

Survey of mammals in Kodaikanal Wildlife Sanctuary - Progress report 2 -



by

Foundation of Ecological, Research, Advocacy and Learning

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Summary

- Between February and December 2018, Dhruv Athreye on behalf of Foundation of Ecological, Research, Advocacy and Learning (FERAL) surveyed the Kodaikanal Wildlife Sanctuary to determine the status and distribution of mammal species.
- The survey was designed by dividing the approximately 610 km² of the sanctuary into square grid cells, each 9 km² in size, and then recording signs of mammal species along a 8 km long sampling transect within each grid cell.
- Dhruv, with the help field assistant, Dorai, sampled a total of 84 grid cells that fell within the boundaries of the sanctuary. Dhruv and Dorai collected all their data on foot and by the end of the survey had walked approximately 550 km.
- Besides seeing animals directly, which was not often, the presence of a mammal species within a grid cell was detected mainly from identifying indirect signs of animals, such as pellets/droppings and tracks/footprints.
- By the end the survey, Dhruv and Dorai had recorded over 9000 signs of 18 mammal species within the sanctuary.
- Animals were seen directly on 317 different occasions, and their presence confirmed in a grid cell based on indirect evidence that included 4473 detections of pellets/droppings and 4086 detections of tracks/footprints of all species combined.
- The species detected the most was the gaur (3137), followed by sambar (2884), muntjac (840), and elephant (716).
- After the rains end in 2019, we will conduct the first ever camera-trapping survey of large carnivores in the Upper Palanis, for which we have obtained an additional 1-year permit, valid till March 2020, from the Forest Department.

Introduction

The Palani Hills are an eastern spur of the Western Ghats, a region recognized as a globally important biodiversity region. Spanning an area of 2068 km², the Palani Hills have an altitude range of 400–2500 m and receive rainfall that varies 600–2000 mm across an east-west gradient. These varied environmental conditions have given rise to a diverse set of habitats that support a rich assemblage of animals and plants. This assemblage includes animal species endemic to the Western Ghats, such as the Nilgiri tahr (*Nilgiritragus hylocrius*) and grizzled giant squirrel (*Ratufa macroura*), and endangered animal species like the tiger (*Panthera tigris*) and Asian elephant (*Elephas maximus*). The Palani Hills also support vital watersheds that support millions of people living at its foothills and plains.

In 2009, the Tamil Nadu Government designated approximately 610 km² of the Palani Hills as the Kodaikanal Wildlife Sanctuary (KWS; Fig. 1). To measure how and to what extent any management measures implemented in the sanctuary would benefit its mammal species, it is imperative there exists an understanding of the abundance and distribution of mammals in the sanctuary. Information on the current status of mammal species, however, does not exist, and the last time a comprehensive survey of animals was conducted in the Palani Hills was over 20 years ago. This study was planned with the goal to correct this shortcoming and establish baseline estimates of the abundance and distribution of mammal species in KWS.

