



Wildlife Monitoring, methods and field execution



for a living planet

Shariq Shafi
WWF-India

Photo: © Santosh Saligram





Why monitoring matters?

- It is essential for keeping track of animal movement patterns, habitat utilization, population demographics and various changes in animal numbers.
- It helps in preparation of effective management plan.



Selection of estimation method

- the management objectives,
- nature of the habitat,
- special attributes of the animal,
- size of the area,
- availability of resources (time, money, field staff)



Census methods and terms

Direct: Based on observation of actual individuals

Indirect: Based on evidence (tracks, dung, calls, nests etc.)

Population size (N): (no. of indi. in a population)

Population density: (Pop./ no. of individuals per unit area)

Trends/indices: A measurement that is related to the actual total number

Increasing, decreasing \Rightarrow may be more meaningful for the managers.



Census methods and terms cont..

Census: Selected species abundance

Inventory: Listing of all species.

Surveillance: Repeated survey using standardized methods.

Qualitative: e.g. none, few, many/absent, rare, occasional, common, abundant

Quantitative: Numbers viz. 42, 10500.



Total/Sample counts

Total counts: Where entire area of a reserve is searched and all animals tallied.

- No accuracy estimates
- Animal movement issues
- Greater acceptance by lay-man
- High costs

Sample counts: Where a pre-determined portion of the reserve area is searched, usually in a number of small distinct sample areas.

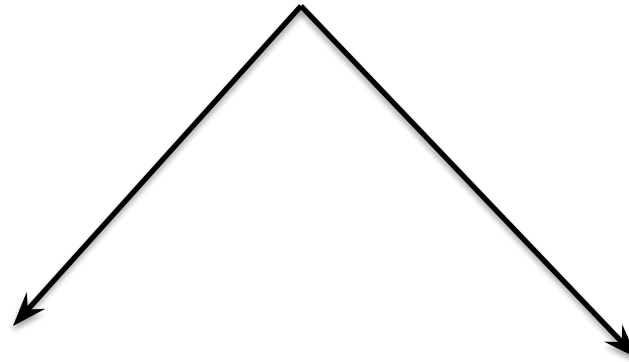
Sampling fraction= area searched

Total area of reserve

More economical; less disturbance to the system



Survey design



Sampling strategy

how to choose where to count

Survey method

how to count



If sampling is used - need to decide how many samples

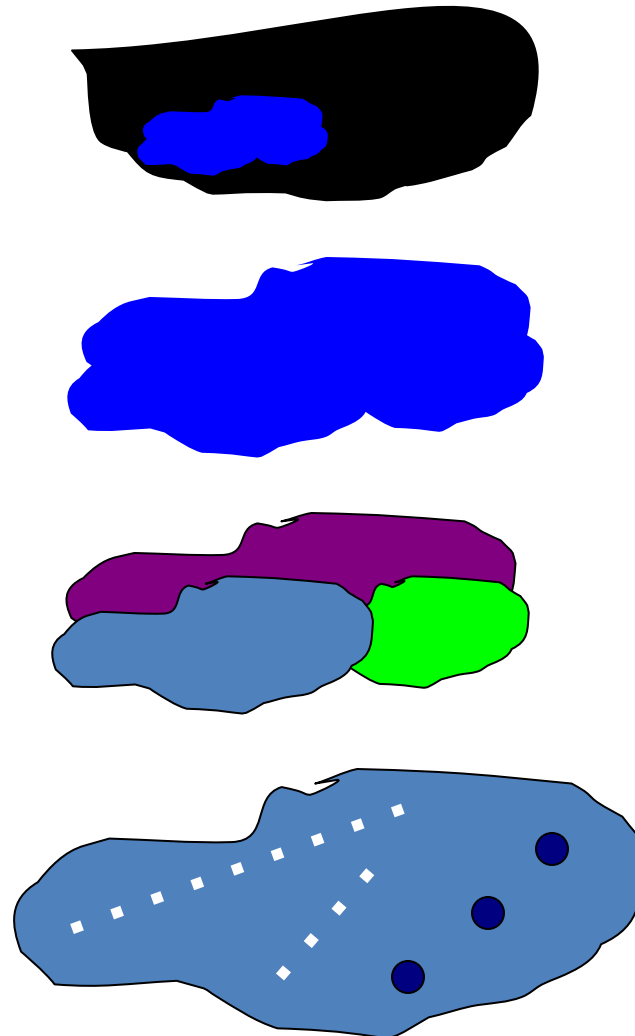
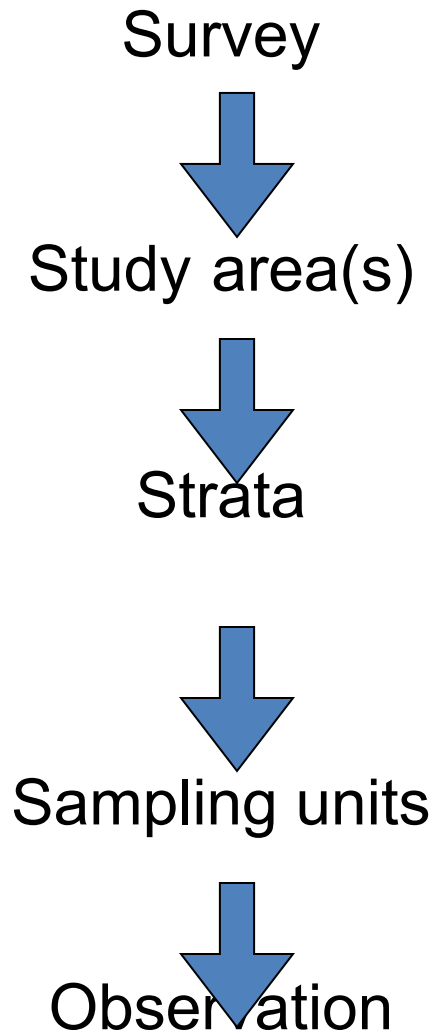
Some methods require minimum samples sizes

