herbivores will be estimated using grid sampling of indirect signs (mainly dung and tracks) as well as direct signs (observation)
3. Presence and density estimates of carnivores will be determined by a camera-trap survey along roads and human and animal trails.

## Target mammalian species

We are interested in the presence and distribution of any ground-dwelling and tree-dwelling species.

The prominent ground-dwelling herbivore species in the Palani Hills are:

1. Asian elephant
2. gaur
3. sambar
4. chital
5. barking deer
6. mouse deer
7. wild boar
8. porcupine
9. Nilgiri Thar
10. sloth bear
11. mongoose

The prominent ground-dwelling carnivore species in the Palani Hills are:

1. tiger
2. leopard
3. dhole/wild dog
4. civet
5. Nilgiri marten

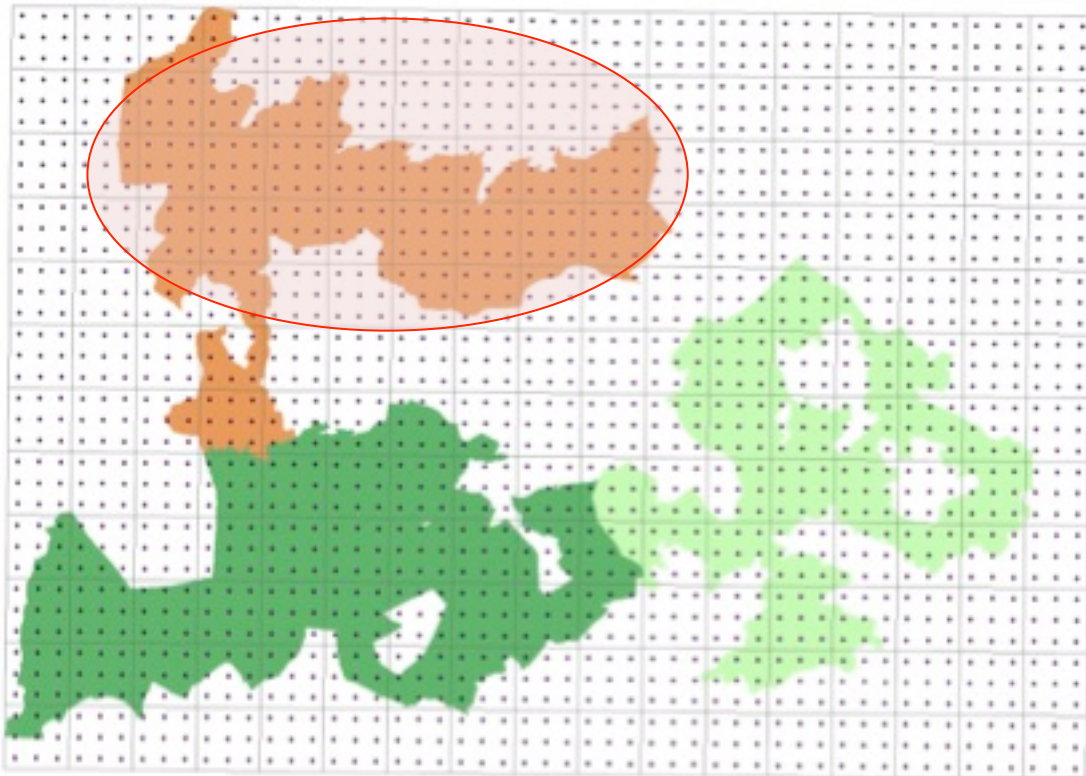
The prominent tree-dwelling herbivore species in the Palani Hills are:


1. bonnet macaque
2. Hanuman langur
3. Nilgiri langur
4. Malabar giant squirrel
5. grizzled giant squirrel