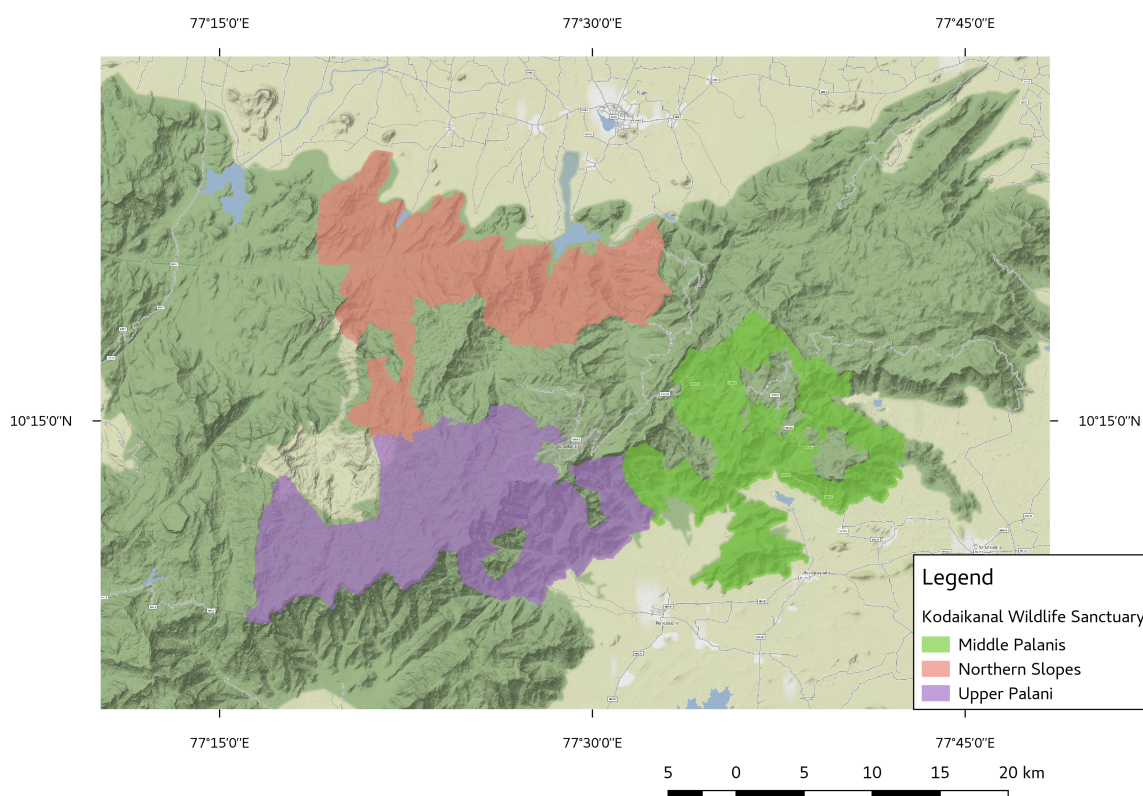


Figure 1. Map of the Kodaikanal Wildlife Sanctuary illustrating its three major regions

Goal

The goal of this project was to establish baseline estimates of the presence, distribution, and abundance of mammal species in the Kodaikanal Wildlife Sanctuary.

Target mammal species

We are interested in the presence and distribution of both ground-dwelling and tree-dwelling species, large and small.

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

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

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

1. tiger
2. leopard
3. dhole/wild dog

4. jungle cat
5. jackal
6. civet
7. mongoose

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

Besides large carnivore species such as tiger and leopard that will be surveyed later in the year using camera traps, we collected data on approximately 20 species, ranging from the black-napped hare to the Asian elephant. We used a grid-based survey of the 610 km² by sampling square grid cells of length 3 km, i.e., each square cell = 3 x 3 km = 9 km² (Fig. 2).

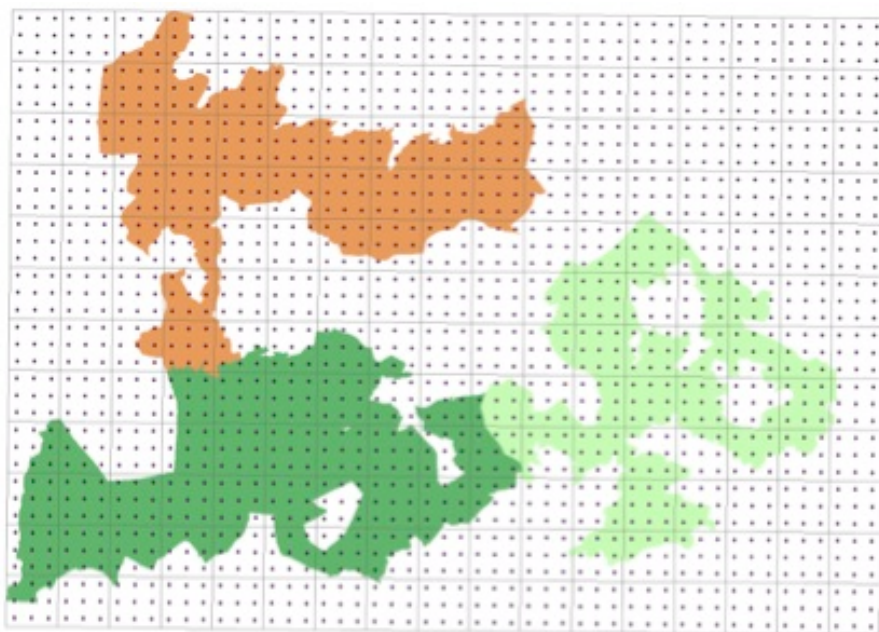


Figure 2. Map showing the 9 km² grid cells used to survey and establish the presence, abundance, and distribution of mammal species in Kodaikanal Wildlife Sanctuary, February-December 2018.

As seen in Fig. 2., the majority of cells did not fully overlap with the sanctuary. Each grid cell was surveyed by walking a S-shaped transect that consisted of connecting the points in a cell illustrated in Fig. 2. The S-shaped transect consisted of eight 1-km segments got from connecting the nine points in a cell (Fig. 3). Survey of each grid would start at either end of the S-shape and data were collected for each segment separately. Dhruv and Dorai walked along animal trails that were oriented in the

direction of a segment as much as a possible to increase detection probability, but if animal paths are not easy to find, they instead walked in a straight line between the two pre-determined end-points of a segment. The start point and orientation of the S was determined by logistical convenience. Any deviation from not walking in a straight line was kept to the minimum, except in unavoidable circumstances (for example, when the line passed along steep rock faces etc.). The transect points in a cell were located using GPS and all transects walked during the survey were recorded using GPS logs.

