

TRAINING MANUAL FOR POPULATION ESTIMATION AND HABITAT ASSESSMENT OF RHESUS MACAQUE IN HIMACHAL PRADESH

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PREFACE

The objective of this training manual is to communicate field-friendly standardized data collection protocols for the front line staff and officers of the forest department. The data when analyzed would provide a scientific basis for assessing the population status of Rhesus macaques, other co-occurring species, habitat assessment, and patterns of interaction with humans and human-use landscapes.

In this manual, we incorporate the experience from earlier exercises, particularly the population estimation exercise carried out by the Himachal Pradesh Forest Department (HPFD) with the expertise of Dr. Mewa Singh (Singh et al. 2015), and on-going population exercises in and around the Wildlife Institute of India, Dehradun.

The training manual contains data collection protocols on macaque population estimation (data sheet 1a, 1b, and 1c), vegetation and habitat status (data sheet 2a and 2b), and human-macaque interaction (data sheet 3). When the protocols outlined in this field guide are followed and data analysed, the wildlife manager will have reliable information on Rhesus macaque populations in time and space (at the resolution of a beat and any higher scale), trends in areas of impact by human activities, habitat status, behavioural patterns and interactions with humans.

All trails walked in the 2015 exercise must be walked again so that a direct comparison of population estimates may be made. Additional trails must be identified in areas that were not sampled, especially in rural and urban areas. It is important to walk trails in all three settings – (i) forests with beats as the sampling unit, (ii) rural areas with village boundaries as the sampling unit, and (iii) urban areas/cities with administrative blocks as the sampling unit. Two to three trails (2-4 km each) must be walked in each sampling unit (~10 sq. km).

POPULATION ESTIMATION

This protocol outlines a simple method for quantifying Rhesus macaque abundance in an area based on visual encounters while walking along fixed trails. Beat in forests, village boundary, and block in cities will be used as the basic sampling unit. In each of these basic units, 2 to 3 trails will be identified. Each trail will be walked three times. The following procedure needs to be followed for data collection:

- A beat/village boundary/block would be considered as the unit for sampling.
- After considering the shape, size, vegetation, and terrain type of the beat, a trail of a minimum of 2km and not exceeding 4 km will be marked for sampling.
- Any trail should traverse similar habitat (broad vegetation types) for as much of its length as possible.
- Care should be taken that a trail is not located near a busy road nor should it run parallel to a river or other features of the landscape which may bias sighting of macaques.
- For each trail the beginning and end point coordinates (Latitude and Longitude) should be recorded by a global positioning system (GPS) receiver.
- Each trail should be walked by 1-2 persons during a fixed time period, when the animals are most likely to be active (7 to 11 am). This may depend on the season. At least one of the persons walking should have good field observation skills.
- A record should be kept of all macaques (and other wildlife) seen during the walk in the prescribed format (see data sheet 1a). For each animal sighting the following needs to be recorded: 1) sighting no, 2) time of the sighting, 3) group size – number of animals in the group sighted, in specific age-sex classes (Appendix I), as accurately as possible. Animals are considered to belong to two different groups if the closest animals from the two groups are separated by a distance of over 30m, and 4) walk/trail bearing, 5) bearing of the animal group, 6) distance to the center of the animal group, 7) latitude and longitude of the observer at the time of sighting, and 8) forest and terrain type where the animals were seen.

- Bearing of the animal (group) should be estimated by using a compass, distance to the animal (group) using a laser range finder (when available), or ocular methods, and latitude and longitude by using GPS or smartphone device (Appendix II).
- A broad habitat category (vegetation and terrain type) needs to be recorded for each sighting.
- Trails must be walked slowly with focus on searching for macaques and other animals.
- Each trail needs to be walked atleast on three different mornings forestimating macaque encounter rates.

Observers must also enter their latitude/longitude every 5 mins while walking each trail in datasheet 1c (waypoints), irrespective of whether animals are sighted on the trail. This is crucial to mapping the trail and will be used in calculating lengths walked and area covered.

