# GAJAH

NUMBER 59
2025

## Journal of the Asian Elephant Specialist Group

# GAJAH

## Journal of the Asian Elephant Specialist Group
## Number 59 (2025)


The journal is intended as a medium of communication on issues that concern Asian elephants both in the wild and in captivity. Areas of interest include but are not limited to conservation, management, behaviour, ecology, health, history and cultural aspects related to Asian elephants. It is a means by which everyone concerned with the Asian elephant (*Elephas maximus*), whether members of the Asian Elephant Specialist Group or not, can communicate their experiences, ideas and perceptions freely, so that the conservation of Asian elephants can benefit. The journal welcomes researchers worldwide to publish their original research articles. All articles published in *Gajah* reflect the individual views of the authors and not necessarily that of the editorial board or the Asian Elephant Specialist Group, the Species Survival Commission, or IUCN.

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IUCN SSC Species Survival Commission

Asian Elephant Specialist Group

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## Editorial Note

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ISSN (Online) 2773-6989
ISSN (Print) 1391-1996
DOI: 10.2305/SJDF1602

## Cover

Elephants in Eastern Duars Elephant Reserve,
Buxa, West Bengal.
Photo by Parveen Kaswan

Layout and formatting by Dr. Jennifer Pastorini

Printed at Shree Ram Print O Pac, New Delhi, India

DOI: 10.2305/CCOR5226
*Gajah 59 (2025) 1*

# Editorial

Jennifer Pastorini (Editor)

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This 59th issue of *Gajah* includes seven research articles and a short communication. Six articles deal with elephants in India while the remaining two are from China and Bangladesh. In the News and Briefs section you can find five meeting reports, an obituary and a compilation of abstracts from recent publications.

In the first **Research Article** Ramesh K. Pandey and coauthors assessed India's Elephant Reserves under Project Elephant for overlap with other conservation areas and land-use change. One third of the area was found to overlap with protected areas. Forest loss in Elephant Reserves was minimal, with 72% forest cover remaining and only 4.9% converted to other land uses since 1985. Sudem Goyary *et al*. studied human-elephant conflict (HEC) in the Baksa District, Assam, based on compensation records. Human population growth intensified HEC. Records showed seasonal peaks during paddy and fruit ripening. Border villages were most affected, highlighting the urgent need for mitigation measures. Prakash C. Gogineni and coauthors report on the rescue of a female elephant and her calf. In 2022, three elephants entering Jagatpur, Odisha, caused severe conflict. Two elephants were rescued, transported, and released into Kandhara Reserve Forest. Jambugahapitiye Dhammaloka reviews elephant classification in ancient Indian elephantology. The paper highlights Sanskrit criteria based on physical traits and behaviour, focusing on historical traditions and providing particular reference to Nīlakaṇṭha's *Mātaṅgalīlā* as a key classical source. Shraddhaben K. Vadgama describes training methods at Sakrebyle and Dubare Elephant Camps in Karnataka. Captive-born elephants adapted faster than wild-captured ones, making training more efficient. Zoe He's publication summarises preliminary results of a census of captive Asian elephants in China begun in 2022. Data on 148 elephants and 35 family groups kept at 26 facilities are presented. Major welfare concerns were observed. Mohd Talha and co-authors treated a case of intestinal impaction in a young captive Asian elephant in Dudhwa Tiger Reserve. Prompt clinical intervention resolved obstruction caused by consumption of fibrous grass.

The **Short Communication** from M. Abdul Aziz *et al*. documents the first record of a wild 'white elephant' in Bangladesh. The one-month-old calf was observed in a herd living in a fragmented forest in the Chittagong Hill Tracts, in an area with continued habitat loss and increasing HEC.

In **News and Briefs** Prajna P. Panda and Vivek Menon report on the 12th Meeting of the Asian Elephant Specialist Group held in Bien Hoa, Vietnam in September 2025. Heidi S. Riddle gives an overview of the Fourth Asian Elephant Range States Meeting which was held in Siem Reap, Cambodia, resulting in "The Siem Reap Declaration for Asian Elephant Conservation". M. Ananda Kumar *et al*. report on the Elephant Conservation Group's ninth meeting which was held in Bien Hoa, Vietnam. Ahimsa Campos-Arceiz and colleagues summarise the happenings at the "International Workshop on Asian Elephant Conservation and the Development of a New Asian Elephant National Park in China". Fernanda Z. Teixeira *et al*. writes about two workshops organised by the Asian Elephant Transport Working Group in Bhutan and Sabah, Malaysia.

I would like to thank the members of the editorial board for their work on each article. I am grateful to all the authors for sharing their valuable and interesting findings with the readers of *Gajah*. The AsESG sincerely appreciates SAFE's (Saving Animals from Extinction) financial support, which funded the printing and mailing, making the distribution of hard copies possible.

DOI: 10.2305/YEXJ5224
*Gajah 59 (2025) 2-3*

# Notes from the Chair IUCN SSC Asian Elephant Specialist Group

Vivek Menon

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Dear Members

It gives me a lot of satisfaction and pleasure to sit down to write this note as this is the last chairs note of the IUCN SSC Asian Elephant Specialist Group (AsESG) that I will pen. It has been an honour and privilege to lead our committed band of elephant expert volunteers over the last decade and as I prepare to hand over to the new chair by the end of this month, I look back at the past 10 years with happiness.

The impact report that has been published and launched at our last meeting in Vietnam encapsulates the story of our group during this period. Major impacts during this period are three successive range state declarations (the Jakarta declaration in 2017, the Kathmandu declaration in 2022 and the Siem Reap declaration in 2025) co-led by the AsESG, listing of the Asian elephant under the Convention on Migratory Species in 2020, the revision of the Red List Assessment for it in the same year and putting a new subspecies, the Bornean elephant, on the Red List in 2024. No less important is the fact that we were able as a group to work with the range states and develop 10 range state action plans out of the 13 countries in which the elephant exists in the wild.

The membership has responded wonderfully and formed nine working groups which produced key outputs such as the volumes on mitigating impacts of roads and railways on Asian elephants, protecting Asian elephants from linear transport infrastructure, rehabilitation of captive elephants as an option for augmenting wild populations, emerging diseases affecting Asian elephants and guidelines on artificial waterhole management with relation to Asian elephant management. Two outputs on captive elephants were also released which were the ones on management and welfare of captive Asian elephants used in tourism and the guidelines on management and care of captive elephant bulls in musth.