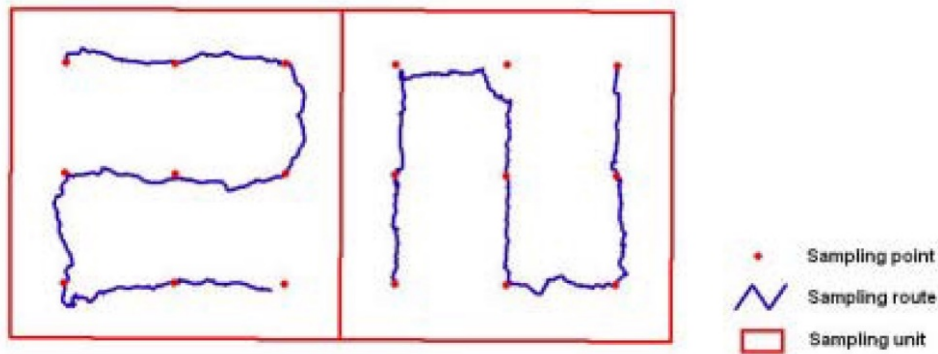


Figure 3. An illustration of the S-shaped transect that will be surveyed within each grid cell.

Animal signs

Data of animal signs were collected for every 100 m along a segment and the presence/absence of a species was 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 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 1m² 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

Results

Dhruv and Dorai took 11 months to complete the grid-based survey, February-December 2018. In total, they walked over 550 km within the 84 grid cells that overlapped either completely or partially within the boundaries of KWS. During the survey, the presence of 18 different animals species were detected, based either on seeing animals directly, dead or alive, or based on indirect signs such as pellets/droppings or tracks/footprints.

Gaur was detected the most often, on 3137 different occasions, followed by sambar (2884), muntjac/barking deer (840), and elephant (716) (Fig. 4). It was not surprising that a tree-dwelling species was directly seen the most often; Malabar giant squirrel were seen on 68 different occasions, followed by bonnet macaques (51), Nilgiri langur (13) and Hanuman langur (9). In Figure 5 we see how the proportion of direct observations is higher for all tree-dwelling animals compared to ground-dwelling animals, the mongoose being the only exception.

Table 1. Direct, indirect and total number of detections of different mammal species in the Kodaikanal Wildlife Sanctuary.

Mammals	Direct	Indirect	Total Count
Bear	0	40	40
Bonnet macaque	51	41	92
Chevrotain	1	75	76
Civet	0	107	107
Dhole	5	263	268
Dusky palm squirrel	10	0	10
Elephant	4	712	716
Gaur	70	3067	3137
Grizzled giant squirrel	2	0	2
Hanuman langur	9	6	15
Hare	11	212	223
Malabar giant squirrel	68	84	152
Mongoose	3	0	3
Muntjac	17	823	840
Nilgiri langur	13	40	53
Porcupine	3	359	362
Sambar	68	2816	2884
Total	344	8814	9158

