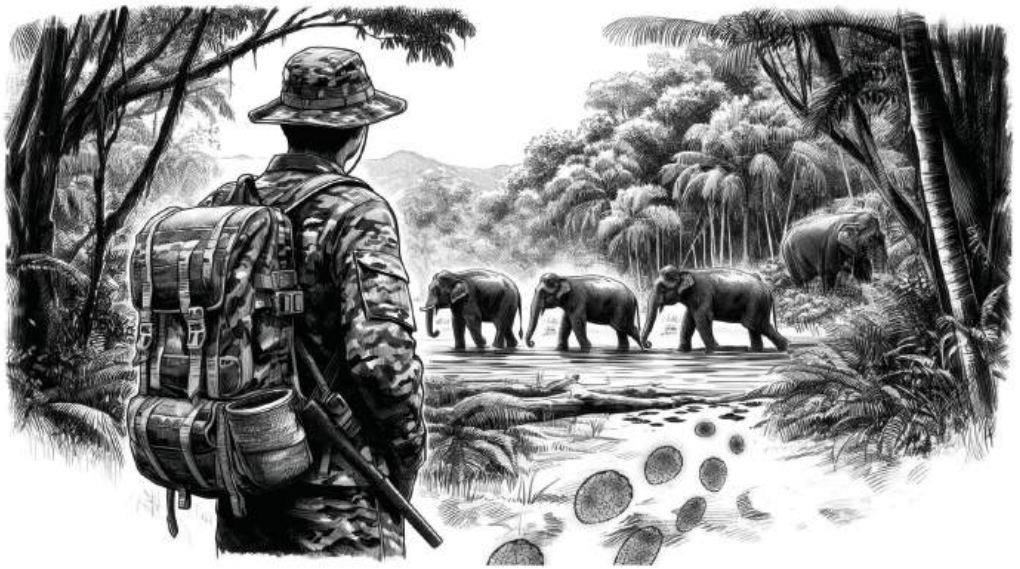




Basics of Elephant Tracking



TPC^{DL} | TPN^{DL} | TPS^{DL} | TPW^{DL}

(A Joint Venture of Tata Power and Government of Odisha)



Photo: Haree Krishna

This booklet is published by : SNEHA NGO

Supported by : TATA Power & Odisha Forest Department

Text & Content : Haree Krishna, Dr. Thammaiah C. K., Mohan Raj

Translation : Sabyasachi Rath

Editing Assistance : Ranjit K Patnaik

Photos : Respective authors and the rest has been credited

First Printing : 20 August, 2024

Design & Printed at : The Managers, Bhubaneswar, Odisha

©All rights reserved. No part of this publication may be reproduced, stored in any retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying or otherwise, without the prior written permission of the copyright holders.

Acknowledgement

This booklet has been created and published by SNEHA-NGO with support from Tata Power and the Office of the PCCF (Wildlife), Govt. of Odisha.

- The text and content of the booklet has been conceived, created and edited by the SNEHA-NGO team comprising of Mohan Raj, Dr. Thammaiah C.K, Haree Krishna, Ramasamy Krishnan, Ranjit K. Patnaik with translation to Odia by Sabyasachi Rath.
- Photographs and illustrations in the booklet have been contributed by Dr. Thammaiah C.K, Dr. Subrat Debata, Haree Krishna and Abhimanyu Madhusudan.
- The source of data and information has been duly cited with credits to the researchers appearing on the reference page.
- The creation of this booklet would not have been possible without the support of Shri. Susanta Nanda, IFS - PCCF (Wildlife) and vital inputs contributed by Dr. Manoj Nair, IFS- CCF (Wildlife). The SNEHA-NGO team is thankful to Shri. Sudhansu Sekhar Khora, IFS, RCCF, Angul Circle, Shri. Sumit Kumar Kar, IFS, DFO-Dhenkanal division and Shri. Nitish Kumar, IFS, DFO-Angul division for their kind approval.
- The SNEHA-NGO team is grateful to Dr. Bivash Pandav, Sr. Scientist-WII and Dr. Pratyush Mohapatra, Sr. Scientist-ZSI for their valuable advice.



CONTENT

Preface	01
Introduction to Tracking	07
Types of Tracking	11
Recognising Signs and Tracks	13
Safety First	14
Recognizing an Elephant Charge	15
What to do when an elephant charges	16
Toolkit for tracking	17
Survival Tips	18
References	19



Photo: Haree Krishna

Preface

The practice of studying animal signs and footprints to get knowledge about the environment and the subjects of the tracking is known as wildlife tracking. Tracking and monitoring wildlife can be useful for a variety of management purposes, such as developing strategies for introduction and eradication of animals, recognizing the movements of animals and their habitat usage, analysing population demography, and, prevention of hunting and poaching. We will be covering some of the important aspects, which will help one to effectively track elephants in the wild.

Through a combination of theoretical foundations, practical exercises, and expert insights, you will gain a deeper appreciation for these incredible creatures and develop the expertise to contribute meaningfully to their conservation. Whether you are a seasoned professional or just starting your journey in wildlife conservation, this book will serve as an invaluable resource and guide.

