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TRUMPET

PROJECT ELEPHANT DIVISION

MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE 2021

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

Project Elephant Division & Elephant Cell

Chief Advisor:
Mr. Ramesh Kumar Pandey

Editorial Team
Dr. Prajna Paramita Panda
Dr. K. M. Selvan
Dr. Parag Nigam
Dr. Bilal Habib

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भारतीय वन्यजीव संस्थान
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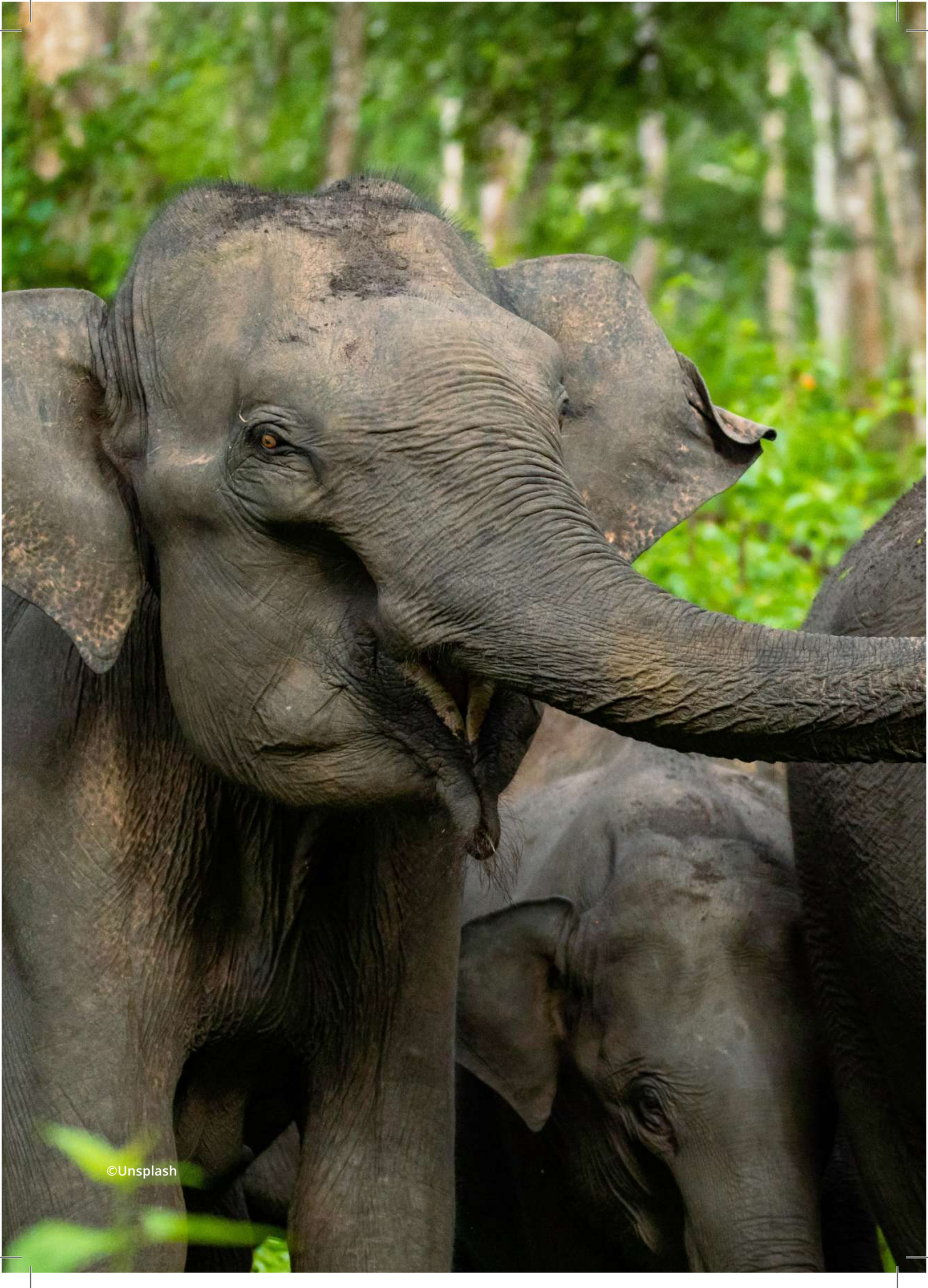
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"Public participation and local knowledge are necessary tools for elephant conservation and addressing man-animal conflicts. There is a need to identify areas where man-animal conflicts exist and visit local areas while framing a policy to address these issues. A bottom up approach towards conservation, involving local communities is the way forward towards wildlife conservation."

Shri Bhupender Yadav,
Hon'ble MEF,MoEF&CC
12th August, 2021

"Elephant conservation is intricately linked to ecosystem conservation. Saving elephants is akin to saving forests, and saving forests results in saving the entire ecosystem."

Shri Ashwini Kumar Choubey,
Hon'ble MoS, MoEF&CC
12th August, 2021

Monitoring Elephant Populations in India

Ramesh Kumar Pandey,
IGF & Director, Project Elephant

Rationale for monitoring elephant populations

Among the 13 range countries in Asia, India has the largest population of Asian elephants (Elephas maximus), harbouring over 60% of the extant population in the wild within its geographic limits. In comparison to many other South Asian and South-East Asian countries where the elephant populations have plummeted and ranges have drastically shrunk, the elephant population in India has been relatively stable during the last several decades and in fact, had increased in a few landscapes. This is nothing short of a remarkable feat as elephants co-exist in India with over 1.3 billion people with high population density besides being a continuously growing economy. Elephant conservation in India thus exemplifies the deep cultural affinity of the society towards wildlife conservation in specific and an overall reverence towards nature in general. While all this provides a reason for being ecstatic, elephant conservation in India continues to be a challenge as it involves a tacit reconciliation between conserving elephant populations and at the same time address human–elephant conflict, which can affect the well-being of local communities. Integral to both elephant conservation and management of human–elephant conservation is effective monitoring of elephant populations that involve systematic data collection on elephant distribution (occupancy), population size, trends and others. Systematic monitoring of elephant populations forms the backbone to evaluate the efficacy of various management interventions on the elephant habitat. Further, theoretic concepts such as optimal carrying capacity of elephants that a landscape can support, which is often discussed in official parlance can be understood only if there is rigorous monitoring of populations.

Challenges facing monitoring elephant populations

In spite of its utility, systematically monitoring elephant populations is challenging due to inherent logistical difficulties. As elephants are distributed over a vast area covering 1.25 lakh km2 of forests and grasslands encompassing a diversity of habitats that include rugged mountainous terrain, there is significant spatial variation in elephant occurrence, which poses a fundamental logistical challenge to design elephant population surveys. Further, as

elephants are known to track resources within their habitats, there could be significant seasonal variations in local density (known as ecological density) of elephants, which can confound estimates if such variations are not adequately considered. Furthermore, access can be a major challenge to carryout field surveys owing to remoteness and other terrain-related challenges. Moreover, trained human resources required to systematically record data can be a limitation in many areas as the forest staff are already absorbed with patrolling and other set forest duties.

Overview of the methods followed in estimating elephant population size

Despite the aforementioned fundamental challenges, India has been monitoring its elephant populations since the 1970s onwards using a combination of methods. In particular, the Project Elephant Division of the Ministry of Environment, Forests and Climate Change, Government of India in coordination with the elephant range States in India had brought-in refinements to improve on the methods as well as the scope of the elephant estimation. Following the recommendations by the Project Elephant Steering Committee, a combined approach entailing use of "sample block count" that involves direct enumeration of elephants within the demarcated blocks and dung density estimation following a distance-sampling approach were advanced since the year 2002 onwards. Estimating elephant population size using two different methods provides a basis for comparing between the methods. Because elephant ranges are often spread over two or more states in all the four regional populations viz. North western, North eastern, East central and Southern, emphasis was placed on carrying out population estimation in a synchronized manner with active inter-state coordination. During the 2017 "synchronized elephant census" conducted across India by the Project Elephant Division along with the elephant range states, in addition to population size, elephant distribution was estimated. The distribution map proved to be useful especially in light of range expansion of elephants observed in some of the states with major implications for elephant conflict management.

Future directions on population estimation

Occupancy (or distributional area provided as regional and local elephant distributional maps) and population size (abundance or density) are two important population metrics that are absolutely essential for management. However, in addition to these metrics the "vital rates" of the elephant population such as the growth rate, mortality rate and rate of dispersal etc which determine the future of the population are crucial to understand to make future predictions about the elephant populations. These vital rates (or simply demographic rates) are estimated based on rigorous assessment of sex-ratios, age structure of the elephant population and also systematic record keeping of births and mortality. Clearly, the efforts required to understand demographic rates are much higher. In the forthcoming elephant population estimation efforts, data that will be useful to understand age structure of the population may be experimented. The age structure of the population can be obtained from elephant dung measurements, which correlate with different

(Left-Right) Dr. Dhananjai Mohan, Director WII; Shri Subhash Chandra, DGF&SS;
Shri Ashiwini Kumar Choubey, MoS, EF&CC; Shri Bhupender Yadav, Hon'ble MEF&CC;
Shri R. P. Gupta, Secretary, MoEF&CC; Dr. S. P. Yadav, ADG (NTCA); Shri Ramesh Kumar Pandey, IGF (PE)


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age classes. Such experiments would serve as a first major step towards better understanding of elephant populations in the country.

Further, it is apt to place on record that the process of estimating tiger abundance followed by the Government of India is much more refined and statistically robust. A very powerful statistical approach known as the "capture-recapture sampling" is being used to estimate tiger abundance based on photographic re-captures. As tigers have body markings (stripe patterns) that are unique to every individual, capture-recapture sampling was amenable for the species. However, elephants do not have such body markings and identifying individual elephants is not easily done with photographs. Therefore, in case of elephants, DNA-based capture-recapture approach can be a suitable alternative to photographic capture-recapture methods used for tigers. However, this needs to be experimented. In the DNA-based capture recapture technique, the individual elephants will be identified based on the DNA extracted carefully from the fresh dung during the field surveys, which will be processed in the laboratory.

With regard to population estimation, statistically sound approaches to estimate elephant population size are manifold. However, the need of the hour is to use methods that are simple to understand for the frontline forest staff that collect data in the field. The field methods need to be practical and simple as working in elephant habitats is challenging and need to have safety considerations as well. The Project Elephant has been committed to improve on the methods to monitor wild elephants in the country. It is appropriate to note that the tiger population monitoring program steered by the National Tiger Conservation Authority (NTCA) and the tiger range states with technical support from Wildlife Institute of India (WII) had emerged as one of the most systematic monitoring programs of an endangered species across the world, widely lauded for both the scale of effort involved as well as the standard of information being disseminated. There is a high overlap between tiger and elephant habitats in the country with both the species primarily occurring in diversity of tropical forests across different biogeographic zones. Considering this, the Ministry of Environment, Forests and Climate Change (MoEF&CC) of the Government of India has come up with a novel plan of carrying out tiger and elephant population estimation in a synchronized manner. With subtle modifications in the field data collection process, it appears possible to collect high-quality data on both tiger and elephant population size and other demographic rates. The team combining of the Project Elephant Division, NTCA and WII are working together to standardize field methods and analytical procedures to experiment tiger and elephant population monitoring as a joint exercise for the first-time ever. This should avoid duplication of work, save on the resources and help in improving the methods to estimate elephant population by making use of the technological advancements in the field of science of animal population monitoring.