When I took over in 2015, the group was facing challenges of internal communication and trust. We decided together that we needed in person meets for us to come together again and I am happy that we were able to raise the resources for five meets: The 8th meeting in 2016 at Guwahati, India, the 9th one in 2018 at Bangkok, Thailand, the 10th in 2019 at Kota Kinabalu, Malaysia, the 11th in 2023 at Delhi, India and the last in 2025 at Bien Hoa, Vietnam. The membership which stood at 90 when I took over has increased by nearly 50% to 130 span-

**Figure 1.** Asian Elephant Range States Meeting in Siem Reap, Cambodia.


**Figure 2.** Eighth Asian Elephant Specialist Group Meeting in 2016 at Guwahati, India.

ning 21 countries. Most importantly we have members now from all range states and equally all range state governments have become ex officio members. The diversity indices of our membership can be made better as only a third of the members are females and the median age being 54.2 years. Both these can move just a little bit to the centre with parity among genders and a little more increase among younger members being most welcome.

It feels good to have received three Citations of Excellence from the IUCN SSC Chair Jon Paul Rodriguez for the group in 2009, 2021 and 2024! I must dedicate this to the entire membership but particularly the leadership team of Heidi Riddle, Christy Williams, Ee Phin Wong and Jennifer Pastorini for having helped me steer the group. Prajna Panda the program manager bore the brunt of getting things done and without her help the group would not be in such a strong position.

I leave the group in the able hands of Heidi Riddle as the incoming Chair of the AsESG and her leadership team and wish them and the group all the very best. I will of course remain an active member of the group and also in my new role as IUCN SSC Chair will assist the group in any way I can

Vivek Menon
Chair IUCN SSC AsESG
Chair IUCN SSC


**Figure 3.** Twelfth Asian Elephant Specialist Group Meeting in 2025 at Bien Hoa, Vietnam.

DOI: 10.2305/DNNO5427
Research Article *Gajah 59 (2025) 4-10*

# Elephant Reserves of India: Spatial Overlaps, Land Use Changes and Conservation Implications

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**Abstract.** 'Elephant Reserves' established under the 'Project Elephant' program, serve as the management unit for elephant landscapes in India. We examined the spatial overlap between Elephant Reserves and other conservation areas. We found that 33% of the area of Elephant Reserves overlapped with Protected Areas and Tiger Reserves, enhancing their conservation status. Land use changes from 1985 to 2015 in Elephant Reserve areas were analysed using pre-classified remote sensing data. Results revealed that 4.9% of forest cover in Elephant Reserves were transformed to other land-uses and that currently 72% of the area of Elephant Reserves was under forest cover, indicating that forest loss was minimal.

## Introduction

The Asian elephant (*Elephas maximus*) is both a flagship and keystone species. Elephants contribute to tropical forest ecosystems, through seed dispersal, nutrient cycling and biomass removal (Poulsen *et al*. 2018). Asian elephants were once found from the Yangtze-Kiang River basin in China to the Tigris and Euphrates River basin in west Asia (Shoshani & Tassy 1996). However, they are now restricted to less than 7% of their former range (Pandey *et al*. 2024a). They occur in 13 countries in Asia as disjunct populations, with a global population of about 50,000 (Williams *et al*. 2020).

India harbours the world's largest population, with around 22,000 (Qureshi *et al*. 2025). Several factors such as cultural affinity, religious reverence, and nature-friendly attitudes among Indian societies, coupled with strong public support for elephant conservation, political commitment, enhanced institutional capacities and robust legal frameworks have contributed in securing the largest Asian elephant population in the world (Pandey *et al*. 2024b). Asian elephants are listed as 'endangered' in the IUCN Red List, included in Appendix I of CITES and listed under Schedule I of the Indian Wildlife Protection Act of 1972.

In India, elephants are distributed over 163,000 km$^2$, which is 52% of the global range, in the North-west, North-east, East-Central and Southern regions (Pandey *et al*. 2024a). In response to growing conservation challenges primarily stemming from ivory poaching and habitat threats, the Government of India launched 'Project Elephant' in 1992 as a centrally sponsored scheme to provide technical and financial assistance to elephant conservation. In order to strengthen the cultural bonds with elephants, the elephant was declared as a national heritage animal. Elephants have relatively large home ranges that often include areas outside Protected Areas (PA) (Sukumar 2003). In India, PAs consist of lands designated under the Wildlife (Protection) Act of 1972. Such areas encompass ~178,640 km$^2$ or 5.4% of the country and consists of 106 National Parks, 574 Wildlife Sanctuaries, 309 Community Reserves, and 145 Conservation Reserves (ENVIS Centre on Wildlife & Protected Areas 2025). Another category of conservation areas in India are Tiger Reserves (TR). Since the inception of 'Project Tiger' in 1973, 53 TRs have been declared, cov-


Manuscript Editor: Prithiviraj Fernando

ering ~76,000 km$^2$ across 18 states (Nautiyal *et al*. 2023). PAs and TRs in India do not cover all elephant habitats and therefore are inadequate for management of elephants (Bist 2002). Therefore 'Project Elephant' prioritises a landscape approach to elephant conservation, by identifying Elephant Reserves (ER) and focusing on holistic and integrated management of areas identified as elephant habitat.

ERs may include Reserve Forests, PAs, TRs and multiple-use forest areas such as revenue lands and revenue forests, and human-use areas. While ER provides a conceptual framework for effective landscape management for elephants, it is not a legal entity as land-holding is not vested with the Forest Department. PAs and TRs are typically notified in areas that are inherently wildlife-rich and productive. ERs have been declared taking into consideration the elephants' large mobility and thus includes areas of human-elephant interface and corridors that provide permeability between landscapes. Thus, in comparison to the size of PAs (mean 221.5 km$^2$) and TRs (mean 1433.4 km$^2$), ERs are much larger (mean 4809.1 km$^2$). Project Elephant conservation funding is primarily for ERs to support activities such as habitat improvement, mitigation of human-elephant conflicts, and the maintenance of critical movement corridors.

The number of notified ERs increased from five in 2001 to 33 by 2023 across 14 states (Fig. 1) covering a total area of 80,777 km$^2$, which constitutes about 2.5% of the country's landmass. They are spread across all four regions of elephant distribution. The southern region has 12 ERs covering 30,364.4 km$^2$, northeast 11 ERs encompassing 19,520 km$^2$, east-central 7 ERs covering 21,671.4 km$^2$, and the northern region 3 ERs covering 9,222.4 km$^2$. The sizes of ERs vary significantly with the smallest being Singphan in Nagaland at 23.5 km$^2$, and the largest being Singhbhum in Jharkhand at 13,440 km$^2$ (Pandey *et al*. 2024b).