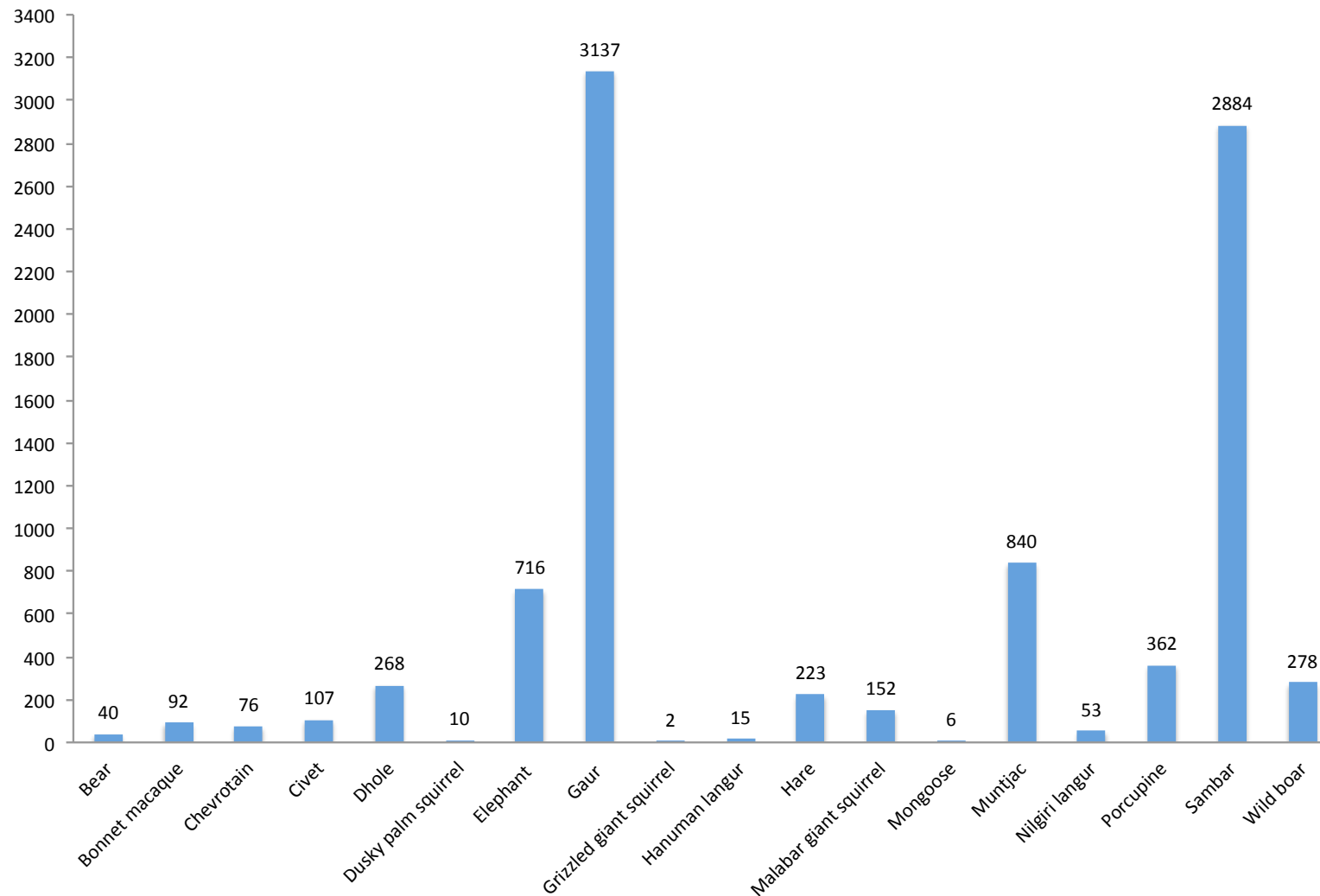


Figure 4. Total number of detections of different species during survey of mammals in Kodaikanal Wildlife Sanctuary, February-December 2018.

