BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
(SOUTHERN ZONE BENCH, CHENNAI)

Original Application No.259 of 2024(SZ)

IN THE MATTER OF:

Suo Moto matter in respect of
news item appearing in
The Hindu dated 19.07.2024 titled
"845 elephant deaths recorded in
Kerala in eight years".

And

MOEF & CC, Through its Regional
Office, Bangalore and ors. ...Respondent(s)

REPORT FILED BY THE PRINCIPAL CHIEF CONSERVATOR OF FOREST- 2ND RESPONDENT

Index

Dated at Chennai on this the 04th day of February, 2026

M/s. E.K.KUMARESAN

Standing Counsel for State Government of Kerala - NGT(SZ) Chennai Bench

SUMMARY ON ELEPHANT MORTALITY AND CONSERVATION STRATEGIES IN KERALA

I. Introduction and Basis of Proceedings

The present matter had originated from a Suo Motu cognisance taken by the Principal Bench of the National Green Tribunal in O.A. No. 1043 of 2024, following a news report in *The Hindu* dated 19.07.2024 titled "845 elephant death recorded in Kerala in 8 years." The report highlighted rising mortality rates, particularly among elephants under ten years of age, citing 40% of young elephant deaths to Elephant Endotheliotropic Herpesvirus-Haemorrhagic Disease (EEHV-HD). Subsequently, the matter was transferred to the Southern Zonal Bench. Pursuant to Government Order G.O.(Rt) No. 451/2024/F&WLD, an Expert Committee was constituted to critically examine mortality trends from 2019-20 to 2024-25 and recommend science-based interventions.

II. Composition of the Expert Committee

The five-member Expert Committee responsible for the report comprised the following officials and subject matter experts:

Chairman: Shri. Pramod G. Krishnan IFS, Additional Principal Chief Conservator of Forests (Administration) and Chief Wildlife Warden, Kerala

Members: Dr. Arun Zachariah, Forest Veterinary Officer, Kerala Forest Department, Shri. Radhakrishnan S.R., Deputy Conservator of Forests, Project Elephant, Shri. Manu Sathyan, Divisional Forest Officer, Flying Squad, Ernakulam & Nodal Officer, HAWK, and Dr. M. Balasubramanian, Lead Wildlife Monitoring Expert, Parambikulam Tiger Conservation Foundation.

III. Mortality Trends and Population Stability

The Committee analysed data over six financial years (April 2019 – March 2025), and has observed the following key trends:

a) A total of 744 wild elephant deaths were recorded across Kerala's forests during the study period, averaging approximately 124 deaths per annum.
b) Based on population estimates ranging from 2,000 to 2,785 individuals, the annual mortality rate was calculated to fall between 4.45% and 6.2%.
c) The population is considered demographically stable as the estimated annual recruitment of about 168 calves marginally exceeds the average annual mortality of 124 deaths.
d) Mortality peaks were observed in the financial years 2019-20 (135 deaths) and 2024-25 (150 deaths), indicating temporal fluctuations driven by external factors.
e) A critical seasonal trend identified that mortality consistently surges during the dry season from January to May due to resource scarcity, whereas it drops significantly during the monsoon months of June through September.

IV. Demographic Analysis of Mortality

The data exhibited a U-shaped mortality curve, with specific vulnerabilities identified in the youngest cohorts:

a) While adults over 15 years comprised the largest share of mortality at 48.7%, a disproportionate impact was found among the young, with calves under one year and juveniles aged 1–5 years accounting for a combined 30.9% of total deaths.
b) Juveniles are particularly vulnerable, constituting only approximately 6.5% of the total population but suffering 16.5% of all recorded deaths.
c) Male elephants faced higher mortality at 49.4% compared to females at 46.2%, a bias most pronounced in sub-adult males due to behavioural traits such as dispersal and higher risk-taking in conflict zones.

V. Causes of Mortality

The investigation categorised deaths into Natural and Human-Induced causes, in the following patterns:

a) Natural causes accounted for 89.6% (667 deaths) of the total mortality, with disease being the leading factor at 12.10%.
b) Intraspecific conflict accounted for 11.29% of deaths, followed by predation at 7.26 %, which was notably high in tiger-rich landscapes like Wayanad.
c) Human-induced causes accounted for 10.4% (77 deaths) of the mortality, representing a smaller volume but entirely preventable loss.
d) Electrocution was identified as the leading unnatural cause at 5.51%, with incident rates tripling over the six-year period.
e) Transport accidents involving vehicle and train collisions accounted for 1.08% of the total mortality.
f) Explosives (1.08%) and poaching (0.54%) persist as threats, with juveniles increasingly falling victim to explosive traps often set for wild boar.

VI. Spatial Analysis and Human-Wildlife Conflict

Spatial mapping identified a strong correlation between high-mortality zones and HEC hotspots, particularly during the dry season:

a) Primary mortality zones include the Wayanad landscape, Nilambur region, Parambikulam-Munnar-Malayattoor belt, and Periyar-Ranni-Konni landscape.
b) The Malayattoor Division recorded the highest overall natural mortality with 89 deaths, while the Palakkad Division emerged as a hotspot for human-induced deaths, accounting for 13% of such cases primarily due to train collisions.
c) Munnar and Ranni faced higher incidences of electrocution, correlating with agricultural interfaces and infrastructure.
d) The period from January to June was identified as a high-risk window where HEC incidents escalate due to elephants moving closer to human settlements for water and crops like jackfruit.

VII. Recommendations

The Committee proposed targeted "Missions" to address specific threats and ensure long-term population viability:

a) The implementation of "Mission FFW" (Food, Fodder & Water) as a priority dry-season intervention for habitat restoration and artificial water provisioning to reduce settlement encroachment.
b) "Mission Solar Fencing" to restore non-functional barriers and strictly regulate illegal power fences to curb the rising trend of electrocution.
c) The establishment of "Mission RRT/PRT" (Rapid and Primary Response Teams) to ensure swift conflict intervention and prevent retaliatory killings.
d) "Mission Real-Time Monitoring" to track elephant movement across corridors, enabling preventive actions before conflict occurs.
e) "Mission Tribal Knowledge" to integrate traditional mitigation practices into modern conservation strategies.
f) Infrastructure safety measures, including the insulation of power lines and specific mitigation in transport zones like Palakkad, are critical to reducing accidental mortality.
g) A state-level surveillance system for EEHV and strict implementation of the Wild Animal Mortality Auditing Framework (WAMAF) are essential for effective disease management and data standardisation.

VIII. Conclusion

While the Kerala wild elephant population indicates demographic stability, the rising incidence of juvenile mortality and preventable anthropogenic deaths (electrocution and transport accidents) presents a significant long-term risk. The data points to the dry season as the critical window for intervention. Hence, the present scenario calls for strict enforcement of the proposed infrastructural safeguards and disease surveillance mechanisms, while ensuring that the state's conservation strategies evolve from reactive measures, to proactive landscape management.

COUNSEL FOR 2ND AND 3RD RESPONDENT.

STANDING COUNSEL FOR GOVT. OF KERALA

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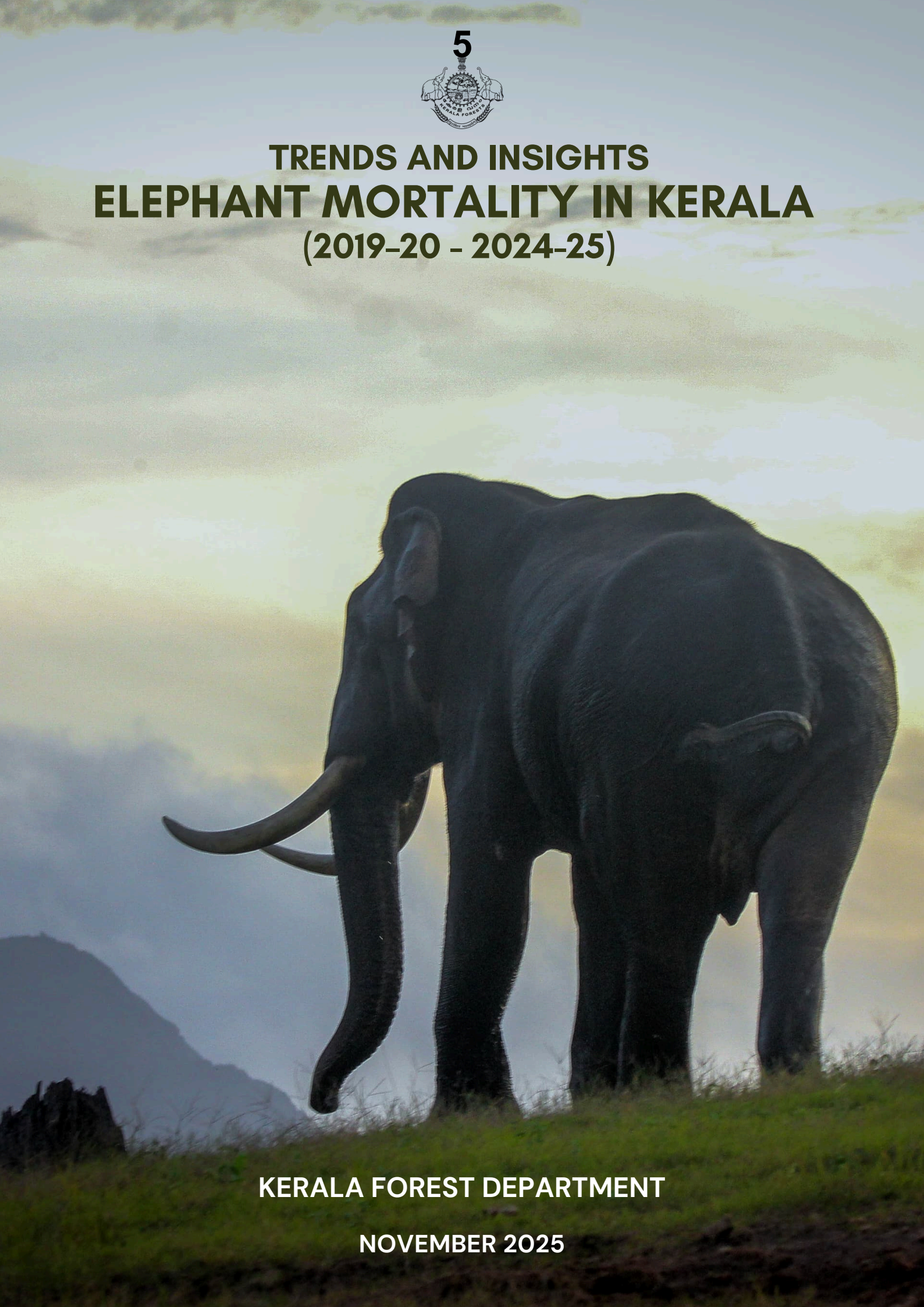
TRENDS AND INSIGHTS
ELEPHANT MORTALITY IN KERALA
(2019-20 - 2024-25)



KERALA FOREST DEPARTMENT

NOVEMBER 2025

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TRENDS AND INSIGHTS

ELEPHANT MORTALITY IN KERALA

(2019-20 –2024-25)

Prepared by

THE EXPERT COMMITTEE

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KERALA FOREST DEPARTMENT
THIRUVANANTHAPURAM
November 2025

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PREFACE

As keystone species, elephants play a critical role in maintaining the ecological integrity of their habitats. Beyond their ecological significance, they hold profound cultural, social, and economic importance, particularly in regions like Kerala, where they are deeply embedded in local traditions and wildlife-based tourism. However, their survival is increasingly jeopardized by both natural and anthropogenic threats, including habitat fragmentation, human-elephant conflicts, climate change, and emerging diseases. Understanding the dynamics of elephant mortality is essential for formulating effective conservation strategies to secure their long-term survival.

This report, "Trends and Insights: Elephant Mortality in Kerala (2019–2024)," presents a comprehensive analysis of elephant mortality trends in Kerala over a six-year period. It examines the underlying causes of mortality—both natural and human-induced—while analyzing demographic, temporal, and spatial patterns. Utilizing data from the Kerala Forest Department, advanced survey methodologies, and conflict incident reports, this study seeks to identify key drivers of elephant mortality and provide evidence-based recommendations for mitigating these threats.

The findings underscore the pressing need for proactive conservation measures, particularly in high-mortality and conflict-prone areas. Notable concerns include seasonal fluctuations in mortality, the heightened vulnerability of juvenile elephants, and the increasing prevalence of human-induced deaths, such as electrocution, poisoning, etc. This report also highlights the significance of habitat management, community engagement, and technological interventions in mitigating human-elephant conflicts and promoting the well-being of both elephants and local communities.

We hope this report serves as a valuable resource for policymakers, conservationists, and researchers dedicated to the protection of Kerala’s elephant population. By fostering a deeper understanding of the factors influencing elephant mortality, we aim to contribute to the development of targeted conservation strategies that support human-wildlife coexistence and ensure a sustainable future for these iconic species.

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EXECUTIVE SUMMARY

Kerala's wild elephants, a **keystone species of immense ecological, cultural, and conservation value**, face mounting threats amid steadily increasing mortality rates. In response, the Government of Kerala issued **G.O.(Rt) No. 451/2024/F&WLD (dated 15-10-2024)**, forming an Expert Committee to study the issue and recommend interventions. This report analyses elephant mortality over **six financial years**, offering insights into the **temporal, demographic, causal, and spatial patterns** of death to support **evidence-based conservation planning**.

Between **April 2019 and March 2025**, Kerala recorded **744 wild elephant deaths** (≈124/year) with an **annual mortality rate of 4.5–6.2%**. Despite these losses, the population remains **demographically stable**, as recruitment (≈168 calves/year) slightly exceeds mortality. However, the lack of standardized mortality benchmarks across states underscores the need for **consistent, population-linked monitoring** for long-term conservation planning. Mortality showed **seasonal and annual peaks**—notably in **2019–20 and 2024–25**, and between **January and May (dry season)**—driven by **resource scarcity and HEC**. **Monsoon months** recorded lower deaths. Strengthening **dry-season management** through habitat restoration, water provisioning, and conflict mitigation is critical.

Demographic patterns showed a **U-shaped mortality curve**, with **calves, juveniles, and older adult females** being most vulnerable. While adults over 15 years accounted for most deaths by number, this reflected their population size. Notably, **juveniles (1–5 years) -** only **6.5% of the population** - accounted for **16.5% of all deaths**, highlighting **disproportionate vulnerability** from **low immunity and fragmented herds**. **Male elephants**, especially calves and sub-adults, faced consistently **higher mortality**, likely due to **dispersal behaviours, risk-taking, and conflict-zone exposure**. These findings call for **age- and sex-specific conservation responses**, especially for **juvenile and sub-adult males**.

Natural causes accounted for **89.6% of deaths**, mainly due to **disease and aging**. **Elephant Endotheliotropic Herpesvirus (EEHV)** was a leading killer among **calves and juveniles**, especially in **small, isolated herds** with **low immune priming**. The link between **habitat fragmentation and EEHV vulnerability** underscores the urgency of ensuring **habitat connectivity and herd health**.

In contrast, **10.4% of deaths were human-induced**, yet **entirely preventable**. **Electrocution (5.51%)** - mostly from **illegal high-voltage fencing** - was the leading cause, with cases **tripling over six years**. Other causes included **vehicle collisions (1.08%)**, **poaching**, **explosives**, and **poisoning**, often linked to **retaliatory actions**. **Juveniles and sub-adults** were more susceptible to these threats, while

adults were especially vulnerable to electrocution. These patterns demand **urgent mitigation measures**: **power line insulation, fencing regulation, early-warning systems**, and **community engagement**.