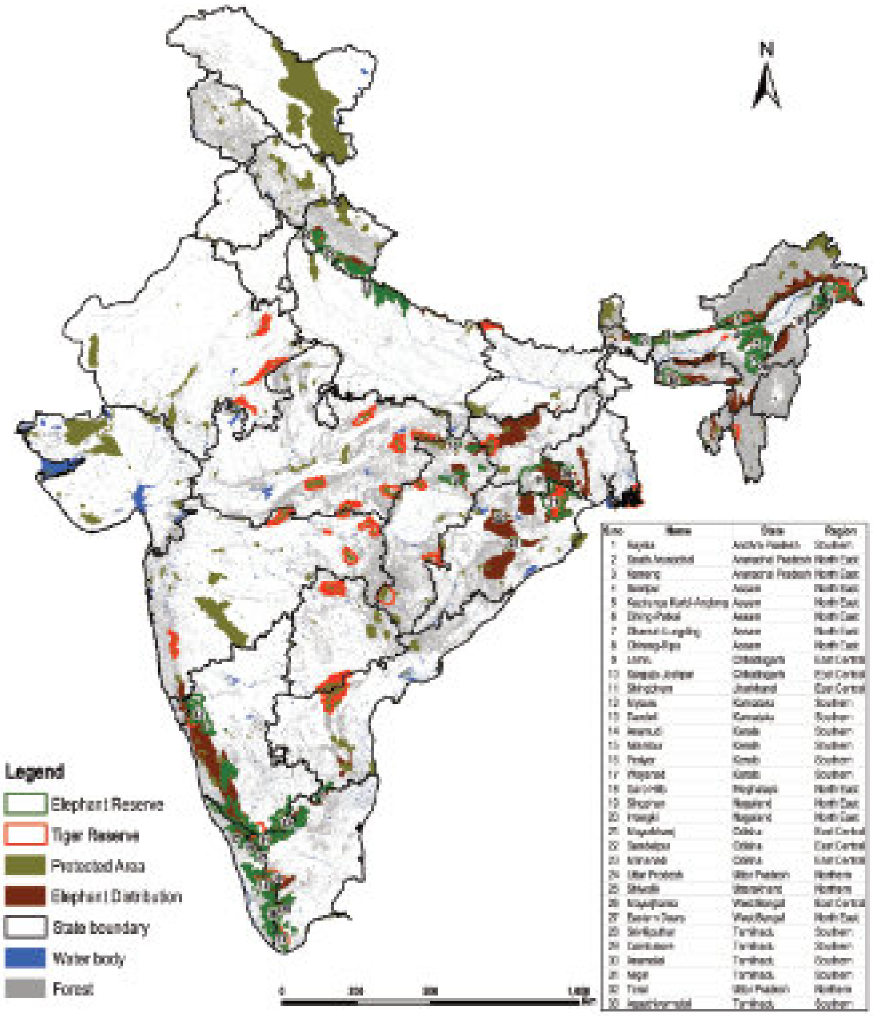


**Figure 1.** PAs, TRs, elephant distribution range and ERs. ERs are numbered in the map and listed in the table.

*Integrating ER management with PAs and TRs*

Three essential constituents considered for managing elephant landscapes are (i) protecting intact forest habitats (ii) identifying and protecting corridors that connect otherwise discrete forest habitats and (iii) effectively managing human-elephant conflict. Project Elephant has developed a "Framework for Preparation of Elephant Conservation Plans" (ECP) (PE-WII-MoEFCC 2024), to provide a comprehensive approach for the management of ERs. The ECP provides a landscape-level approach to elephant conservation including corridors and takes into consideration other management plans for ER areas that also have other designations. To gauge the effectiveness of ERs, management effectiveness evaluations are conducted to assess the implementation of policies, and impacts on elephant populations and habitats.

Here, we assess the spatial overlap between ERs, PAs and TRs and the landscape dynamics in ERs.

## Methodology

The boundaries of the ERs were obtained from State Forest Departments and official gazette notifications. The boundaries of PAs and TRs were obtained from the National Tiger Conservation Authority and the Wildlife Institute of India's National Wildlife Database.

To assess Land Use Land Cover changes (LULC), classification products at 100-m resolution for 1985, 1995 and 2005 were acquired from Oak Ridge National Laboratory Distributed Active Archive Center (Roy *et al*. 2015). Data were derived from Landsat 4 and 5 Thematic Mapper, Enhanced Thematic Mapper Plus, Multispectral data, India Remote Sensing satellites, Resourcesat Linear Imaging Self-Scanning Sensor-1 or III data, ground truth surveys, and visual interpretation. Further, the LULC data for 2015 was acquired from the BHUVAN – Thematic Services website at the scale of 1:50,000 derived from Resourcesat-2 Satellite Linear Imaging Self Scanning Sensor – III data

**Table 1.** Land-use and land-cover classification scheme used in the study.

| Land cover type | Land use type with IGBP Classification (Roy *et al*. 2015) for 1985, 1995 and 2005 | Land use type with NRC LULC50K Mapping Project (NRSC 2019) for 2015 |
|---|---|---|
| Agriculture | Crop land | Crop land |
| | Fallow land | Fallow land |
| | Plantations | Plantations |
| | - | Current shifting cultivation |
| Forest | Evergreen needle forest | Evergreen / Semi evergreen |
| | Evergreen broad leaf forest | Deciduous |
| | Deciduous needle forest | Forest plantation |
| | Deciduous broad leaf forest | Scrub forest |
| | Mixed forest | NA |
| | Savanna/woodland (including woody scattered trees) | NA |
| | Mangrove forest | Swamp / Mangroves |
| Barren land | Barren land | Salt affected land |
| | Waste land | Gullied / Ravinous land |
| | NA | Scrub land |
| | NA | Sandy area |
| | NA | Barren rocky |
| | NA | Rann |
| Built up | Built up (urban and rural) | Urban |
| | NA | Rural |
| | NA | Mining |
| Water body | Water bodies | Inland wetland |
| | Permanent wetland | Coastal wetland |
| | NA | River / Stream / Canals |
| | NA | Water bodies |
| | NA | Snow |

(NRSC 2019). These layers follow the IGBP (International Geosphere Biosphere Programme) LULC classification scheme (Loveland & Belward 1997). The Bhuvan LULC database defines 'forest' as land with a tree canopy cover exceeding 10% and an area of more than 0.5 hectares, with trees capable of reaching a height of 5 m and Roy *et al*. (2015), as canopy cover of over 60% and vegetation height exceeding 2 m.

The two classifications of LULC were merged and five major LULC classes were used to assess LULC change (Table 1). Vectorisation of the raster subset was executed to estimate the area of various classes. Spatial analyses were performed in ArcGIS 10.6.1.