Although from the surface it appears simple, even enumerating captive elephant population is challenging owing to illegal capture and transfer of captive elephants. As a step in the similar direction, the PE Division has embarked on creating a pan-India genetic database of captive elephants. The Elephant Cell of the PE Division – WII is entrusted with the task. The objective of this ambitious assignment is to bring every captive elephant in the database. In this process, it is proposed that the biological samples from individual captive elephants would be collected to create the central database. Once the database is established, monitoring illegal capture and clandestine transfer of captive elephants will be simpler and judicial prosecution of offenders would be easier.

Given that population estimation and monitoring forms the foundation for conservation of an endangered species, with all these innovative efforts being pursued, there is little doubt that management of elephant populations will become more informed. Also, advancements made towards improving population estimation and monitoring will add to our ongoing efforts to address human–elephant conflict given that elephants move across landscapes often through man modified areas connected by tenuous corridors, knowledge about spatial distribution and population estimates would be crucial for adaptive management.

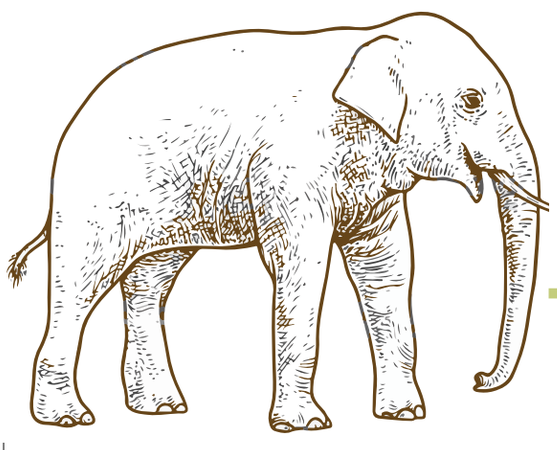
Penny for a Thought: Administrators of Karnataka Elephant Reserves on Elephant Conservation

Kumar Pushkar,
APCCF (WL), Karnataka

Karnataka is home to the largest number of Elephants in India, with over 6000 elephants, besides having one of the largest population of tigers and leopards. As we are aware, there are major conflict issues in Karnataka due to fragmentation and degradation of the habitat, growing population of both humans and elephants. As mitigatory measures, Karnataka has been taking up the physical barrier erection on the Forest boundaries and high conflict areas which include EPT, Solar Fencing and Rail barricades besides deployment of Anti-depredation camps, payment of quick Ex-gratia and so on. I strongly feel that mitigation of the conflict on short term and long-term basis, is the most important key for the Conservation of the Elephants. I would like to stress on the need to have a thought and scientific study on effective population management of Elephants in the Wild, besides coming up with other long term mitigation measures

Manoj Kumar IFS,
Chief Conservator of Forests,
Chamarajanagara Circle,
Karnataka

The elephant – man relationship has been extremely good in most parts of Karnataka, due to unlimited human compassion and tolerance towards this enormous pachyderm. The Asian elephant, considered as a symbol of fertility, wealth and abundance, has a long history dating back as far as the Harappan civilization of 2500 – 1500 BC. The depredation by elephants often results in great loss of property and human life, the local people, by and large, do not have any wrath against the marauders, often finding justification for the destruction of life and property, by blaming themselves for the sins and wrongdoings which may have brought forth the wrath of the Elephant God. Unfortunately, this trend is slowly but gradually fading away. The conservation plans for the elephants will have to concentrate not only on restoring the fragmented and degraded home ranges of the elephant, but also on the improvement of the quality and security of the life of the human populations which share the elephant habitat and its resources.



Dr. P. Shankara, IFS,

Chief Conservator of Forests, Hassan Circle, Karnataka

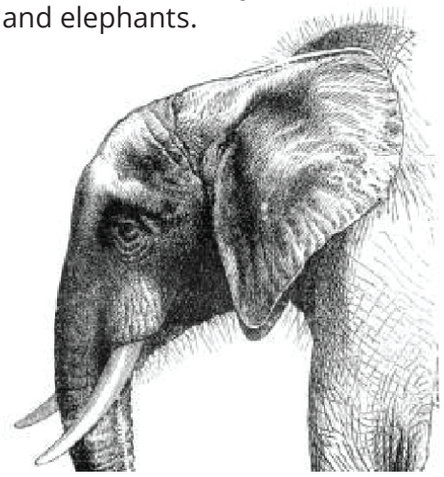
Elephants are the largest animals on land, serve a critical role in our ecosystem and therefore known as a "Keystone Species". They provide many vital ecosystem services. These intelligent endangered animals play a critical role in several religions, cultures and traditions across the world and several communities worship them.

Loss of elephant habitats due to fragmentation and degradation led to an increased conflict between people and elephants. Elephant corridors are disturbed leading to confinement of elephants in isolated small patches resulting in an increase in both intensity and frequency of human-elephant conflict. Arresting the spread of invasive exotic weeds, enriching the degraded habitats with native fodder species and involvement of local communities can go a long way in mitigation of human-elephant conflict. Mitigation of human-elephant conflict and facilitating co-existence is a challenging task ahead of all conservationists.

Shri Venkatesh B., IFS,

Chief Conservator of Forests, Bengaluru Circle, Karnataka

Elephant is a mega herbivore animal which has a major impact on the terrestrial ecosystems in which they live. With 6049 elephant, Karnataka stands number one in terms of elephant population and remains a key player in protection and conservation. However, their conditions seem dire, as they face an all encompassing threat such as shrinkage of their forest ranges, habitat degradation and fragmentation, poaching of their body parts etc. The biggest threat to their survival is not poaching but habitat loss. Explosion of human population and their resource use has squeezed elephants into smaller fragmented habitats leading to conflict with humans. Further, the IUCN has listed the Asian elephant as Endangered with a decreasing population. Therefore, elephant conservation is more important now than it has been ever before. We have to device suitable strategies and adopt measures which are just for both humans and elephants.



Shri Takhat Singh Ranawat, IFS,

Conservator of Forests, Kodagu Circle, Karnataka

Kodagu district is an integral part of the Mysuru Elephant Reserve. Nagarhole Tiger Reserve is also a part of the district which has the highest density of elephants across the country. This was possible because of the conservation measures adapted by the Karnataka Forest Department over the past few decades. However, in the recent times there is an increase in Human Elephant conflict across the state and especially in Kodagu landscape. Forest Department has been taking numerous initiatives to mitigate the conflict. Karnataka Forest Department have been pioneers in many such mitigation measures like installing Railway barricade, solar fencing, tentacle fencing, early warning systems, radio collaring etc. These measures have considerably reduced human - elephant conflict across the landscape. However, there is a constant need to evolve new strategies for effective conflict management. Innovative solutions need to be designed across the landscape and transcending division boundaries.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Kabini Elephant Project: A long-term programme for understanding Asian elephant behaviour and ecology

Keerthipriya P. and TNC Vidya
Animal Behaviour and Sociogenetics Lab,
Jawaharlal Nehru Centre for Advanced
Scientific Research, Bengaluru

During all her growing up, Pinkisafa's clan had been unusually small, unlike those of many others around her. When she was three, there was her mother Pinky and her grandmother Peggy, both with very pink trunks. Then there was Pericles, a year and a half older than her, seemingly her brother but really her uncle as he was Peggy's son! Another uncle, the amiable and big-eyed (for an elephant) Moti, some seven years older than her, was around off and on, sometimes with the group consistently, sometimes wandering off and then looping back to the group. There were no sisters or aunts though. She had seen or smelt large clans of some 40 elephants, ambling out of the forest in smaller groups and joining each other to graze on the backwaters of the River Kabini in the dry season. There were fights between clans over the choicest grazing spots. Peggy and Pinky largely stayed away from these fights and the other clans also largely ignored them. As a subadult, Pinkisafa had experienced the occasional fight with other clans, but the others usually had strength in numbers. Asian elephant clans comprise adult females and young ones of both sexes. Subadult males (5-15 years old) disperse from their clans gradually whereas females remain part of the clan. The clan is thus matrilineal – clan members come from the same maternal lineage. Males that have dispersed often move long distances eventually and range in new areas, away from their maternal clan. They can form loose associations with other males or can temporarily associate with other female clans, but are solitary for about half or more of their time. Thus it was that when Pinkisafa was four, Pericles also began his solitary explorations, investigating

other clans. Two years later, Pericles was rarely with the clan, although the older Moti continued to show up occasionally.

The bamboo around the Kabini backwaters flowered in 2011. Bamboo generally show mass flowering and die out after that. Thus, after the glut of grain, there was little forage, especially in the dry season of 2013 following a drought. It was a disastrous few years for the clan. Peggy died on 13th March 2013, probably over 50 years old. A few months later, Pericles stopped visiting, although Moti continued to show up occasionally. Then Pinky died suddenly in mid 2015. After her mother's death, Pinkisafa would occasionally associate with her uncle Moti. Alas, there was a drought again next year – the rains failed in 2016 - and Moti, who was in terribly bad body condition in the following dry season, disappeared, not to be seen again. Thus Pinkisafa, who had been mostly alone since Pinky died, lost the last member, albeit a male, of her clan.

From 2016, Pinkisafa had begun to hang out with another clan that shared the backwaters. This was a clan of about 20 individuals. Female Asian elephants show a fission-fusion society, in which all the individuals of a clan

are often not seen together in the form of a single group. Instead, the clan may range in the form of multiple groups (each group is a set of individuals that is seen together at one point in time), females of these different groups joining other groups (of the same clan) to fuse into larger groups, or fissioning away into smaller groups depending on their needs. Thus, Pinkisafa associated with different groups of this clan, usually feeding near the periphery of the group, not completely accepted by the new clan, but often not actively pushed away either. She was occasionally alone, occasionally with a couple of other clans, including the largest in the area, but received more aggression from that clan. Now, five years on, she is more integrated into her new clan, having allomothered a calf also. We look forward to her having her own calf in this new clan!

This single true story throws up multiple lines of questions as well as understanding:

— 1 —

Elephant societies can be highly dynamic, and specific events can affect individuals.

— 2 —

Female clans show fission-fusion dynamics and long-term data are required to uncover female clans; we have found group sizes to be limited in this population, possibly because of resource availability.

— 3 —

Subadult males disperse from their natal clans and there can be considerable variability in how quickly they disperse, even within the same clan.

— 4 —

Individuals' body condition can change very rapidly because of the daily requirement for large amounts of food, and even individuals that seem healthy some months prior can succumb to drought.