Spatial analysis identified four major **mortality hotspots** viz., **(i) Wayanad, (ii) Nilambur, (iii) Parambikulam-Munnar–Malayattoor, and (iv) Periyar-Ranni-Konni.**

These are **ecologically sensitive areas** with **dense elephant populations** and **vital migratory routes**. The **Malayattoor-Thrissur belt** is particularly critical, with overlapping **high mortality and human-elephant conflict**, warranting **targeted intervention**. At the forest division level, **Malayattoor, Periyar (East), Wayanad WLS**, and **Ranni** had the highest death tolls, demanding **division-specific strategies**. **Electrocution was common in Munnar and Ranni**, while **Palakkad** emerged as a **train-hit hotspot**. Spatial trends show **natural deaths in forest interiors** and **human-induced deaths near human settlements**, reinforcing the need for **landscape-level planning and infrastructure reforms**.

Key recommendations include: strict WAMAF implementation, year-round water and fodder provisioning, habitat connectivity enhancement, infrastructure upgrades, anti-poaching intelligence, real-time monitoring systems, and EEHV surveillance and response. A **science-based, landscape-level, and community-inclusive approach** is essential to **reverse current mortality trends** and ensure the **long-term survival** of Kerala's elephants.

Kerala's **Forest Department missions** - including **Mission FFW (Food, Fodder & Water)**, **Mission RRT/PRT (Conflict Response)**, and **Mission Real-Time Monitoring** - are strengthening protection and conflict management. Complementary initiatives such as **Mission Solar Fencing**, **Mission Tribal Knowledge**, and **Mission Public Sensitisation** promote coexistence through habitat restoration and community engagement. Finally, Kerala's elephant population remains **stable but vulnerable** to seasonal stress, habitat pressures, and preventable deaths. Sustained progress depends on **systematic mortality tracking**, **disease control**, **habitat restoration**, and **community-inclusive conservation** to ensure the **long-term viability of wild elephants** in the state.

In nutshell, Kerala's elephant mortality crisis is a **complex conservation challenge**, shaped by **demographic vulnerabilities**, **disease outbreaks**, and **human threats**. Although natural causes dominate, the **rise in human-induced deaths - especially electrocution - demands immediate, integrated action**. Conservation strategy rooted in **habitat restoration, conflict mitigation, disease control, and regulation enforcement** are vital for securing the future of Kerala's wild elephants.

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TRENDS AND INSIGHTS: ELEPHANT MORTALITY IN KERALA (2019-20 to 2024-25)

1. INTRODUCTION

Elephants are among the most iconic and ecologically significant species, playing a crucial role in maintaining ecosystem health and balance. As keystone species, Asian elephants (*Elephas maximus*) contribute to habitat integrity by dispersing seeds, regulating vegetation, and shaping forest dynamics. Any alteration or decline in their populations can thus set off cascading ecological impacts, such as diminished biodiversity and weakened ecosystem resilience (Blake et al., 2009).

Beyond their ecological role, elephants are central to the life world of forest-fringe communities, especially through wildlife-based ecotourism. In Kerala, Protected Areas like Periyar, Parambikulam, and Wayanad attract thousands of tourists annually, with elephant sightings as a major draw. Ecotourism supports conservation and provides vital livelihoods through guiding, hospitality, and related services. A decline in elephant numbers would reduce tourism appeal, leading to income loss and increased dependence on forest resources, thereby intensifying pressure on fragile ecosystems. Elephants also hold deep cultural significance in Kerala, symbolizing strength and divinity in religious rituals and festivals, and are integral to the region's spiritual identity (Menon et al., 2017).

However, rising threats such as habitat fragmentation, human encroachment, and escalating Human-Elephant Conflict (HEC) jeopardize both elephant survival and community welfare. These intertwined challenges demand urgent, integrated conservation strategies that protect elephant populations while also securing the ecological, economic, and cultural systems they support (Sukumar, 2006; MoEF&CC, 2020).

1.1. Elephant Population Status

India plays a pivotal role in global elephant conservation, harbouring over 60% of the world's wild Asian elephant population. According to the most recent nationwide estimation conducted in 2017 by the Government of India, the country supported an estimated 29,964

elephants. These were primarily distributed across four major regions: the North-eastern, Central, North-western, and Southern landscapes. Among them, the Southern region - encompassing Tamil Nadu, Karnataka, and Kerala - constitutes a vital stronghold for the species, collectively supporting approximately 14,000 individuals, or 47% of India's total elephant population (MoEF&CC, 2024).

Within this southern landscape, Kerala holds particular importance due to its substantial share of the regional elephant population. To ensure effective conservation planning and monitoring, the State has consistently undertaken systematic population assessments. Initially, these efforts were part of broader wildlife surveys conducted by the Kerala Forest Department (KFD) in collaboration with the Kerala Forest Research Institute (KFRI), during which elephant counts were carried out alongside those of other wildlife species. Notable early exercises were conducted in 1993 (KFRI, 1993), 1997 (Easa & Jayaraman, 1997), and 2002 (Easa et al., 2002).

A significant shift occurred in 2005 when Kerala began participating in the All-India Synchronized Elephant Population Estimation initiative led by the Government of India. From this point onward, the State transitioned to dedicated elephant-focused surveys. These specialized efforts, conducted with scientific support from the Tiger Conservation Foundations and KFRI, led to a series of targeted population estimates in 2005, 2007, and 2010 (Sivaram et al., 2005, 2007, 2010), followed by subsequent assessments in 2012 (Balasubramanian & Veeramani, 2012), 2017 (Balasubramanian & Easa, 2017), 2023 (KFD, 2023), and 2024 (KFD, 2024).

Over the years, advancements in survey techniques have significantly enhanced the accuracy and reliability of these assessments. In recent exercises, Kerala has incorporated advanced digital technologies such as digital mapping, alongside refined survey methodologies. These innovations have greatly improved the precision of population estimates by reducing the likelihood of both overestimation and undercounting. Reflecting the benefits of these methodological improvements, the 2024 block count recorded an estimated 1,793 elephants (KFD, 2024), a figure comparable to the 2023 estimate of 1,920 elephants (KFD, 2023), with no statistically significant change.

A recent study conducted by the Wildlife Institute of India (Qamar Qureshi et al., 2021–2025), titled *"Status of Elephants in India: DNA-based Synchronous All-India Population Estimation of Elephants,"* provides the first comprehensive DNA-based assessment of India's wild elephant population. The study reveals that most wild elephants are concentrated in the southern states, with Karnataka hosting the largest number (6,013), followed by Tamil Nadu (3,136) and Kerala (2,785). Using DNA extracted from dung samples, researchers were able to identify individual elephants, resulting in more accurate estimates than earlier counting methods. Overall, the 2025 census recorded 22,446 wild elephants nationwide, indicating an apparent 18% decline compared to the 2017 estimate.

1.2. Threats to Elephant Populations

Elephant population trends are shaped by a complex interplay of ecological and anthropogenic factors. One significant driver is the natural movement of elephants across the 957 km interstate forest boundary shared by Kerala, Karnataka, and Tamil Nadu. These cross-border migrations are often triggered by seasonal variations in resource availability, altered rainfall patterns, and droughts - such as those experienced in 2016–17 - which compel elephants to move in search of food and water (Sukumar et al., 2020). Compounding these pressures are broader environmental challenges, including habitat fragmentation and the impacts of climate change. Rising temperatures, the spread of invasive plant species, and declining availability of food and water are increasingly undermining elephant health, reproduction, and long-term survival (KFD, 2023; KFD, 2024).

In addition to environmental stressors, human-induced threats have played a major role in shaping elephant population dynamics (Sukumar, 1989; Sukumar, 2006). Habitat degradation, reduced forage quality due to invasive species, and escalating human-elephant conflicts (HEC) contribute to rising mortality. Among anthropogenic causes, electrocution, train collisions, and retaliatory killings remain the leading sources of unnatural deaths. Despite the implementation of conservation programs such as Project Elephant, these threats persist, underscoring the challenges of ensuring elephant survival (Sukumar, 1992; 1994).

The rapid expansion of agriculture and urban infrastructure has led to substantial habitat loss, forcing elephants into closer proximity with human settlements and increasing the frequency and intensity of HECs. Crop raiding and livestock depredation impose significant economic costs on local communities, often straining relationships between residents and conservation authorities (Hoare, 1999). In response, some communities resort to retaliatory actions such as electrocution, poisoning, and the use of explosive traps - further contributing to elephant mortality. Adding to these challenges is the growing threat of both emerging and endemic diseases (Daszak et al., 2000).

One particularly concerning disease is elephant endotheliotropic herpesvirus (EEHV), which poses a serious risk to juvenile elephants. Studies by Zachariah et al. (2013) have documented its widespread prevalence and its role in young elephant mortality. Supporting evidence from the Mudumalai Tiger Reserve, which borders Kerala, indicates that 61% of elephant deaths there were linked to disease and predation - highlighting the significant role of natural causes in shaping mortality trends (Mohanarangan et al., 2022).

1.3. Elephant Mortality Trends in Kerala

Monitoring elephant mortality is essential for understanding population health and guiding effective conservation strategies (Arivazhagan & Sukumar, 2005; Fernando et al., 2012; PE-WII-MoEF&CC, 2024). This is especially important in Kerala, where habitat fragmentation poses persistent challenges. Mortality data compiled by the Kerala Forest Department (KFD) from 2014 to 2019 reveal that 92.5% of wild elephant deaths were attributed to natural causes such as disease and old age, while the remaining 7.5% resulted from unnatural causes, primarily electrocution and train collisions (GoK, 2021; Ramakumar, 2022).

Among unnatural causes, a growing concern is the use of explosive traps - typically intended for wild boars - which can unintentionally injure or kill elephants. Similar incidents have been reported in neighbouring states like Tamil Nadu and Karnataka (Sukumar, 1994). A tragic example was the widely publicized 2020 Palakkad incident, where a pregnant elephant died after ingesting a bait filled with explosives. In 2019 (calendar year) alone,

Kerala recorded 119 elephant deaths, with 84 due to natural causes and several others linked to human-related incidents, including eight cases of electrocution (GoK, 2021).

In response to the increasing frequency and complexity of elephant mortality, the Government of Kerala has initiated targeted interventions. A recent step includes the issuance of Government Order G.O.(Rt) No. 451/2024/F&WLD (dated 15-10-2024; see Annexure 1), which constituted an Expert Committee to evaluate wild elephant deaths over the past decade. However, detailed and consistent mortality data is currently available for the six-year period from 2019 to 2024.

This report, therefore, focuses on analyzing elephant mortality trends in Kerala during this period, examining both natural and unnatural causes, and identifying key patterns to support informed and adaptive conservation strategies.

2. OBJECTIVES

This report provides a detailed assessment of elephant mortality trends in Kerala from 2019-20 to 2024-25. It examines the underlying causes, both natural and unnatural, and explores patterns and implications of elephant deaths, aiming to contribute to the development of effective conservation strategies. The key objectives are as follows:

- To comprehensively assess elephant mortality trends in the state, examining annual and monthly patterns while identifying key variations and overarching trends.
- To analyse age and gender-specific mortality patterns and compare them with the State's estimated population structure, providing insights into demographic influences on mortality.
- To investigate the causes of elephant mortality, covering both natural factors and human-induced threats.
- To examine the seasonality and spatial distribution of elephant mortality, identify hotspots, and compare them with the monthly HWC incident reporting system

maintained by the KFD, offering seasonal and spatial insights for targeted mitigation efforts.

- Based on the in-depth analysis, to provide evidence-based recommendations and strategic and site-specific measures for reducing elephant mortality and mitigating key threats.

3. SCOPE OF THE STUDY

This study examines elephant mortality in Kerala over the period from 2019-20 to 2024-25, systematically analysing data from all the territorial forest divisions and Protected Areas in Kerala. It draws upon mortality records maintained by the Kerala Forest Department, accessed through a specialized web portal (HAWK), to ensure a thorough assessment of mortality trends across different landscapes. The analysis delves into annual and monthly variations, demographic patterns based on age and gender, and the primary causes of mortality, including both natural and human-induced factors. Additionally, it evaluates the seasonal and spatial distribution of elephant deaths, identifying key mortality hotspots and correlating them with HWC incident reports (from WhatsApp Group) and current population structure. By integrating these insights, the study aims to enhance understanding of mortality dynamics and contribute to the development of targeted conservation strategies. Ultimately, this report will present data-driven, site-specific recommendations and strategic interventions to mitigate causes for unnatural elephant mortality and strengthen conservation efforts across the State.

4. REVIEW OF LITERATURE

4.1. Threats to Elephant Populations

Elephant populations in India face persistent threats from habitat loss, fragmentation, and poaching (Leimgruber et al., 2003; Choudhury et al., 2008). Though ivory poaching has declined, its long-term impacts - especially on skewed sex ratios - are still evident (Baskaran, 2013). Historical studies in Tamil Nadu attribute 45–68% of tusker deaths to ivory poaching (Sukumar, 1989). Given the species' slow reproductive rate, such pressures may result in delayed population declines and eventual local extinctions (Armbruster et al., 1999).

4.2. Elephant Mortality Trends in India

4.2.1. Landscape- and State-Level Studies

Comprehensive, long-term analyses of elephant mortality across large landscapes are limited in India. Most available research is localized or short-term, hindering a broader understanding of mortality trends critical for informed conservation planning. Official mortality records, though valuable, are often restricted and inconsistent. A notable exception is a 32-year dataset (1979–2011) from Mudumalai Tiger Reserve and adjoining divisions in the Nilgiris-Eastern Ghats range, which revealed mortality patterns during peak poaching decades (Daniel et al., 1987; Davidar et al., 2015; Prasad, 2000).

4.2.2. Odisha Case Study

Odisha is among the few states with publicly available long-term mortality data. Over an 18-year period (2001–2018), 1,061 elephant deaths were recorded across 943 incidents, with the highest mortality in winter and in human-dominated landscapes. Disease was the leading cause, followed by accidents and unknown factors, with over half of the deaths involving elephants under 20 years of age (Pelai et al., 2021).

4.3. Disease-Related Mortality: EEHV

Elephant Endotheliotropic Herpesvirus (EEHV) is a major cause of death among juvenile Asian elephants, especially those aged 1–10 years (Hoornweg et al., 2021; Long et al., 2016). EEHV1A, EEHV1B, EEHV4, and EEHV5 affect Asian elephants, while other strains infect African elephants. While adults often carry the virus latently, young elephants are highly vulnerable to the often-fatal EEHV-Haemorrhagic Disease (EEHV-HD).

In captive settings, EEHV-HD accounts for 50–60% of juvenile deaths, with mortality rates of 12–17% among calves born in Western zoos (Howard & Schaftenaar, 2018; Jesus et al., 2021). Though most research originates from captive populations, EEHV-related fatalities have been documented in semi-captive and wild elephants across Asia (Zachariah et al., 2013, 2018; Bouchard et al., 2014; Reid et al., 2006). However, limited surveillance in wild populations constrains understanding of its full impact.

4.4. Age-Specific Mortality Patterns

Studies on age-specific elephant mortality in the wild reveal clear differences between Asian and African populations, as well as strong age and sex-related patterns. In the wild Asian elephants, long-term observations from southern India (1980–2000) show that mortality is highest among calves—particularly males under five years old, with rates of 10–30% per year—while female calves under one year experience 5–15% mortality, and subadult or adult elephants (5–40 years) show much lower rates of about 3% annually (Sukumar, 2003).

In African savanna elephants, calf mortality also varies regionally, reaching around 25% in Etosha and 10% in Manyara, whereas adult females experience only 1–5% annual mortality, and total population die-off rarely exceeds 4% per year (Sukumar, 2003). Overall, these studies indicate that elephant mortality is highly age-dependent and influenced by ecological and environmental factors such as drought, habitat conditions, disease, and human pressures, with juvenile survival emerging as a key determinant of long-term population stability and growth.

Vanitha et al. (2005) reported high mortality in captive elephant calves in Tamil Nadu, with 31.3% deaths in the 0–1 year group and around 7% in the 1–10-year group. These figures support broader evidence linking EEHV-HD to high calf mortality, particularly in elephants under 10 years.