e.g. density estimation

- 60-80 records for line transects**
- 80-100 records for point transects**



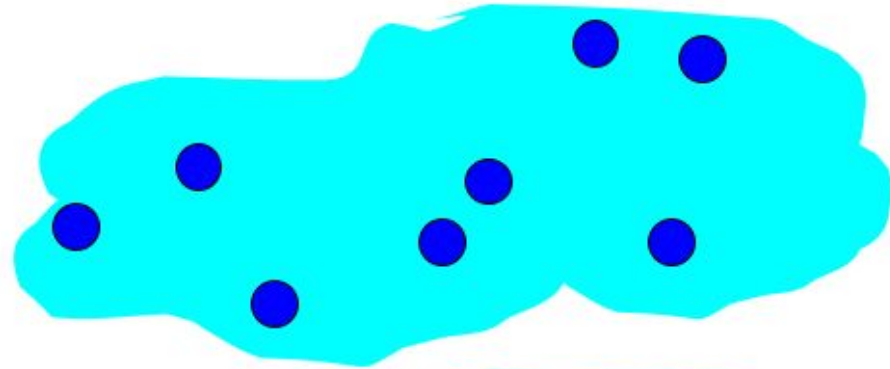
Survey Design



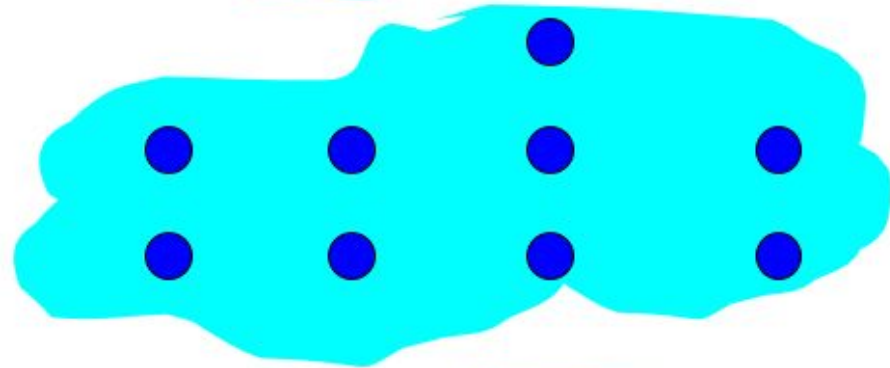


Sampling Design

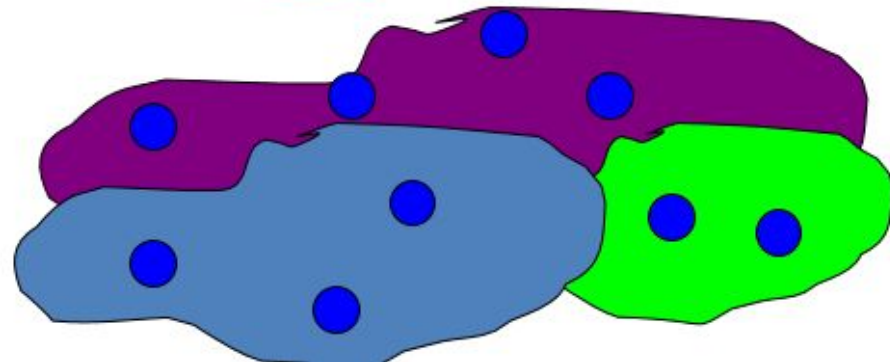
● Random



● Systematic



● Stratified





Sampling Considerations

- **Sample size: depends on**
 - **Precision**
 - Affected by variability
 - Increased by larger sample size
 - **Accuracy**
 - Affected by systemic errors & biases
 - Increased by reducing biases
 - Habitat (detectability)
 - Species traits (behaviour, conspicuity)
 - Season/time of day
 - Weather
 - Observer



Improve accuracy & reduce bias

- **Use appropriate sampling strategy**
- **Use appropriate survey method**
- **Identify and attempt to remove sources of bias**



Sources of bias

- **Census method**
- **Effort & speed**
- **Habitat**
- **Species concerned**
- **Time of sampling/data collection**
- **Season**
- **Weather**



Observer bias and solutions

Observer skills always vary-

- Most contacts are calls or song: expertise may vary a lot.

Improve observer skills

- Provide detailed instructions,
- Provide training - workshops
 - - census methods, review skills
- Identification - field guides, tapes, field trips





Census methodologies

- **Elementary**
 - Total species lists
 - Species lists with abundance categories (e.g. common, rare, scarce etc.)
 - Checklists
- **Index counts (relative densities)**
 - Encounter rates, Point counts, line transects
- **Absolute counts**
 - Block counts (for large ungulates and megaherbivore)
 - Line/Point transects
 - Territory mapping



Census methodologies cont..