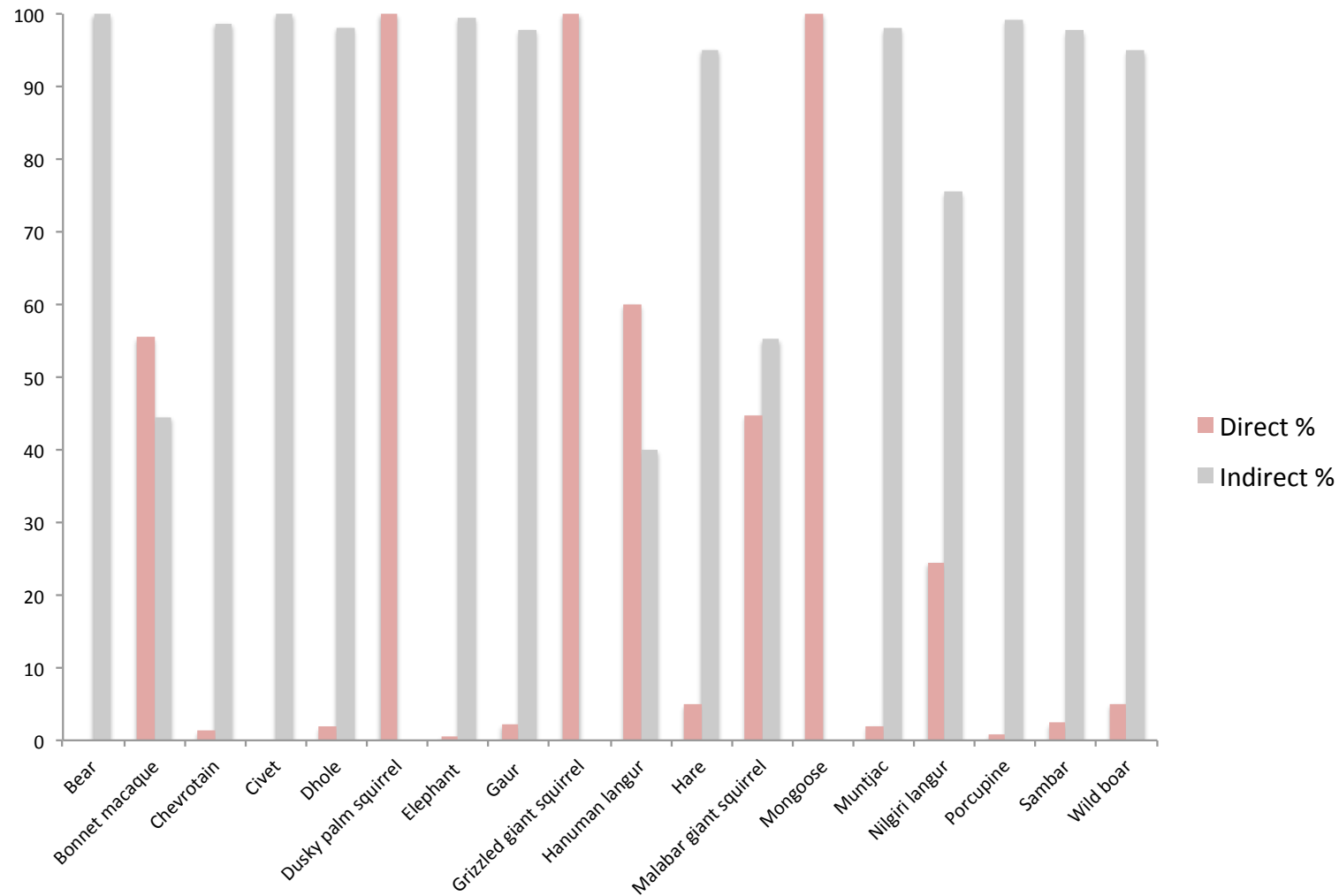


Figure 5. Percentage of direct and indirect detections of mammal species surveyed in Kodaikanal Wildlife Sanctuary, February-December 2018.

Species distribution maps

Below are preliminary results from analyzing the distribution of different species (Figs. 6-10): in Figure 6 we see that bear are found throughout the sanctuary, though at low abundances, and are more likely to be found in Northern Slopes region of the sanctuary; in Figure 7 we see that sambar are found in high abundance throughout the sanctuary; in Figure 8 we see that wild dog are found at both low and moderate abundances equally across the three regions of KWS; in Figure 9 we see that elephant are found in greater abundance in the Northern Slopes region compared to the rest of the sanctuary; and in Figure 10 we see that gaur are found in high abundance distributed equally across the three regions of the KWS.