4.5. Comparative Studies

To contextualize findings from the present study, several past investigations were referenced. These include demographic studies by Arivazhagan & Sukumar (2005) in the Nilgiris and adjacent protected areas, mortality assessments in Mudumalai (Mohanarangan et al., 2022), and research on electrocution-related deaths in the Ranni landscape (Baskaran et al., 2013). Long-term datasets from Mudumalai and the Nilgiris (Davidar et al., 2015), population studies from Biligirirangan (Sukumar, 2003), as well as mortality analyses from Odisha (Pelai et al., 2021), provide valuable benchmarks for understanding regional variation and conservation challenges, supporting comparison with Kerala's mortality patterns in the current study.

5. METHODOLOGY

5.1. Primary Data Sources and Collection Methods

The study utilized data from the **HAWK (Hostile Activity Watch Kernel)** system, a cloud-based platform monitoring forest and wildlife crimes in Kerala. The mortality module within HAWK was central, recording detailed data on wildlife deaths, particularly elephants. Data were categorized into:

- **Demographic Details**: Age, sex, and carcass oldness.
- **Spatial Information**: Division, range, and geo-coordinates.
- **Causal Data**: Natural (e.g., disease, aging) and unnatural causes (e.g., poaching, electrocution, train hits).
- **Documentation**: Postmortem reports and mahazars.

This structured classification enabled trend analysis by year, location, cause, age class, and gender, revealing ecological and anthropogenic drivers of elephant mortality.

5.2. Integrating Population and Conflict Data for Mortality Assessment

To contextualize elephant mortality patterns, the elephant mortality analysis drew upon two complementary datasets:

- **Elephant Population Estimation (2023):** Elephant populations were estimated at the State level in both 2023 and 2024, within the six-year mortality reporting period (2019–2024). Earlier assessments (2005, 2007, 2010, 2012, 2017) were excluded as they fall outside this reporting window. The 2023 estimate, including age–sex composition, was adopted as the **baseline** because it was considered more reliable than the 2024 estimation. This reliability was supported by the higher number of sightings in 2023 (1,296 classified individuals) compared to 2024 (992). The greater sightings in 2023 were likely facilitated by more favourable climatic conditions, particularly lower rainfall during the enumeration.

- **Human–Elephant Conflict Data (May 2024 – April 2025):** Conflict incidents systematically recorded at the State level since May 2024 were analysed to explore

potential links between conflict intensity and elephant mortality. The dataset documented both the types of conflict incidents (e.g., crop raiding, property damage, attacks on humans) and their spatial hotspots, providing essential context for interpreting human-induced mortality such as electrocution, vehicle collisions, poaching, and poisoning. A total of 7604 cases were reported as human–elephant conflict during this period; however, elephants were actually involved in conflict in only 2333 cases (30.7%), while the rest (5271 reports – 69.3%) were merely sightings of elephants near human habitations. Therefore, only the confirmed conflict incidents were considered in the analysis to identify conflict hotspots, assess monthly patterns, and examine possible relationships with monthly mortality trends.

Together, these datasets enabled a more nuanced assessment of elephant mortality by linking population structure, including age–sex composition, with observed mortality patterns, while also relating the spatial intensity of conflict to human-induced deaths.

5.3. Analytical Approach to Understand Elephant Mortality

The analysis framework covered:

- **Temporal Trends**: Yearly and monthly mortality fluctuations.
- **Spatial Patterns**: Division-wise distribution and high-risk zones.
- **Demographic Analysis**: Age and gender-specific vulnerabilities.
- **Cause-specific Mortality**: Categorized by age group and classified into natural *vs*. human-induced deaths.

This multi-dimensional approach provided a comprehensive understanding of elephant mortality, supporting targeted conservation strategies and scalable wildlife management practices.

6. RESULTS

6.1. Temporal Analysis of Elephant Mortality in Kerala's Forests

Between April 2019 and March 2025, 744 wild elephant deaths were recorded in Kerala's forests (Table 1). Of these, 573 cases (77%) were classified by both age and gender,

while an additional 26 cases (3.5%) were classified by age alone, bringing the total number of cases suitable for demographic analysis to 599 (80.5%). The remaining 145 cases (19.5%) could not be classified due to advanced decomposition or other limiting factors that hindered proper examination.

Table 1: Yearly and Monthly Cumulative Trends in Elephant Mortality Across Kerala's Forests

Month	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	Total	Rank
Apr	7	12	11	10	12	12	64	6
May	20	14	6	6	12	21	79	1
Jun	14	9	9	12	8	13	65	5
Jul	14	2	11	12	8	20	67	4
Aug	9	7	9	5	8	9	47	12
Sep	12	12	10	4	5	8	51	9
Oct	6	10	13	9	6	5	49	11
Nov	7	9	6	5	10	13	50	10
Dec	10	4	4	18	9	11	56	8
Jan	10	14	10	11	10	8	63	7
Feb	11	9	9	18	16	12	75	3
Mar	15	12	8	6	19	18	78	2
Total	**135**	**114**	**106**	**116**	**123**	**150**	**744**	

Using the above dataset, the following analysis examines annual patterns, monthly fluctuations, and emerging trends in elephant mortality across Kerala's forests.

6.1.1. Overall Mortality Rates

The Kerala Forest Department's 2023 survey estimated the elephant population at 1,920 individuals using the block count method and 2,386 individuals using the dung count method (KFD, 2023). Based on these figures, the population is approximated at about 2,000 individuals. During the six-year reporting period, an average of 124 deaths per year was recorded, giving an overall annual mortality rate of 6.2% (124 out of 2,000), irrespective of age or sex.

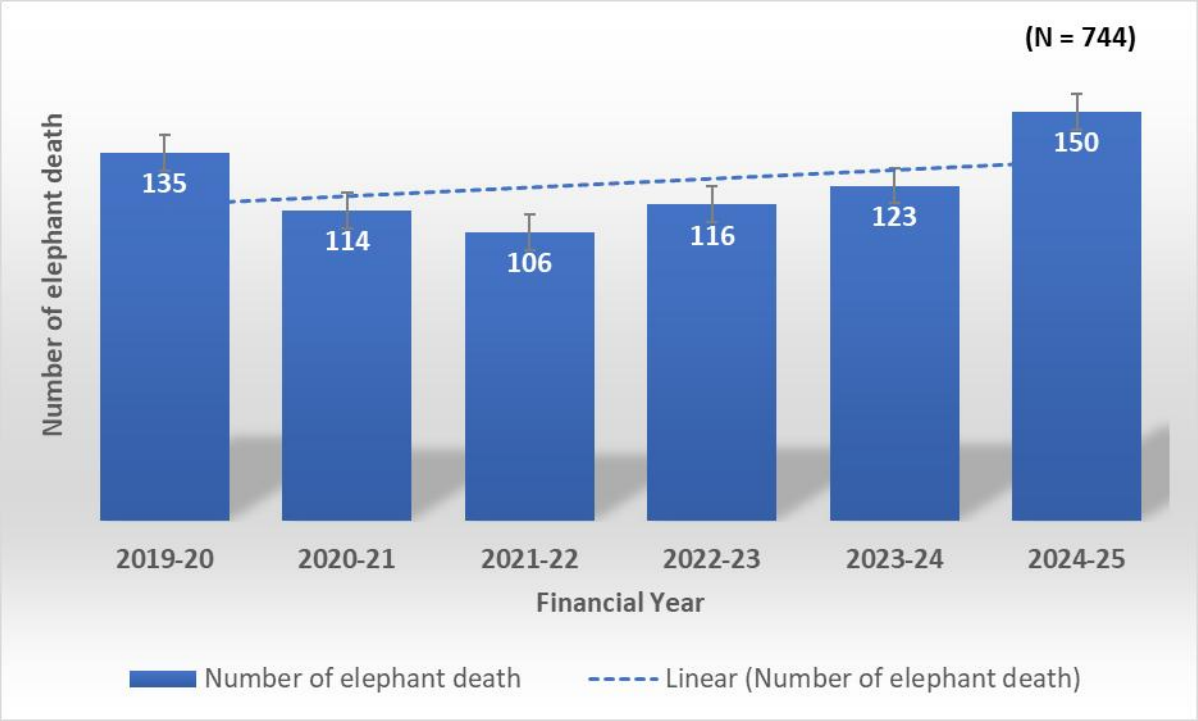
Based on the DNA-based Synchronous All India Population Estimation of Elephants (SAIEE, 2021–2025) conducted by the Wildlife Institute of India (Qamar Qureshi et al., 2021–2025), Kerala's wild elephant population is estimated at 2,785 individuals. Using this

population estimate and the recorded average annual mortality of 124 elephants, the annual mortality rate for the state is calculated at approximately 4.45%.

6.1.1.1. Annual Trends

Over six years, annual elephant mortality showed clear fluctuations (Fig. 1). Deaths peaked at 135 (18.1%) in 2019–20, declined to 106 (14.2%) in 2021–22 - the lowest point - then rose to 113 (15.2%) in 2023–24. In 2024–25, deaths surged to 150 (20.2%), marking the highest count during the reporting period.

Fig. 1: Annual trends in elephant mortality in Kerala (cumulative data: 2019-20 – 2024-25)



6.1.1.2. Monthly Trends

Monthly analysis (Fig. 2) shows distinct seasonal trends in elephant mortality:

- January–May (High Mortality): Highest deaths occur in this period, with May (79/10.6%), March (78/10.5%), February (75/10.1%), and January (63/8.5%) showing consistently elevated figures.
- June–September (Moderate Mortality): Deaths decline during monsoon months, with August (47/6.3%) recording the lowest. June (65/8.7%) and July (67/9.0%) show moderate but steady numbers.

- October–December (Variable Mortality): Mortality fluctuates; December (56/7.5%) sees a notable peak due to 18 deaths in 2022–23, while October and November show less consistent patterns.

Fig. 2: Monthly trends in elephant mortality (cumulative data: 2019-20 – 2024-25)

6.1.2. Comparative Analysis of Seasonal Trends in Elephant Mortality and HEC Incidents

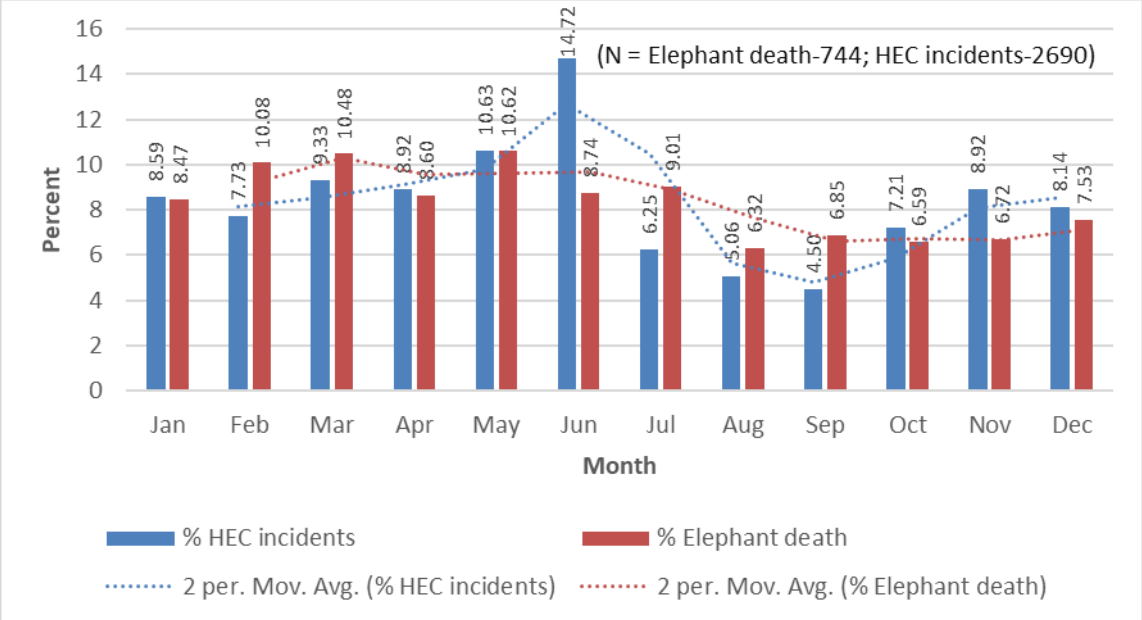
Figure 3 compares monthly percentages of HEC incidents causing property and crop damage[1] from July 2024 to June 2025 with elephant death percentages recorded between April 2019 and March 2025. When the data is grouped into two broad seasons, a clear contrast emerges between the dry-to-early monsoon months (January–June) and the main monsoon-to-post-monsoon months (July–December).

During January to June, HEC incidents are notably higher, with an average damage rate of about 10.07%. The peak occurs in June (14.72%), followed by elevated rates in May

[1] Out of a total of **8,410 Human-Elephant Conflict incidents reported from July 2024 to June 2025**, the majority - **5,720 cases (about 68%)** - were **mere elephant sightings** without any physical damage. The remaining **2,690 incidents (around 32%)** involved **actual damage to crops and property**, indicating that while elephant presence near human settlements is frequent, only about one-third of encounters escalate into destructive conflict. This suggests that a significant portion of HEC events represent opportunities for **preventive interventions and early warning measures**, as many incidents involve elephants passing through rather than actively causing harm. Strengthening community awareness and rapid response mechanisms during such non-destructive encounters could help reduce the number of cases that result in property or crop loss.

(10.63%) and March (9.33%). This trend indicates that conflict escalates as the dry season advances, with elephants moving closer to agricultural areas in search of food and water. The March to June period coincides with the jackfruit season, attracting elephants to farmlands, while June marks the start of paddy cultivation, further increasing human-elephant interactions. Additionally, water scarcity between March and May in certain areas compels elephants to approach human settlements, intensifying conflict during this time. Elephant deaths also show relatively high percentages in this period, peaking in March (10.48%) and May (10.62%), indicating a strong relationship between increased human-elephant interactions and mortality. The overlap of availability of crops such as Jack fruit and resource scarcity likely exacerbates these conflicts.

Fig. 3: A Comparative Analysis of Seasonal Trends in Elephant Mortality (2019-20 - 2024-25) and HEC (July 2024 – June 2025)



In contrast, July to December exhibits lower conflict intensity, with an average damage rate of about 6.68%. The lowest values are observed in August (5.06%) and September (4.50%), when monsoon rains ensure abundant natural food and water, keeping elephants within forest habitats. Correspondingly, elephant deaths are relatively lower and more stable, averaging around 7.17%, with minor fluctuations. This period represents a phase of relative calm, where improved ecological conditions reduce direct encounters between elephants and human communities.