— 5 —

The competition between female clans for food in high density areas may be increased by artificially created resources such as dams.

— 6 —

It is possible for females to integrate into new clans under some circumstances, but the process is slow. Short-term studies would have classified Pinkisafa into different clans without discovering the switch between clans.

The Kabini Elephant Project

It was possible to watch the unfolding of Pinkisafa's life because of a long-term monitoring programme set up in Nagarahole and Bandipur National Parks and Tiger Reserves. Started in 2009, the ongoing Kabini Elephant Project has been collecting data on individually identified elephants in these reserves. These reserves have high elephant density, are well-protected, and are part of the larger Nilgiris-Eastern Ghats landscape in southern India, which holds the single largest population of Asian elephants in the world. Elephants are identified based on a combination of ear, tail, back, and tusk characteristics. As ears vary in shape and in the way they fold at the top, and often also have nicks, tears, or holes, they are very useful for identification. Over the years, more than 900 elephants have been sighted, identified, and named. Some individuals like Pinkisafa have been observed from when they were juveniles or calves.

Various ear shapes and top folds, and some ears with tears or holes in them. Ears are important features used in the identification of individual Asian elephants.

Photos: TNC Vidya, Kabini Elephant Project.

The study areas are sampled based on a pre-determined schedule, from early morning till evening, but following a stratified sampling design (with greater frequency of sampling around the backwaters) due to logistics. When elephants are sighted, they are identified and their associations noted down, along with the location. Lactation status of females and musth status of males are also recorded, along with information on body condition or new injuries. Births (along with the mother's identity) and deaths are recorded. Dung samples are collected when possible, from identified individuals that have been observed defecating. A small quantity of the outermost layer of dung is collected, and the samples used to extract DNA in our lab and genotype individuals. This data is used to estimate the genetic relatedness between individual elephants. Similarly, tissue samples from dead individuals are used to genotype them, and to match them with previously sampled live animals if the carcass is not identifiable. Data on behaviour and resource availability are also collected.

This long-term project has uncovered the social structure of female elephants, which was once thought to be identical to that of the African savannah elephant. Now, we know that there are some underlying similarities, but the group sizes are smaller here, resulting in different observed social structures in the two species. Adult male social structure in the Kabini population is also different from that of the African savannah elephant, with rarer all-male groups, and young adult males not showing a preference for associating with old adult males in Kabini. Resource availability and distribution have also been assessed and their effects on competition within and between female clans studied. Population demography, the role of calves in female social organisation, the effect of kinship on male and female societies, and male dispersal and reproductive success are also being examined in this population.

The need for sustaining long-term projects

Long-term programmes of monitoring animals are crucial for obtaining basic, accurate information about populations, as inferences based on the short term may be confounded by changes in the biotic and abiotic environment. This is understandably a greater problem for long-lived species such as elephants. Since elephants are highly social and intelligent, apart from being long-lived, their behaviour and lives can be very different not only depending on age and sex, but also based on individual personality. Thus, management decisions need to be centred around identified animals, keeping in mind the

individuality in behavioural decisions, and the fact that protection is unlikely to be uniform across elephant ranges. Therefore, long-term studies of identified individual elephants are essential. Censuses of elephants based on statistically weak or logistically difficult methods have also elicited calls for long-term research in Elephant Reserves in order to obtain reliable data on age-structure and demography, and carry out continuous monitoring of individuals and habitat.

Long-term projects on African elephants date back to the 1960s and 1970s, with the Amboseli Elephant Research Project, Kenya beginning in 1972 and approaching 50 years of monitoring now, the Addo Elephant Research Project (South Africa) beginning in 1976, and the Lake Manyara elephants (Tanzania) monitored from 1966-~2007. There have been many more projects subsequently, for example, the forest elephants of Dzanga Bai (Central African Republic) monitored from 1990 (stopped in 2013 due to the civil war), and the Samburu Elephant Project (Kenya, see Wittemyer et al. 2005) being monitored from 1997. Such long-term datasets have made it possible to understand the social structures of male and female elephants, ecophysiology, ranging patterns, population dynamics and the impact of elephants on habitat, and the effect of management practices on elephants.

As Clutton-Brock and Sheldon (2010) write about the importance of long-term monitoring projects in Science,

"Stick at it for a year or two and, if you are lucky, you will be able to recognize individuals and spot interesting new behavior patterns. But to understand the network of social relationships between individuals, you need to know their ages, kin relations, and relative dominance rank. That will take at least one decade or, more likely, two. However, other important questions will take three or four decades of systematic data collection: how and why groups increase or decline in size; how genetic differences interact with environmental factors to affect breeding success and survival; how population density is regulated. During all this time you will need to withstand the vicissitudes of funding, political disturbances, and the demands of your career and family."

The Kabini Elephant Project is India's only long-term programme of monitoring such a large number of individually identified elephants. It has been funded largely by the Department of Science and Technology, and the Council of Scientific and Industrial Research, Government of India, and supported by the Karnataka Forest Department. Such long-term projects need to look beyond immediate utility for a specific administrative range, and focus on the importance of baseline demographic, behavioural, and ecological information from Protected Areas that can be used to compare with other populations, including those with more human disturbance. Our scale of demographic data, understanding of social structure, and inferences such as restricted group sizes, or the lower frequency of musth in males, would not have been possible with short datasets. Since the best of patrolling cannot detect all the carcasses in most Indian forests, monitoring of identified individuals is also crucial in inferring deaths, especially of young ones, and using this information in demographic analyses. Monitoring is increasingly also important in understanding ranging patterns.

As Asian elephants inhabit ecologically diverse habitats even within India, it is important to set up such long-term projects in these different habitats, and monitor multiple key populations. Differences and commonalities between these populations will provide an understanding of elephant ecology. Further, the Asian elephant is a keystone species, and long-term monitoring of their life histories and behaviour can also provide insights about the ecosystems they occupy. Such long-term projects are a serious undertaking; they require the combined efforts of all the members of the project, continued permits and support from the State Forest Departments / Ministry of Environment, Forest and Climate Change, cooperation with on-field staff in the study area, and continued funding. But only with multiple such long-term collaborative efforts can we begin to properly understand the ecology and behaviour of this flagship species, and apply that understanding to its conservation and management.

L-R: Pinky, Pinkisafa, Prince (a visiting subadult male), Pericles, Peggy in 2009.
Photo: TNC Vidya, Kabini Elephant Project.

L-R: Pinky, Pinkisafa, Pericles, Peggy, and Moti sighted together in 2009.
Photo: TNC Vidya, Kabini Elephant Project.

Pinkisafa (left) and Pinky (right) in 2014,
after Peggy's death.
Photo: Keerthipriya P, Kabini Elephant Project.

Pinkisafa and Moti after Pinky's death.
Photo: Hansraj Gautam, Kabini Elephant Project.

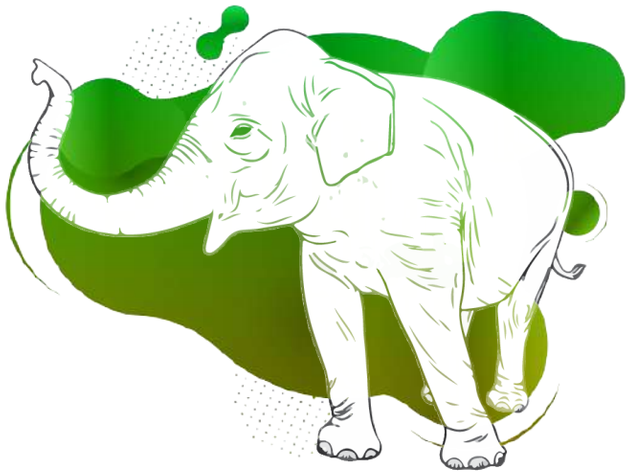
Pinkisafa alone.
Photo: Ankana Sanyal, Kabini Elephant Project.

Pinkisafa (second from the right) with her new clan.
Photo: Ankana Sanyal, Kabini Elephant Project.

Human Elephant Conflict Management in Kodagu

Maria Christuraja IFS
Karnataka FD

Kodagu is in the heart of elephant country in Karnataka. The district borders Nagarhole Tiger Reserve with one of the highest densities of Asian elephants in the world to the East and to the West other wildlife rich areas Brahmagiri and Talacauvery wildlife sanctuaries in Karnataka and Wayanad Wildlife sanctuary in Kerala. Elephants being long lived, long ranging and highly intelligent animals adapt to circumstances in a way that is unique in the animal kingdom.



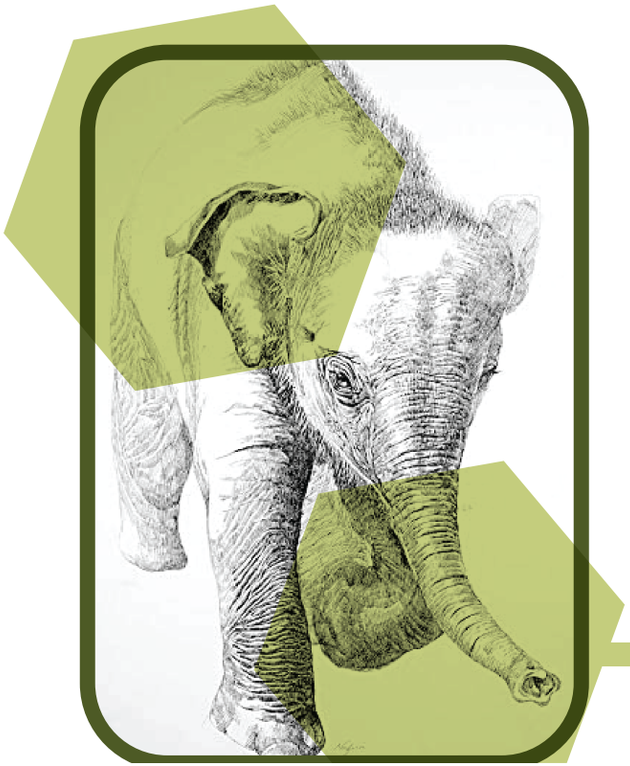
Elephants are not biologically wired to live within the small habitats that forms the "PA network" of India. This results in their moving out of the Protected Areas to meet their various biological needs including dispersal movement, migration across seasons and availability of concentrated food resource in cultivated areas. The fundamental cause of conflict is land use change and associated fragmentation of landscape. Elephants are inherently predisposed to eating crops. In contiguous forests, they spend 12-18 hours a day feeding on a range of grasses, shrubs and leaves. But when they have settlements and agriculture around them, they quickly learn that they can meet their needs in a few hours among the crops. The variety of behavior adaptations seen in elephants in Kodagu to live and survive in human dominated landscape is a case in point to show their flexibility of character as a species. Over the years elephants which had adopted crop raiding as a way of life tend to become bold and chase the humans confronting them.