This book has been written to explain the basics of tracking elephants to educate and train Forest Department staffs and officers to locate and study the elephants and their movement up-close. Tracking elephants scientifically and safely is expected to generate data and information which would support critical decisions to conserve Elephants as well as mitigate Human Elephant Conflict. Before starting to learn the essentials of tracking one should have basic knowledge on elephant ecology, behaviour, social dynamics, and their habitats.



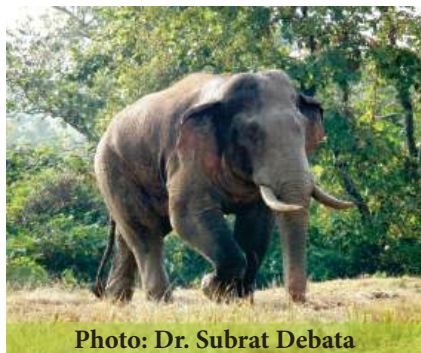


Photo: Dr. Subrat Debata

A prime adult tusked

Elephant Ecology

Elephants are the biggest terrestrial mammals on the planet. They have a long lifespan, a wide habitat range, intelligence, with complex social structures, and play an important role in ecological functions. African bush elephants, African forest elephants, and Asian elephants are the three elephant types found in the world. Here we will be discussing about Asian elephants (*Elephas maximus*), the largest mammal of Asian continent majorly found in

the Southern part of Asia. India holds 60% of the whole Asian elephant population in the world.

Asian elephants are classified into three sub-species; Sri-Lankan Elephants (*Elephas maximus maximus*), Indian Elephants (*Elephas maximus indicus*) and Sumatran Elephants (*Elephas maximus sumatranus*) (Sukumar, 2006). Indian elephants inhabit a range of different habitats, including dry thorn forest, moist and dry deciduous forest, tropical evergreen and semi-evergreen forest, as well as secondary forests near human habitation and cultivation lands. Elephants need a lot of area in order to meet their needs for social connections, water, and nourishment. They travel great distances in search of resources, sometimes crossing agricultural areas and human habitations which can result in confrontations with humans.

Indian elephants are herbivores and spend up to 19 hours a day eating as much as 136 kilograms (300 pounds) of fruit, grasses, roots, and bark. They are migratory animals with large home ranges, meaning they wander across their forest habitat searching for food, water, and mates (Sukumar, February 1989).

Habitat Preferences

Asian elephants prefer varied habitats including forests, grasslands, and scrublands. They are adaptable but are commonly found in tropical and subtropical moist broadleaf forests, where they can find ample food and water. They consume 60% grass and 40% shrubs; this mainly depends upon seasonal availability of vegetation and grasslands are one of favourite food spot for elephants (Mofulu, 2023). They are “large generalist herbivores”, which are able to consume and convey long distance dispersal of many seeds especially fruits as they are voracious frugivores (White, 1994). Thus, they have an important role in ecology.

They normally can't stand exposed to the heat of sun for long, as they don't have sweat glands on their body, and, hence they would seek shade during the sun's peak heat. At

that time the animal finds shade beneath the tree canopy and if they feel secure, they would sleep.

Social Dynamics and Behaviour

Asian elephants mostly form groups of six to seven related females and that group is led by an old female, known as the Matriarch. Matriarch are the oldest and most experienced female of the matriarchal group. A matriarchal group will contain about 5 to 20 individuals who interact with other family units of that area. Males of the matriarchal group, upon reaching adolescence, leave the group leading a solitary life and sometimes they form temporary groups with other males (Sukumar, 2006). Young elephants often attach themselves to older bulls to learn the art of survival in different landscapes. Males often visit the herds looking for ovulating females and also as a social call. Males are also pioneers, often discovering new areas and once they establish safe feeding grounds, other female herds would follow with time.

Elephants follow polygynous mode of reproduction in which one male mate or copulates with multiple females, and such access for mating is determined by fighting in between potential bulls. Females



Photo: Dr. Subrat Debata

A female herd



Photo: Abhimanyu Madhusudanan

A adult male in Musth

undergo 16 months of oestrus cycle in which one week is the receptive period (Rasmussen & Schulte, 1998). Mother and calf is the most basic unit which combines to form a familial group which will at least contain two adult females and calves. The familial group combines further to form a bigger unit called bond group and several such bond groups join together to form a clan. A clan will form and disperse again into bond groups based on various factors (Wittemyer et al., 2007).

Musth : Males undergo a phase with peak levels of testosterone followed by peak aggression and sexual arousal which is known as Musth. Non-musth males avoid competing with the individuals in musth and also females prefer bulls in musth for mating (Rasmussen & Schulte, 1998). Musth in smaller males get suppressed by the bigger males in musth and the mating access is also higher for the bigger males. Musth is also a roving stage for males as they leave and explore the non-musth territory in search of mates (Keerthipriya et al., 2020).