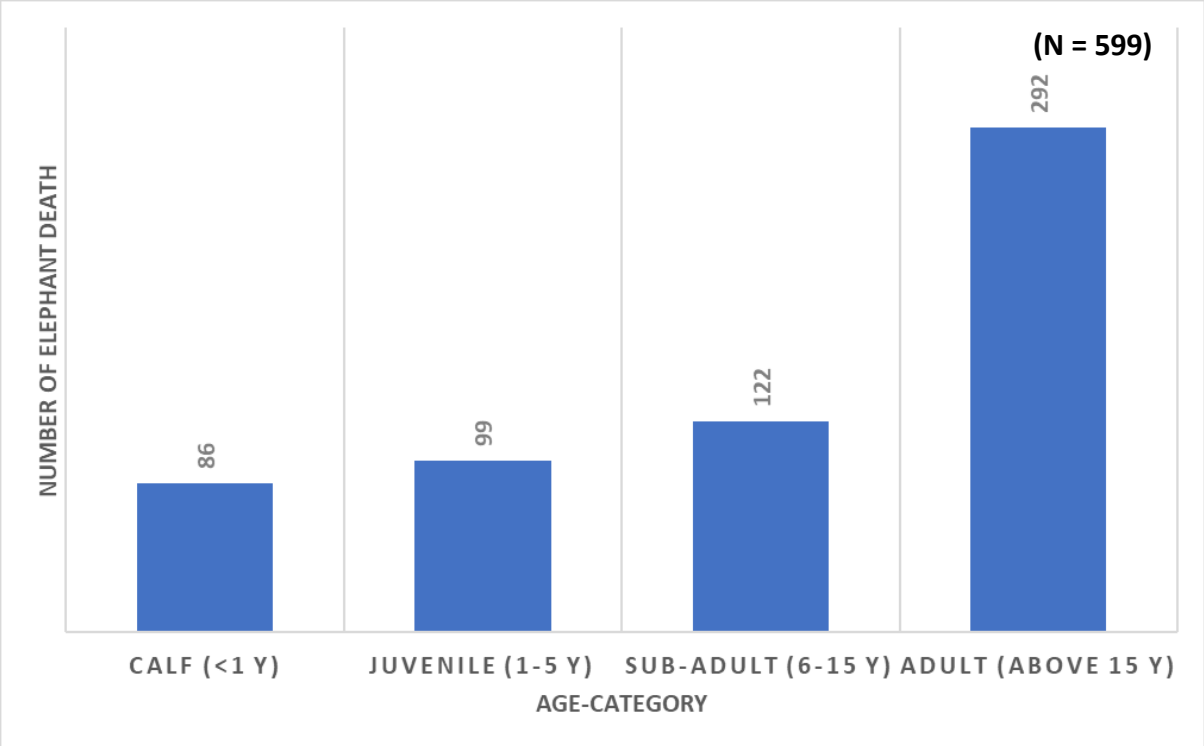
Overall, the January–June period stands out as the critical high-risk season for both crop damage and elephant mortality, while July–December reflects a low-conflict phase. These seasonal dynamics highlight the importance of strategically focusing mitigation measures—such as crop protection, water provisioning, and early warning systems—during the first half of the year to minimize both human and elephant losses and promote long-term coexistence.

6.2. Demographic Trends in Elephant Mortality

6.2.1. Analysis by Age-Category

From 2019–20 to 2024–25, 599 elephant deaths in Kerala show a clear age-wise trend (Fig. 4). Calves under one year accounted for 86 deaths (14.4%), and juveniles aged 1–5 years for 99 deaths (16.5%), indicating peak early-life mortality. Sub-adults aged 6–15 years recorded 122 deaths (20.4%), while adults over 15 years saw the highest mortality with 292 deaths (48.7%).

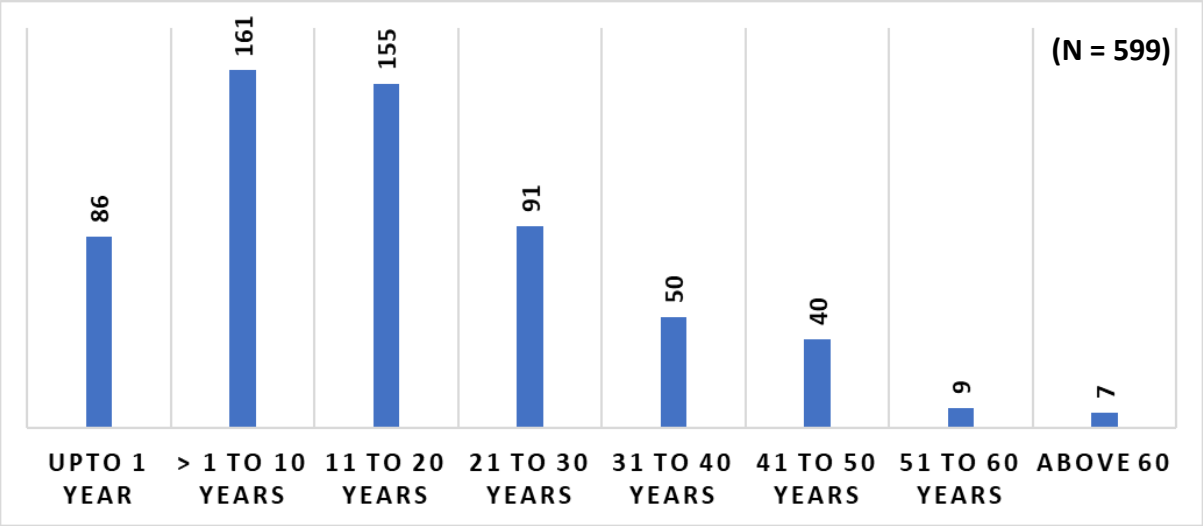
Fig. 4: Age-wise distribution of elephant mortality in Kerala during 2019- 20 to -2024-25



'Y'= Years

By 10-year intervals (Fig. 5), the 1–10-year group had the highest mortality (161 deaths, 26.9%), followed by 11–20 years (155 deaths, 25.9%). Mortality declined in older groups: 21–30 years (91 deaths, 15.2%), 31–40 (50, 8.3%), 41–50 (40, 6.7%), 51–60 (9, 1.5%), and 60+ (7, 1.2%).

Fig. 5: Trends in elephant mortality across age categories (10-year intervals) in Kerala



'Y'= Years

Overall, the data reveals peak mortality in the first decade of life, a moderate decline during adolescence, and sustained high absolute mortality among adults.

6.2.2. Analysis of Age and Gender Category

Table 2 details elephant mortality in Kerala by age and gender from a total of 599 recorded deaths, including 296 males (49.4%) and 277 females (46.2%). The adult age group (15+ years) recorded the highest number of deaths at 284 (47.4%), with females comprising 60.6% and males 39.4%. The calf category (<1 year) had 76 deaths (12.7%), where male deaths (59.2%) exceeded females (40.8%). Among juveniles (1–5 years), there were 94 deaths (15.7%), with males accounting for 68.1%, while females made up 31.9%. In the sub-adult group (6–15 years), 119 deaths (19.9%) were recorded, with male mortality at 63.0%, surpassing females at 37.0%. Male deaths consistently outnumbered female deaths in calves, juveniles, and sub-adults, while adult females showed higher mortality. Additionally, 26 cases (4.3%) lacked gender identification, reflecting data collection gaps.

Table 2: Age and gender-wise categorization of elephant mortality in Kerala

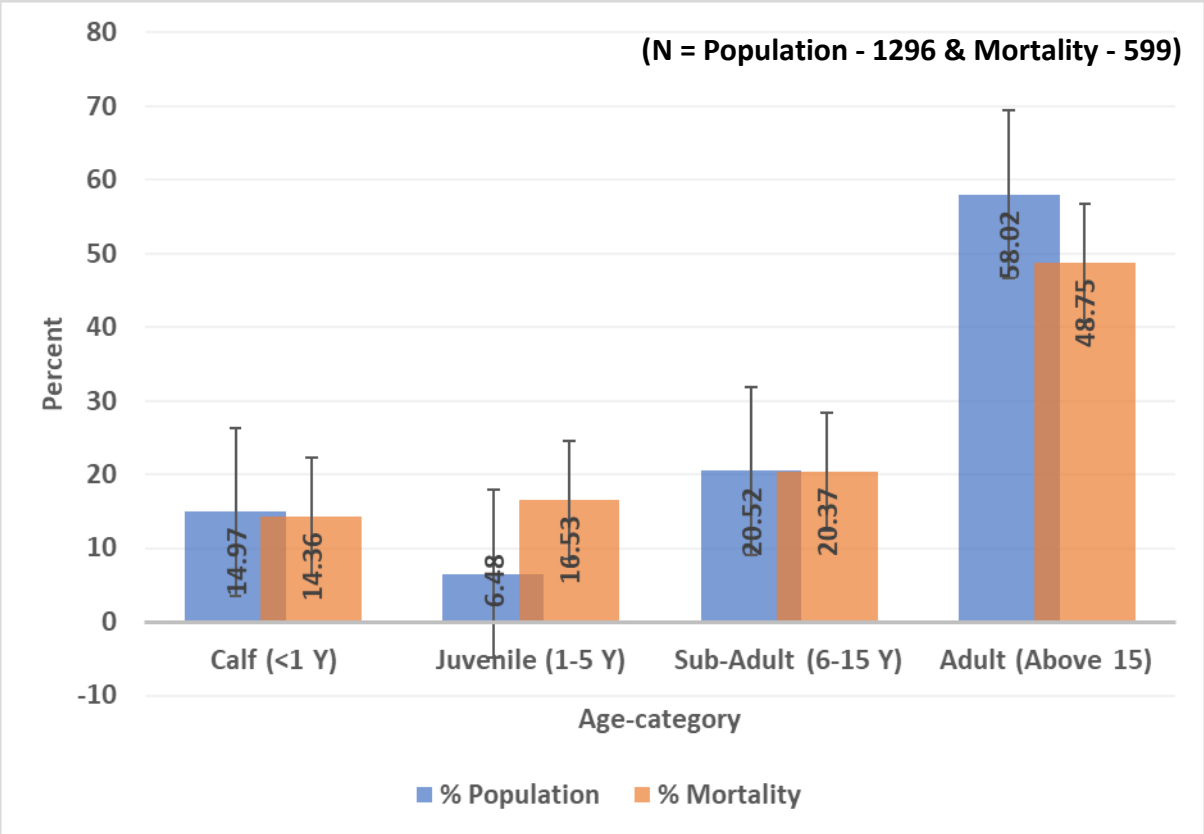
Age-Category	Gender classification			Total
	Female	Male	Ungendered	
Adult (Above 15)	172	112	8	**292**
Calf (<1 Y)	31	45	10	**86**
Juvenile (1-5 Y)	30	64	5	**99**
Sub-Adult (6-15 Y)	44	75	3	**122**
Total	**277**	**296**	**26**	**599**

'Y'= Years; 'Ungendered' indicates an unknown gender, but a determined age

6.2.3. Comparative Analysis of Age-Specific Elephant Population and Mortality

Figure 6 presents a comparison between age-wise elephant mortality over six years (2019–20 to 2024–25) and population distribution from 2023.

Fig. 6: Age-Wise Comparison of Elephant Mortality (2019-20 – 2024-25) and Population Distribution (2023)



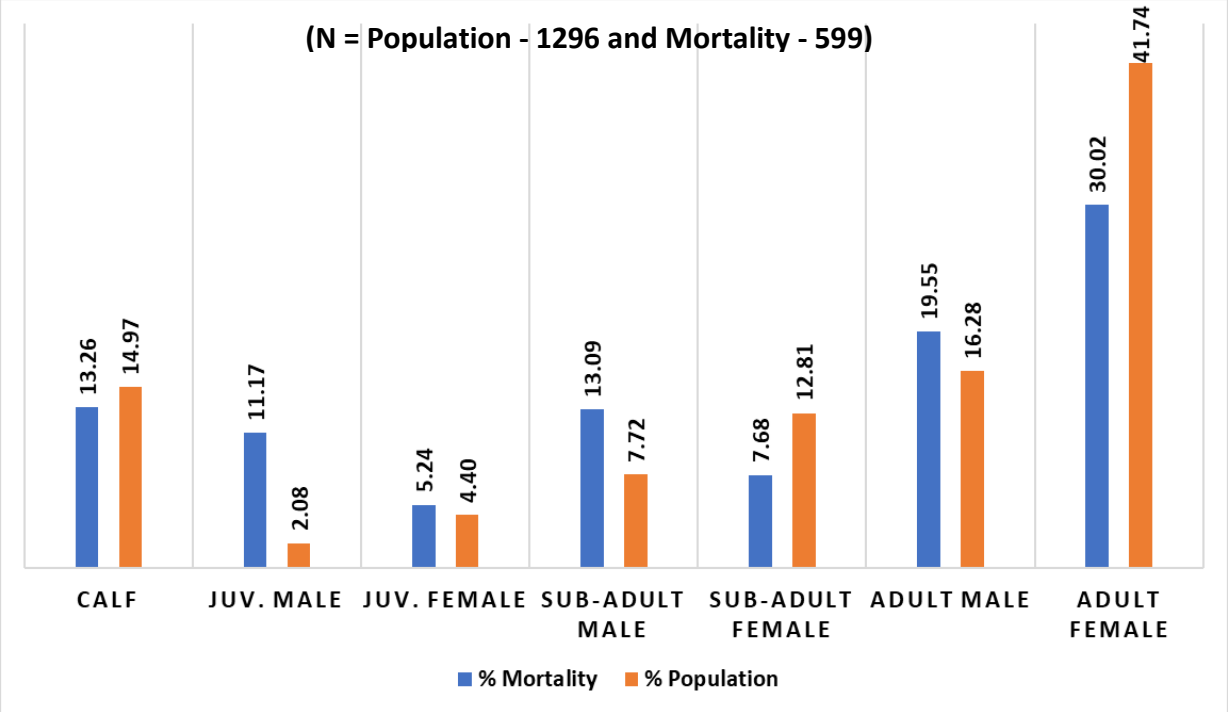
Adults (above 15 years) form the largest segment of the population (58.02%) and also account for the highest mortality share (48.75%), though slightly lower than their

population proportion. Sub-adults (6–15 years) show near parity between population (20.52%) and mortality (20.37%), indicating a consistent loss rate during this age phase. Calves (<1 year) represent 14.97% of the population and 14.36% of mortality, showing a balanced pattern. In contrast, juveniles (1–5 years) exhibit a significant disparity, constituting only 6.48% of the population but accounting for 16.53% of deaths, highlighting this group as particularly vulnerable.

6.2.4. Comparative Analysis of Age and Gender-Specific Elephant Population and Mortality

Figure 7 compares age-and-gender-based elephant mortality and population in Kerala. Calves show similar mortality (13.26%) and population (14.97%) rates. Juvenile males display high vulnerability, with mortality (11.17%) far exceeding their population share (2.08%), while juvenile females show a moderate difference (5.24% mortality vs. 4.40% population). These trends indicate that juvenile and sub-adult males are the most vulnerable demographic groups, requiring targeted conservation attention.

Fig. 7: Age-Sex Based Population (2023 Estimation) and Mortality Distribution (2019-20 to 2024-25 average) of Elephants in Kerala

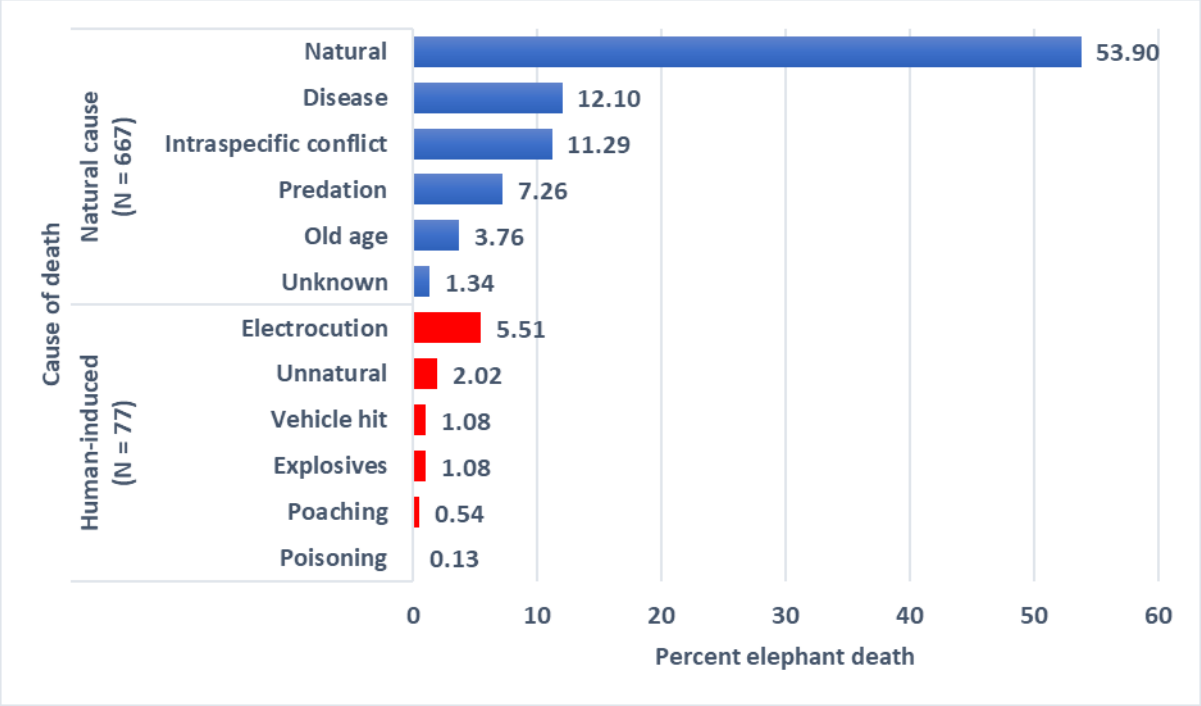


6.3. Causes of Elephant Mortality

6.3.1. Natural-Causes vs Human-Induced Threats

Figure 8 presents the causes and frequency of elephant mortality in Kerala from 2019–20 to 2024–25. Natural causes account for the majority of deaths (667 cases), representing 89.64% of total mortality. The largest share is attributed to unspecified 'natural'[2] causes (53.90%), followed by disease (12.10%), intraspecific conflict (11.29%), and predation (7.26%). Minor contributors include old age (3.76%) and unknown natural factors (1.34%).