VEGETATION AND HABITAT STATUS

To quantify the habitat parameters and determine levels of human disturbance, sampling will be done along the same trail on which ungulate encounter rates were estimated. For economy of time and effort, each trail may be sampled for macaque encounter one way and vegetation and habitat status may be sampled while returning on the same trail. Sampling for vegetation and habitat status will be done only on one day, not all three days. Vegetation and habitat status would need to be sampled every 400m along the trail and quantified visually at the following categories for each plot.

(a) In 15 m. radius circular plot (datasheet 2a)

- Within a distance of 15 m of the observer the five most dominant tree species (all vegetation > 6ft in height, including bamboo) and five most dominant shrub species (vegetation >40cm & < 6ft) need to be listed in the order of dominance (abundance).
- The observer needs to categorize shrub density (under-story vegetation) as absent (0%), very low (1-25%), low (26-50%), medium (51-75%), and dense (76-100%) on a five point scale (0 to 4).
- If exotic invasive weeds are present, their abundance needs to be scored on 0 to 4 scale (0 being absent and 4 high abundance) and the three most common weeds seen in 15m radius need to be listed in order of abundance.
- The observer needs to visually quantify the canopy cover at the center of the 15m plot. The observer should classify the proportion of the sky above that is covered by canopy foliage and record it in percentage.

(b) In 1m radius circular plot (datasheet 2b)

- Quantify the percent ground cover, i.e. the proportion of the ground covered by herbs, grasses (green and dry), weeds, and bare ground
- List the 3 most dominant grass/herb species in order of dominance.

HUMAN-MACAQUE INTERACTION

To understand how macaques use human landscapes and resources, and to map the pattern and level of conflict, forest staff must enter information in datasheet 3 for each sampling unit (beat/village boundary/block).

- Human disturbance through presence of trees with signs of lopping/wood cutting, grass/other NTFP collection, number of human/livestock foot trails, presence of garbage, and feeding of macaques by people.
- Number of permanent human settlements, human population, and livestock population.

Annexure I – Age-Sex classes in Rhesus macaque (*Macacamulatta*)

Age-Sex class	Definition
Adult Male	Prominent scrotum.
Adult Female	Red anogenital regions, nipples.
Juvenile (includes sub-adults)	Independent, weaned, larger in size than infants but smaller than adults, lack of red sexual skin in anogenital regions.
Infants	Generally dependent upon the mother, unweaned and usually carried by the mother during group progression.



Adult male



Adult female



Juvenile



Infant with adult female

Annexure II – Mapping of location and trail



1. Download Locus application on your phone through the Play Store.
2. Open Locus, go to Settings, and make sure that Latitude and Longitude are in degree decimals for e.g. 30.228221 and 77.82341, and not in degree-minutes-seconds.
3. If shape files are available, you can import shape files of study area in Locus. For importing .kml or .kmz files, go to import files->import from dropbox->select required files-> import->files will load in Locus. This step is not compulsory.
4. Before starting to walk the trail, open Locus -> Tracks ->Track recording-> click on start icon->start walking your trail->click on stop icon after trail ends->Track will be recorded in your phone-> save the track by “trailID_beat/block_division”.
5. Every 5 mins while walking the trail, create a waypoint as follows. In Locus->go to points->create new point->save as “trailID_beat/block_waypointnum” to the point->save point
6. In order to share trails and waypoints files->Go to menu-> click on share icon-> select the files->share via email-> type the respective email id -> share
7. All saved tracks and points are automatically stored as .gpx files, and can be shared via email.
8. These .gpx files can be then imported in to Google Earth for mapping and further analysis

ANNEXURE III – Data entry for Distance in Microsoft Excel

In Microsoft Excel, the following separate columns are to be created: **region; area; trail.id; trail.length; species; cluster.size; distance; angle.**

- **Region:** to be coded with a single numeral as per the unit of study or data received.
- **Area:** to be entered as a numeric value for the study area (in sq. km.) from which data has been collected.
- **Trail.id:** trail identification code as per prior allotment.
- **Trail.length:** length of trail in kilometres.
- **Species:** name of the species being recorded, for e.g., Rhesus macaque, langur.
- **Cluster.size:** total animals (Rhesus macaques) recorded for a single sighting.
- **Walk bearing:** bearing of trail at the point of observation.
- **Animal bearing:** bearing of animal from observer through compass.
- **Animal distance:** distance of centre of animal group from observer in metres.