## Methodology

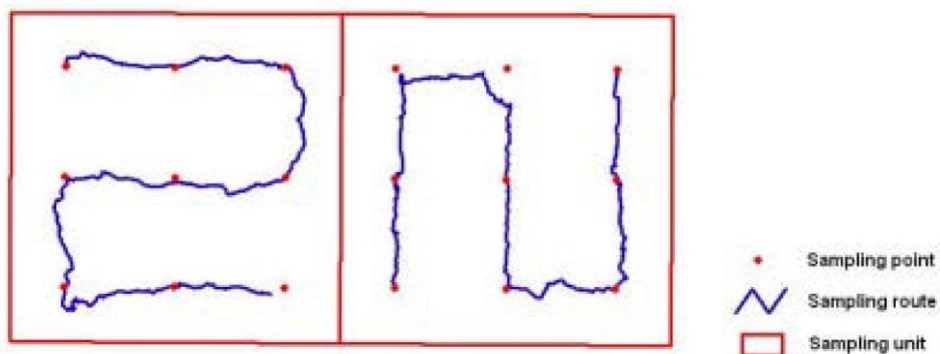
We will analyze the data using occupancy models, and therefore we will follow standard occupancy modeling protocol. This typically consists of a grid-based survey in which data of both the presence of animals and environmental covariates are collected.

To be able to survey the entire  $\sim 650 \text{ km}^2$  of the sanctuary, we will survey square grid cells of length 3 km, i.e., each square cell =  $3 \times 3 \text{ km} = 9 \text{ km}^2$  (Fig. 2).



**Figure 2** Map depicting the  $9 \text{ km}^2$  grid cells that will be surveyed of the Kodaikanal Wildlife Sanctuary.  Represents the area I have surveyed thus far.

Each grid cell will be surveyed by walking a S-shaped transect that will be connected by eight 1-km segments (Fig. 3).



**Figure 2** An illustration of the S-shaped transect that will be surveyed within each grid cell.

Survey of each grid would start at one end of the S-shape, and data will be collected for each segment separately. Observers will attempt to walk along animal paths and trails that are oriented in the direction of a segment to increase detection probability, but if animal paths are not easy to find or distinct, observers will instead walk in a straight line between the two pre-determined end-points of the segment.

The start point and orientation of the S will be based on logistical convenience. Any deviation from not walking in a straight line will be kept to the minimum, except in unavoidable circumstances (for example, when the line passed along steep rock faces etc.).

## **Animal signs**

Data of animal signs will be collected for every 100 m along a segment, i.e. the presence/absence of a species will be recorded for every 100 m along a transect. The animal signs that signify the presence of a species include:

1. tracks
2. dung
3. direct sightings
4. calls that can be reliably related to the species being in that 100 m sub-segment

## **Detectability and environmental covariate signs**

### **Detectability**

Besides signs of animals, data on detectability covariates will be collected along each 1-km segment every 200 m, i.e. at 5 points along a segment. At each of these five points, sampling will be done within a 1m<sup>2</sup> quadrat and the following data that influenced detectability of animals, especially dung, will be collected:

1. visual estimates of the percentage of ground covered by:
  - a. soil
  - b. rock
  - c. ground vegetation
  - d. leaf litter
2. leaf litter depth at four locations within the quadrat
3. dominant soil type, classified into three categories, at four locations within the quadrat:
  - a. hard soil
  - b. moist soil
  - c. sandy soil

### **Environmental**

We will also measure the following environmental covariates as indicators of habitat quality for each 100 m segment:

1. evidence of any human disturbance activities:
  - a. direct human sign (DHS): human trail, human habitation, or poaching

- b. forest produce (FP): lopping, cut stem, tree notches, dead-wood extraction, soil removal, non-timber produce collection, logging, leaf litter removal
  - c. cattle (CTL)
  - d. fire (FIR)
2. presence of *Lantana camara*, *Eupatorium odoratum*, and *Parthenium hysterophorus*, three invasive species associated with disturbed habitat;
  3. visual estimates of canopy height; and
  4. visual estimates of the number of distinct canopy stories, dependent on the presence of woody species:
    - a. <5m
    - b. 5-10 m tall trees
    - c. 10-20 m tall trees
    - d. 20-30 m tall trees

## Progress and Results

We began applying for permissions from the Tamil Nadu Forest Department in October to conduct our research. The process of obtaining the various permissions required took until the middle of January. During this time we also: collected detailed topographical maps of the software; began to build the basic layers of a Geographic Information System (GIS) of the Kodaikanal Wildlife Sanctuary; and finalize the methods we would use for the survey.

After hiring a field assistant from Kuthiriayar village—located in the plains on the northern border of the study area—we began the survey on the 3 February, 2018. I have been in the field at for an average of 23 days/month [In March, though, we were unable to survey much because of unseasonal rain and family constraints]. As of the August 1, 2018, we had surveyed a total of 60 grid cells, all of which fall in the Kodaikanal, Palani, Devadhanapatty, and Poombarai ranges.