All conflict management methods presently practised fit in one of the following category of mitigation options:

1. **Ex gratia for Crop and Property loss**
2. **Scaring/Driving Elephants**
3. **Blocking elephant pathways** (Barriers – the most common long-term strategy for HEC management employed by Forest Departments across the country)
4. **Removing Problem Elephants** (herds/individuals)
5. **Coexistence** (In most cases not acceptable to communities)

Primary/Rapid Response Teams

In Kodagu landscape, the management option that had reduced pressure on forest administration in handling conflict had been the deployment of rapid response teams and an effective means of communication between the teams and public thus effectively maximising the utility of those teams. The teams were headed by a permanent forest official either a DRFO/Forest Guard. The size of the teams is flexible depending on the amount of elephant issues in a particular area. Multiple Whatsapp groups were created with local public as members to interact with the team on real time. Information flow was unrestricted from the public while official communication was moderated by the RRT team leader. This resulted in reduction in human fatalities significantly. The major cause of human fatality was unplanned chasing of elephants from estates by planters and labourers. The deployment of teams hit at the root of the problem and removed the unplannedness from the elephant driving process. Whenever a drive was done by RRT teams the target group of planters and labourers were alerted of the operation beforehand and were allowed time for taking adequate precautions. The quick response from the teams resulted in complete stop of any chasing of elephants by common public. This also gave the forest administration peacetime to explore other mitigation options.



GPS collars

One of the major intervention in Elephant conflict management in Kodagu was tracking of conflict elephant herds using GPS collars. In 2018-2919, matriachs from 9 different herds that move regularly between forest and plantations were collared with GPS device to track their movement real time. The matriarchs were tranquilized with Xylazine, isolated from the herd and collared. The collars were GPRS based and transmit the coordinates of the herd at fixed times. The coordinates were made available to frontline staff managing conflict situation in the field through an android app. The movement of these herds is under continuous monitoring by the various RRT teams who plan their operations for the day and use the information to alert public. This early warning system provides directly and simply the most crucial information in conflict management which is the location of elephants. This puts the staff at an advantage with public and help them manage the situation effectively. Collaring of herds and using the information for conflict management requires regular follow up with replacement of collars when there is malfunction and adding more herds to the monitoring network.

Hanging Solar Fence

Solar Power Fences in Elephant Landscapes used in India are based on one of the adapted designs of the Gallaghar Electric Fence for livestock control. Elephants are known to regularly break the fence by pushing a tree, using legs to push non electrified parts like support poles, breaking poles or wires using tusks, etc. The other major problem is intense weeding of undergrowth required along the fence line. Usually this maintenance is not done on time resulting in voltage drop below functional levels allowing easy damage of fence and entry to elephants. Thirdly power system failure (due to faults in energizer, battery, insulation) is another key reason for voltage drop. Once the rated voltage drops below 6 kV, the shock becomes bearable. Below 4 kV the fence is as good as non existent. One of the major interventions for HEC management in Kodagu was hanging solar fence. A new fence design which had revolutionized the barrier systems for elephants in Kodagu and elsewhere wherever it had been deployed and properly maintained. The power lines that are vulnerable to tusk damage in the cattle proof fence design is modified as loose

Hanging wires aligned vertically like a screen across elephant path. Freely hanging wires does not break under force. They swing and move out of the way. If there is no power in the fence the elephant can simply walk through without damaging the fence. This is key as it reduces the material damage and consequent repair and maintenance close to nil. The main power line runs at a height of 4-4.5 metre from ground well above eye level and beyond the reach of elephant trunk. From this line vertical twisted steel wires are hanged continuously all along the line at a distance of 60-100 cm apart. The hanging wires extend upto 3 feet above ground. The power system is the same as for the traditional cattle proof power fence. But it is important to choose good quality solar panel, energizer and battery unit to ensure continuous power supply as per design requirement. The voltage needs to be kept in the range of 7 kV-10 kV with pulse duration between 1-1.2 seconds. The successful management of these fences require a secure system of maintenance regime and regular monitoring of voltage.

Depending on the habitat characteristic multiple design alternatives can be devised. In Kodagu, even a single line supported by trees (properly insulated) along Elephant Proof Trench have been found effective. Single line and tree support was adopted to avoid felling of trees. Otherwise ideally in places where there are no tall trees and ample space (~4m clear of vegetation) is available a two line design would be most suitable and damage proof. Two lines, one metre apart perpendicular to the pole makes the pole unreachable for the elephant. This also results in multiple shock for the animal trying to cross resulting in a strong negative feedback.

In more than 36 months of its installation in Srilanka where this design was invented and pioneered by Shri. S. Wijeyamohan, not one elephant crossing or fence damage had been reported. In last 18 months in Kodagu district, the same success continues. But for this to work the voltage in the lines has to be above 7 kV. For the voltage to remain above 7 kV, the power system has to work properly and the floor below the fence maintained free of undergrowth/weed. This requires continuous monitoring and maintenance. This is a simple, robust and cost effective alternative. The cost is less by an order of upto 25 - 50 times to some of the physical barriers that are being erected across the country.

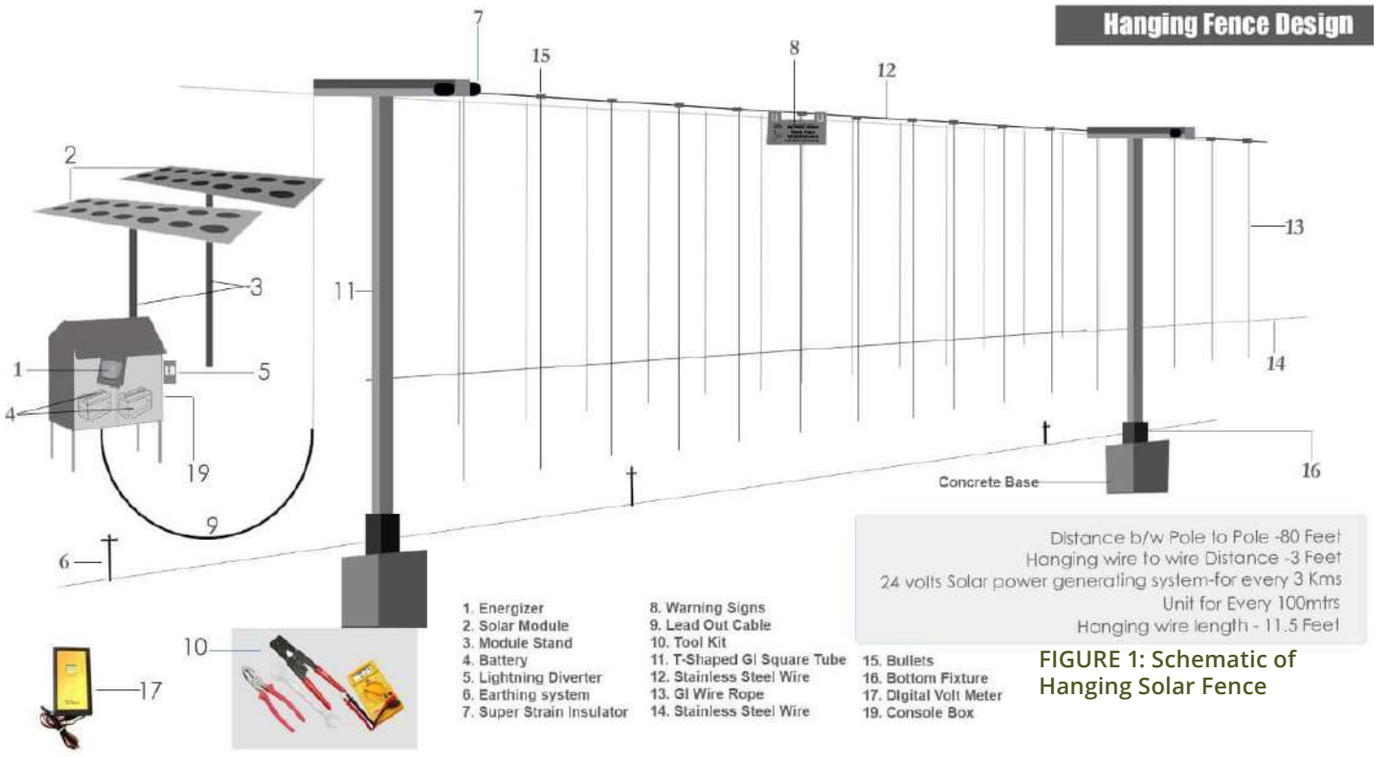
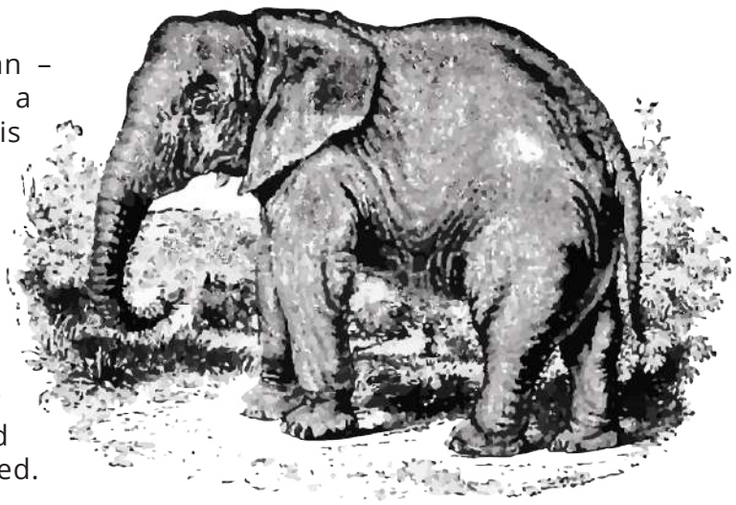


FIGURE 1: Schematic of Hanging Solar Fence

Results



The mitigation strategies to reduce human – elephant conflict started in 2017-18 and a significant reduction in human fatalities is recorded in recent years. However, the increase in numbers of human fatalities and injuries in 2019-20 are reported from new areas not traditionally known for having human fatalities or high elephant numbers indicating human-elephant conflict to be highly dynamic and ever changing with elephants continuing to explore newer areas and opportunities to disperse and raid crops when their traditional paths are blocked.