- Line Transects (birds, mammals, reptiles etc)
- Road transect using vehicles
- Point count & call count (mainly for birds)
- McKinnon's species richness method (birds, mammals, herpetofauna etc)
- Pellet/dung count
- Waterhole surveys
- Camera trapping



Dung Surveys

Dung: Reliable indicator of animal presence can be used as index of population abundance

Methodology:

(i) Correct identification of dung from different species of separate groups of dropping

Differences in size, shape, patterns of indentations or protuberances at the end of pellets

carry a selection of pellets with you



Waterhole Technique for Wildlife Census

Large mammals; Drier parts of the country.

Requirements:

- (i) All dry season water sources are identified**
- (ii) Dry season water sources are not too numerous & are widely scattered.**
- (iii) Water sources are not meandering stream or rivers.**

Index counts; poor validity for population estimation



Methodology for waterhole count

- (i) Survey time - least availability of water
- (ii) Prior survey of all water points
- (iii) Machan /hide for at least 2 persons; for enough to avoid disturbance
- (iv) Full moon period should be chosen
- (v) Field staff selection; their training; their gear
- (vi) Data to be collected in Performa



Designing Camera trap Study

- ❖ No. of Camera Sites
- ❖ Sampling Period/Camera days
- ❖ Placement design
- ❖ Type of study, purpose, goal
- ❖ Logistics, training, funds

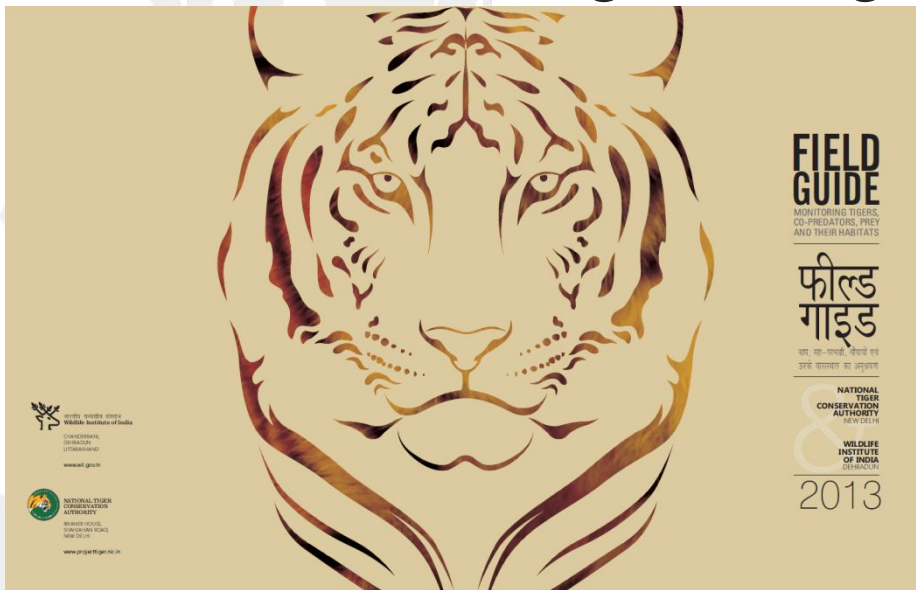


EVALUATING THE STATUS OF TIGERS

Factors determining status of tigers

- Habitat status
- Prey availability
- Co-predators
- Presence / Signs of tiger

STATUS OF TIGER, CO-PREDATORS, PREY AND THEIR HABITAT IN INDIA



F
D
C

Phase I
State FD

Tiger / Carnivore Sign Survey

Ungulate Encounter Rate

Habitat Quality

Beat level sampling (10-20
km²)

Occupancy & Relative Abundance
Spatio-Temporal Monitoring



Landscape Complex Characterization
(Remotely Sensed & attribute data in GIS)

Modeling Patterns Underlying Tiger Occupancy, Source
Population
and Connectivity

Phase II
WII & PT

Phase III
WII & SFD

Stratified Sampling based on Phase I & II for –
1. Tiger Density – Capture – recapture frame work
2. Ungulate Density – Distance sampling