**Results**

*Overlap of PAs with ERs*

A total of 130 PAs overlapped with 30 ERs, with 61 PAs in the northeast overlapping with 10 ERs, 49 PAs in the southern region overlapping with 11 ERs, 11 PAs in the east-central region overlapping with 6 ERs, and 9 PAs in the northern region overlapping with 3 ERs (Fig. 2, Table 2).

*Overlap of TRs and ERs*

A total of 26,154. km$^2$ comprising 25 TRs overlapped with the 33 ERs, with 12 TRs in the southern region overlapping with 8 ERs, 7 TRs in the North East overlapping with 6 ERs, 4 TRs in the North overlapping with 2 ERs, and 2 TRs in East Central overlapping with 2 ERs. The area of overlap between TRs and ERs in the southern region was 13.4% of overall ER range in the country, in the northeastern region 9%, in the northern region 6%, and in the east-central region 4%.

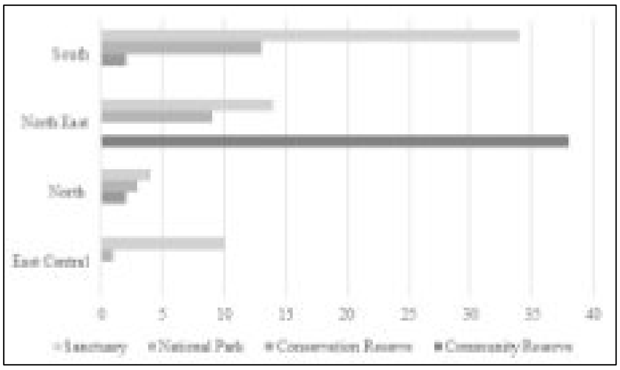


**Figure 2.** Region wise number of PAs overlapping with ERs.

*Overlap of PAs, TRs and ERs*

The total spatial overlap among PAs, TRs, and ERs was ~17,548 km$^2$ and in the southern region was 21% of the total area of ERs in the country and in Northeast 10%, in East Central 7% and in Northern region 5%.

Forest areas in ERs administrated by the Forest Department, that were not PAs or TRs but were mostly notified forests.

*Land-use and land-cover in ERs*

Around 72% of the area of the ERs were under forest cover in 2015 and the rest comprised of other land-uses. There were shifts in land use patterns in ERs in all four regions with increase in agriculture (Table 3 and Fig. 3).

**Discussion**

Spatial analysis indicated a substantial spatial overlap between the PAs, TRs, and ERs, with 15% of the area of PAs overlapping with ERs, 33% of ERs overlapping with PAs, 36% of the area of TRs overlapping with ERs, and 32% of ERs overlapping with TRs. Areas under PAs and TRs have management plans, which prioritise wildlife conservation. They also have stat-

**Table 2.** Extent of area of overlap between PAs and ERs (km$^2$).

| Zone | Community Reserve | Conservation Reserve | National Park | Sanctuary | Total |
|---|---|---|---|---|---|
| East Central | - | - | 1359.17 | 3601.87 | 4961.04 |
| North | - | 51.11 | 1978.61 | 1160.45 | 3190.17 |
| North East | 24.07 | - | 4523.84 | 2366.98 | 6914.89 |
| South | - | 78.15 | 3594.66 | 8428.16 | 12,100.97 |
| Total | 24.07 | 129.27 | 11,456.27 | 15,557.45 | 27,167.06 |

**Table 3.** Percentage wise LULC classification of the ERs.

| Region | Year | Forest | Water | Agriculture | Barren land | Built up |
|---|---|---|---|---|---|---|
| East Central | 1985 | 71.8 | 1.1 | 25.3 | 1.5 | 0.3 |
| | 1995 | 70.5 | 2.7 | 24.7 | 1.5 | 0.6 |
| | 2005 | 69.6 | 2.7 | 25.8 | 1.3 | 0.6 |
| | 2015 | 68.4 | 1.6 | 27.4 | 1.9 | 0.6 |
| North East | 1985 | 75.8 | 3.0 | 19.6 | 1.2 | 0.4 |
| | 1995 | 74.7 | 3.6 | 20.0 | 1.2 | 0.5 |
| | 2005 | 73.5 | 3.6 | 21.3 | 1.1 | 0.5 |
| | 2015 | 71.4 | 1.8 | 25.6 | 0.7 | 0.5 |
| North | 1985 | 71.4 | 6.0 | 21.3 | 0.9 | 0.1 |
| | 1995 | 71.2 | 6.4 | 21.3 | 0.7 | 0.1 |
| | 2005 | 71.3 | 6.2 | 21.5 | 0.6 | 0.1 |
| | 2015 | 73.8 | 2.8 | 21.8 | 1.5 | 0.1 |
| South | 1985 | 76.1 | 2.6 | 19.6 | 1.3 | 0.4 |
| | 1995 | 75.1 | 3.1 | 20.1 | 1.2 | 0.5 |
| | 2005 | 74.0 | 3.1 | 21.3 | 1.1 | 0.5 |
| | 2015 | 71.8 | 1.7 | 25.4 | 0.6 | 0.5 |

utory protection under the Wildlife (Protection) Act, 1972. ERs that were notified forests, came under the Indian Forest Act, 1927, or under local laws, so also have statutory protection. Overlap of ERs with PAs and TRs increases legal protection, as unlike ERs, PAs and TRs are legally protected. Consequently, ~33% of the overall extent of ERs were legally protected.

PA and TR overlap of ERs provided other indirect benefits as well, as financial resources allocated for PAs and TRs are utilized for anti-poaching measures, habitat management, scientific monitoring, rapid response mechanisms and community development programs, which also benefit elephants.

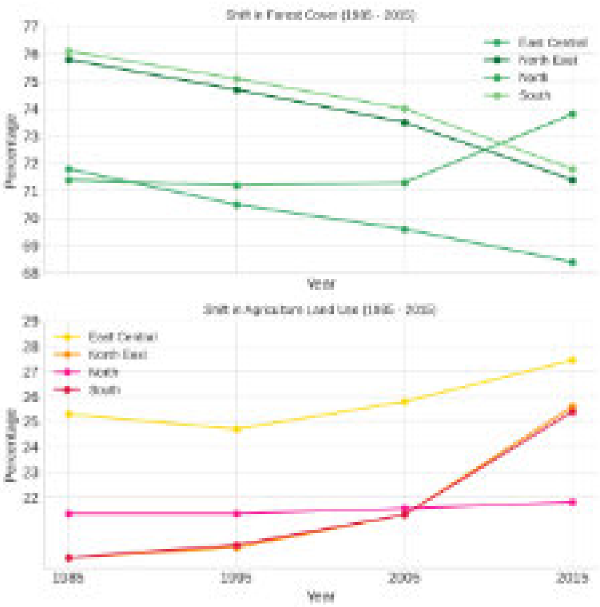


**Figure 3.** Forest cover and agriculture land use (1985–2015) in ERs.

*Land-use and land-cover in ERs*

As 72% of the area of ERs was under forest cover, forest loss was minimal. A major challenge in the management of ERs is addressing the 28% of areas with non-forest land-uses, as they are not under administrative control of the Forest Department. Here land-use is driven by economic and development aspirations. Therefore, multi-sectoral engagement to promote wildlife friendly land use is a priority. Thus, our findings highlight the importance of integrating participatory approaches and multi-sectoral coordination with local communities, revenue departments, and other stakeholders, for the effective management of ERs.