Tuskless Males (Makhnas)

Makhnas are tuskless male elephants having small tushes instead of long tusks like that of normal adult males. Contrary to the myth, the makhnas are not feminine by nature, but they are as masculine as normal males and they too undergo musth and mate with females to produce offsprings. Makhnas are larger in body size compared to the normal tuskers and are strongly built (Sukumar, 2003). In Srilanka, the majority of the males are makhnas resulting in females having to mate with makhnas, unlike in India where they are less preferred by the potential females, which makes



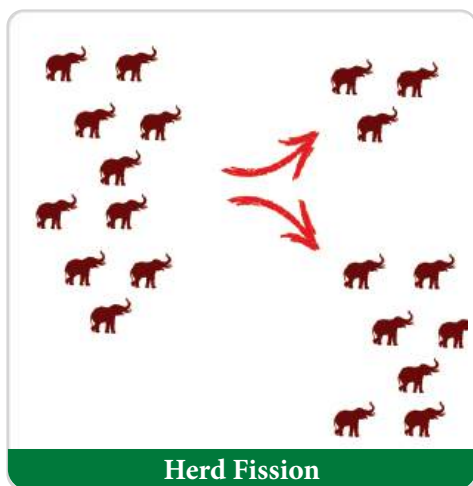
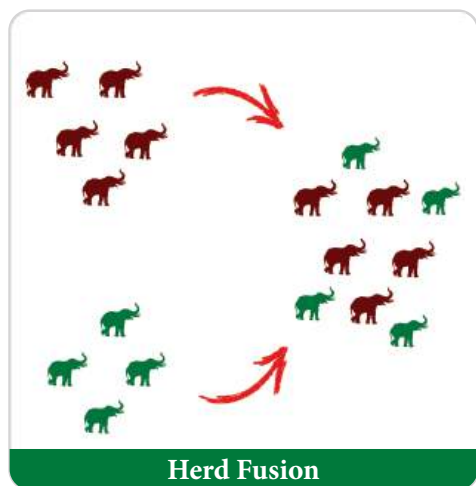
(A makhna elephant)

Photo: Abhimanyu Madhusudanan

Herd Fission and Fusion

Elephant herds are fluid in composition and group formation is primarily based on familial relatedness. Groups can split (fission) or come together (fusion) depending on environmental conditions, resource availability, and social factors. This dynamic structure allows them to adapt to changing circumstances. In our context that would depend upon resources like food and water availability. If there is good enough

fodder then elephants would join together, can break into smaller units, and scatter when threatened. They would do the same if availability of water and fodder become scarce. In some case they will gather together when they have to face a stronger foe. This dynamic group structure makes tracking much more complicated and need continuous monitoring for understanding the animal and its ecology (Couzin, 2006).

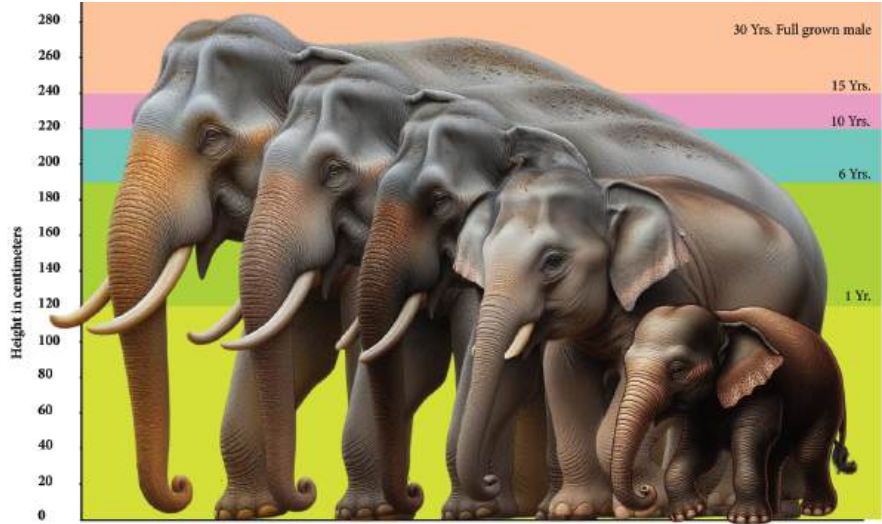


Age Classifications:

Elephants have potential life spans exceeding six decades and an extended period of growth and maturation. Growth in elephants extends over many years, with height at birth being around 40% of adult size. Males and females achieve about 90% and 95% respectively of their adult height by the age of 15. Elephants are among a handful of species, where body size can be used to delineate a number of age classes. Assigning free ranging individuals with size-age classes is essential for cross sectional and short-term studies. Shoulder height is one of the old and prime parameters for classifying elephants based on age, along with that skull size, ear size and folds, temporal and buccal depressions, tusk thickness are other characters used for age classification in elephants. Elephants are said to be fully grown at the age of 25 and such adult males or females should most priorly be used as the reference individual in the field for height calculation. A fully grown adult cow will have a height of 240 cm and an adult bull will have 270 cm (Mumby et al., 2015; Varma et al., 2012).