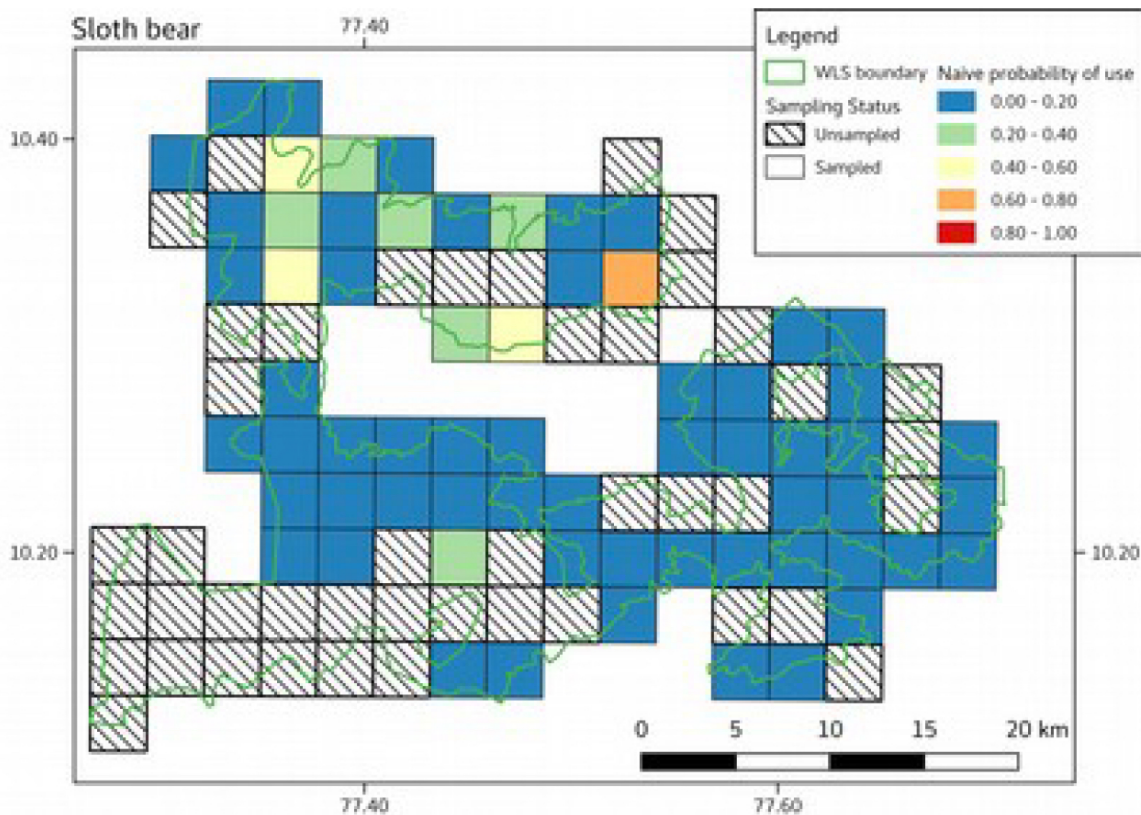


Figure 6. Distribution of bear in Kodaikanal Wildlife Sanctuary.

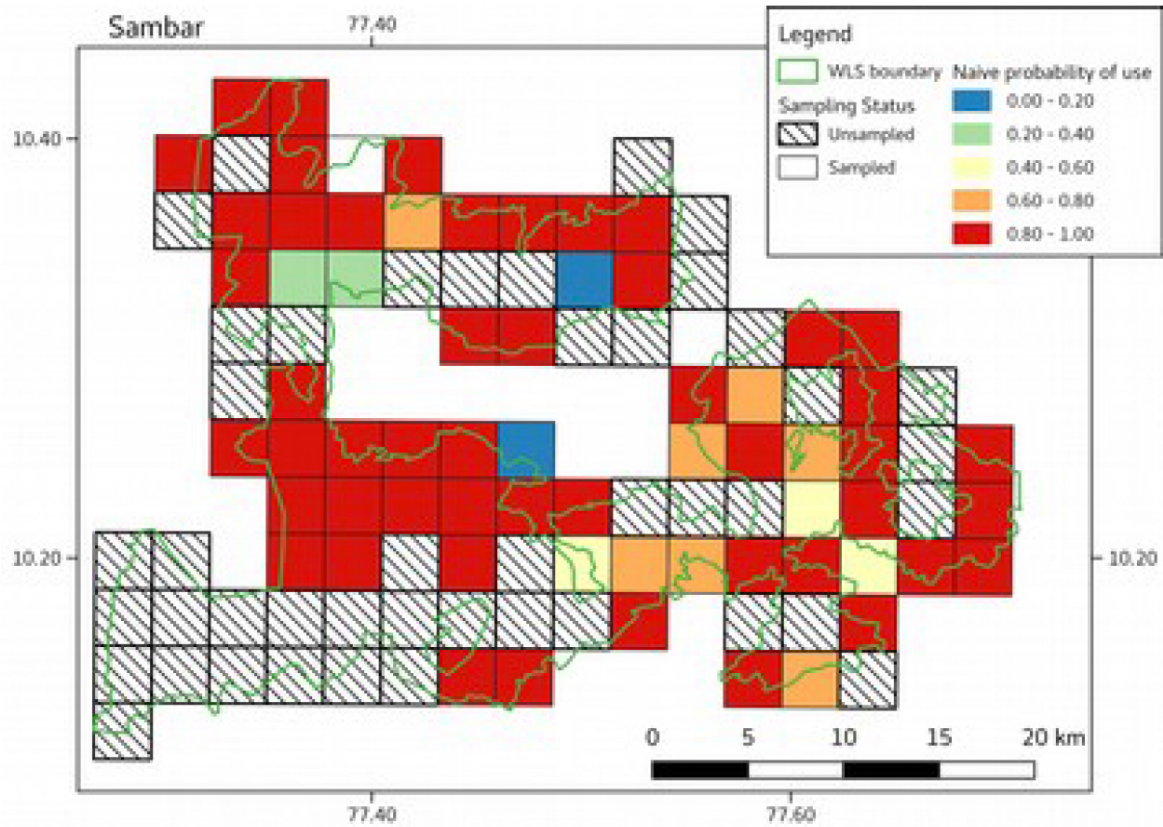


Figure 7. Distribution of sambar in Kodaikanal Wildlife Sanctuary.