The forest cover of ERs in the north-east, southern and east-central region regions declined by 4.4% and 4.3% and 3.4% respectively over 30 years. Forest loss occurring in southern and north-eastern elephant distribution regions was also observed, by Padalia *et al.* (2019). In the north-east region, jhum cultivation and illegal logging exerted substantial pressure on forest cover (Mahapatra *et al.* 2025). Forest cover in the southern region was more affected by population expansion, cropland conversion, mining, rail and road network connectivity (Menon & Bawa 1997). A relatively high level of fragmentation leading to isolation of patches of forests, that can severely impact the movement patterns of elephants resulting in negative interactions with humans was observed in the east-central region (Padalia *et al*. 2019). In recent times, Jharkhand, Chhattisgarh, Odisha, and South Bengal in the East Central region, have reported high levels of human-elephant conflict, which could be attributed to loss and fragmentation of elephant habitat due to LULC changes (Pandey *et al*. 2024b).

The slight observed increase in forest cover and decrease in water bodies in the northern region may not represent actual change but could be due to classification issues in LULC mapping. Babu *et al*. (2019) assessed the landscape dynamics in elephant habitat of the northern region and concluded that the forest area is relatively less affected and nearly stable, which is consistent with our findings.

Overall, the shifts in forest cover in ERs in India have been relatively minimal. Agricultural land use within ERs increased in all regions, indicating intensification of agriculture during the last few decades. The evolving LULC pattern has fragmented elephant habitats, forcing elephants into close proximity with human settlements and influencing their movement due to obstruction of migratory pathways (Billah *et al*. 2021), which may also affect the ranging behaviour of dispersing elephants and result in the emergence of new human-elephant conflict zones.

## Acknowledgements

We extend our gratitude to the Ministry of Environment, Forest, and Climate Change, Government of India, for their invaluable support. We sincerely acknowledge the state forest departments of the elephant range states for providing data on the elephant reserves. We acknowledge the support provided by the Director of the Wildlife Institute of India and the Director of the Academy of Scientific and Innovative Research. The support provided by K. Muthamizh Selvan, Lakshminaryanan. N, Adithya Bisht, Raju Rawat and Kirti Bisht is duly acknowledged.

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**Figure 4.** Elephants in Terai Elephant Reserve, Dudhwa, Uttar Pradesh. Photo by Surendra Kumar.

DOI: 10.2305/CNGG3503
Research Article Gajah 59 (2025) 11-16

# Human-Elephant Conflict Assessment Based on Compensation Records in Baksa District, Assam, India

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**Abstract.** In Northeast India, the demands of rising human populations compromise elephant habitats causing human-elephant conflict (HEC). We conducted a study of HEC in Baksa District, Assam, obtaining data from Baksa Forest Division records. HEC mostly occurred during the winter paddy ripening season and the summer fruit ripening season. HEC had a significant impact on villages that border elephant habitats. The majority of HEC incidents involved crop raiding and about 35% were house damages. To reduce HEC, effective mitigation measures such as early warning systems and solar fences, need to be implemented.

## Introduction

Human-elephant conflict (HEC) refers to adverse interactions between people and elephants. HEC incidents include crop raiding, property damage, and fatalities affecting both humans and elephants. Although not a new phenomenon, HEC has been escalating across much of elephant range in India, with approximately two human fatalities per day attributed to it (Singh 2024). Loss and fragmentation of elephant habitat due to human activities have caused greater increase of human-elephant interactions and crop raiding (Liu *et al*. 2017).

Cultivations in areas with elephants are vulnerable to raiding, due to elephants' preference for crops (Sukumar 1991). Consequently, easily accessible crops exacerbate HEC (Gubbi 2012). Elephants frequently traverse human-dominated landscapes, including settlements, to reach crops, often resulting in damage to human property (Talukdar *et al*. 2023). Confrontations between humans and elephants during crop-raiding incidents, or human retaliatory actions, lead to injuries and fatalities on both sides.

India is home to the largest population of Asian elephants (*Elephas maximus*), composed of populations in the south, northeast, and north of the country distributed across 23 states (MoEFCC 2017). Assam in the northeast of India has a population of around 5,800 elephants (Piraisoodan *et al*. 2024). Key elephant habitats in Assam comprise protected areas such as national parks and wildlife sanctuaries, the area along the northern borders adjoining Bhutan and Arunachal Pradesh, and hills of the Karbi Anglang Plateau (Piraisoodan *et al*. 2024). Around 85% of Assam's elephant population is concentrated in 12 out of 43 Forest Divisions.

Assam is 78,438 km$^2$ in extent and has a population density of 398 persons/km$^2$ (Census of India 2011), which imposes significant pressure on natural resources, particularly forests. The state recorded a loss of 83.92 km$^2$ of forest and tree cover between 2021 and 2023 (Forest Survey of India 2023). Most of the remaining forests in the state are categorised as open or moderately dense, with minimal coverage of highly dense forests (Forest Survey of India 2023). These factors contribute to the intensification of HEC in the region.

HEC is prevalent along the periphery of elephant habitats in the state and habitat shrinkage has been identified as its primary cause (Talukdar *et al*. 2023). The districts of Baksa and Chirang in Assam are particularly prone to HEC (Talukdar *et al*. 2024). Residents in HEC-affected areas typically seek monetary compensa-


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tion from the government. Compensation claims made by victims are not always accurate and require verification by Forest officials before settlement. The locations of HEC incidents in compensation records are deemed reliable and useful for identifying HEC hotspots (Sengupta *et al*. 2020).