Ear folding is another important key to identify the age of elephants. Ear fold of elephants is taken into account with its degree of folding ; Ear fold will be 25% at the age of 25-30yrs, over 50% in between 30-40yrs, 100% in between 40-50yrs and folds get completely flattened beyond 50yrs. Likewise depigmentation of the ear and skin is

	Male shoulder height	Female shoulder height
Age Classes	(in Cm)	(in Cm)
Calf < 1 Year	Up to 120	Up to 120
Juvenile 1 to 5 Years	120-180	120-180
Sub-adult 5-15 Years	180-240	180-210
Adult 15 years & above	Above 240	Above 210



Aging in male elephants



Aging in female elephants

also used in age classification in which the animal will have reddish dots at the ear corners at between the age of 25-30yrs, depigmentation gets clearly visible by the age of 40, and gets more prominent by the age of 50 and forms a clear reddish layer by the side of ears reaching beyond 50yrs (Sukumar, 1988; Arivazhagan & Sukumar, 2008).

Introduction to Tracking

“Tracking is a science-oriented art of finding and locating an animal using various animals’ signs like ground spoor, vegetation spoor, scent, feeding signs, urine, faeces, saliva, territorial signs, auditory signs etc.”



Tracking was one of the skills used by the early men to find food which involved mainly animal meat. The most significant adaptations of the human species, hunting and gathering came about over hundreds of thousands of years. Much of our intelligence, emotions, and social interactions are derived from this adaptation. Furthermore, the evolution of tracking would have been crucial to the evolution of hunting, as tracking is one of the most essential and universal aspects of hunting. From this we can say that the tracking skills in humans developed along with hunting practices (Liebenberg, 1990). In

modern civilized society, we have developed our tracking instincts for wildlife and its conservation.

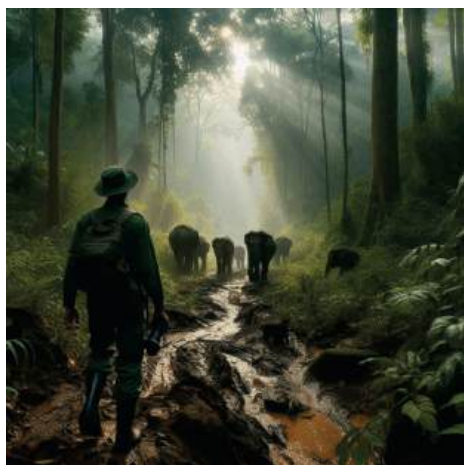
In wildlife management, the role of an experienced tracker is important and inevitable. Spotting and following animals in stealth between varying vegetation is challenging and tricky. For that the tracker needs concise knowledge regarding the animal's behaviour and its habitat. Along with that, keeping stealth, agility and presence of mind will help to succeed in data collection and locating the animal. Almost all animals, especially wild ones are shy in nature and hide or runaway at the slightest disturbance. The intensity of this nature is fluid between and within species. Difficulties or challenges in locating the animal depend on how good they are in getting away from disturbances or threats. Nature has selectively amplified their escaping tactics during the course of evolution.

A tracker must understand such strengths of the animal and work accordingly to break through their hiding tactics. Apart from these the most important benefit is the tracks and signs which the animal leaves during its movement and the tracker finds and reads these signs to make calculated prediction, which will lead to spotting the

animal. Complexity of these signs and tracks varies among species and terrain they inhabit. Body size is one of the key factors in this hide and seeks game. More the size, easier it is to spot the animal and more glaring will be the signs. Along with this, colouration, especially camouflage and tactics also plays a role.

Introduction to Elephant Tracking

Elephants being the largest land animals are easy to be spotted over long distances in an open land, but never easy in thick vegetation. Spotting these grey giants within the shades of canopy is difficult and in such habitats one needs to go closer to them. Typical elephant habitats are extremely favourable for these giants as thick under-growths and canopy enable them to set a perfect hideout. This makes elephant tracking a little bit tricky and dangerous.



Elephants are the smartest among all animals and they adapt and trespass almost all the barriers created by humans to explore different feeding grounds and habitats. They are long distance travellers and are active throughout day and night. Locating such animal is challenging and needs good tactics as they move continuously over long distances.

Elephants having complex life events and long-term life cycle, monitoring and studies also need to be long enough to make proper assessments. Individual identification and marking itself takes lots

of manpower and time. Identification of characters, mainly the ones which helps to keep apart an individual as a unique one is used for profiling (de Silva et al., 2013). For such activities, a tracker's role is inevitable.

In all the typical elephant habitats across India, there is crop depredation, and this requires rapid understanding of the whole scenario from both the perspectives of the human and the elephant, which will help to arrive at a long-term solution to the Human Elephant Conflict (HEC). Tracking elephants is the most important step in understanding the elephant behaviour and its habitat use. Tracking and locating the elephant will help to observe its behaviour in its natural habitat, as they are not aware of the presence of tracking team. Through this land-use by the animal, elephant tracks, diet, depredation pattern, depredation timing and seasons can be analysed and concluded. Along with this, health condition of the animal, herd fission and fusion can also be studied.