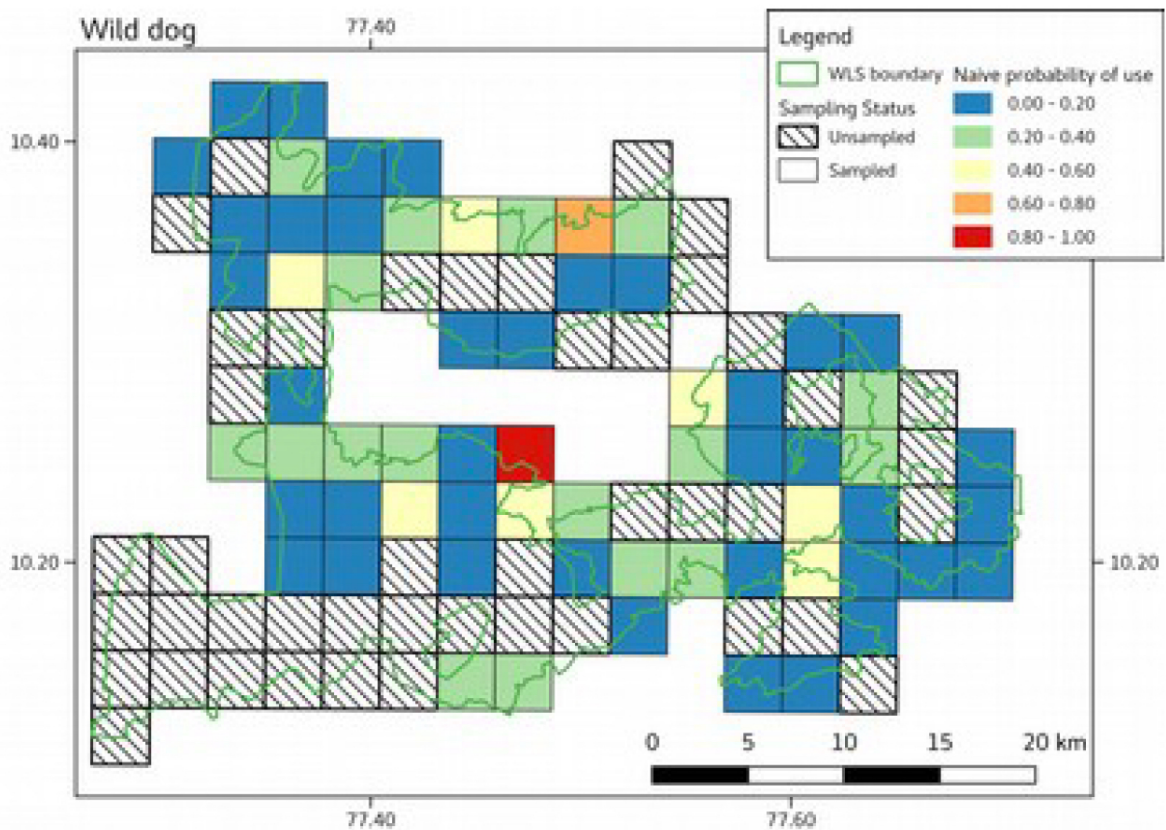


Figure 8. Distribution of wild dog in Kodaikanal Wildlife Sanctuary.