Convert Indices to Density & Numbers

All Stages Audited by NTCA

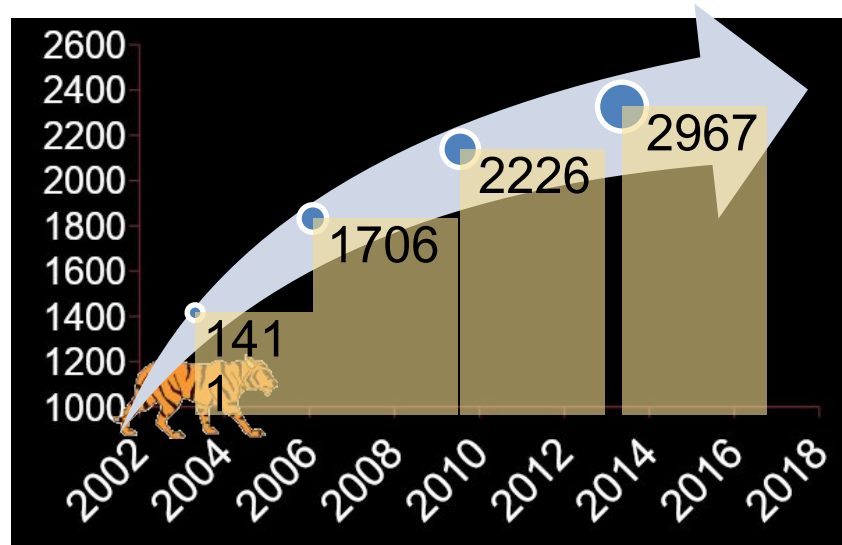
STATE-WISE AND LANDSCAPE-WISE TIGER ESTIMATION

STATES	YEAR 2010	2014
Shivalik-Gangetic landscape	353	485
▪ Uttarakhand	227	340
▪ Uttar Pradesh	118	117
▪ Bihar	8	28
Central Indian and Eastern Ghats landscape	601	688
▪ Andhra Pradesh	72	68
▪ Chhattisgarh	26	46
▪ Madhya Pradesh	257	308
▪ Maharashtra	169	190
▪ Odisha	32	28
▪ Rajasthan	36	45
▪ Jharkhand	10	3
Western Ghats landscape	534	778
▪ Karnataka	300	406
▪ Kerala	71	136
▪ Tamil Nadu	163	229
▪ Goa	---	5
North-Eastern landscape	70	76
▪ Assam	143	167
▪ Arunachal Pradesh	----	28
▪ Mizoram	5	3
▪ Northern West Bengal	---	3
▪ North East Hills and Brahmaputra plains	148	201
▪ Sunderbans	70	76



SOME BIG NUMBERS
 Area covered in census: 3,78,118 sq kms
 Individual tigers photographed: 1,540
 Sample beats: 29,717