Dorai and I climbing Serrapadi Mattam



Dorai and I at Tevankarai river

**Table 1.** Number of direct sightings and indirect signs of different species detected in the Kodaikanal Wildlife Sanctuary.

<b>Mammals</b>	<b>Direct</b>	<b>Indirect</b>	<b>Combined</b>	<b>Total Count</b>
Elephant	0	370	149	519
Gaur	0	663	812	1,475
Sambar	1	648	479	1,128
Chevotain	0	18	0	18
Muntjac	1	141	42	184
Pig	0	50	30	80
Black Naped Hare	0	78	25	103
Bonnet Macaque	24	8	19	51
Hanuman Langur	8	0	4	12
Porcupine	0	115	0	115
Dhole	2	64	0	66
Bear	0	28	0	28
Civet	0	83	0	83
Grizzled Giant Squirrel	2	0	0	2
Malabar Giant Squirrel	32	5	15	52
Dusky Palm Squirrel	6	0	0	6
Nilgiri Langur	9	0	0	9
<b>Total</b>	<b>85</b>	<b>2,271</b>	<b>1,575</b>	<b>3,931</b>

We have either directly seen or indirectly detected 17 different mammalian species on 3931 occasions (Table 1, Fig. 1). Signs of gaur have been the most abundant followed by elephant (Table 1). Animals that have been directly sighted had been mostly arboreal species, primates and squirrels, but we did get to see both a sambar and muntjac once, and we were lucky to see dhole (wild dog) on two separated occasions (Table 1).



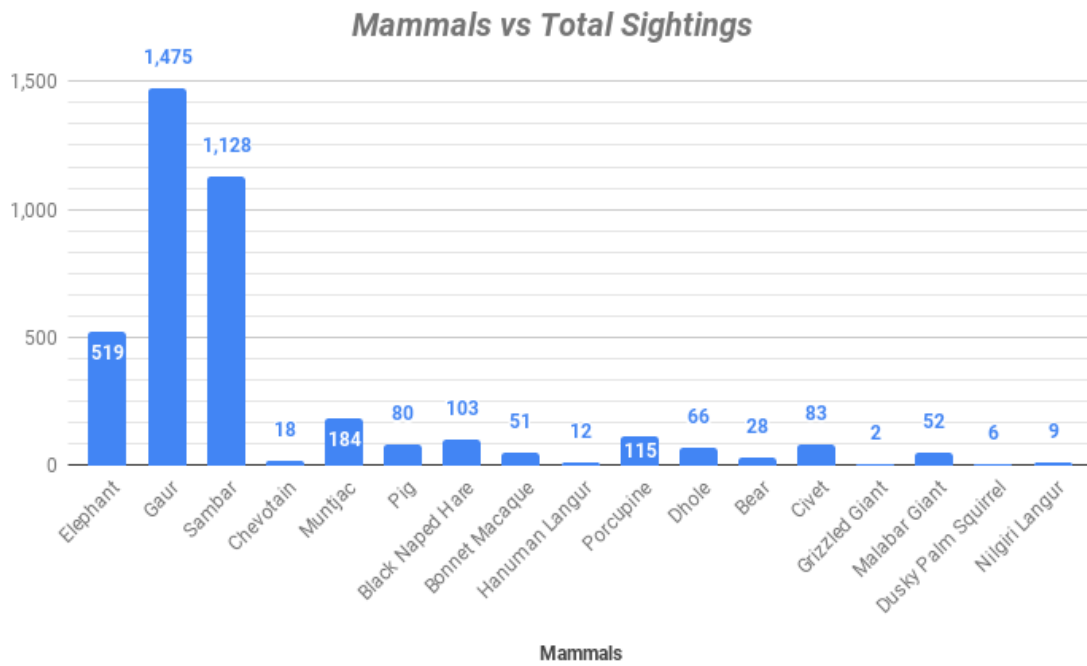
Civet dung



Elephant dung



Porcupine dung



**Figure 1. Total number of detections of different species during the survey.**



Wild dog track



Gaur and sambar tracks

**Future plan of action**

- Complete the grid-based survey.
- Do a preliminary camera-trapping survey
- Write up final report