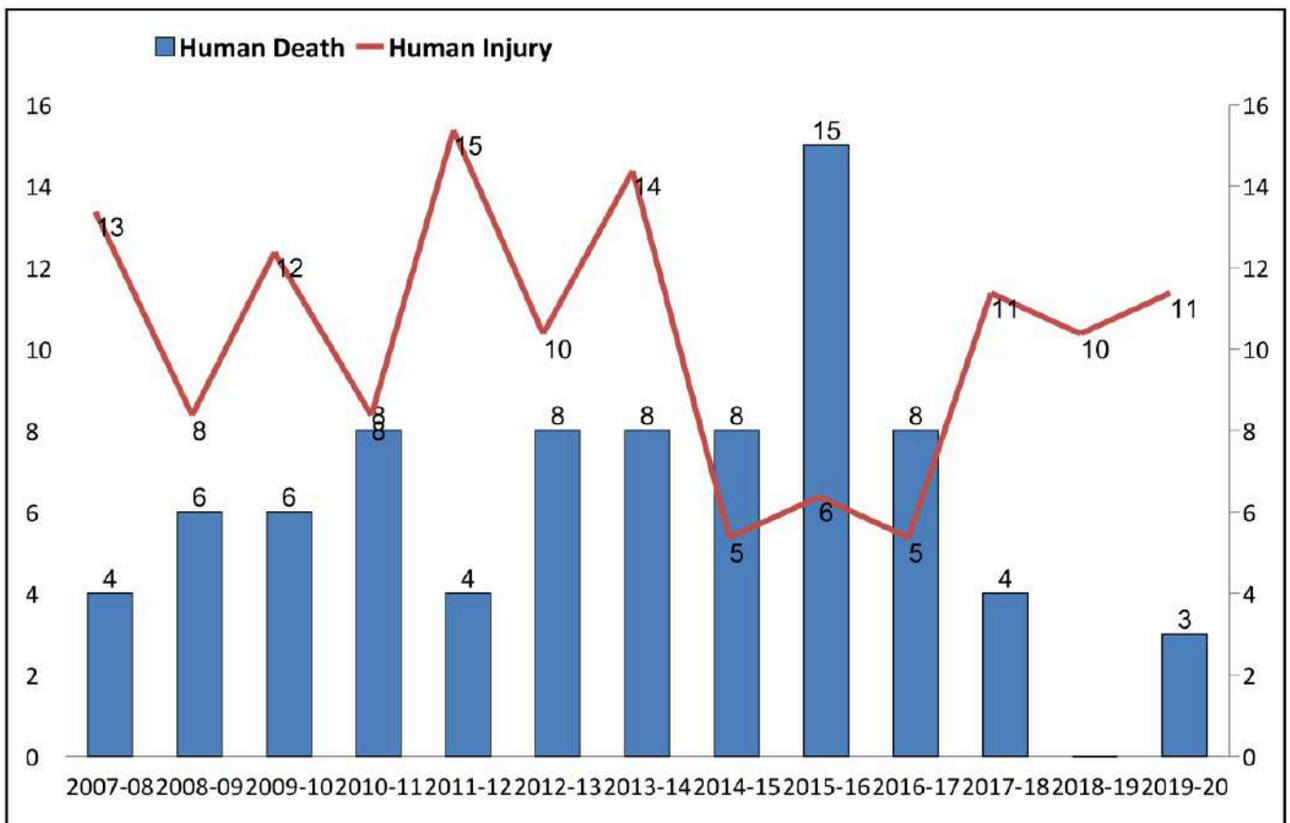
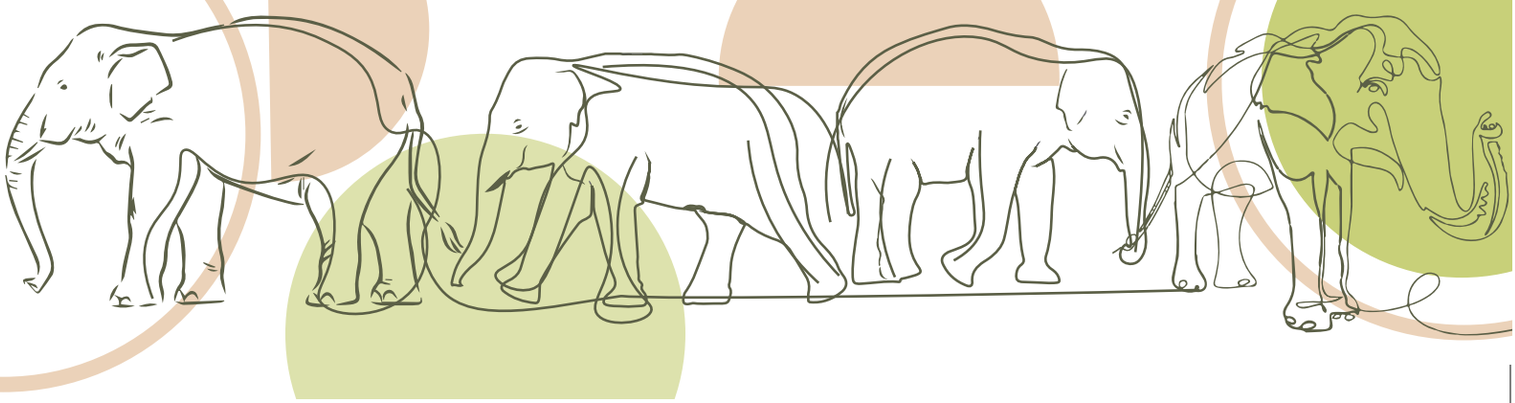
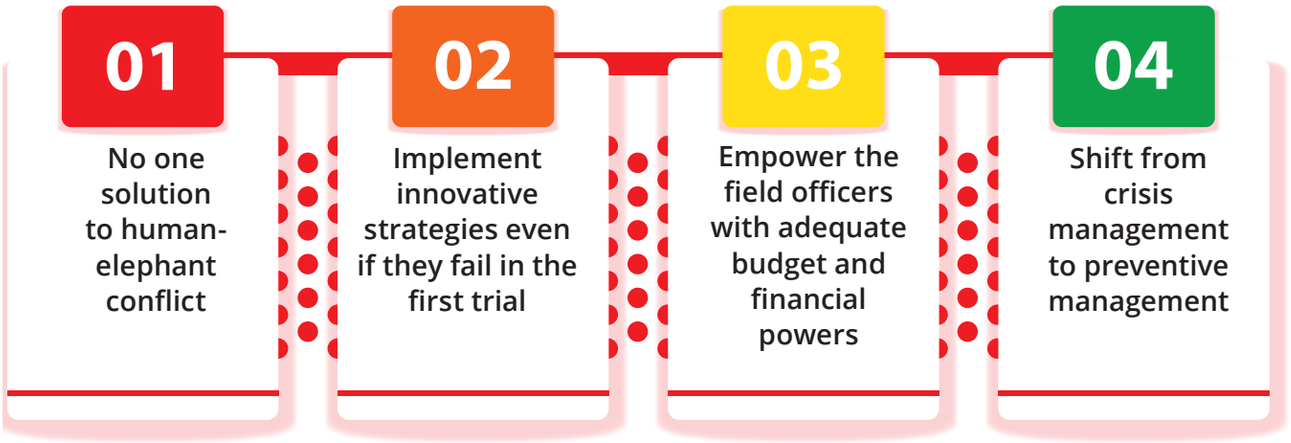


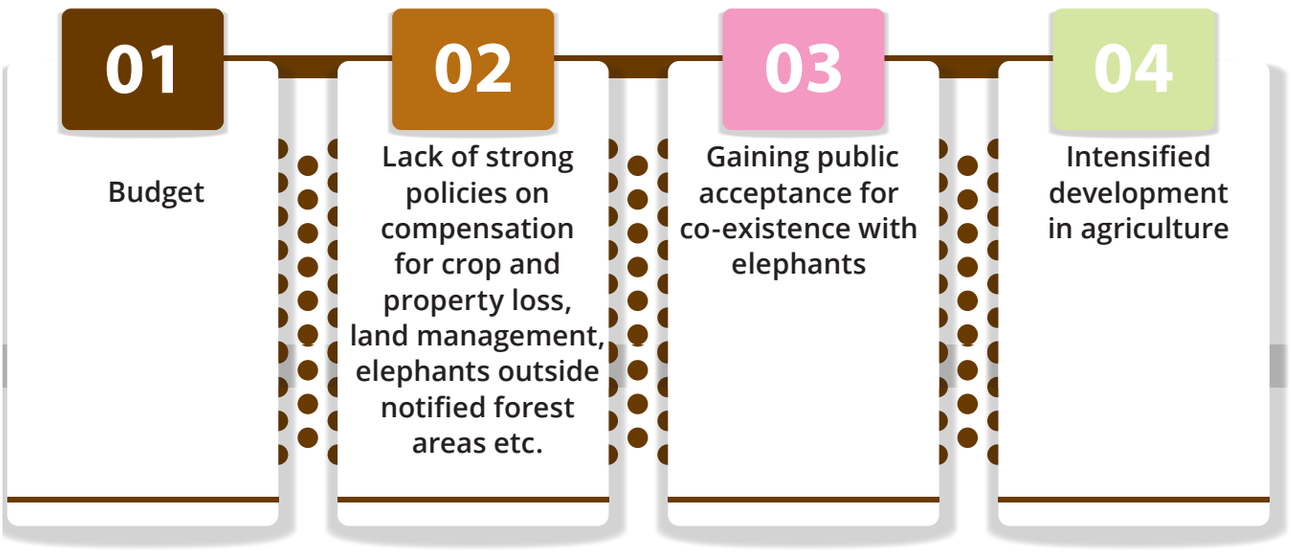
Fig. 2: Human Death and Injury Cases in Kodagu District (2007-08 to 2019-20)



Learnings



Constraints



Future measures

Being Humane to the Elephants

Prachi Mehta
Wildlife Research
and Conservation Society

Conflict is Costly…

We have always been awed by the elephants and they feature prominently in our life, right from the cave paintings to nursery rhymes, history, epics, religion and culture. However, since last few decades, elephants have got a new identity: they top the list of 'Problem Animals' in all its range countries, posing serious challenge for its conservation. Like all other wildlife, elephants are facing the brunt of fragmentation and habitat loss. Living in the transformed landscapes brings them closer to the human habitation, and thus begins the challenge of sharing of resources between people and elephants, leading to the inevitable altercation between the two.

Human-elephant co-existence, in simple terms is a conflict of interest between the two species. Local communities have to pay a huge price for living in proximity to the elephant habitat. A close encounter with elephants can result in any of this: death, injury, crop damage, destruction of property and a scare for life. Either way, there is a loss of social and economic security for the people. On the other hand, elephants face the grave consequences of trespassing in to "now what is human-dominated habitat". It is not uncommon to witness elephant herds passing through towns, railway tracks and highways to reach their original habitat. However, situation often turn hostile when elephants get teased and chased by the mob and then the elephants retaliate in self-defence resulting in unfortunate outcomes on human lives. As a consequence, elephants are either killed or declared rogue and kept in captivity for life.