graphics: hitesh mathur





Orientation of front line staff



Sign survey





Camera Deployment in the Field



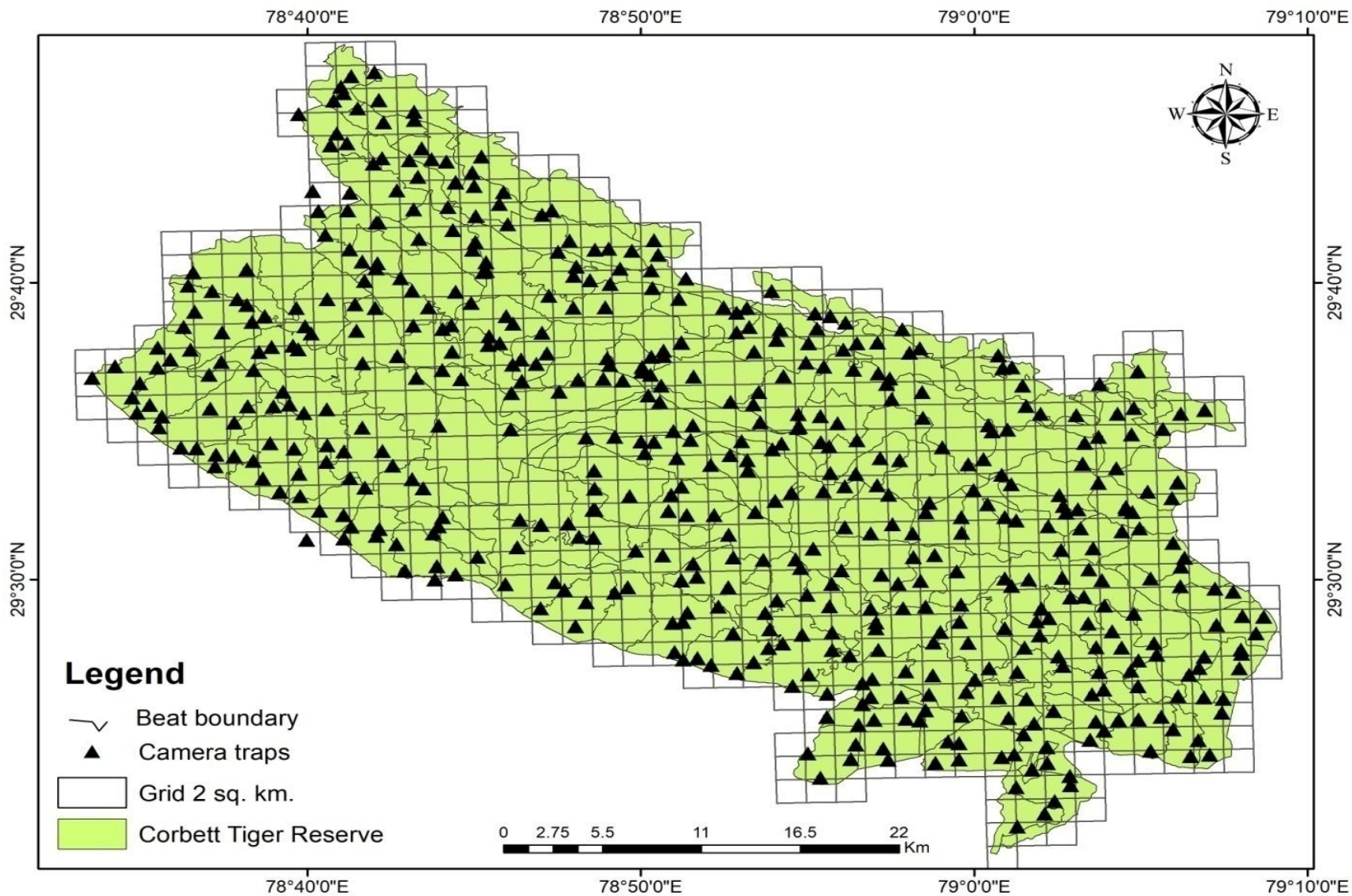


Intensive search for potential camera site





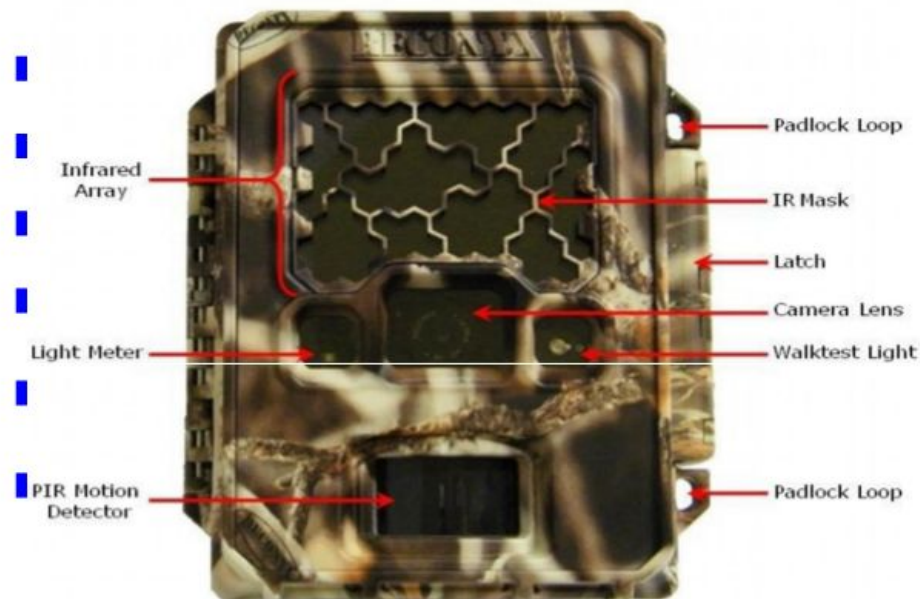
Grid map of Study area



Methodology: What is Camera trapping?

- ❖ A heat and motion sensing camera that captures images of wildlife and other animals automatically passing in front of them.

Camera trap - Reconyx



How a camera trap works...



Some standard settings

- ❖ Time delay
- ❖ Battery status
- ❖ Memory details
- ❖ Date and time settings
- ❖ Flash intensity
- ❖ Picture quality
- ❖ Video mode

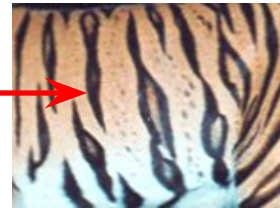
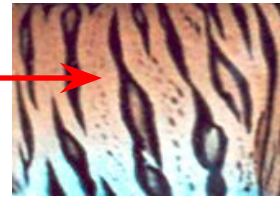
Camera brands – few examples







Stripes of each tiger are unique like human fingerprints





Advantages of Camera trapping

- ❖ Best suited for rare & cryptic animals
- ❖ Simple to operate
- ❖ Non-invasive technology
- ❖ Species presence/absence
- ❖ Good tool for home range estimation
- ❖ Inter-seasonal behaviour through sessional monitoring



Not only wildlife gets captured



Monitoring of illegal activities

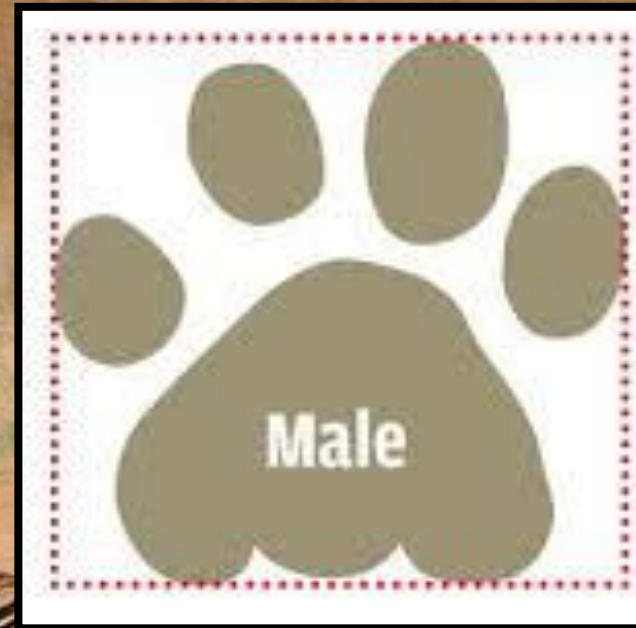


Revealed the presence of shy animals





Pugmarks Uniqueness



Broad differences between pugmarks of members of the cat and dog families

Since most of the soft-padded four-toed pugmarks seen in the jungle belong to either the cat or the dog family, it is important to understand their distinctive features.



Pugmark of a Dog



Pugmark of a Cat

Note:

1. While claw marks are visible in a dog's pugmark, in cats, unless they are walking over slippery or very steep ground, or are startled, claw marks are not visible.
2. In the dog family, except in the case of hyaena, the gap

Distinguishing the right and the left pugmark

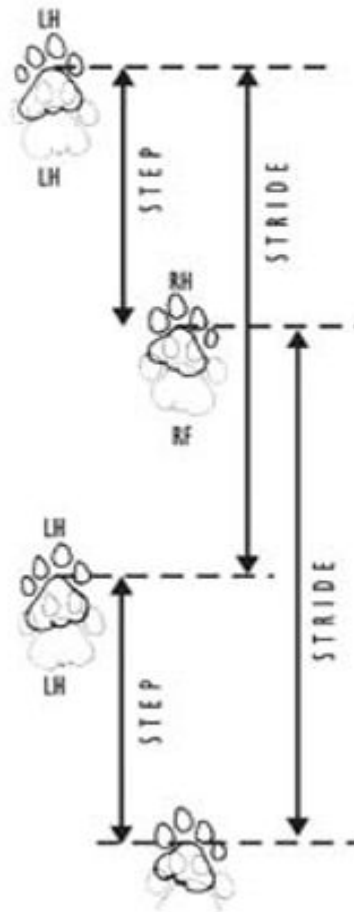


1. Fold-in the thumbs of both your hands.
2. Stretch out the remaining four fingers in each hand.
3. In your left hand you will see that the third finger from the left is the longest. This occurs in the tiger too.
4. In your right hand you will see that the third finger from the right is the longest. This occurs in the tiger too.