Every observation/sighting for Rhesus macaques to be entered serially in the excel sheet in separate rows. Region, area, trail.id and trail length shall remain same for all entries of any one particular trail.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	region	area	trail.id	trail.length	species	cluster.size	walk.bearing	sighting.angle	radial.distance					
2	1	16	1	12										
3	1	16	1	12	Rhesus	9	25	80	12.5					
4	1	16	1	12	Rhesus	1	26	34	11.5					
5	1	16	1	12										
6	1	16	1	12	Rhesus	1	24	65	97.7					
7	1	16	1	12										
8	1	16	1	12	Rhesus	6	25	103	37					
9	1	16	1	12	Rhesus	7	30	111	23.3					
10	1	16	1	12	Rhesus	9	32	33	49.5					
11	1	16	2	12	Rhesus	5		99	77.2					
12	1	16	2	12	Rhesus	5		16	43.1					
13	1	16	2	12	Rhesus	9		26	100.4					
14	1	16	2	12	Rhesus	9		34	42.5					
15	1	16	2	12	Rhesus	12		50	63.4					
16	1	16	2	12	Rhesus	11		6	50					
17	1	16	2	12	Rhesus	4		58	116					
18	1	16	2	12	Rhesus	14		40	37.8					
19	1	16	2	12	Rhesus	4		58	58					

Annexure IV – Estimating animal bearing and distance (in absence of equipment)

- A.** In case compass is not available, observer can measure the sighting angle/bearing of the animal by using his/her arms to first create a 90° angle on the side of the sighting. Then, keeping one arm stationary, move the other arm to halve the angle, so that the arms now form 45° . They can halve the angle similarly once more and identify which quadrant the sighting falls in (Figure 1.)

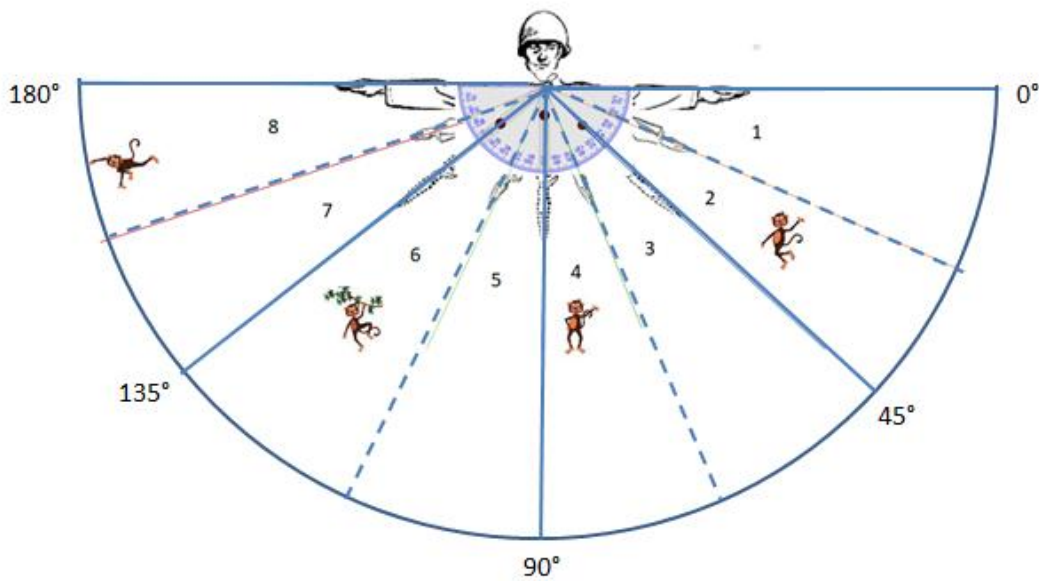


Figure 1. Measuring sighting angle/bearing using observer's arms to identify which segment the animal is in.

- B.** In case rangefinder is not available, distance of sighting can be measured through ocular method. All observers must fill in datasheet 1d three times – once during training, once at the end of the training session, and once after completing all trail walks in the population estimation exercise. This is important to estimate any observer errors and standardising the data collected. All trainers must have rangefinders during the training of staff.