Fig. 8: Causes of Elephant Mortality in Kerala (2019-20 – 2024-25): Natural vs. Human-Induced Factors



Human-induced deaths make up 10.36% (77 cases), with electrocution as the leading cause (5.51%), likely linked to exposed or poorly managed electrical infrastructure. Other causes include unnatural[3] incidents (2.02%), vehicle collisions (1.08%), explosives (1.08%),

[2] The classification of '**natural'**, as a cause of death under the broader category of '**Natural-cause'**, refers to unspecified natural events where necropsy findings do not indicate mortality caused by human-induced threats, nor any other reasons provided under the 'Natural' category.

[3] The classification of '**unnatural**' as a cause of death under the broader category of '**Human-Induced**' applies to cases of suspicious death where necropsy findings do not provide conclusive evidence of a specific cause of mortality. This includes instances where no

poaching (0.54%), and poisoning (0.13%). While natural mortality dominates overall, disease, intraspecific aggression, and predation are notable threats within that category. In contrast, human-induced deaths, though fewer, are concentrated and often preventable, highlighting the need for targeted interventions, particularly in managing electrical infrastructure and mitigating conflict-related risks.

6.3.2. Natural-Causes vs Human-Induced Threats: By Age-Category

Figure 9 offers valuable insights into patterns of elephant deaths, distinguishing between natural and human-induced causes in different age-categories.

Fig. 9: Heat Map of Elephant Mortality Causes in Kerala (2019–2024): Categorized by Age

Category	Cause of death	Calf (<1 Y)	Juvenile (1-5 Y)	Sub-Adult (6-15 Y)	Adult (Above 15 Y)	Total
Natural causes	Natural	53	55	60	154	**322**
	Disease	13	16	15	32	**76**
	Intraspecific conflict		3	19	46	**68**
	Predation	18	11	10	11	**50**
	Old age		1		16	**17**
	Unknown		2	2	3	**7**
Human-induced causes	Electrocution		2	13	19	**34**
	Unnatural	1	6		4	**11**
	Explosives		3	2		**5**
	Vehicle hit				5	**5**
	Poaching	1			2	**3**
	Poisoning			1		**1**
Total		**86**	**99**	**122**	**292**	**599**

Y = Year

Natural causes dominate the overall mortality figures, with 'Disease' being the most significant contributor across all age groups, accounting for 322 out of 599 total deaths (53.8%). This cause is particularly prevalent among adult elephants, with adults alone contributing 154 deaths due to disease, indicating the vulnerability of older elephants to

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apparent external injuries, poisoning, or other visible indicators of human-induced threats can be identified, yet the circumstances surrounding the death raise reasonable suspicion of human involvement. Additionally, it encompasses cases where no definitive threats listed under 'Human-Caused' threats can be established through post-mortem examination.

health-related issues. Additionally, 'Old Age' is a notable natural cause, responsible for 76 deaths (12.7%), with the majority of these also occurring among adult and sub-adult elephants. Infanticide and birth complications, while lesser in absolute numbers, still account for 68 deaths (11.4%), primarily among calves and juveniles, reflecting neonatal and early-life vulnerabilities. Other natural causes like parasites (50 deaths, 8.3%) and accidents such as drowning and falls (34 deaths, 5.7%) are also observed but are relatively lower in impact.

In contrast, human-induced causes, though fewer in number, still represent a significant portion of mortality. Train accidents account for 17 deaths (2.8%), with a sharp impact on juvenile and sub-adult elephants. Poisoning, electrocution, and snares/traps together account for a total of 28 deaths (4.7%), and though individually they seem minor, their collective impact underscores the ongoing threat from human conflict and illegal activities. Electrocution alone is responsible for 11 deaths, most of which affect sub-adults and adults, revealing exposure to human habitation and power infrastructure. Gunshot wounds, though relatively rare at 5 deaths, remain a concern. Notably, hunting and man-made barriers like fences caused 5 and 3 deaths respectively, suggesting the indirect but fatal consequences of human territorial encroachment.

The heat map clearly visualizes that natural causes account for the majority (over 85%) of elephant mortalities, but human-induced causes, while lesser in quantity, show a concerning pattern, particularly in sub-adult and adult groups, indicating an intersection of elephant migration routes and human activity.

6.4. Spatial Distribution of Elephant Mortality

Figure 10 presents elephant mortality patterns in Kerala (2019–20 to 2024–25), identifying four key hotspots based on incident density.

The Wayanad Landscape, including Wayanad Wildlife Sanctuary and adjacent forest divisions, is part of a transboundary forest region spanning Kerala, Karnataka, and Tamil Nadu, supporting 30–35% of India’s Asian elephants. High mortality here is mainly linked to seasonal migrations, especially in summer.

The Nilambur–Nilgiri Landscape (Nilambur North and South) forms a vital ecological corridor connecting to Mudumalai Tiger Reserve and the Nilgiri Forests in Tamil Nadu, facilitating elephant movement.

The Parambikulam–Munnar–Malayattoor Landscape, covering several forest divisions, connects with the Anamalai Tiger Reserve, supporting transboundary elephant movement and regional conservation.

The Periyar–Ranni–Konni Landscape in southern Kerala, encompassing Periyar Tiger Reserve and nearby divisions, is crucial for maintaining the state's elephant population and habitat continuity.

These hotspots underscore the importance of ecological connectivity, migration corridors, and interstate coordination in elephant conservation.

6.4.1. Comparison of Elephant Mortality Hotspots and HEC Zones

A spatial comparison of elephant mortality hotspots (2019-20 – 2024-25, Fig. 13) and HEC hotspots (May 2024–April 2025, Fig. 11) reveals critical overlaps and divergences, offering insight into the varying nature and causes of elephant deaths across Kerala.

i. High Mortality & High Conflict Zones (Overlapping Hotspots):

- Wayanad region (incl. Wayanad WLS) and Thrissur–Chalakkudy–Vazhachal–Malayattoor belt (bordered by human settlements) show persistent overlap of both high mortality and intense HEC.

- Additional overlapping clusters include:
    - Marayoor FD & Chinnar WLS
    - Fringe areas of Periyar West Division (e.g., Sabarimala) and Ranni & Konni FDs

  These overlaps suggest conflict-related stressors - like crop raiding, retaliation, and habitat intrusion - may be contributing to elephant deaths.

Fig. 10: Kernel Density Map of Elephant Mortality Across Kerala Forest Divisions (2019-20 – 2024-25)

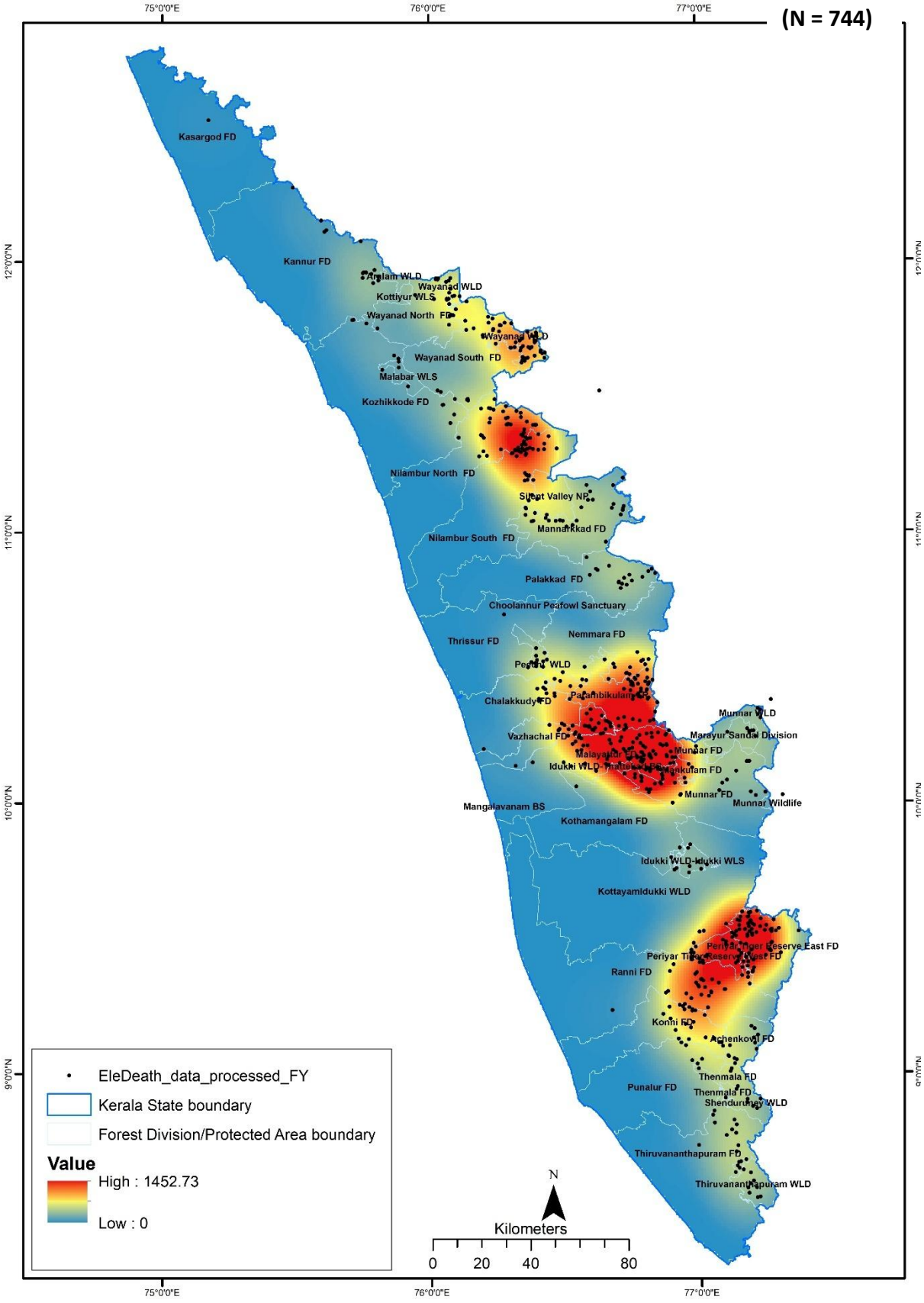
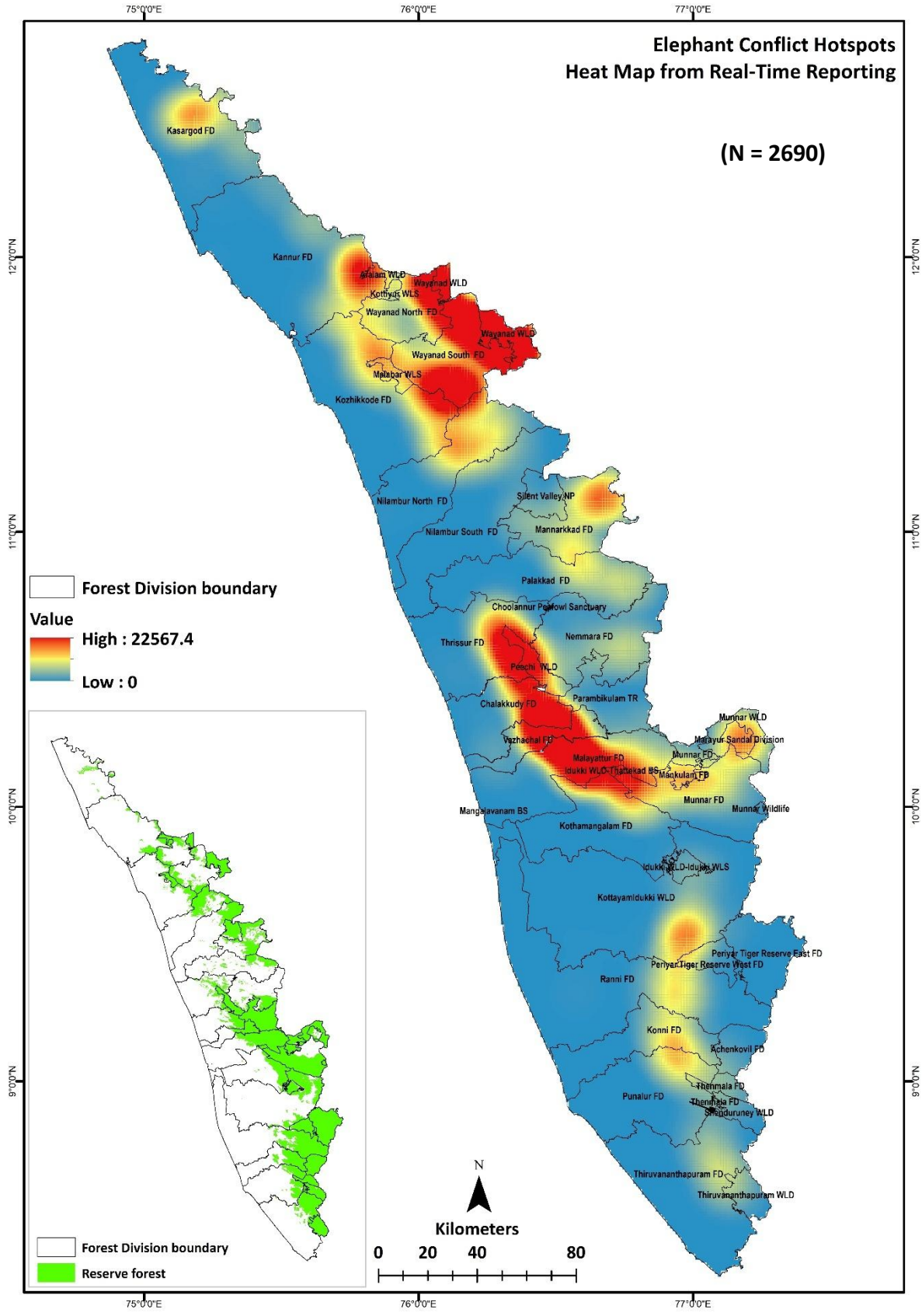


Fig. 11: Hotspots of HEC locations reported in Kerala from May 2024 to April 2025



ii. High Mortality, Low Conflict Areas:

- Periyar and Parambikulam Tiger Reserves (core zones with limited human presence) show elevated mortality but low conflict, indicating natural causes such as disease or accidents.
- Nilambur North & South FDs and Kottayam FD also record high mortality with fewer HEC incidents, supporting the likelihood of non-conflict-related causes.

iii. High Conflict, Low Mortality Areas:

- Thrissur FD experiences frequent HECs but relatively low elephant deaths, suggesting effective mitigation or less lethal encounters.
- Palakkad FD reports high conflict mainly due to train collisions, yet with fewer fatalities overall.