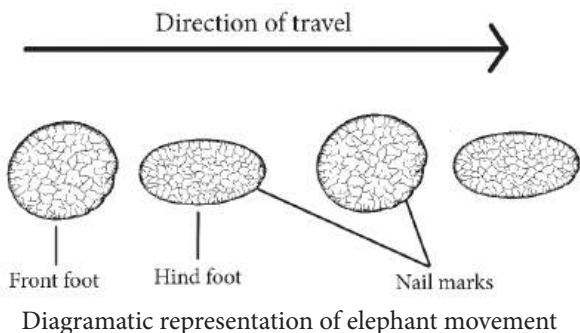
Why track Elephants?

- Profiling of animals in the wild.
- Studying population structure.
- Radio collaring of animals.
- Studying population dynamics like herd composition, fission and fusion of the group.
- Studying animal behavior in the wild
- Tracking injured animal for giving medical aid.
- Prevention of poaching.

Essentials of Elephant Tracking

- ❖ Don't use any fragrant soap when bathing or deodorants afterwards which the elephant would detect very easily. If you chew gums, pan or any mouth fresheners, it would give away your smell to the elephant. Always approach elephants downwind, that is, the wind will be blowing from the elephant towards you.
- ❖ Elephants have poor eyesight with a range up to 40 ft. only. During bright sunlight it is very ineffective, but during low light situation it is very sensitive. If you stand still, they won't be able to spot you easily but can spot you at the slightest of movement (Horne & Loomis, 2014).
- ❖ Wear cloths which blend with the vegetation. Make use of headgears like caps and hats to befuddle the animal from recognising and differentiating you as a living being.
- ❖ Establish the direction of wind from time to time – Make use of a small thread or sense with your wet finger. Wet side of the finger will be cooler, indicating the direction of the wind.
- ❖ Scent of elephant is important indication of their presence nearby, intensity of which varies based on the wind direction.
- ❖ Reading pad prints of the elephants provide almost concise idea of the direction where the animal went. Pad prints of the elephants are unique with random patterns of cracks beneath the sole of the foot. They walk on toes with large round front foot having five hoofed toes and the oval hind foot having four hoofed toes. Front side of both the pad prints will make the five nail mark whereas the hind portion will be smooth with four nail mark.





- lighting would bring a contrast to the track highlighting the ridges and valleys.
- Smooth soil will give the perfect direction indications whereas in hard soil you need to look for scuff marks made by the nails.
- Circumference of the pad print will give an approximate idea of the animal's age-group and height, as the height of the animal is double the front pad print circumference.
- Bulls and Makhnas in musth are dangerous to deal with as they won't be worrying about their potential threats. They can be spotted and safely followed by keeping a safe distance.
- Musth glands will produce a stinky secretion which is stronger than the normal body scent of the elephants. During musth urine will be dribbling along the inner hind limb which will make those area look dark. Tracks of bulls will have dragging lines of 10-12 cm width made by their trunk forming serpentine pattern.
- Elephants are used to be around water sources as along with huge food content they will need to drink more water also. In river beds with low and muddy water content they dig with their forelimb in nearby soil to get pure filtered water.
- Elephants, when active will continuously make some sounds except while paying attention when threatened. Apart from their growls, chirps, trumpets and snorts we can hear their ear flapping which they almost continuously do to regulate temperature even during their sleep. Branch breaking sounds by elephants are strong and sturdy which is different from the ones made by monkeys. While sleeping they may snore and some-times they fart, which can be clearly heard from a distance.
- From the position of the dung also we can get the idea of direction where the animal went. A line can be drawn from one to another giving the direction they went.

- Dung and urine in a single spot can indicate that it is a cow and if slightly apart it indicates a bull as the genitals are placed distantly from the anus in males. But this is only an indication to determine the sex of the animal, never a confirmation.
- The time taken for tracking animal can't be predicted as they can move fast through thick jungle. Thus, it may take days to track an animal. Still it's always better to start tracking in morning hours especially before sunrise. This will help gaining maximum day light tracking of the animal. Elephants are active during dusk and dawn and they make use of shades during extreme heat of the day where they may rest or sleep.

Types of Tracking

One has to adapt to different types of tracking as each type would require different durations in different situations.

Tracking for Profiling

- Profiling of elephants involves observing and documenting the morphological characters of the animal for which the tracker or the observer needs to view the animal from all four sides; front, back and the flank regions. Profiling is the most important step in studying animals in an area. As once the animal gets marked or identified uniquely it can be monitored and kept in track based on key characters which keeps this individual apart from the others.
- Animal needs to be spotted in a place with adequate lighting to view the minute profiling features for which a binocular or a camera will be made use of.
- Profiling can mostly be done during day time and the animal should be preferably in an open land.
- Feeding grounds of the animal and the resting spots can be identified and the tracking team can wait for the animal to come out.
- Observers should choose a perfect hiding spot which is unreachable for the elephants; in-between boulders, hill tops and tall trees.
- Foliage breaks, dung piles, smoothened surfaces etc. can be examined to assess the activity of the animal there. Smoothened soil surface will be probably of the animal lying there for sleep, or standing there for long time.
- Tears, holes, folds, and scars of the ears, warts on the body, head characters, back shape, tail length, tail brush characters, tusks and tushes are some of the characters which can be used for profiling individuals. Animal with broken tail or amputees are key to precise identification of the individual as unlike other characters which are not easy to identify or assess in low light conditions (de Silva et al., 2013).
- Time taken for such a study can be anywhere between six to eight months and may

even take a year or two depending on the elephant population, their movement as well as habitat.