Difference between Step and Stride

Other Important measurements





Leopard (*Panthera pardus*)



Leopard तेन्दुआ



Golden Jackal (*Canis aureus*)



Jackal गीदड़



Sloth Bear (*Melursus ursinus*)



Sloth Bear भालू



Indian Fox (*Vulpes bengalensis*)





Jungle Cat (*Felis chaus*)



Dr Sangeeta Dhanuka 2012
Jungle cat



Leopard Cat (*Prionailurus bengalensis*)





Fishing Cat (*Prionailurus viverrinus*)





Small Indian Civet (*Viverricula indica*)





Large Indian Civet (*Viverra zibetha*)



Attack

4/10/2013 1:45 AM

Cuo



Common Palm Civet (*Paradoxurus hermaphroditus*)





Sambar (*Rusa unicolor*)





Spotted Deer (*Axis axis*)



Pic: Anand Kumar



Indian Muntjac (*Muntiacus muntjak*)





Hog Deer (*Axis porcinus*)





Nilgai (*Boselaphus tragocamelus*)





Wild Pig (*Sus scrofa*)



1/7/2017 7:37 PM



Sampling of Ungulates

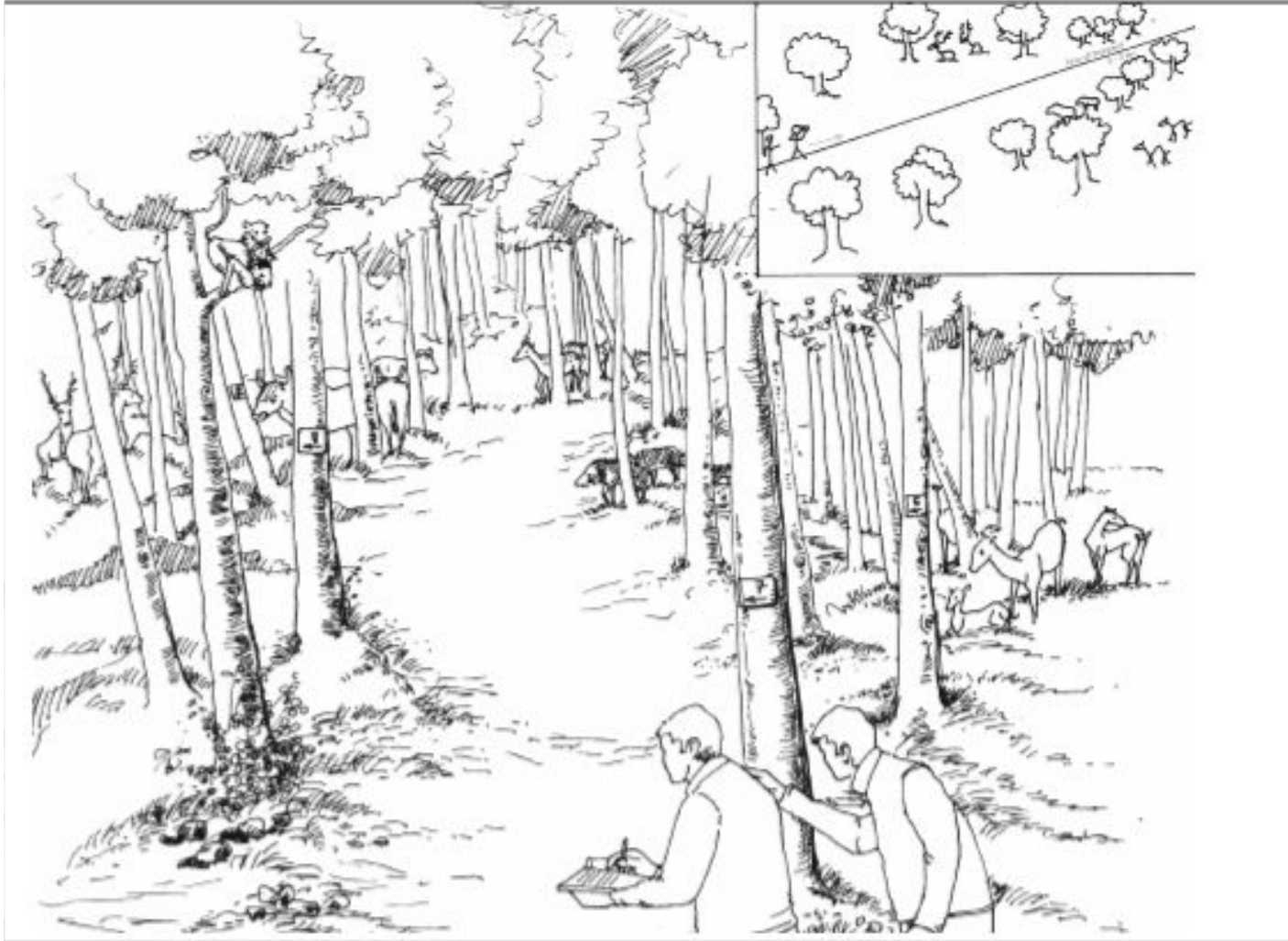


Figure 3. Sampling for ungulate encounter rates

आरेख 3. चौपायों की गणना

Form 2: Ungulate Encounter Rates

2

- Established line transect 2-3 km in each beat.
- Beginning & End points marked permanently.
- Walk early morning. Count no. of each species, group size, young of the year.