This analysis underscores the need for region-specific interventions, addressing both conflict mitigation in overlapping hotspots and health monitoring in non-conflict zones with high mortality.

6.4.2. Analysis of Elephant Mortality Causes across Forest Divisions

Figure 12 provides a Forest Division-wise analysis of elephant mortality in Kerala, distinguishing between natural and human-induced deaths.

Under natural causes, the Malayattoor Division recorded the highest mortality with 81 deaths (12.2%), including 50 general, 12 disease-related, 7 each from intraspecific conflict and predation, 4 from old age, and 1 unknown. Other divisions with high natural mortality include Periyar East (62), Wayanad WLS (50), Munnar and Ranni (48 each), and Nilambur South (40). Intraspecific conflict caused 84 deaths (11.29%), with Parambikulam reporting the highest (11 deaths, 13.1%). Predation accounted for 54 deaths (7.26%), mainly in Wayanad WLS (9), Malayattoor (7), and Ranni (3) - reflecting ecological pressures in tiger-rich zones.

Though fewer, human-induced deaths remain critical, totalling 77 (10.35%). Leading causes include electrocution (41, 5.5%), unnatural causes (15, 2.02%), explosives and vehicle collisions (8 each, 1.1%), poaching (4, 0.54%), and poisoning (1, 0.13%).

Fig. 12: Heat Map of Elephant Mortality Causes Across Forest Divisions in Kerala

Forest Division	Natural cause						Human-induced						Total
	Natural	Disease	Int. conflict	Predation	Old age	Unknown	Electrocution	Unnatural	Explosives	Vehicle hit	Poaching	Poisoning	
Achenkovil	10	1	1	2									14
Aralam WLS	1		1										2
Chalakkudy	5	1	1	3			1						11
Eravikulam NP	5	1											6
Idukki WLS	5				1								6
Kannur	6	1					3	3					13
Kasaragod		1											1
Konni	10	2	2		2				1			1	18
Kothamangalam	1												1
Kottayam	7						1				1		9
Kozhikkode	6	2	1			1		2					12
Malayattoor	50	12	7	7	4	1	5	3					89
Mankulam	2	1	1										4
Mannarkad	19	2	2			1	2		3				29
Marayoor	3	2	1				1						7
Munnar	27	4	3	2	1	3	4	4					48
Nenmara	8		6	1	1		1						17
Nilambur (North)	19	8	2	5			2	1					37
Nilambur (South)	26	6	7	1			1						41
Palakkad	6		1				3			7			17
Parambikulam TR	17	4	11	2							1		35
Peechi WLS	5	1	1	3	3		1						14
Periyar (East)	40	4	7	4	5	2		1					63
Periyar (West)	11	1	1	3	1		1		1				19
Punalur	2						2		1				5
Ranni	26	6	4	3	3		3	1	2				48
Shendurney WLS	3		4										7
Silent Valley NP	3		1								2		6
Thenmala	1	2	1										4
Thiruvananthapuram	8	3	2				2						15
Thiruvananthapuram WL	7	4											11
Thrissur	1						1						2
Vazhachal	25	6	5	4	5	1	1						47
Wayanad (North)	5	2	1	5	1		1						15
Wayanad (South)	6	5	3			1	2						17
Wayanad WLS	25	8	7	9	1		3			1			54
Total	**401**	**90**	**84**	**54**	**28**	**10**	**41**	**15**	**8**	**8**	**4**	**1**	**744**

NP = National Park; WLS = Wildlife Sanctuary; TR = Tiger Reserve; Int. = Intraspecific

Palakkad Division reported the highest human-induced deaths (10, 13%), including 7 vehicle collisions, marking it a transport conflict hotspot. Munnar recorded 8 deaths (4 electrocution, 4 unnatural), linked to infrastructure threats. Ranni had a mix of causes, including explosives, reflecting human hostility or unsafe mitigation. Kannur reported 6 deaths (7.8%), split between electrocution and unnatural causes. Despite high total mortality, Malayattoor's 8 human-induced deaths made up only 9% of its total, indicating lower conflict intensity.

The widespread electrocution - notably in Malayattoor (5) and Munnar (4) - calls for urgent power infrastructure reform. Explosives reported in Konni, Ranni, Mannarkkad, Punalur, and Periyar West suggest illegal trapping or poaching. Suspected poisoning cases in Chalakkudy remain unconfirmed or unclassified.

In summary, natural causes dominate elephant deaths across Kerala, but human-induced mortality, though smaller in number, is concentrated and highly preventable, posing a significant threat to conservation efforts.

6.4.3. Geographic Distribution of Specific Threats

Figures 13(a)–17(c) illustrate the spatial distribution of key natural causes of elephant deaths across Kerala's forest divisions from 2019–20 to 2024–25, focusing on disease, predation, and intraspecific conflict.

Figure 13(a): Disease-Related Mortality: Malayattoor Division recorded the highest number of disease-related deaths (12), followed by Nilambur (North) and Wayanad Wildlife Sanctuary, with 8 deaths each. Nilambur (South), Ranni, and Vazhachal reported 6 deaths each, and Wayanad (South) followed with 5 deaths. In contrast, eleven divisions reported only a single death, indicating limited disease impact in those regions.

Figure 13(b): Predation-Related Mortality: Wayanad Wildlife Sanctuary, a tiger-rich area, reported the highest predation deaths (9), reinforcing the correlation between high predator density and elephant calf vulnerability. Malayattoor Division followed with 7 deaths, likely influenced by its proximity to Parambikulam Tiger Reserve. Nilambur (North) and Wayanad (North) each reported 5 deaths, while Periyar (East) and Vazhachal recorded 4 deaths. Chalakkudy, Peechi WLS, Periyar (West), and Ranni reported 3 each. Despite its

location near tiger habitat, Nenmara Division reported only 1 death, suggesting lower predation pressure there.

Figure 13(c): Intraspecific Conflict Mortality: Parambikulam Tiger Reserve had the highest deaths from intraspecific conflict (11), pointing to population density or social stress. Malayattoor, Nilambur (South), Periyar (East), and Wayanad WLS each recorded 7 deaths, followed by Nenmara (6) and Vazhachal (5). Ranni and Shendurney WLS reported 4 deaths, while Munnar and Wayanad (South) had 3 each. Divisions like Achenkovil, Aralam, Chalakkudy, and Silent Valley reported just 1 death, indicating minimal conflict levels.

The data highlight Malayattoor, Wayanad WLS, and Parambikulam as consistent hotspots across multiple natural mortality categories. Disease and predation dominate in tiger-linked landscapes, while intraspecific conflict is pronounced in densely populated or ecologically stressed habitats. These insights are vital for tailoring division-specific management and health monitoring strategies.

Figures 14(a) and 14(b) depict the spatial distribution of key human-induced causes of elephant mortality in Kerala from 2019–20 to 2024–25, focusing on electrocution, explosives, vehicle collisions, unnatural causes, poaching, and poisoning.

Figure 14(a): Electrocution, Explosives, and Vehicle Collisions: Electrocution is the most widespread cause, with Malayattoor (5 deaths) and Munnar (4) at the top. Kannur, Palakkad, Ranni, and Wayanad WLS each recorded 3 deaths, while other divisions reported fewer cases, showing a broad but scattered impact. Explosives, though less frequent, signal illegal trap use, with Mannarkad (3 deaths) leading, followed by Ranni (2) and others with single incidents. Mortality due to train hit were highly localized but fatal, especially in Palakkad (7 deaths), making it a major transport conflict zone. Wayanad WLS reported one case, underscoring corridor overlap.

Figure 14(b): Unnatural Causes, Poaching, and Poisoning: Unnatural causes were notably high in Munnar (4 deaths), Kannur, and Malayattoor (3 each), with scattered cases elsewhere, indicating indirect or accidental threats. Poaching, though limited, remains a concern, with Silent Valley (2 deaths) and Kottayam and Parambikulam (1 each), pointing to ongoing illegal hunting. A single poisoning case in Konni suggests intentional harm to elephants.

Fig. 13 (a): Locations of elephant death due to natural causes (Disease) from 2019 to 2025

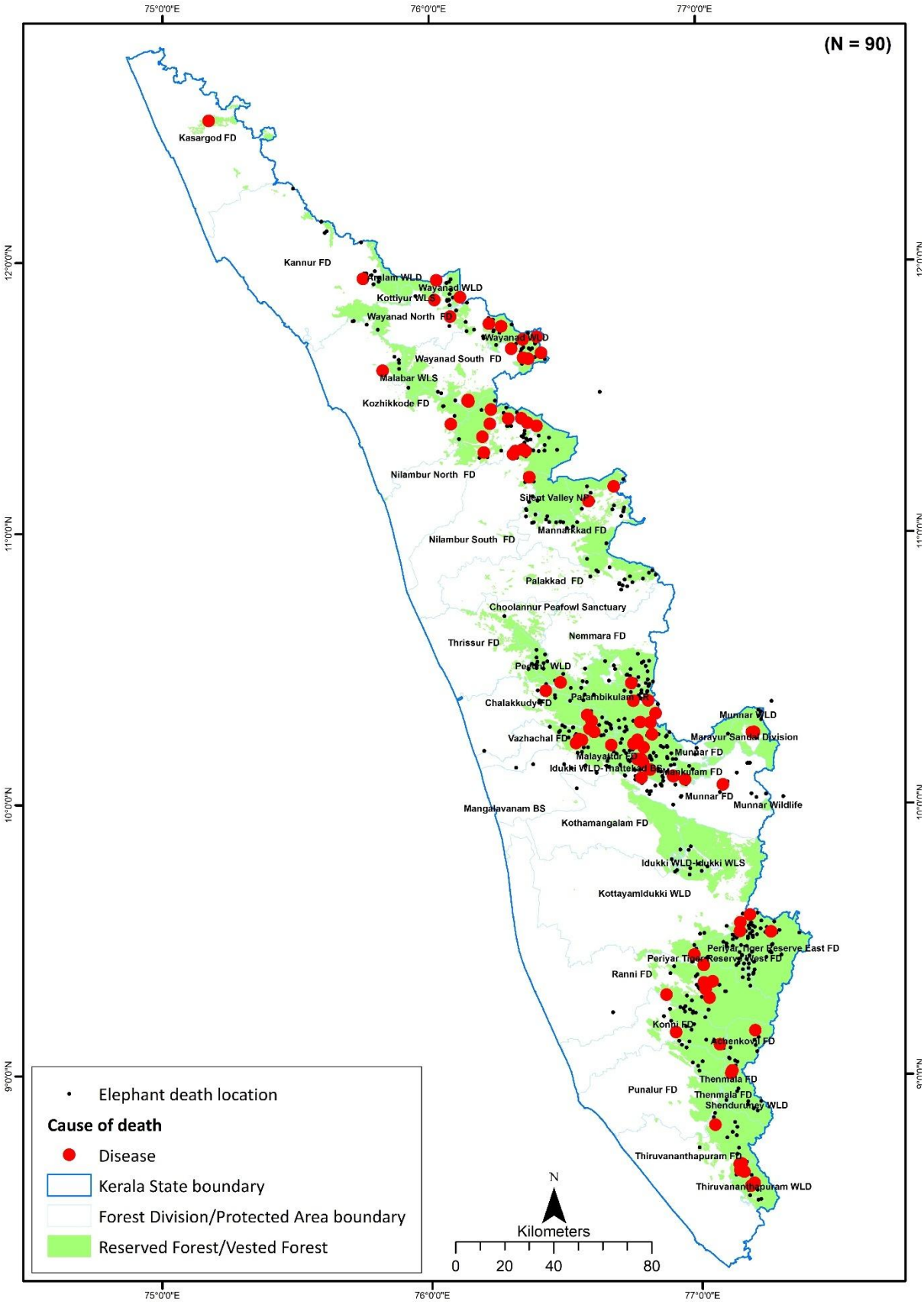


Fig. 13 (b): Locations of elephant death due to natural causes (Predation) from 2019 to 2025

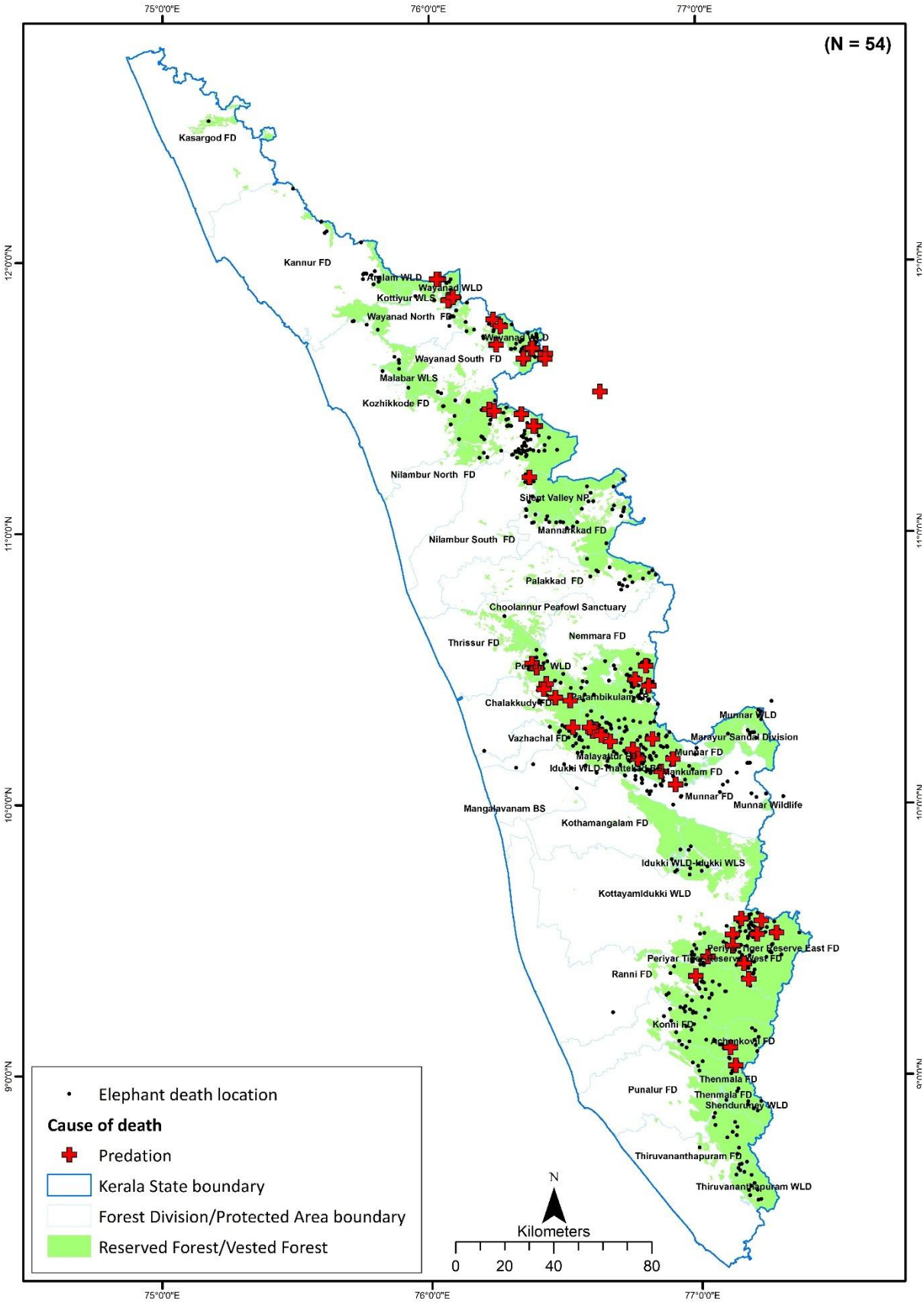


Fig. 13 (c): Locations of elephant death due to natural causes (Intraspecific conflict) from 2019 to 2025