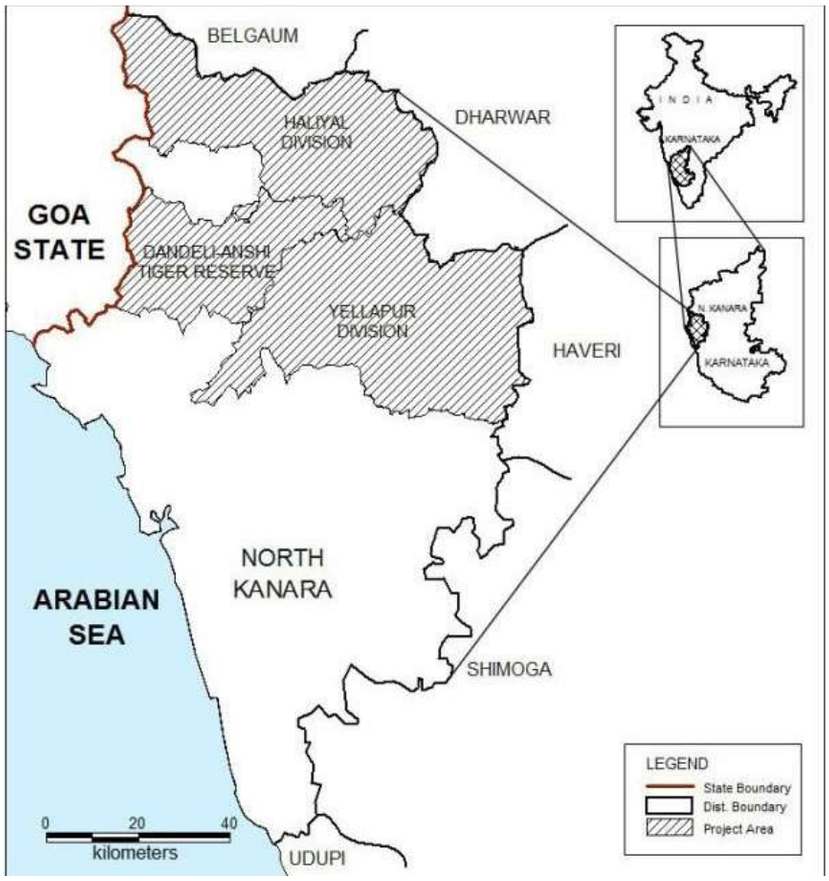
Cause of the Conflict …

The main reason for increasing HEC is attributed to fragmentation of the forests. The forests that the elephants once frequented are lost but the movement paths are retained in their memory so the elephants visit the same area and get in to close proximity to the people. Also, elephants weigh over 4 tonnes and to maintain their large body, elephants need to feed through the day. Each elephant requires about 150 kg of food in the form of herbs, shrubs, grass, tree leaves, bark, roots and fruits. They obtain this by travelling through the forests over an expanse of 500 to 1000 km2 in their home range. While traveling they come across crop fields with attractive crops like paddy, sugarcane, maize, banana where they get ample food without spending much energy. Being intelligent animals, elephants are known to carry out a rapid survey to check the status of crops in the area so they know when to return! However, each visit by the elephant invites economic and social implications to the farmers, which ultimately gets reflected in retaliatory killing or capture of the elephants.

What is the solution to deal with the HEC? Many feel that a permanent solution would be to capture and domesticate the elephants from high intensity HEC region. This has been tried and has not solved the issue. Also capturing elephants from their native habitat is not justified. The forests are there because elephants are there. Elephants are landscape animals and traverse through vast stretches of forests, feeding and dispersing the seeds. The seeds dispersed through elephants regenerates the forests naturally and thereby support the rich biodiversity. Anyone who has experienced the efforts and resources in raising the forests by artificial regeneration, would appreciate that elephants can achieve this feat effortlessly and at no cost! Elephants have a pivotal role in conservation of biodiversity thus survival of elephant population in wild and in its range countries is very crucial.

The Case of North Canara Elephants

In India, the onus of HEC mitigation is considered as the task of the State Forest Department. The strategies focus on elephant drives, installing physical barriers such as elephant trenches, solar and railway fences, providing monetary compensation for human death, and for crop and property damage, and if the situation demands, then exclusion of elephants by way of capture and translocation. A detailed discussion on the efficacy of various measures is beyond the scope of this article and is available in a manual titled "There's Many a way to Keep the Elephants Away" available at https://www.wrcsindia.org/publications-1.



Location of North Canara district in Karnataka State

However, just as one size does not fit all, each site needs to have different HEC mitigation strategy.

North Canara, also known as Uttar Kanara, located on the crestline of Western Ghats, shares its border with Belgaum and Dharwad districts. The North Canara district supports a population of approximately 60 to 80 elephants, which represents the northern-most range of elephants in the Western Ghats. During 19th century, the elephant herds from SouWKarnataka, especially from the Malnad-Mysore region would locally migrate northwards for a few months and return to Mysore region through the same route. During mid-1960s, the construction of Lingamakki dam on Sharavati river disrupted their movement corridor and a few elephant herds got stranded in North Canara district. Unable to move South-wards, they made their residence in the Forests of Kali Tiger Reserve (KTR), earlier known as the Dandeli-Anshi Tiger Reserve (DATR).

Each year between September to February, the elephant herds from KTR come out of the forests, distribute themselves in smaller groups and visit the crop fields of Yellapur and Haliyal divisions for feeding on paddy, sugarcane, banana, coconut and other crops. In March they return to Kali Tiger Reserve and stay there till the onset of next cropping season.

HEC mitigation by the People, for the People

The North Canara district reports about 1000 cases of crop damage by elephants every year. After having studied the pattern of HEC in Kodagu, Maharashtra, Assam, West Bengal, and Chhattisgarh, we understand that the cause of HEC mitigation is unique in each site. Accordingly, conflict management strategies need to be based on the historical, geographical and cultural context. Based on this learning, we are implementing Community-based Elephant Conflict Management Model (CBCM) in North Canara district. The central concept of CBCM is to empower the local communities in protecting their own crop fields from elephants. Traditionally, farmers are used to guarding their crop fields but with increasing area of crop fields,

they are unable to detect the elephants coming inside from various entry points.

Through our project, we are renewing the interest of the farmers in protecting their own crop fields by introducing a combination of crop protection measures. This includes a mix of traditional methods, farm-based deterrents, and some technology-driven deterrents. We work in close association with the Forest Department and many initiatives are being supported by Village Forest Committees (VFC) and Eco-Development Committees (EDC) of the Forest Department. This way it helps in institutionalizing CBCM model so it can sustain itself. The measures used by us are briefly described below

1. Night guarding coupled with trip alarms: First line of defence which is useful in alerting the farmers as soon as the elephants enter the crop field, so that the farmers can take timely action to protect their crops.

2. Chilly-based Deterrents: Different types of deterrents can be prepared in advance using chilly seeds and other ingredients to generate pungent smoke that elephants find irritating. This helps in preventing elephant entry in the crop fields.

3. Solar flicker lights and infra-red trip alarms: These devices are useful in protecting large extent of crop fields.

4. Honey-bee Fence: Wood logs are used for making bee hive fences. Also, the honey generated from the bee-hive is an additional incentive for the farmers.

5. Livelihood program: We are training local communities in making elephant-themed handicraft products. This initiative is helping in generating income for communities and offsetting some of their losses due to elephants.

Tree watchtowers for safe guarding

Trip Alarm for Early Alert


01


02

01. Ground Chilly Smoke
02. Chilly Chudi
03. Chilly Brick
04. Chilly Smoke
05. Tree log used as bee hive fence
06. Log colonised with bee hives


03


04


Fig 05


06


01


02


03


04


05


06

01. Light and sound ball.
02. Infra-red unit.
03. With Forest Officers and staff in the Project Area.
04. Workshop on elephant monttoring methods.
05. Training local communities in elephant themed handicraft.
06. Handicraft prepared by the women.

Achievements of CBCM

To assess the impact of CBCM, we are regularly monitoring the effectiveness of crop damage cases in CBCM villages and non-CBCM villages. Our findings indicate that the crop fields that are regularly guarded by the farmers reported almost nil or reduced crop loss by elephants compared to the villages that are not practicing any type of crop guarding. Encouraged by the outcome of our ongoing work, more farmers and villages are coming forward to participate in the CBCM model.

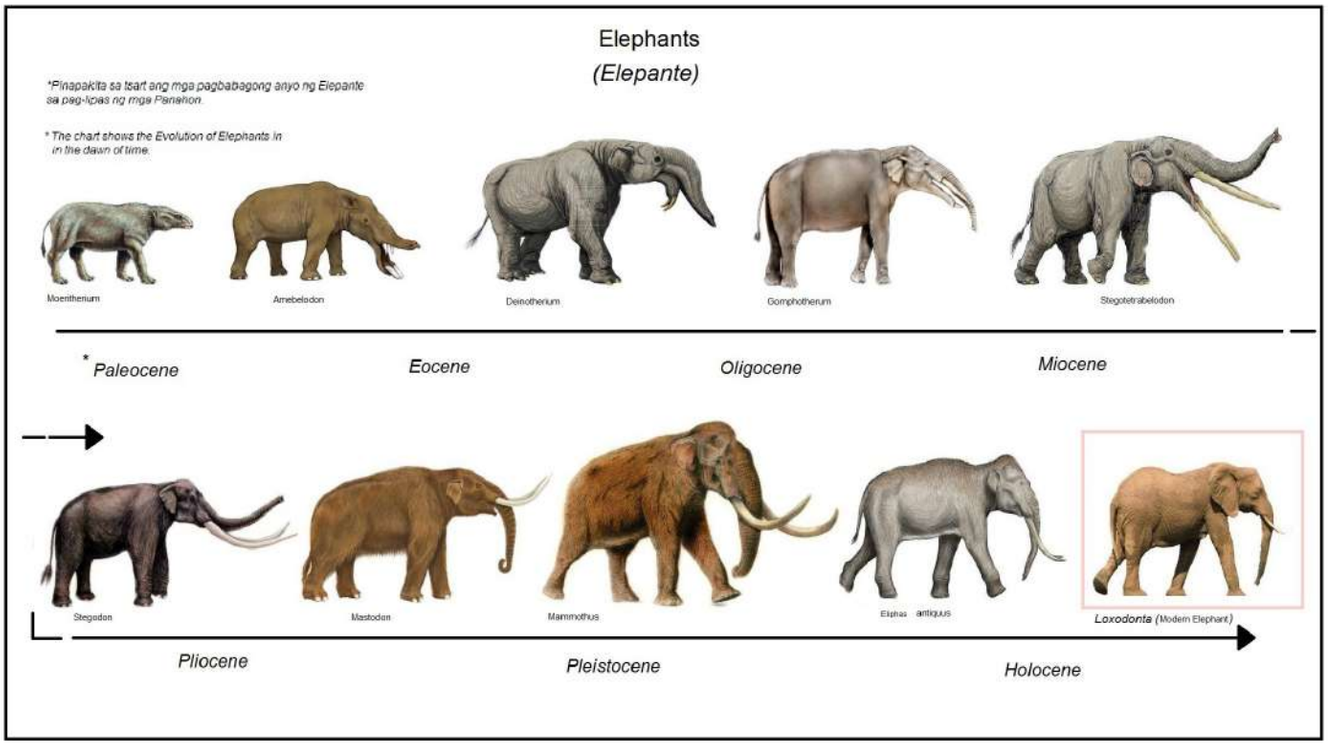
The CBCM model is successful in areas where the farmers participate in crop guarding willingly and regularly. This model is slow to implement but quick to show results. The success of CBCM relies on implementation at various levels. In our project latest technological innovations has been introduced by Jayant Kulkarni and rigorous field implementation has been done by Ravi and Sharath. This has helped in establishing a trustful rapport with the field staff and local farmers, which is the most important ingredient of CBCM. Our constant presence in the project area for last ten years is possible because of the continued financial support from the Asian Elephant Conservation Fund (AECF), US Fish and Wildlife Service. The unstinted support from Karnataka Forest Department has contributed most significantly to the success of this project. We are glad that we have been able to demonstrate way forward for HEC mitigation through a collaborative model with the Forest Department and local people.