Tracking for Population dynamics and Behaviour study

- For understanding the population dynamics, the team should be concentrating to track a group of elephants only, so that signs and evidences based on the same should be checked for.
- Habitat and especially terrain used by the group will certainly have more prominent signs of foliage breaks, dung piles and pad prints.
- Elephant herd composition especially its size, varies with time as group fission and fusion occurs based on certain factors during the course of time.
- Team needs to get a bird's eye sweep over the area with at least a minimum gap of 15 minutes or more based on the extend of visibility.
- Unlike the profiling purpose the observer can choose a vantage point far away which will give a wider view on the group. Group number, behaviour and bonding can easily be sighted and documented.
- Taking behavioural data needs more precise observation on a group or individual for whom the team might need to spend nights in the forest as observations are of long durations.
- Time taken for population estimates would be generally for three or four days depending on the set timelines but population dynamics and behaviour study may take several months or even a couple of years.



Female elephants with calf

Tracking for Radio Collaring

- Elephant profiling forms the most important key in radio collaring as the practice is mainly aimed on an individual for whom they need precise characteristic data. We need movement data, that is why we radio collar animals.
- A larger group of Trackers may be needed for this purpose who can make use of available behavioural data to search the area where the chances of finding the elephant is high.
- Select vantage points on high elevations to get primary idea on animal's presence.
- Animal can be confirmed and marked with profiling characters.
- Time taken for such tracking can be from a day to a few days depending on availability of resources like Kumkis as the tranquilizing and radio collaring team may not wait indefinitely.

Tracking an Injured elephant

- Injured elephants mostly try to position themselves near water bodies.
- Based on how severe the injury is, they will move from place to place as the stress levels will be high.
- For tracking, first one needs to have an idea on the type of injury the animal is carrying. If it's having a fracture the animal won't prefer moving for long distances, they will most probably be near water sources. If they are having an injury on other parts especially those which won't involve in running or walking activity they will travel and look for hideouts to soothe themselves and feel protected.
- Trackers should try to spot signs like blood stains, unusual sliding marks among pad-prints and distress calls.
- It is better to track the animal during day and wait for the animal to come out of the cover during night.
- Time taken for such tracking may vary from few hours to few days depending on the extent of the injury.

Recognising Signs and Tracks

Pad-prints

1. Front Foot Pad:-

Shape: Circular.

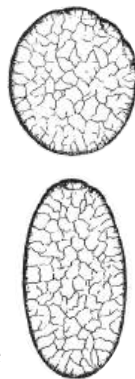
Toe Marks: Typically four toenail impressions. These are spaced fairly evenly along the front edge of the pad.

2. Hind Foot Pad:-

Shape: More elongated or oval.

Size: Slightly smaller than the front foot.

Toe Marks: Typically four toenail impressions. These are also along the front edge but are less distinct.



(Photo Haree Krishna)

Elephant pad-prints on soft soil



(Photo Haree Krishna)

Elephant pad-prints on mud

Pad-prints on smooth surfaces: The image shows the ridges and folds in the foot print. If any elephant is followed and tracked for a few days, the tracker can identify the animal based on the pad ridges and valleys.

Pad-prints on hard surfaces: Toe nail impressions can be seen on hard soil and on other surfaces like rocks and roads; you better look for dirt prints and strides. Many of the elephant crossing roads will have muddy prints.

Other Signs



Photo: Haree Krishna

Elephant rubbing mark on a tree



(Photo: Abhimanyu Madhusudan)

A debarked tree

Tree debarking: One of the feeding signs of elephants in which they debark trees using their tusks.

Scratch and rubs: Elephants have a bulged body on their flank especially on stomach, hip and shoulders. They scratch on trees or hard surfaces from which one can get the idea of their presence. Presence of mud on those surfaces can be examined for getting the idea of how old these signs are.

Foliage and vegetation disturbances: These signs are crucial and unavoidable as passing through thick vegetation, even without feeding, the leaves or soft parts of the plants get affected by the rough elephant skin. For reading such signs you need keen observation skills. Bigger breaks of foliage and branches are clearly visible.

Safety First

- Never underestimate the animal as their senses, power and habitat cover always favors them.
- Always use the trees or thick shrubs while advancing and never try to chase a swiftly moving elephant.
- As you move into the habitat, identify the escape routes, tall rocks, big trees so that you can run and climb to safety when chased by the elephant.
- Olfactory senses are keen for elephants, so it's better to suppress your pheromone scent using an elephant dung or cow dung from that location. You can apply that on to your clothes.
- Always check for the wind direction, which should be blowing towards you from the animal's side. If not, sit behind a small bush decreasing your surface area

contact with the wind.