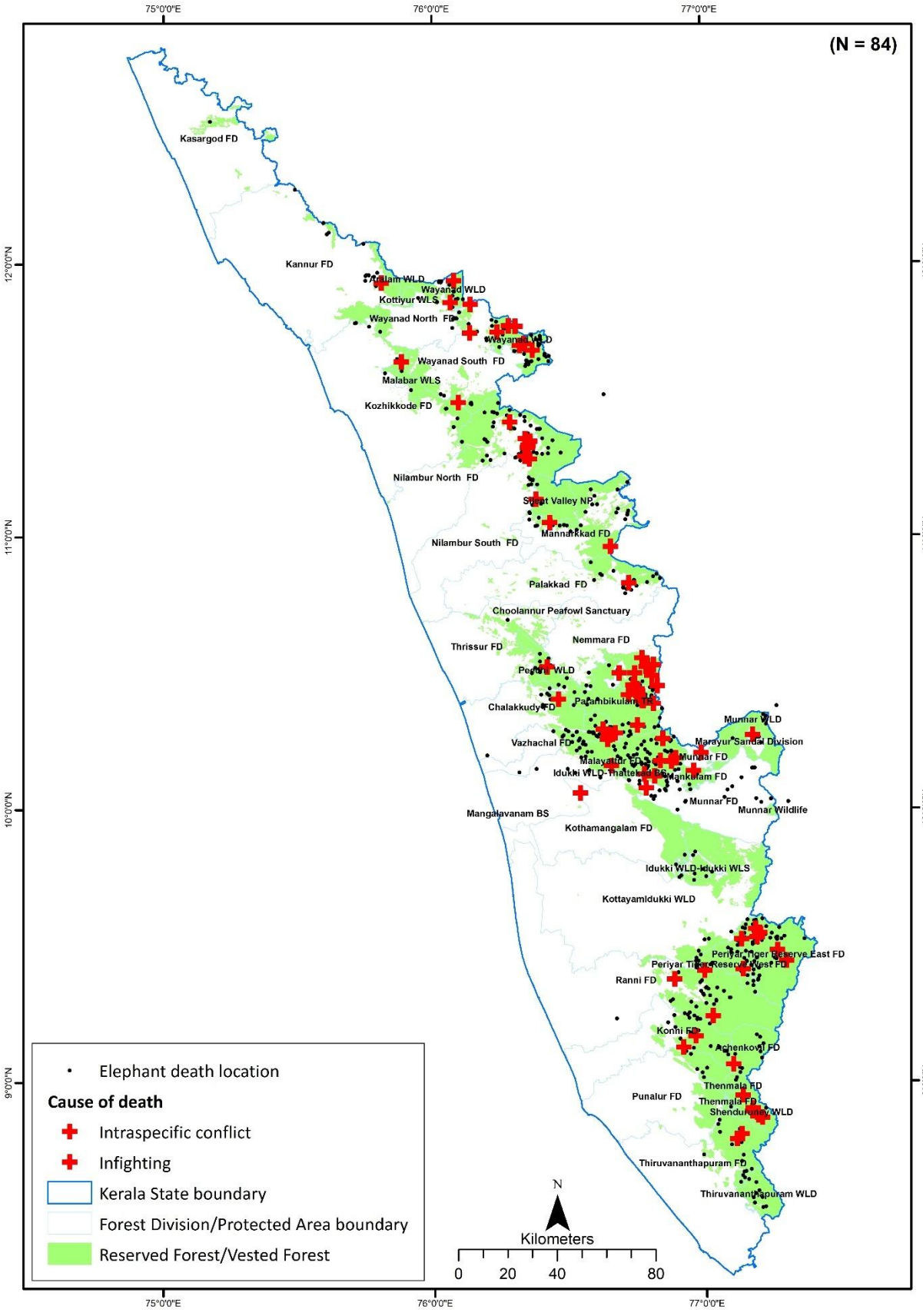


Fig. 14 (a): Locations of elephant death due to Anthropogenic causes (Electrocution, Explosives and Train Hit) from 2019 to 2025

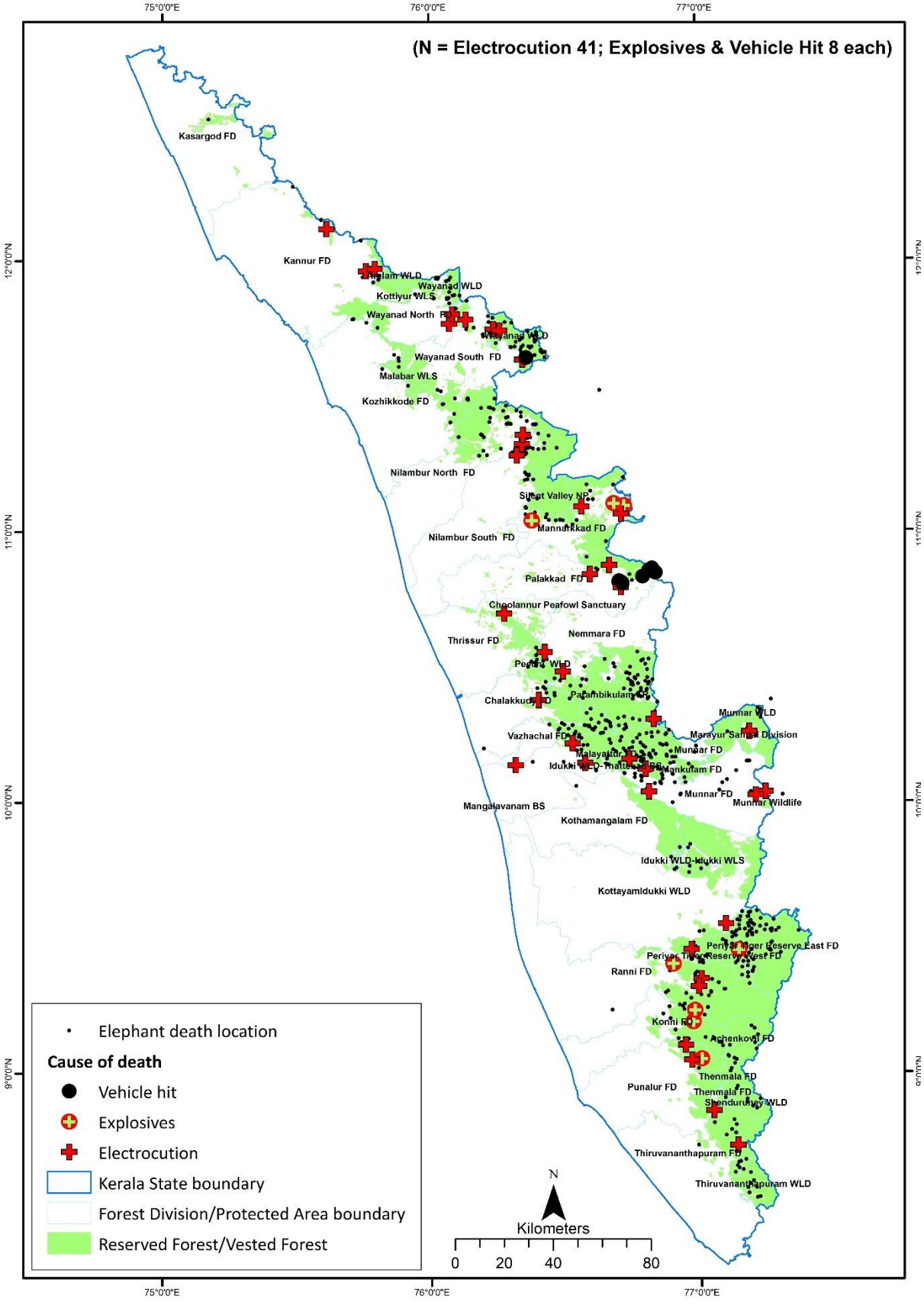


Fig. 14 (b): Locations of elephant death due to Anthropogenic causes (Unnatural, Poaching and Poisoning) from 2019 to 2025

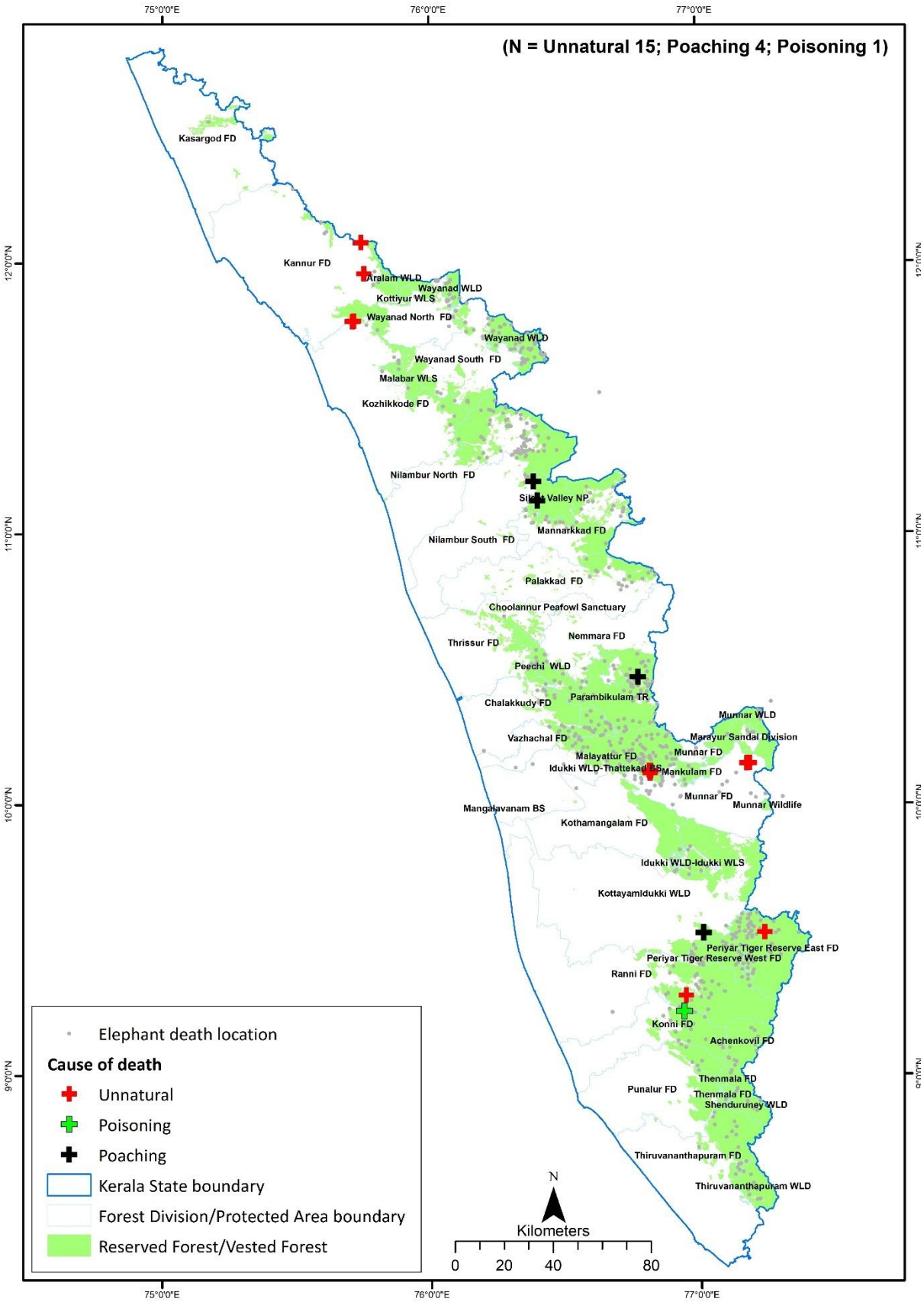


Table 3 presents data on various human-caused threats to elephants across different forest divisions in Kerala. The table helps identify which divisions are most affected and the nature of threats they face.

Table 3: Presence of Specific Human-Caused Threats to Elephants in Kerala

Forest Division	Electro-cution	Un-natural	Explo-sives	Vehicle hit	Poa-ching	Poi-soning	Total
Periyar (West) Division	5	3					8
Chalakkudy Division	4	4					8
Marayoor Division	3	3					6
Nenmara Division	3	1	2				6
Nilambur (South) Division	3			1			4
Peechi Wildlife Sanctuary Division	1						1
Thrissur Division	2	1					3
Vazhachal Division	2		3				5
Wayanad (North) Division	2		1				3
Kottayam Division	2						2
Nilambur (North) Division	2						2
Punalur Division	1		1				2
Mannarkad Division	1						1
Thiruvananthapuram Division	1						1
Wayanad (South) Division	1						1
Ranni Division	1						1
Kannur Division	1						1
Wayanad Wildlife Sanctuary Division	1						1
Palakkad Division	3			7			10
Munnar Division	1						1
Malayattoor Division	1				1		2
Periyar (East) Division		2					2
Kozhikkode Division		1					1
Konni Division			1			1	2
Parambikulam Tiger Reserve Division					1		1
Silent Valley National Park Division					2		2
Total	**41**	**15**	**8**	**8**	**4**	**1**	**77**

7. CONCLUSION AND DISCUSSION

7.1. Overall Mortality Patterns and Demographic Stability of Wild Elephants in Kerala

7.1.1. Overall Mortality

Between April 2019 and March 2025, a total of 744 wild elephant deaths were recorded in Kerala's forests, averaging 124 deaths per year. Using the Kerala Forest

Department's 2023 population estimate of ≈ 2,000 elephants, this translates to an annual mortality rate of about 6.2%. When the same mortality figures are recalculated using the Wildlife Institute of India's DNA-based population estimate of 2,785 elephants for the 2021–2025 period, the annual mortality rate decreases to around 4.45%.

At present, there are no published estimates of the *overall* mortality rate of Asian elephants - defined as the proportion of individuals dying each year relative to the total population - for India or for any other elephant range countries. Existing studies have generally focused on mortality in specific demographic groups (such as calves, subadults, or adult males) or have reported only absolute annual death counts from localized regions. For example, Palei et al. (2021) documented elephant deaths in Odisha - a state-level study - categorized by age and sex, yet their study did not attempt to relate these figures to the total elephant population to derive population-level mortality rates. Thus, published work does not provide baseline values against which Kerala's overall mortality rate can be meaningfully compared.

These gaps highlight a significant lack of standardized, population-based mortality data across the Asian elephant's range. Without such data, it is not possible to determine whether Kerala's mortality rate is relatively high or low in comparison to other regions. This underlines the need for systematic approaches to estimating mortality - integrated with accurate population assessments - to enable robust comparisons and inform long-term conservation planning.

Although there is no comparable literature on overall elephant mortality rates, it remains important to assess whether the observed mortality levels in Kerala could affect the stability of the wild elephant population. Evaluating population stability requires consideration of both mortality and recruitment, the latter being determined primarily by the birth rate among breeding females.

In Asian elephants, females generally exhibit an inter-calving interval of about five years, indicating that roughly one-fifth of the adult female population gives birth in any particular year. This reproductive rhythm, however, is influenced by several ecological and physiological factors and can vary depending on habitat conditions. Sukumar (2003)

reported that wild elephant populations in southern India may experience longer calving intervals - ranging from five to seven years - particularly in environments where food availability and nutritional quality are limited. Such variation highlights the sensitivity of reproductive rates to environmental quality and the importance of resource conditions in shaping population dynamics.

In the case of Kerala, detailed demographic data collected in 2023 provide a useful basis for assessing reproductive potential. Among 1,296 elephants for which age–sex information was available, 541 individuals - approximately 42% - were identified as adult females. Extrapolating this proportion to the estimated total population of about 2,000 elephants suggests that the state supports roughly 840 adult females. If one-fifth of these adult females (around 168 individuals) produce calves annually, an estimated 168 calves would be added to the population each year.