## Methodology

*Study area*

Bodoland, officially known as the Bodoland Territorial Region, is an autonomous administrative region in Assam (Fig. 1). It comprises four districts situated on the northern bank of the Brahmaputra River, below the foothills of Bhutan and Arunachal Pradesh. The Bodoland Territorial Region is located between 26° 7′12″N latitude and 89°47′40″E to 92°18′30″E longitude. The area experiences four seasons in a year: pre-monsoon (March – May), monsoon (June–September), post-monsoon (October – November), and winter (December – February). The temperature drops to around 10°C in January and reaches a maximum of approximately 34°C during July and August (Bhattacharyya *et a*l. 2024). Baksa District is one of the administrative divisions within the Bodoland Territorial Region. The district covers a total area of 2,457 km$^2$ and has a population of 950,075 (Census of India 2011). It has extensive forests rich in flora and fauna. There were approximately 679 villages in the Baksa District.

The Bodo community forms the largest ethnic group in the region, accounting for approximately 12 million people (35% of the population), followed by the Bengali-speaking Muslim community, which represents the largest minority group (Census of India 2011). The district's economy is predominantly agricultural, with limited urbanisation and industrial development. Majority of the population rely on agriculture for their livelihood. Paddy is the principal staple crop, cultivated in both the summer (June–July) and winter (October–November) seasons; however, winter paddy is more widely cultivated (Kalita & Baruah 2021). Tourism in the region is managed by the Department of Bodoland Tourism, with Manas and Raimona National Parks serving as the primary centres of tourist attraction.

*Data collection and analysis*

Six years of data (2015–2020) were obtained from the Baksa Forest Division records, covering HEC incidents in the whole of Baksa District. For each HEC incident documented, the following data were extracted; complainant's name, village, location, type of conflict, date and time of the incident and the compensation amount disbursed. Additionally, for crop damages; the extent, and for property damage; the type of household and the extent, for human casualties; name of the victim, age, sex, location and probable cause of the incident, for injuries; whether minor or major. Villages with 11 to 50 HEC incidents over the study period were categorised as highly affected and those with more than 50 incidents as severely affected. HEC incidents were classified into six categories based on the type of loss caused by elephants, as crop losses, house damage, human injuries, combined damage to houses and crops, human fatalities and injury or death of livestock.

## Results and discussion

*Types of HEC incidents*

A total of 1,182 HEC incidents were reported between 2015 and 2020. The largest proportion of incidents were crop losses (N = 709), accounting for 59.98% ($\chi^2$ = 2125.19, d.f. = 5, p<0.0001), followed by house damage (N = 382, 32.32%), human injuries (N = 43, 3.64%), combined damage to houses and crops (N = 30,

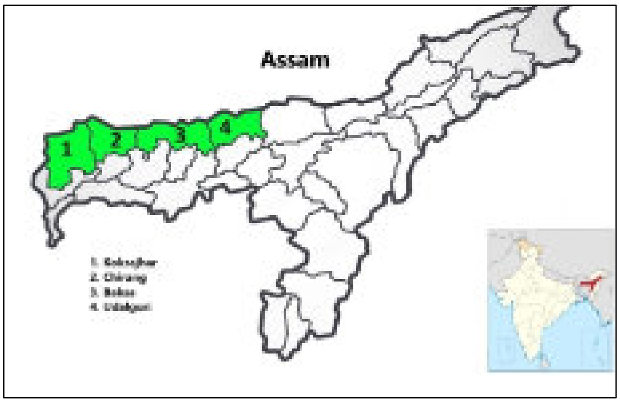


**Figure 1.** Map showing the Bodoland Territorial Region of Assam, India.

2.54%), human fatalities (N = 10, 0.84%), and injury or death of livestock (N = 8, 0.68%) (Fig. 2).

The main agricultural crop was paddy, and the high prevalence of its raiding underscored its role as the primary driver of HEC. Other incidents of HEC may have arisen secondary to crop raiding. Our findings are consistent with studies conducted in other areas of Assam, such as Manas National Park (Nath *et al*. 2015), Swang Reserve Forest and its adjacent areas in Nagaon District (Baishya *et al*. 2021), and Patharia Hills Reserve Forest in Karimganj District (Talukdar *et al*. 2023). Similarly, studies from other regions of India with different primary crops have also reported crop raiding as the main cause of HEC. For example, Gubbi (2012) found that finger millet, maize, and cotton were mostly raided by elephants in Nagarahole National Park in Karnataka (India), while Patil & Patil (2019) reported that coconut palms were the most frequently damaged crop in Sindhudurg District of Maharashtra, India.

A total of 382 houses were damaged, and an additional 30 houses were damaged along with crops. Property damage commonly occurred when elephants attempted to access harvested paddy stored inside or outside the houses, when raiding banana plants in home gardens, or when moving through human settlements to reach agricultural fields.

Our findings indicate that HEC is closely linked to the maturity of the paddy crop and the ripening of summer fruits as HEC incidents were high at these times. Although the summer season aligns with the rainy season during which elephant habitat conditions are considered favourable, elephants appeared to preferentially raid jackfruit and banana. Since these fruit trees are typically cultivated in home gardens, such incidents often led to property damage.

The records indicated that 43 injuries and 10 fatalities of people occurred during the study period. Based on the government records, Mohan (2024) reported that 383 people and 89 elephants lost their lives from HEC in Assam between 2019 and 2024 giving a ratio of human: elephant deaths of 4.3:1. The Baksa Division records an average of 0.070 human deaths per year per 100 km$^2$ due to HEC, which is lower than the state (Assam) average of 0.089. In comparison, several other Forest Divisions reported much higher human mortality rates, including Udalguri at 0.854, Goalpara at 0.801, Tinsukia at 0.169, Nagaon at 0.141, Kamrup at 0.120 and Sonitpur at 0.092 (Talukdar *et al*. 2024). These higher values collectively contribute to an increase in the state's overall average.

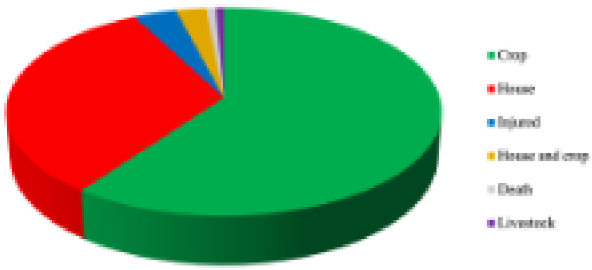


**Figure 2.** Number of HEC incidents in Baksa District of Assam from 2015-2020.

*Temporal distribution*

HEC intensity exhibited significant variation across years ($\chi^2 = 49.88$, d.f. = 4, $p < 0.001$). It was highest in 2017 and lowest in 2018 (Fig. 3). Incidents were highest during June–July and October–November (Fig. 4). The peak in October–November coincided with the late autumn to early winter period, when paddy matured. Elephants entered the crop fields at night to feed on the ripening paddy. Studies such as those by Das *et al*. (2012), Nath *et al*. (2015) and Talukdar *et al*. (2023) corroborate that the peak period of HEC aligned with the crop maturity season in late autumn and early winter. Another notable period of HEC occurrence in Baksa was during