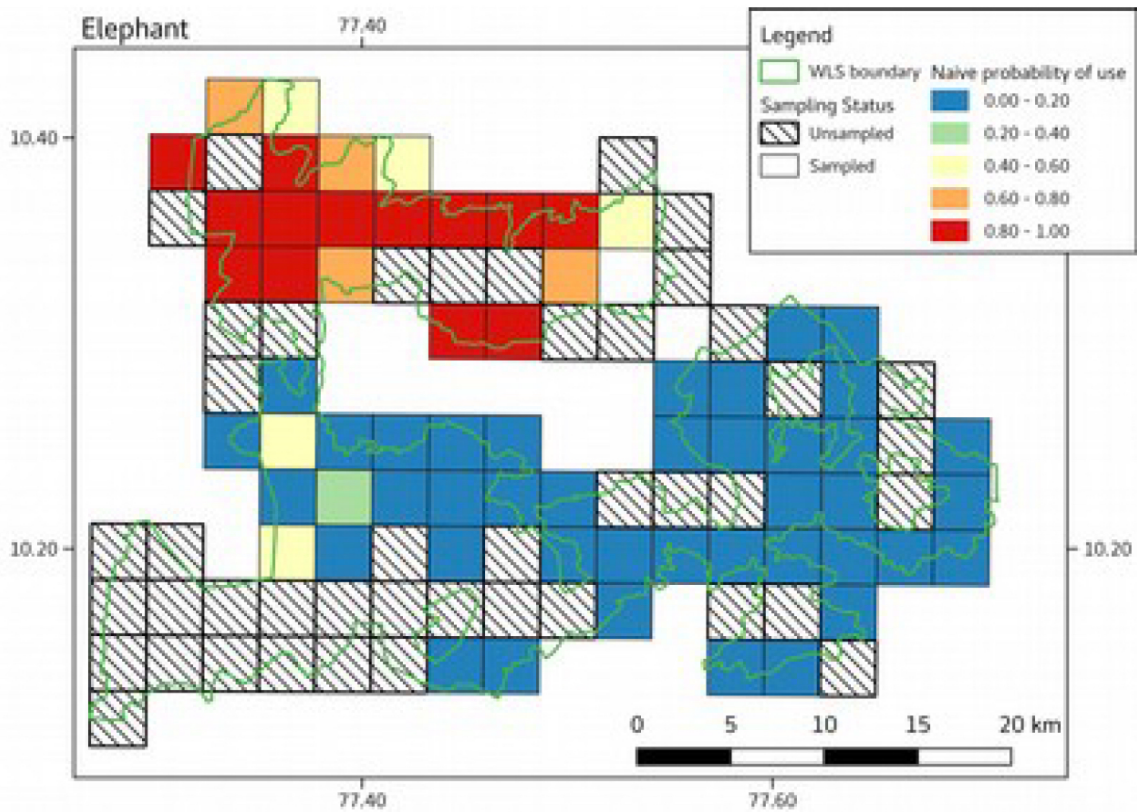


Figure 9. Distribution of elephant in Kodaikanal Wildlife Sanctuary.

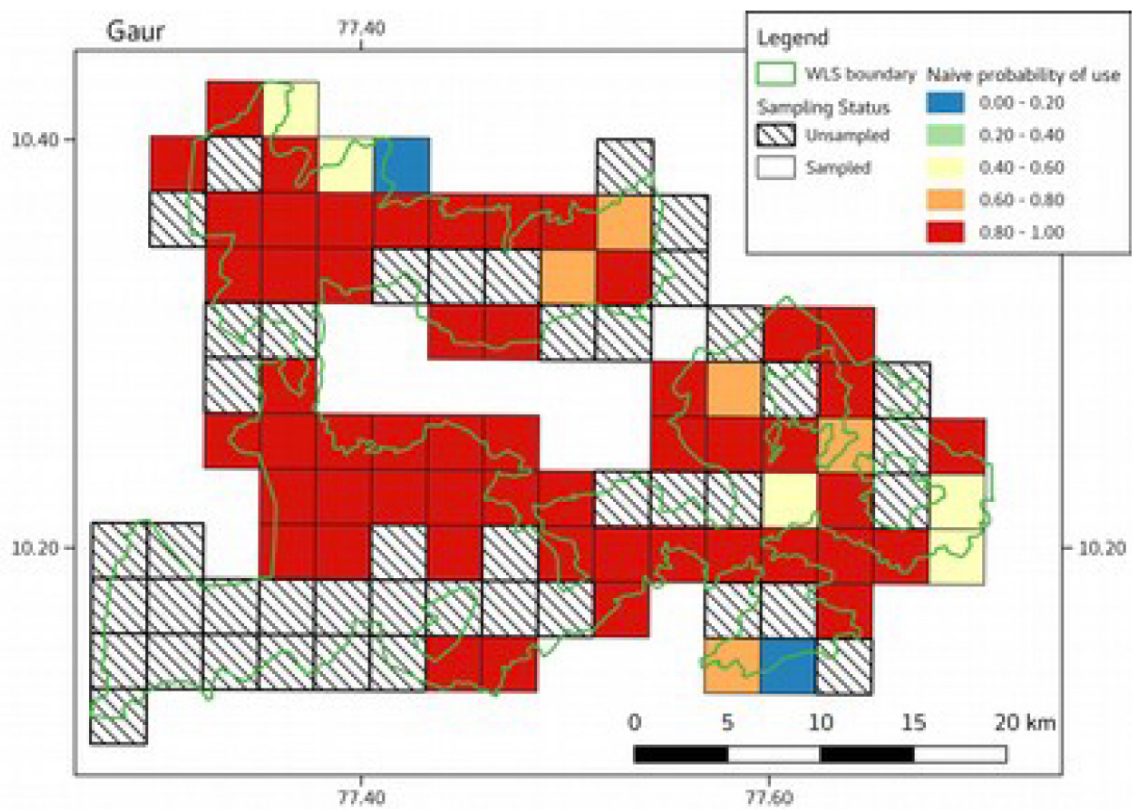


Figure 10. Distribution of gaur in Kodaikanal Wildlife Sanctuary.

Proposed work plan

We plan to complete the camera trap survey for large carnivores later this year once the rains end. The survey will most likely be confined to the Upper Palanis because of the availability of multiple roads in the region. We will also complete the final occupancy analysis later this year and submit one final report next year once the camera trapping has been completed.