- Never follow or stay close to the animal in scrub forests without monitoring their presence from a tree or with a drone.
- You can never outrun an elephant which can accelerate up to 40 km/hr. in plain lands, so better avoid getting too close to the animal in plains.
- The profiled data of the elephants if available should be studied and understood by the trackers before embarking on the trip. Individual who has killed humans can pose a big threat to the life of trackers and hence if needed one needs to be armed or tracking in such an area can be avoided.
- Elevation and slopes act as the limiting factor for elephants to travel, thus, low chances are there for their occurrence in high slopes and elevation. Such terrains can be used while tracking or when surrounded or chased by elephants.
- Ensure that stray dogs do not follow a tracking team into the forest as they may bark at elephants and put your life in danger.
- Boots may be necessary to walk in the field, inside forests, but it can be a hindrance while climbing trees. It is advisable to change over to chappals in a vulnerable area so that you can quickly climb trees when chased. Many expert trackers prefer not to wear shoes and rely more on chappals.
- Carry a cane (stick) which can be pounded on the ground to create noise and vibrations to keep the elephants at bay.

Recognizing an Elephant Charge

Elephant makes a mock charge and a real charge which depend on situation and understandings of the animal. Based on the visible behavior of the elephant, the tracker can determine whether it's a mock charge or not. Most of the charges done by the elephants are mock charges.

Signs to look for:

Ears: - Mock charging elephant will be spreading its ears like a fan, completely opened perpendicular to the body whereas in charging ones they will hold their ear completely pinned back flat to their body.

Trunk: - Mock charging elephants will keep their trunk freely hanging whereas a charging elephant will curl and keep its trunk sturdy before it charges.

Leg swinging: - Mock charging elephants swing one of their front legs before the charge. Such movements are called displacement movement which indicates that the animal is scared and won't make a real charge.

What to do when an elephant charges?

The tracker or any human should avoid the situation to stand face to face with an elephant. They should keep stealth and low profile in the field. Still, if you face that horrible situation unfortunately, following actions can be taken

During mock charge

1. Stand on your ground making loud noises and calls, this will most probably deter the animal from charging.
2. Never run with your back to the elephant during mock charge as the animal might chase you for a long distance.

During Real Charge

1. If you are chased by an elephant in a plain ground with no hideouts, it is better to run making sharp turns when the elephant is getting close to you.
2. Slip into crevices on ground in which you could barely slip in. Such spots will help you keep away from the animal.
3. Make use of decoy objects like a dark coloured gamcha around your waist, or whatever object you are holding which has the sweat and smell of your body and drop them while being chased by elephants. This will divert the animal's attention to the object giving you precious time to save your life.
4. If there are no options left, like you can't run out of the scene, you should shout as loud as possible. In all probability, the elephant might consider you as a potential threat and leave you alone (<https://www.wikihow.com>).



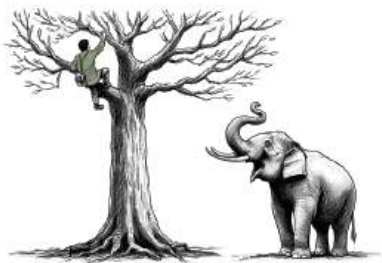
When surrounded by a herd

While feeding, the herd may spread over a distance and the tracker might get misled with only one elephant group near him. Such a situation is more dangerous and this may occur if we are not watching in all the directions. In such a situation, one of the members should get a bird's eye view by climbing a tall tree. In the absence of a tree, a drone if available can be used. This will help them to be safe from surprise encounters. Even if these options are there, a terrain with canopy cover is not easy to view and monitor from height. In such conditions use of the tracker's senses and team coordination are the only options. Members should move forming a section in which each individual will be covering a particular sector with active sense for sound, smell

and sight. Elephant tracks or senses you mostly with smell and hearing. Tracker should counteract those senses by staying silent in the field and using short sign languages among members. Wind direction is one of the key aids for the elephants to sense your presence, so better keep checking the wind direction along with the group spread.

Trees as potentially safe vantage points

Trees are one the safest points which can save you when being chased. Hence, tree climbing is one of the essential skills that may prove to be a life saver. The trees should be tall, strong and should contain enough branches to support you for long durations. You should at climb to a height of at least 15 ft and opt for a tree like mango which have strong roots as well as rough trunk for easier climbing.



Toolkit for tracking

Have a check list of all the gadgets and items needed for short- and long-term tracking, so that you don't miss out any essential equipment or tool. You can pick and choose the items as per the type and duration of tracking.