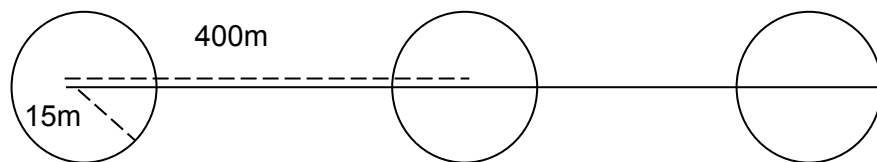


Form 3: Vegetation plot

3



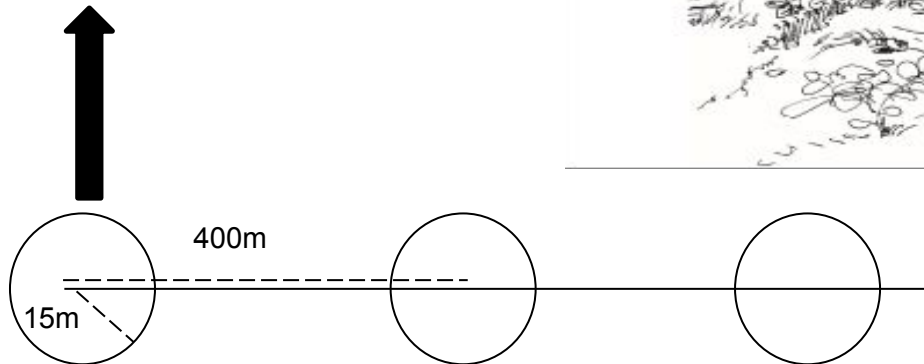
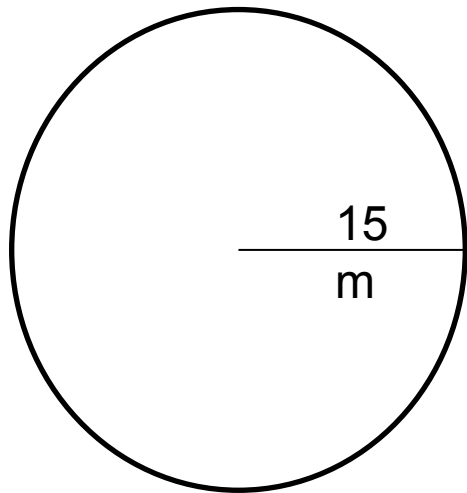
15m radius plots at every
400m on 2km transect



Form 3A: Vegetation
plot
Form 3B: Human
disturbance
Form 3C: Ground
cover

Form 3A: Vegetation plot

Figure 4. Sampling tree and shrub species in a 15m plot every 400m along the transect
आरेख 4. पेड़ों की जाति की पहचान, 15मी. प्लॉट में हरके 400मी. रेखांकित मार्ग पर ।





Form 3B: Human Disturbance

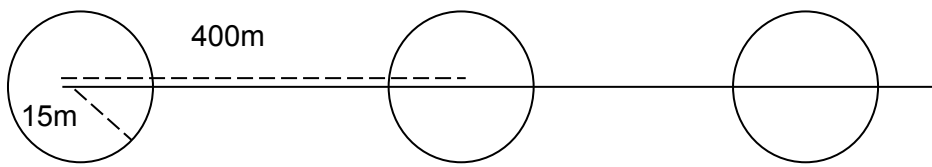
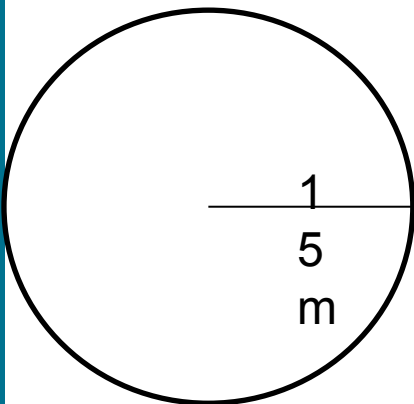
मानवीय व्यवधान

संकलनकर्ता : _____ दिनांक : _____ वनमंडल _____ रेंज _____

बीट : _____ ट्रोजेक्ट लाइन क्रमांक : _____

प्लॉट नं.	जैविक दबाव							
	पेड़ों की कटाई (कटे हुए पेड़ों की संख्या)	शाखाओं की कटाई (कटी शाखाओं की संख्या)	घास/बांस की कटाई (हाँ/ना)	पगड़ियों (हाँ/नहीं) मनुष्य या पालतू पशु द्वारा (पगड़ियों की संख्या)	मनुष्य की मौजूदगी (देखी गयी संख्या)	पालतू पशुओं की मौजूदगी? (देखी गयी संख्या)	अवशिष्ट (कि०, मि०, से०) उत्तर	दे शान्तर (कि०, मि०, से०) पूर्व
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

पृष्ठ - 3



क्या बीट में मनुष्यों के खाई निवास स्थल हैं? हाँ/ नहीं। यदि हाँ तो कितने..... उनकी अनुमानित जनसंख्या