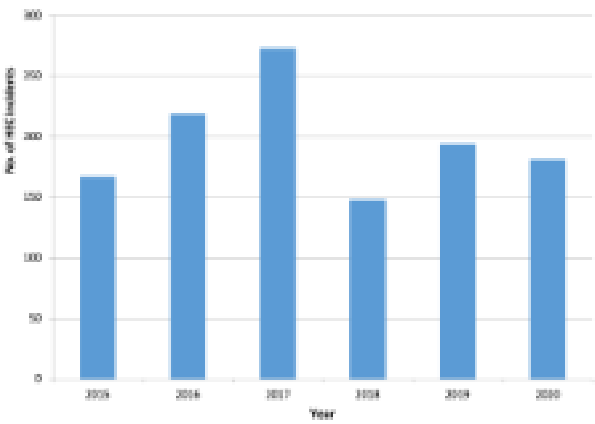


**Figure 3.** Annual number of HEC incidents in the Baksa District.

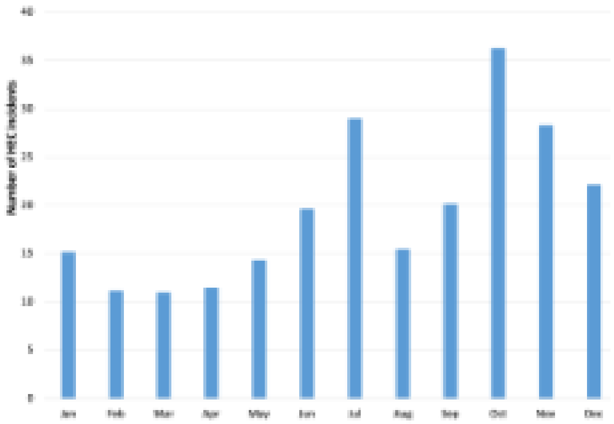

**Figure 4.** Average number of monthly HEC incidents in the Baksa District.

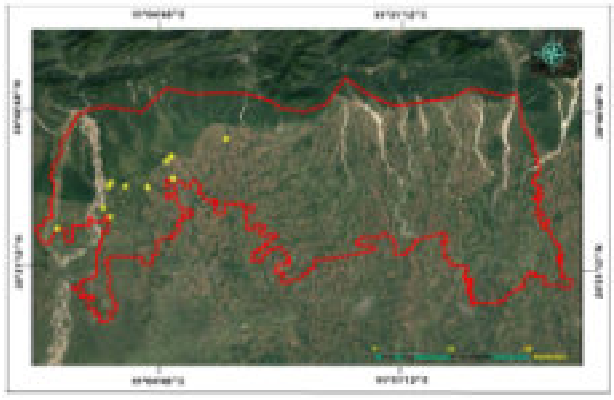

**Figure 5.** Villages in Baksa District commonly affected by HEC. The dark-green-shaded regions denote the Manas landscape.

July, coinciding with summer, when summer paddy began to mature. Houses and crops in home-gardens were also frequently damaged by elephants in summer, when jackfruit ripened. Home-gardens were generally not raided during the winter, possibly because mature paddy crops were widely present, unlike in summer when they were limited to a few fields. Winter fields were also often located away from human dwellings, reducing the likelihood of human-elephant encounters.

*Spatial distribution of HEC*

HEC incidents occurred in 105 villages between 2015 and 2020, representing 15.46% of the total 679 villages in the district. However, the actual proportion of the villages is considerably lower because many of the villages listed in the compensation records are parts of larger official villages, and these smaller units were recorded to accurately identify the victims.

The HEC affected villages were situated along the southern border of the Manas landscape, as indicated by the green-shaded areas in Figure 5. Notably, over two-thirds (70.39%) of these incidents were in 16 villages. Among them, five villages were severely affected (Fig. 6) and 11 villages highly affected (Fig. 7). Many villages (n = 46) only experienced single conflicts between the study periods. The severely affected villages were Bhuyanpara, Bansbari, Raghabbil, Karebari and Barengabari while the highly affected villages were Madanguri, Pakriguri, Chukrungbari Pathar, Daoraibari, Kumguri, Kagrabari, Gyatigoan, Katajhar Pathar, Kokilabari, Khusratari and Mayanagpara. In villages such as Bhuyanpara, Bansbari, and Raghabbil HEC incidents were recorded during both the summer and winter seasons in all years. The areas with severely and highly affected villages require special attention and targeted measures to mitigate the conflict.

The average crop area damaged by elephants in the study area was 0.85 acres, ranging from 0.33 to 2.47 acres (± 0.79), which is relatively small compared to the 1.28 acres reported by Talukdar *et al*. (2023) in the Patharia Hills Reserve Forest of Assam and 2.77 acres reported by Gubbi (2012) around Nagarhole National Park of Karnataka. Kalita & Baruah (2021) found that most farmers in Baksa District possessed less than 1 hectare (2.47 acres) of land. Also, elephants in our study area, did not remain in a crop field for long while raiding. Therefore, most fields were not completely damaged, pos-

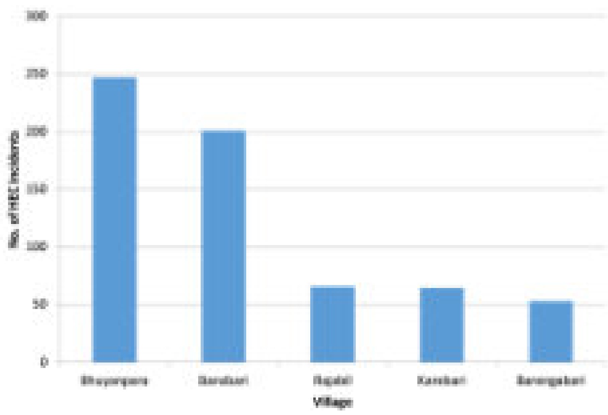

**Figure 6.** Severely HEC-affected villages in Baksa District.

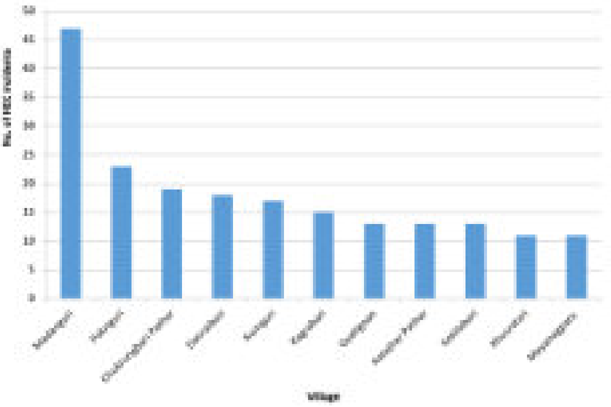

**Figure 7.** Highly HEC-affected villages in Baksa District.

sibly resulting in a smaller area of damage compared to other regions.