Evolution helped survival of the fittest of the elephants! Now the onus is on us. We have to learn to live with the last three species of elephants. Because elephants arrived on the earth before we did, and therefore, they have the right of passage and the right of living as they are the first citizens of this planet. Now is the time to be humane to elephants.

Timeline of Elephant Evolution

Elephants are the largest living terrestrial mammals in the world today. However, elephants did not achieve this feat overnight. Evolution has played a major role in getting elephants the size and shape they currently possess.

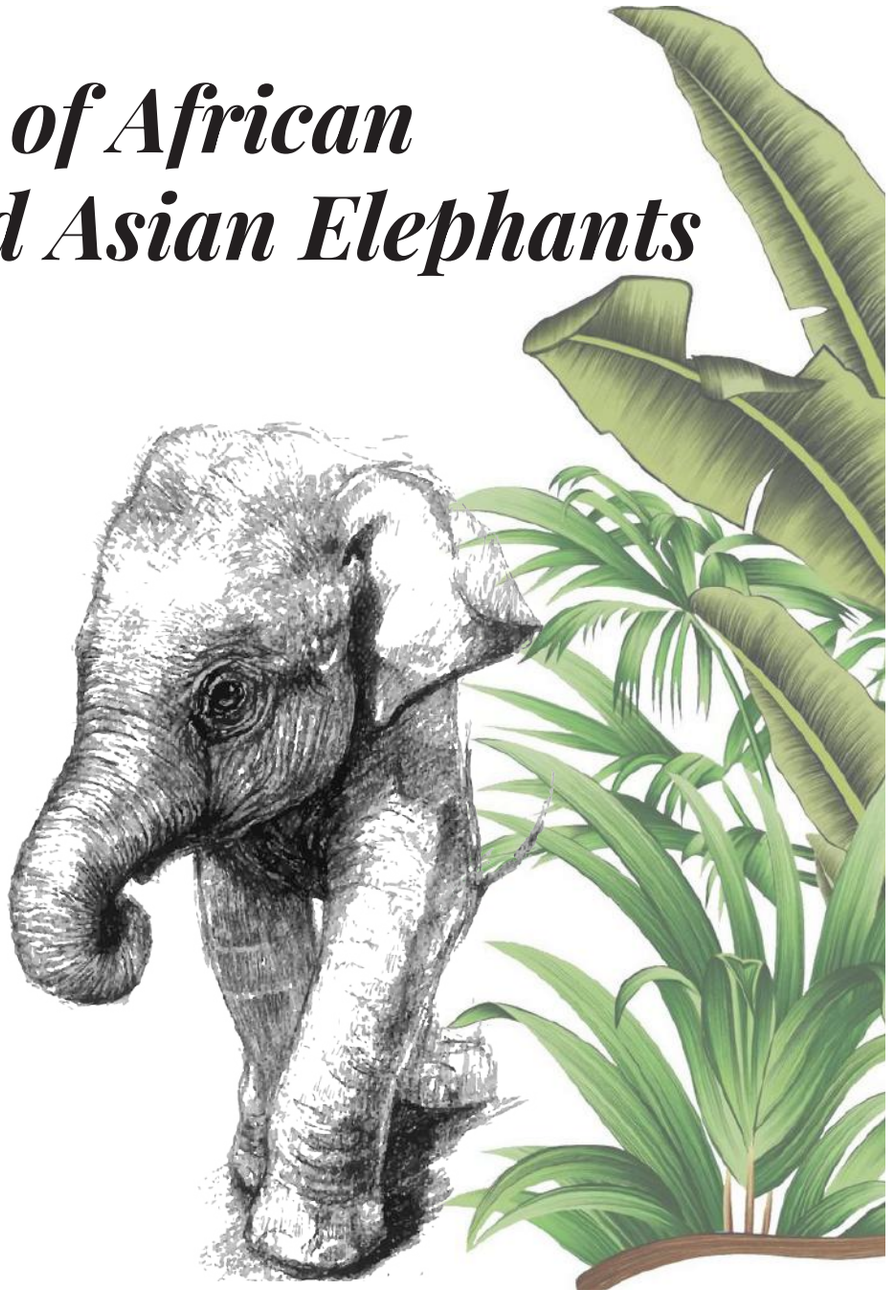
Elephants belong to the order Proboscidea, that includes animals having a tubular nose. In the Eocene era, the earliest Probiscidian was a humble looking Moeritherium, a 3 feet tall pig like animal with a stubby snout. For next millions of years, the Moeritherium underwent several cycles of evolution and speciated as different forms of elephants. These species used the land-bridge from Africa to migrate to America, Asia, and Europe, but could not reach Australia and Antarctica. Among all pre-historic elephants, Mammoths were closest relative to the present-day elephants. Mammoths co-existed with the early humans till as recently as 10,0000 years ago but became extinct owing to hunting and the onset of the ice age.

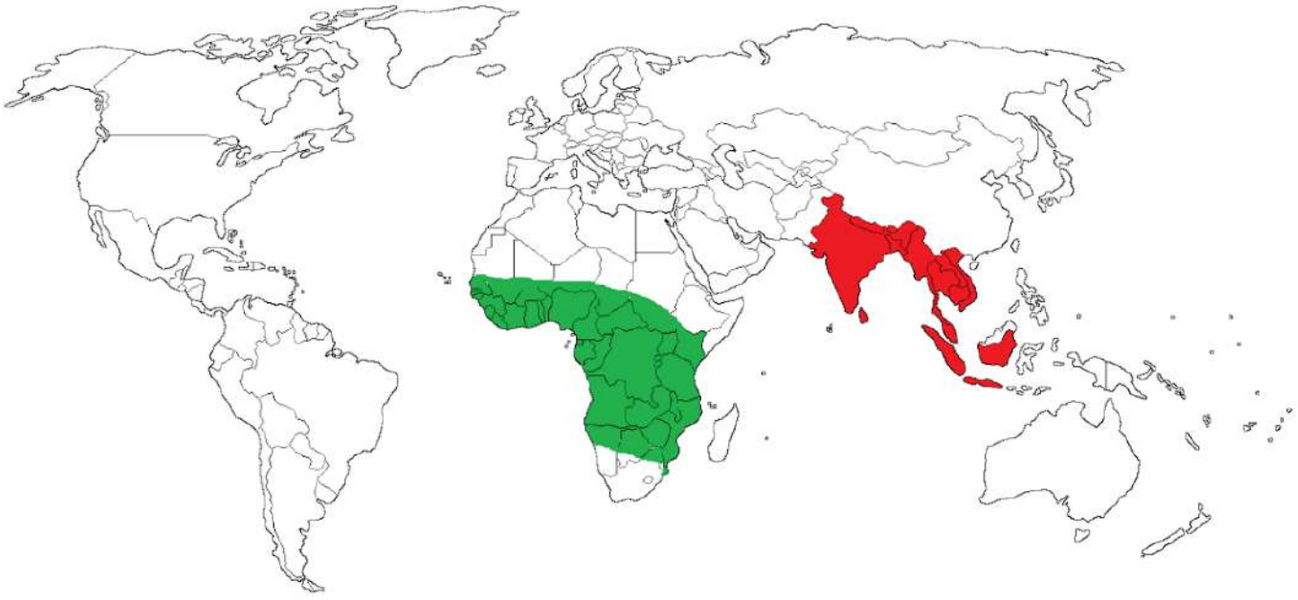


Source: google.com/evolutionoftheelephant)

Distribution of African Elephant and Asian Elephants

In the current millennia, only three species of elephants have managed to survive. In Africa, there are two species, the African Savana (Loxodonta africana) and the African Forest (L. cyclotis) elephant, while the Asian Elephant (Elephas maximus) is confined to Asian countries. The population of African elephant is estimated to be about 7 lakhs distributed in 37 African countries, of which maximum population is found in Botsawana and Zimbabwe. The Asian elephants are not doing as well as its African counterpart. Their population is estimated to be around 52,000 distributed in 13 range countries. India supports over 60 % of Asian Elephant population.





Source: Londoloz I blog.com
*Green – African elephant distribution
Red- Asian elephant distribution

Conservation News

Revisiting the Guidelines on Care and Management of Captive Elephants

The Guideline on "Care and Management of captive elephants" was issued by this Ministry in 2008 elucidating the various norms to be followed for care and upkeep of captive elephants. A workshop with various stakeholders was organised on 3rd August, 2021 to revisit the guideline of the Ministry and devise a framework policy and a comprehensive guideline for welfare of captive elephants.

Health survey and DNA Profiling of Captive Elephants

A total of captive 2675 are estimated to be in India. Despite India's best efforts, illegal trade in live elephants appears to continue. Sporadic cases of illegal capture of wild elephants are reported as well. There are also reports of elephant being smuggled within India from the neighbouring countries like Myanmar and Bangladesh. A large number of unaccounted capture of elephants leads to illegal wildlife market which may fuel demand for ivory. Addressing the concern, the meeting with the State Forest Departments to finalize the approach/methodology to be adopted for collection of data and conducting the DNA profiling of captive elephants was held on 7th July, 2021.

Identification and Ground-truthing of Elephant Corridors

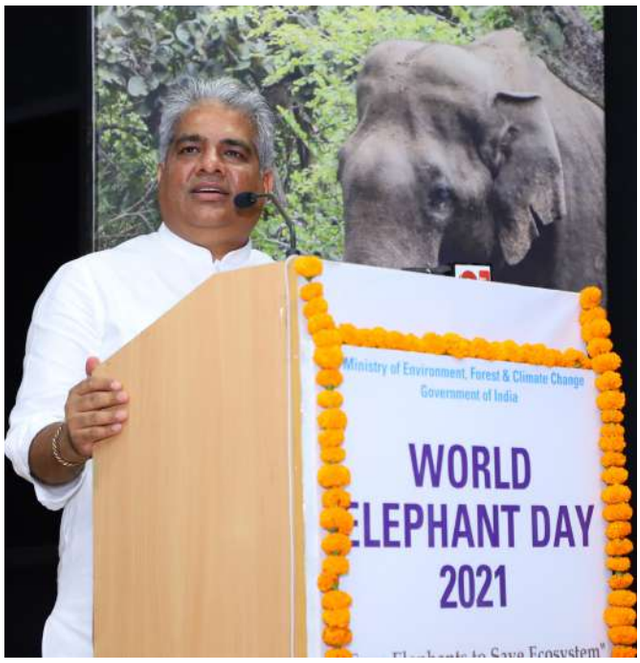
With the increasing instances of human-elephant, it is essential to provide safe passage for elephants from habitat to habitat. Addressing the concern, this Ministry has constituted a Committee in April, 2021 to identify and conduct ground-truthing of 101elephant corridors in India. Kick starting the process, the first meeting of the Committee to discuss on the parameters to be prioritised for identification of elephant corridors was conducted on 23rd July, 2021.