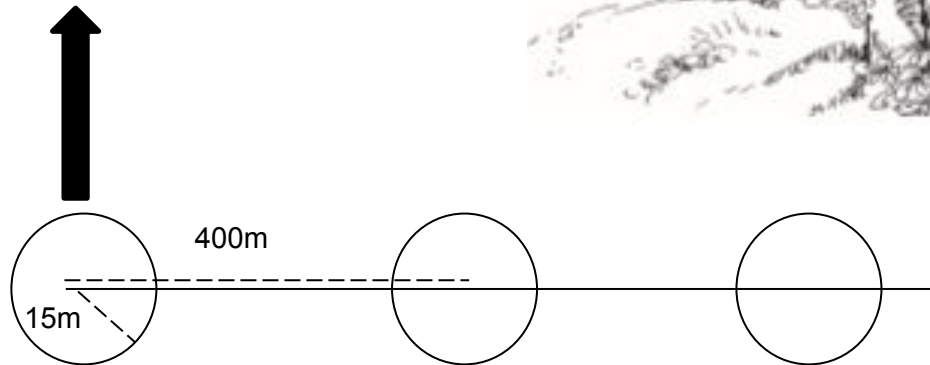
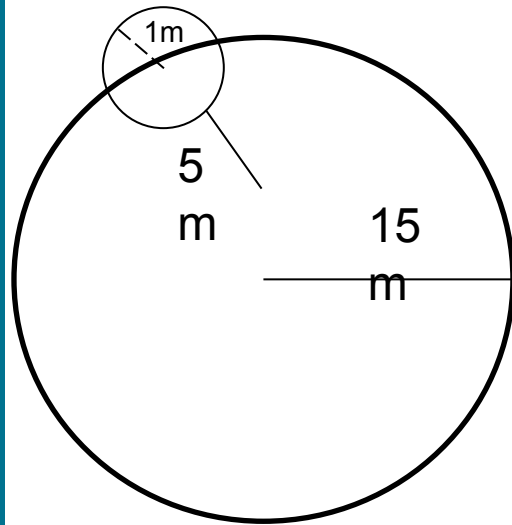
पालतू जानवरों की संख्या....., मवेशी....., भेड़/बकरी....., अन्य पशु.....।

क्या इस बीट में एनटीएफपी इकट्ठा की जाती है हाँ/ ना। अगर हाँ तो एनटीएफपी के नाम

एनटीएफपी इकट्ठा किये जाने की दर 0 से 4 की श्रेणी में तिरों 0-नहीं और 4-बहुत अधिक)



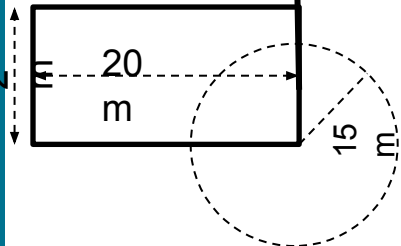
Form 3C: Ground Cover



4

Form 4: pellets counts of ungulates

- Pellets need to be recognized to the species.
- large numbers of pellets (for antelopes) should be categorized as given in form.



**FECAL
PELLETS OF
WILD UNGULATES
AND THEIR
CHARACTERISTICS**

**चौपायों का
गोबर और
उनके लक्षण**

**APPENDIX-II
परिषिष्ट—III**



③
Sambar
सांभर



③
Chital
चौंसल



③
Nilgai
नीलगाय



③
Barking Deer
गुट्टी (मिन्की)



③
Chowsingha
चौरिंग



Data Sheet - 4 Pellet Counts of Ungulates

Name of Observer: Date: Forest division.....Range:

Beat: ID No. of line transect:

Plot NO.	Forest type	Terrain Type	Chital	Sambar	Wild Pig	Nilgai	Gaur	Barasingha	Barking Deer	Hog Deer	Chinkara	Chowsingha	Mouse deer	Hare	Blackbuck	Wild buffalo	Elephant	Rhino	Langur	Peafowl	Cattle	Goat & Sheep	Other Domestic livestock	Others/Unid.
1																								
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								
*Present / Absent																								

*Based on your personal knowledge mention if the species occurs in the beat irrespective of whether its dung was recorded or not.

1. Do goat/sheep graze the sampled area ? Yes / No

2. In case pellets are obtained in large piles then these could be categorized into the following categories:

No. of Pellets	Category
50-100	A
100-200	B
>200	C



Pressure Impression Pads (PIP)



- ❖ 5 Pressure Impression Pad per beat
- ❖ Fixed Location PIP's for Tigers
- ❖ Monitored once a week
- ❖ Carnivores and mega herbivores
- ❖ Occupancy & Relative Abundance
- ❖ PIP Camera trap
- ❖ (Individual identification and population estimation)



TRACK PLOT FOR CARNIVORES AND MEGA HERBIVORES

[PRESSURE IMPRESSION PAD]

Name of Observer:

Date:

Forest Division.....

Range:

Beat:

ID No. of Line Transect:

PIP No.	Forest Type	Terrain Type	Tiger	Leopard	Sloth Bear	Dhole	Hyena	Jackal	Small Cat	Gaur	Elephant	Rhino	Water Buffalo	Others	Others	Deq N	Min N	Sec N	Deq E	Min E	Sec E	
1																						
2																						
3																						
4																						
5																						
6																						

If tracks of young carnivores (eg. tiger cubs) are observed, please mention in remarks.

Remarks:

.....

DATA SHEET - 5



Thank you

panda.org



+100

WWF is in over
100 countries, on
6 continents

1961

WWF was founded
In 1961



+5M

WWF has over
5 million supporters

+16M

WWF has over
16 million followers on
Facebook, Twitter and
Google+