Maps - Navigation	Compass	GPS	Backpack bag	First-aid kit
Shoes & Chappals	Gamcha	Camera	Binoculars	Matchbox
Water bottles (Water Filter Bottle/Halazone tablets) Dehydration kit (Electrolytes)				
Torch with extra batteries	High energy Chocolates		Multipurpose Knife Kit	
Rain covers	Rope	Voltage detector	Whistle	Walkie talkie / VHF Radio
				
				

Survival Tips

- Setting of tracking team is basic for the whole process as you need to clearly communicate, trust and move as a pack to survive while collecting data.
- Be prepared for stay backs in the forest as chances are there that you might get lost inside dense forests.
- Carry enough water and electrolytes with you during field trips. Make use of Water Filter Bottle or Halazone tablets to make water drinkable / bacteria free which you will find in forest streams and water holes. Remember, dehydration is a bigger health risk than starvation.
- Get trained for making and setting up machan on trees.
- Gain knowledge on vegetation especially edible and medicinal ones.
- Carry a multi-tool, compass, first-aid kit, whistle and torch with extra batteries.
- You should always cross check for directions as getting lost in the thick vegetation is common. Train yourself to get an idea on directions without using any gadgets. Forest dwelling tribal do not use any gadgets but somehow manage to find their way out.
- Carry crackers, pepper sprays and good quality whistles which may help to deter animals and also help rescuers to find you.
- The tracker should always keep an eye open for other wild animals that can be threat to their lives like Bear, Snakes, and Big Cats etc.
- Lit a fire when you have to spend the night inside a forest to keep yourself safe from wild animals. The fire should of course be doused as you move on.
- If you get lost in the wilderness, take the help of Compass and GPS to find your way out.



References

1. Arivazhagan, C., & Sukumar, R. (2008). Constructing age structures of Asian elephant populations: A comparison of two field methods of age estimation. *Gajah*, 29, 11-16.
2. Chelliah, K., & Sukumar, R. (2013). The role of tusks, musth and body size in male-male competition among Asian elephants, *Elephas maximus*. *Animal Behaviour*, 86(6), 1207-1214.
3. Couzin, I. D. (2006). Behavioral ecology: social organization in fission-fusion societies. *Current Biology*, 16(5), R169-R171.
4. de Silva, S., Webber, C. E., Weerathunga, U. S., Pushpakumara, T. V., Weerakoon, D. K., & Wittemyer, G. (2013). Demographic variables for wild Asian elephants using longitudinal observations. *PLoS One*, 8(12), e82788.
5. Horne, W. A., & Loomis, M. R. (2014). Elephants. *Zoo Animal and Wildlife Immobilization and Anesthesia*, 703-717.
6. Keerthipriya, P., Nandini, S., Gautam, H., Revathe, T., & Vidya, T. N. C. (2020). Musth and its effects on male-male and male-female associations in Asian elephants. *Journal of Mammalogy*, 101(1), 259-270.
7. Liebenberg, L. (1990). *The art of tracking the origin of science*. David Philip: Claremont, South Africa.
8. Mofulu, F. M. (2023). *Body size in elephants: influence of resources and poaching* (Doctoral dissertation, Anglia Ruskin Research Online (ARRO)).
9. Mumby, H. S., Chapman, S. N., Crawley, J. A., Mar, K. U., Htut, W., Thura Soe, A., ... & Lummaa, V. (2015). Distinguishing between determinate and indeterminate growth in a long-lived mammal. *BMC Evolutionary Biology*, 15, 1-9.
10. Rasmussen, L. E. L., & Schulte, B. A. (1998). Chemical signals in the reproduction of Asian (*Elephas maximus*) and African (*Loxodonta africana*) elephants. *Animal reproduction science*, 53(1-4), 19-34.
11. Sukumar, R., Joshi, N. V., & Krishnamurthy, V. (1988). Growth in the Asian elephant. *Proceedings: Animal Sciences*, 97, 561-571.
12. Sukumar, R. (2006). A brief review of the status, distribution and biology of wild Asian elephants *Elephas maximus*. *International Zoo Yearbook*, 40(1), 1-8.
13. Sukumar, R. (1989). Ecology of the Asian elephant in southern India. I. Movement and habitat utilization patterns. *Journal of tropical Ecology*, 5(1), 1-18.
14. Sukumar, R. (2003). *The Living Elephants*. Oxford University Press, Inc. 198 Madison Avenue, New York, New York 10016.
15. Varma, S., Baskaran, N., & Sukumar, R. (2012). Field key for elephant population estimation and age and sex classification. Resource material for synchronized elephant population count using block count, line transect dung count method and waterhole count. Asian Nature Conservation Foundation, Innovation Centre, Indian Institute of Science, Bangalore.
16. Ways to Survive a Charging Elephant—WikiHow. (n.d.). Retrieved on August 10, 2024, from <https://www.wikihow.com/Survive-a-Charging-Elephant>.
17. White, L.J.T., 1994. *Sacoglottis gabonensis* fruiting and the seasonal movements of elephants in the Lope Reserve, Gabon. *J. Trop. Ecol.* 10, 121e125.
18. Wittemyer, G., & Getz, W. M. (2007). Hierarchical dominance structure and social organization in African elephants, *Loxodonta africana*. *Animal Behaviour*, 73(4), 671-681.

[illegible]