Central Project Elephant Monitoring Committee

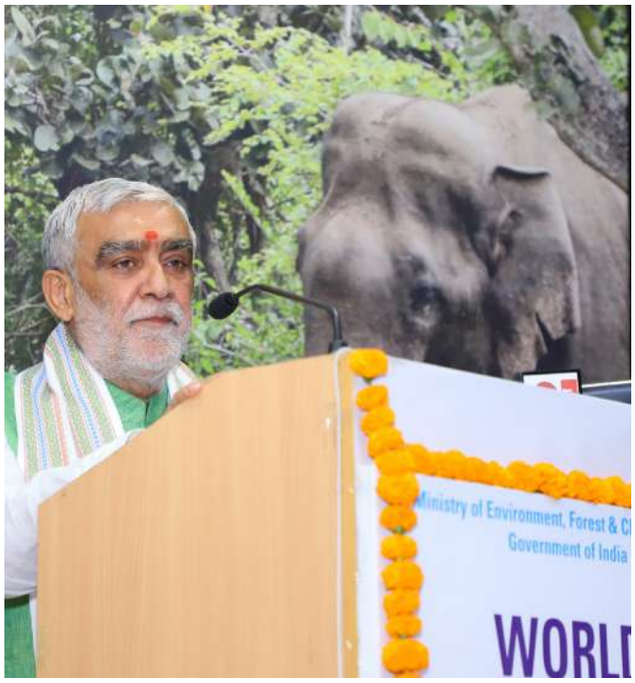
The Central Project Elephant Monitoring Committee was constituted by Hon'ble Supreme Court to look into the issue of elephant conservation including that of human-elephant conflict. Following the line, the Hon'ble NGT requested the Committee to look into the death of elephants due to train hits with railways, States of Tamil Nadu, Kerala and WII and suggest mitigative strategies to prevent death of elephants due to train hits. A meeting of the CPEMC along with Southern Railways, Kerala and Tamil Nadu Forest Department was organised on 28th July, 2021 to review the steps taken by Railways and Forest Department and evaluate the mitigative approaches that can be undertaken to prevent train accidents.

Addressing Conservation Issues Related to Eephants

A total of 741 elephants have died due to electrocution while a total of 186 elephants had died due to train hit during the last 11 years (2009-2020) across India. Intelligence during cyber patrolling reveals the emergence of digital middlemen working between buyer and seller for trade in ivory. Addressing these concerns, a meeting was oragnised with all elephant range states on 02.09.2021 to discuss various issues related to conservation and management of elephants.



Shri Bhupender Yadav, Minister, MoEF&CC on World Elephant Day at New Delhi.

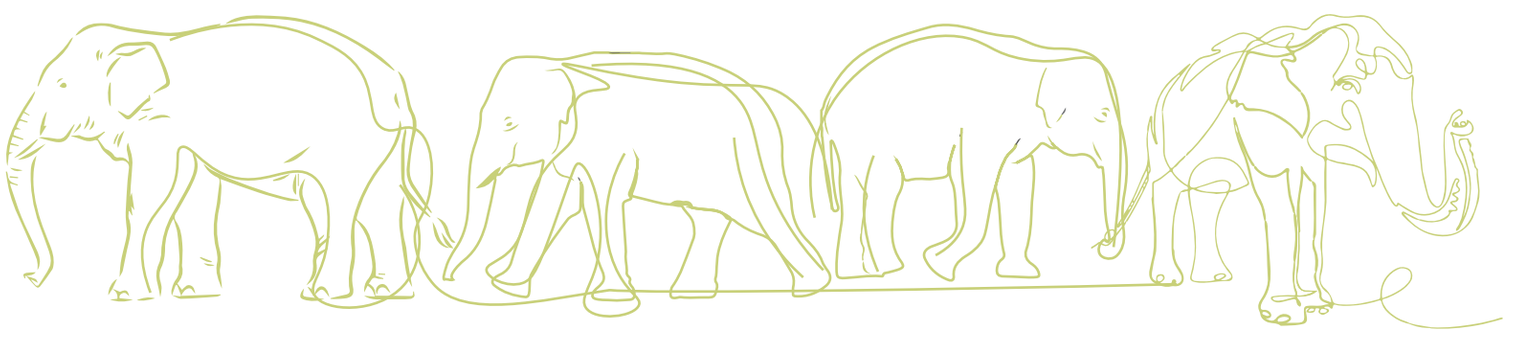


Shri Ashwini Kumar Choubey, MoS, MoEF&CC on World Elephant Day.

World Elephant Day 2021

World Elephant Day dedicated to the preservation and protection of the world's elephants aims to create awareness on elephant conservation, and to share knowledge and positive solutions for the better protection and management of wild and captive elephants.

This year, the World Elephant day was celebrated by Project Elephant Division and Elephant Cell of WII at Indira Paryavaran Bhawan, New Delhi. The programme involved releasing the booklet on "All India Elephant, Tiger and Leopard Estimation" and the fourth edition of the quarterly newsletter of Project Elephant Division and Elephant Cell. A video on measures for encouraging human – elephant co-existence through HEC mitigative approaches was also screened. The announcements of prize winners of the painting competition and essay competition organised on occasion of Baharat ki Aazadi Mahotsav were announced in the presence of the august gathering. The event was oragnised with the esteemed presence of Shri Bhupender Yadav, Hon'ble Minister EF&CC, Shri Ashwini Kumar Choubey, Hon'ble MoS, EF&CC, Shri Subhash Chandra, DGF&SS, MoEF&CC; Dr. S. P. Yadav, ADG (NTCA), Shri Ramesh Kumar Pandey, IGF & Director Project Elephant, MoEF&CC and other senior officers of MoEF&CC. The State Forest Departments, WII and other stake holder organizations joined the celebrations on the virtual mode. Shri Bhupendra Yadav, Hon'ble Minister, EF&CC emphasized public participation and local knowledge are necessary tools for elephant conservation and addressing man-animal conflicts. There is a need to identify areas where man-animal conflicts exist and visit local areas while framing a policy to address these issues. He also stressed that a bottom up approach towards conservation, involving local communities is the way forward towards wildlife conservation. Shri Ashwini Kumar Choubey, Hon'ble Minister of State, EF&CC highlighted that elephant conservation is intricately linked to ecosystem conservation. He also stressed that saving elephants was like saving forests, and saving forests led to saving the entire ecosystem.



(Left-Right) Shri Subhash Chandra, DGF&SS; Shri Ashiwini Kumar Choubey, MoS, EF&CC; Shri Bhupender Yadav, Hon'ble MEF&CC; Shri R. P. Gupta, Secretary, MoEF&CC; Dr. S. P. Yadav, ADG (NTCA); Shri Ramesh Kumar Pandey, IGF (PE)

Azadi ka Amrit Mahotsav

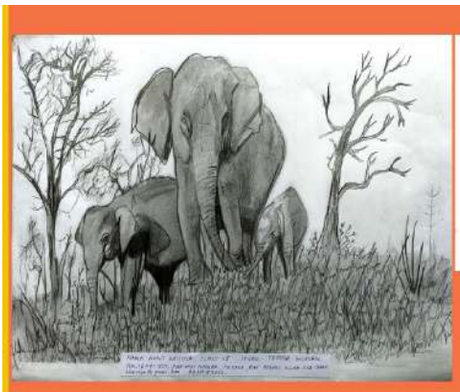
Bharat ka Amrit Mahotsav was launched across the country beginning March 12 as part of celebrations to mark 75 years of Independence. The padyatra was flagged off by the Hon'ble Prime Minister of India, Shri Narendra Modi from Sabarmati Ashram to celebrate and showcase a progressive India and the glorious history of its people, culture, heritage and achievements. The celebrations marks the anniversary of "Dandi March" led by Mahatma Gandhi on 12th March 1930 with 81 marchers from Sabarmati to Dandi. The commemorations include 75 events for 75 weeks involving 75 species of conservation priority in the 10 biogeographic zones of India with one prominent event every week. A week long programme was celebrated by the Project Elephant Division and Elephant Cell as a precursor to World Elephant Day, 2021.

Date	Programme
3rd August, 2021	Workshop on problem management of captive elephants
5th August, 2021	Painting competition for school children oraginsed in collaboration National Museum of Natural History
6th August, 2021	Essay writing competition of college students oragnised with WWF-India
7th August, 2021	Film shows for children oraginsed in collaboration Wildlife Trust of India
9th August, 2021	Workshop on role of technology in mitigation of human-elephant conflict
10th August, 2021	Webinar on elephant conservation vis-à-vis ecological security of the country
12th August, 2021	World Elephant Day Celebration

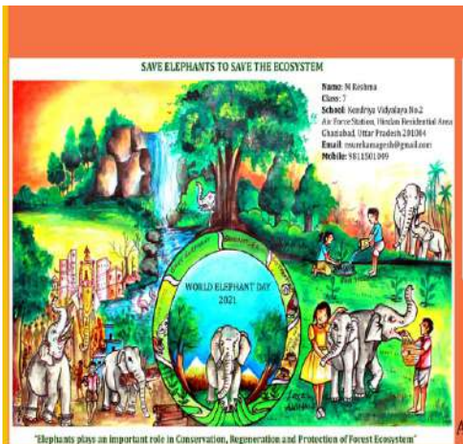
Results of painting Competition organised by Project Elephant Division in collaboration with National Museum of Natural History oragnised on 5th August, 2021-10-28

Result: Category I
(Class 6 – 8)

First Prize
Bhavishya Sharma
Class – VII
M. M. Public School
Pitampura, New Delhi



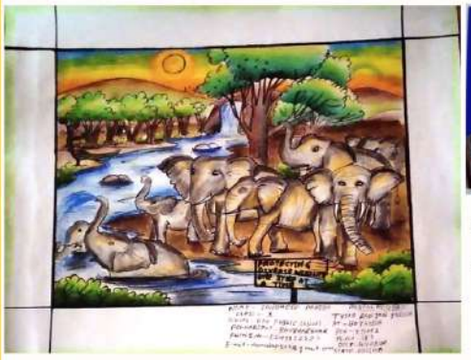
Third Prize
Ronit Baishya
Class – VII
Tezpur Gurukul
Tezpur, Assam



Second Prize
M. Reshma
Class – VII
Kendriya Vidyalaya
No.2
Air Force Station, Hindon,
Gaziabad, Uttar Pradesh

Result: Category II
(Class 9 – 12)

First Prize
Anuj
Class – XI
Govt. Boys Sr. Sec. School
Mangol Pur Khurd
New Delhi



Second Prize
Sandheep Parida
Class – X
DAV Public School
Pokhariput,
Bhubaneswar
Odisha

Third Prize
Sandhya Kumari
Class – XII-C
Govt. Girls Sr. Sec. School
Mohan Garden, New Delhi