When this estimated annual recruitment (≈168 calves – with five-year calving interval) is compared with the average annual mortality of 124 elephants, the figures indicate a positive demographic balance, with births slightly exceeding deaths. Even after accounting for natural fluctuations in mortality or potential uncertainties in population size and reproductive rates, the overall trend suggests that Kerala's wild elephant population is demographically stable or slowly increasing. If a more conservative reproductive rate is applied - for instance, assuming a seven-year calving interval instead of five, where only about one-seventh of adult females give birth annually - the expected annual recruitment would be approximately 120 calves. This value remains close to the observed annual mortality (124 elephants), suggesting that even under less favourable reproductive conditions, the population would remain broadly stable. Conversely, under the more typical five-year interval, the population demonstrates a modest but consistent upward trajectory.

Despite the lack of directly comparable data from other regions, internal demographic analysis based on Kerala's birth and death records provides strong evidence that the state's wild elephant population is not undergoing decline. Rather, the balance between recruitment and mortality indicates a population that is stable or showing a slight increase, reflecting a relatively healthy demographic status under current ecological conditions.

7.1.2. Annual and Monthly Trends

Annual mortality among wild elephants in Kerala exhibited distinct temporal fluctuations over the six-year study period, with pronounced peaks recorded in 2019–20 and again in 2024–25. These peaks may reflect cyclical ecological stressors, such as fluctuations in rainfall and vegetation productivity, as well as anthropogenic pressures, including habitat fragmentation, intensified HEC, and increased exposure to linear infrastructure. Such periodic rises in mortality often coincide with years marked by extended dry spells, forest fires, or heightened human activity along forest fringes, all of which can amplify the vulnerability of elephant populations.

A clear seasonal trend was also evident, with mortality consistently rising between January and May, aligning with Kerala's dry season. During this period, the availability of surface water and forage resources declines sharply, compelling elephants to travel longer distances and increasing the likelihood of conflict-related fatalities, accidents, and stress-induced deaths. The dry months also correspond with seasonality of fruits availability (jack fruit, pine apple, mango etc), further intensifying encounters between elephants and humans. In contrast, mortality rates tended to decline during the monsoon and post-monsoon months (June–December), when water and fodder availability improve and conflict incidents subside.

Taken together, these annual and seasonal mortality patterns suggest that both ecological variability and human pressures play pivotal roles in shaping elephant survival in Kerala. The recurring dry-season mortality peaks highlight the importance of implementing targeted mitigation measures - such as improving access to natural water sources, reducing crop-raiding opportunities, and strengthening conflict management systems - during this high-risk period to enhance the long-term resilience of the state's wild elephant population.

7.1.3. Seasonal Relationship with HEC

A clear overlap between high elephant mortality and intense HEC was observed during the January–June dry months. Water scarcity, crop availability, and increased proximity to human settlements drive both phenomena, underscoring the need to prioritize mitigation and resource-management measures during this high-risk season.

7.2. Demographic Trends in Elephant Mortality

The age and gender specific analysis of wild elephant mortality reveals distinct demographic patterns shaped by both natural and external pressures. Mortality was highest during early life, with calves under one year and juveniles aged one to five years accounting for about one-third of all deaths. This reflects typical biological vulnerabilities such as disease susceptibility, dependence on maternal care, and seasonal stress during the dry period. Mortality declined among sub-adults (6–15 years) but rose again in adults over 15 years, mainly due to aging, disease, and human–elephant conflict. When grouped by decade, elephants aged 1–20 years accounted for over half of all deaths, underscoring the importance of improving survival in younger age classes.

Gender analysis showed slightly higher male mortality (49.4%) compared to females (46.2%). Male-biased deaths were pronounced among calves, juveniles, and sub-adults - likely due to greater dispersal, risk-taking, and conflict exposure - while adult female mortality was somewhat higher within their age group, possibly due to reproductive and maternal stress. About 4.3% of deaths lacked gender identification, pointing to the need for more consistent field data.

When compared with population structure, adults formed 58% of the population but only 49% of deaths, indicating strong adult survivorship. Sub-adults showed near parity between population and mortality proportions, while juveniles were disproportionately affected - constituting just 6.5% of the population but 16.5% of deaths. Juvenile and sub-adult males were particularly vulnerable, representing small portions of the population yet accounting for high proportions of deaths, likely due to dispersal-related risks and conflict.

The demographic profile indicates that Kerala’s elephant population is broadly stable, with mortality levels within expected ranges for Asian elephants. Slightly elevated mortality among sub-adults and adults may reflect local stressors such as habitat fragmentation, resource scarcity, and intensified HEC. Focused management - particularly in conflict-prone zones and during high-risk seasons - alongside continued demographic monitoring is essential for sustaining population stability.

Comparative studies reinforce these findings. In the Biligirirangan landscape, Sukumar's long-term research documented mortality rates of 5–15% for female calves under one year, 10–30% for males under five years, and about 3% for subadults and adults (5–40 years). Kerala's corresponding rates - 6.19%, 9.71%, and 6.68%, respectively - align with these ranges for young elephants but are slightly higher for adults, suggesting region-specific pressures such as intensified human–elephant conflict or disease. For context, African elephant populations show higher calf mortality (10–25%) but lower adult mortality (1–5%) (Moss, 2001; Wittemyer et al., 2007), placing Kerala's elephants in a moderate mortality range.

Kerala's elephants, thus, exhibit stable population dynamics with mortality rates consistent with ecological expectations for the species. However, early-life losses, male-biased mortality, and slightly higher adult deaths highlight the need for sustained conservation efforts focusing on habitat quality, conflict mitigation, and improved demographic monitoring to ensure long-term population health.

7.3. Causes of Elephant Mortality

Natural causes account for nearly 90% of all deaths, dominated by disease, intraspecific conflict, and predation. However, human-induced causes (≈10%) - particularly electrocution and vehicle collisions - though fewer, are largely preventable and require urgent management action. While natural factors remain the main drivers of mortality, the persistence of preventable deaths highlights gaps in infrastructure safety and conflict management that can be addressed through coordinated mitigation measures. Natural mortality rises with age due to disease and senescence, whereas human-induced deaths are concentrated among sub-adult and adult elephants, reflecting increased exposure to agricultural and infrastructural hazards in human-dominated landscapes.

7.4. Spatial Distribution of Elephant Mortality

Four major mortality hotspots - Wayanad, Nilambur–Nilgiri, Parambikulam–Munnar–Malayattoor, and Periyar–Ranni–Konni - emerge as key zones of elephant deaths. These regions correspond to areas of high ecological connectivity and interstate movement, emphasizing the importance of corridor protection and landscape-level planning. Areas such

as Wayanad, Vazhachal, and Ranni show concurrent high mortality and conflict intensity, demanding integrated strategies that combine conflict mitigation with elephant safety initiatives. While natural causes dominate across most forest divisions, human-induced mortality—especially electrocution and train collisions—is spatially concentrated in divisions like Palakkad and Munnar, where targeted measures such as power-line insulation and rail fencing are essential. Malayattoor, Wayanad WLS, and Parambikulam consistently exhibit high natural mortality linked to disease and social stress, while Palakkad and Munnar register higher human-related deaths, underscoring the need for division-specific management interventions and improved inter-departmental coordination.

8. KEY OBSERVATIONS AND RECOMMENDATIONS

8.1. Overall Mortality and Population Stability

- Strictly implement the ongoing Wild Animal Mortality Auditing Framework (WAMAF) as a standardized, population-linked mortality monitoring system integrated with long-term demographic surveillance. Encourage collaborative research with national and state-level institutions to establish uniform mortality benchmarks. These actions are crucial since Kerala recorded 744 elephant deaths (4.45–6.2% annual mortality) between 2019 and 2025, with recruitment (~168 calves/year) slightly exceeding deaths—indicating population stability but constrained by data gaps and inconsistencies.

8.2. Annual and Seasonal Mortality Trends

- Strictly implement Mission FFW (Food, Fodder and Water) as a priority dry-season intervention, focusing on artificial water provisioning, habitat restoration, and fodder enrichment (maintenance of marshy grasslands and open canopy areas, cultural burning, etc.), complemented by seasonal risk forecasting and conflict mitigation from January to May. These measures are vital to counter mortality peaks associated with drought, resource scarcity, and heightened conflict, which typically subside with the onset of the monsoon.

8.3. Demographic Patterns of Mortality

- Enhance calf and juvenile survival through strengthened disease control, habitat management, and continuous health surveillance, while reducing young male

mortality through targeted conflict prevention measures. These actions are essential, as early-life deaths constitute nearly one-third of total mortality, and males remain more vulnerable to conflict-related risks.

8.4. Causes of Mortality

- To minimize preventable human-induced deaths, efforts should focus on insulating power lines that traverse forests and strictly enforcing regulations against illegal high-voltage installations. Additionally, regulating electric fencing and enhancing transport safety are vital to reducing accidental fatalities. Strengthening disease surveillance and improving necropsy reporting (mainly through WAMAF) will further aid in monitoring and mitigating emerging threats. Mission Real-Time Monitoring being implemented by KFD focuses on continuous tracking of elephant corridors and wildlife movement across forest divisions to enable timely preventive actions. These combined measures are essential, as approximately 10% of deaths result from electrocution, collisions, and poisoning—mainly among sub-adults and adults—while the remaining 90% are due to natural causes.

8.5. Spatial Mortality Hotspots

- Implement division-specific management in high-risk zones like Wayanad, Nilambur, Munnar, and Ranni, emphasizing corridor protection and inter-state coordination. Targeted action is needed as these hotspots coincide with high mortality and conflict intensity.

8.6. HEC Linkages

- Enhance dry-season conflict mitigation through improved rapid-response preparedness and active community participation. While Mission RRT focuses on strengthening Rapid Response Teams for swift intervention during HEC, Mission PRT (Primary Response Teams) establishes volunteer forces to provide immediate on-site action before RRTs arrive. These coordinated efforts are crucial, as most mortalities coincide with the peak HEC period from January to June, driven by resource scarcity and increased animal movement near human settlements.

8.7. Disease and Health Management

- Establish a state-level disease surveillance and rapid-response system, expand veterinary infrastructure, and promote habitat-based health improvement. These actions are critical as diseases like EEHV threaten calves, and diagnostic capacity remains limited.

8.8. Overall Conservation Implications

- Implement an integrated, landscape-level conservation strategy that combines habitat restoration, infrastructure safety, disease surveillance, and community participation. In this context, the KFD has identified 12 key landscapes with conflict-prone panchayats and is developing comprehensive landscape management plans aimed at reducing and mitigating HWC across the state. Although Kerala's elephant population remains relatively stable, continued resource scarcity, habitat fragmentation, and recurring conflicts pose risks to its long-term sustainability without consistent, proactive management.

In addition to the above, the Kerala Forest Department is implementing several targeted measures to mitigate HWC and support the stability of wild animal populations. Mission Tribal Knowledge integrates traditional conflict-mitigation practices from tribal communities in collaboration with the Kerala Forest Research Institute and the Scheduled Tribes Development Department, promoting locally adapted solutions. Mission Knowledge advances scientific understanding through partnerships with KFRI, TBGRI, and the Wildlife Institute of India to study behavioral shifts in wildlife and the influence of climate change on conflict dynamics. To reduce animal incursions into human settlements, Mission Solar Fencing restores and strengthens non-functional solar fences along forest boundaries. Complementing these efforts, Mission Public Sensitisation conducts awareness campaigns to foster coexistence and preventive community action. Additionally, Mission *Senna spectabilis* focuses on the removal of invasive Senna plants to improve habitat quality, reduce competition for native species, and lessen conflict pressure. Together, these initiatives contribute to a more balanced coexistence between humans and wildlife in Kerala's landscapes

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Annexure 1

(G.O.(Rt) No.451/2024/F&WLD, dated 15-10-2024 that established an Expert Committee to critically examine wild elephant deaths in Kerala

GOVERNMENT OF KERALA

Abstract

Forest & Wildlife Department - Expert Committee for the study on Elephant Mortality in Kerala - Constituted - Orders issued.

FOREST & WILDLIFE(D) DEPARTMENT

G.O.(Rt)No.451/2024/F&WLD Dated,Thiruvananthapuram, 15-10-2024

Read Letter No. KFDHQ/6233/2024-CWW/WL8 dated 10.09.2024 from the Principal Chief Conservator of Forests(Wildlife) & Chief Wildlife Warden, Kerala

ORDER

Elephant being a flagship species, play a vital role in maintaining the ecological balance of ecosystems. Kerala is part of a larger landscape in the Western Ghats which is one of the prominent elephant conservation areas in the world. The management of elephant population in its all complexity (eg., conservation, mitigating human-elephant conflicts etc.) is one of the crucial management imperatives of the Kerala Forest Department these days. In this background, in the interests of science and management, it is desirable to look at the figures of elephant mortality in Kerala during the last one decade to understand the nature, reasons, pattern, etc.

2. As per the letter read above, the Principal Chief Conservator of Forests(Wildlife) & Chief Wildlife Warden, submitted a proposal for constituting an Expert Committee with respect to the mortality of wild elephants in Kerala.

3. Government have examined the matter in detail and are pleased to constitute the Expert Committee, with the following members, for criticality looking at the mortality of wild elephants in Kerala during the last ten years,

Structure of the Expert Committee

1. Shri. Pramod.G.Krishnan IFS, Additional Principal Chief Conservator of Forests (Administration)holding full additional charge of the

Principal Chief Conservator of Forests (WL) & Chief Wildlife Warden - Chairman

2. Dr. Arun Zachariah, Forest Veterinary Officer - Member
3. Shri. Radhakrishnan S.R., Deputy Conservator of Forests (Project Elephant), O/o the PCCF(WL) & CWW, Kerala - Convenor
4. Shri. Manu Sathyan, Divisional Forest Officer, Flying Squad, Ernakulam and Nodal Officer, HAWK - Member
5. Dr. Balasubramanyam, Lead Wildlife Expert, Parambikulam Tiger Conservation Foundation - Member

4. The committee can seek advise or opinion of experts in the field , if required. If scientific tests are required in the matter, the report or opinion of such experts shall be obtained. The committee shall submit a detailed report, on the mortality of wild elephants in Kerala during the last ten years, within three months to Government.

Necessary expenditure in this regard shall be met from the allotment in the existing Budget Head of Wildlife Wing.

(By order of the Governor)
PRAMOD V R
JOINT SECRETARY

To:

The Principal Chief Conservator of Forests & Head of Forest Force, Thiruvananthapuram

Shri. Pramod.G.Krishnan IFS, Additional Principal Chief Conservator of Forests (Administration) holding full additional charge of the Principal Chief Conservator of Forests (WL) & Chief Wildlife Warden

Dr. Arun Zachariah, Forest Veterinary Officer

Shri. Radhakrishnan S.R., Deputy Conservator of Forests (Project Elephant)

Shri. Manu Sathyan, Divisional Forest Officer, Flying Squad, Ernakulam and Nodal Officer, HAWK

Dr. Balasubramanyam, Lead Wildlife Expert, Parambikulam Tiger Conservation Foundation

The Principal Accountant General(Audit/A&E), Thiruvananthapuram

Stock File/Office Copy

Forwarded /By order

Signed by
Suja S K
Date: 16-10-2024 12:20:10

Section Officer

Copy to- PS to the Hon. Minister, Forest & Wildlife Department
PA to ACS, Forest & Wildlife Department

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL (SOUTHERN ZONE BENCH, CHENNAI)

Original Application No.259 of 2024(SZ)

IN THE MATTER OF:

Suo Moto matter in respect of news item appearing in The Hindu dated 19.07.2024 titled "845 elephant deaths recorded in Kerala in eight years".

And

MOEF & CC, Through its Regional Office, Bangalore and ors.

...Respondent(s)

REPORT FILED BY THE PRINCIPAL CHIEF CONSERVATOR OF FOREST- 2ND RESPONDENT

E.K. KUMARESAN,

Standing Counsel for Government of kerala

No.6, Indian Chambers (SICCI)

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