*Compensation*

Compensation amounts showed significant variation over the years, as they were determined by the number and type of incidents.

On average, those affected by crop-raiding received 4,407 INR (50 USD), compensation for house damage averaged 4,451 INR (50 USD), and for injuries, 12,319 INR (140 USD) (Table 1). The highest total compensation was allocated to crop loss, benefitting 709 persons, with individual payments ranging between 1,500 (17 USD) and 17,000 INR (193 USD), and a total disbursement of 2,974,900 INR (33,823 USD).

Property damage, including houses, remained a pressing issue in the study area. The total compensation paid for house damage was 1,696,000 INR (19,343 USD), with an additional amount of 173,500 INR (1,979 USD) allocated for damages to 30 houses caused by raiding harvested crops (Table 1).

Claims for livestock injury or death due to HEC were the least frequent. Compensation for eight livestock injuries totalled 33,500 INR (382 USD), with individual payments ranging from 2,500 to 9,000 INR, depending on the livestock's size and type (Table 1).

Compensation for human injuries ranged from 5,000 to 30,000 INR depending on the severity of the injury. In total, 455,800 INR (5,198 USD) was paid to 43 injured individuals, with an average payment of 12,318 INR (140 USD) (Table 1).

For 10 human fatalities, a total of 2,200,000 INR (25,091 USD) was disbursed as compensation for ten deaths between 2015 and 2020 in the Baksa District. Until 2017, the compensation amount for a human death was 100,000 INR (1,140 USD), which was then increased to 400,000 INR (4,562 USD).

**Acknowledgements**

We extend our heartfelt gratitude to the forest staff of the Baksa Forest Division for their kind support. We are also grateful to the research scholars of the Wildlife Conservation Research Laboratory, Assam University, Silchar, India, for their invaluable assistance in conducting this study. Additionally, we appreciate the facilities provided by the Department of Ecology and Environmental Science, Assam University, Silchar. Finally, we thank the anonymous reviewers for their valuable suggestions, which have helped improve the manuscript.

**Table 1.** Annual compensation (INR) paid in the Baksa Forest Division.

| Year | Crop (n=709) | House (n=382) | House and crop (n=30) | Livestock (n=8) | Injury (n=43) | Death (n=10) | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 10,900 | 417,500 | 127,000 | 2,500 | 54,000 | 200,000 | 811,900 |
| 2016 | 211,000 | 244,000 | 46,500 | 0 | 50,000 | 0 | 551,500 |
| 2017 | 1,776,000 | 699,000 | 0 | 22,000 | 143,000 | 1,600,000 | 4,240,000 |
| 2018 | 67,000 | 18,500 | 0 | 0 | 56,800 | 0 | 142,300 |
| 2019 | 678,000 | 313,000 | 0 | 9,000 | 120,000 | 400,000 | 1,520,000 |
| 2020 | 232,000 | 4,000 | 0 | 0 | 42,000 | 0 | 278,000 |
| Total | 2,974,900 | 1,696,000 | 173,500 | 33,500 | 465,800 | 2,200,000 | 7,543,700 |

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DOI: 10.2305/DCYD6296
Research Article Gajah 59 (2025) 17-23

# Case Study of the Rescue and Release of a Female Elephant and Calf that Strayed into Jagatpur, Odisha, India

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**Abstract.** In September 2022 two adult female elephants and a calf strayed into the city of Jagatpur, Cuttack, Odisha, triggering intense human elephant conflict. Following a tragic barrage accident that killed one female, the surviving adult was immobilised and transported to the Kapilash Rescue Centre. Subsequently, the calf who independently navigated back into forested habitat, was also darted and transported to the centre. After comprehensive veterinary care, both were translocated to the Kandhara Reserve Forest and released. Post-release monitoring showed stable movement, strong mother and calf bonding, and successful reintegration.

## Background

The State of Odisha holds about 2000 wild Asian elephants (*Elephas maximus*), which is about 74% of the elephant population in eastern India. Elephants are found in around 65% of the State. The Maniabandha-Jhinkala Reserve Forest, Kapilash Sanctuary and the adjacent Reserve Forests (RF) of Patapuri, Megha, Lahada, Gondia, Deogan, Ramei and Aswakhol, located in the Dhenkanal District, together with the Charbatia, Dalijod and Brahmapur RFs located in the Cuttack District forms a single landscape with elephants. Elephants move around these forests and also cross the Mahanadi River into the Chandaka Wildlife Sanctuary situated in the Khordha District. Jagatpur is an industrial town located in the Cuttack District. It lies near the Mahanadi River about 10 km from Cuttack city.

On 27th September 2022 night, three elephants, consisting of a juvenile about 5 feet tall and 2 adult females, strayed into the urban area of Cuttack. The elephants crossed the Birupa branch of the Mahanadi River, close to the Jobra barrage around 3 am and entered the densely populated Pondasahi colony of Cuttack. There was a lot of commotion as people spotted the elephants, resulting in the elephants getting separated from each other and an elderly lady getting killed by one of the adult females. Then this female was chased along roads and moved further into town. Another person was killed in the melee and 3 persons were injured. The other adult female and calf moved back to the river and crossed back into Cuttack town at a point upstream of the Jobra barrage. On encountering people on the other side also, they moved back into the river and tried to retrace their path. The calf slipped into one of the open gates of the Jobra barrage and was carried downstream. The adult female got stuck in the gate and drowned. This was about 5:30 am. The calf subsequently got out of the river and stayed in the riverside vegetation. The female that moved into town was there the whole day and continued to be chased around the streets.

Information from previous sightings suggested that the three elephants had moved from the Dhenkanal Kapilash Sanctuary to Baniabandha RF, in the Khuntuni range of Attagarh Division (Fig. 1). They were identified in Mahabirod range inside Dadraghati RF on 3rd September 2022 and moved downstream along the Brahmani River. On 14th September they crossed the Brahmani River at Sogar in Khamakya West range and entered Dhenkanal range. They stayed for one week in Megha RF and then moved into Kapilash Sanctuary moving along the railway tracks. On 23rd September they entered Baniabandha RF which is adjacent to


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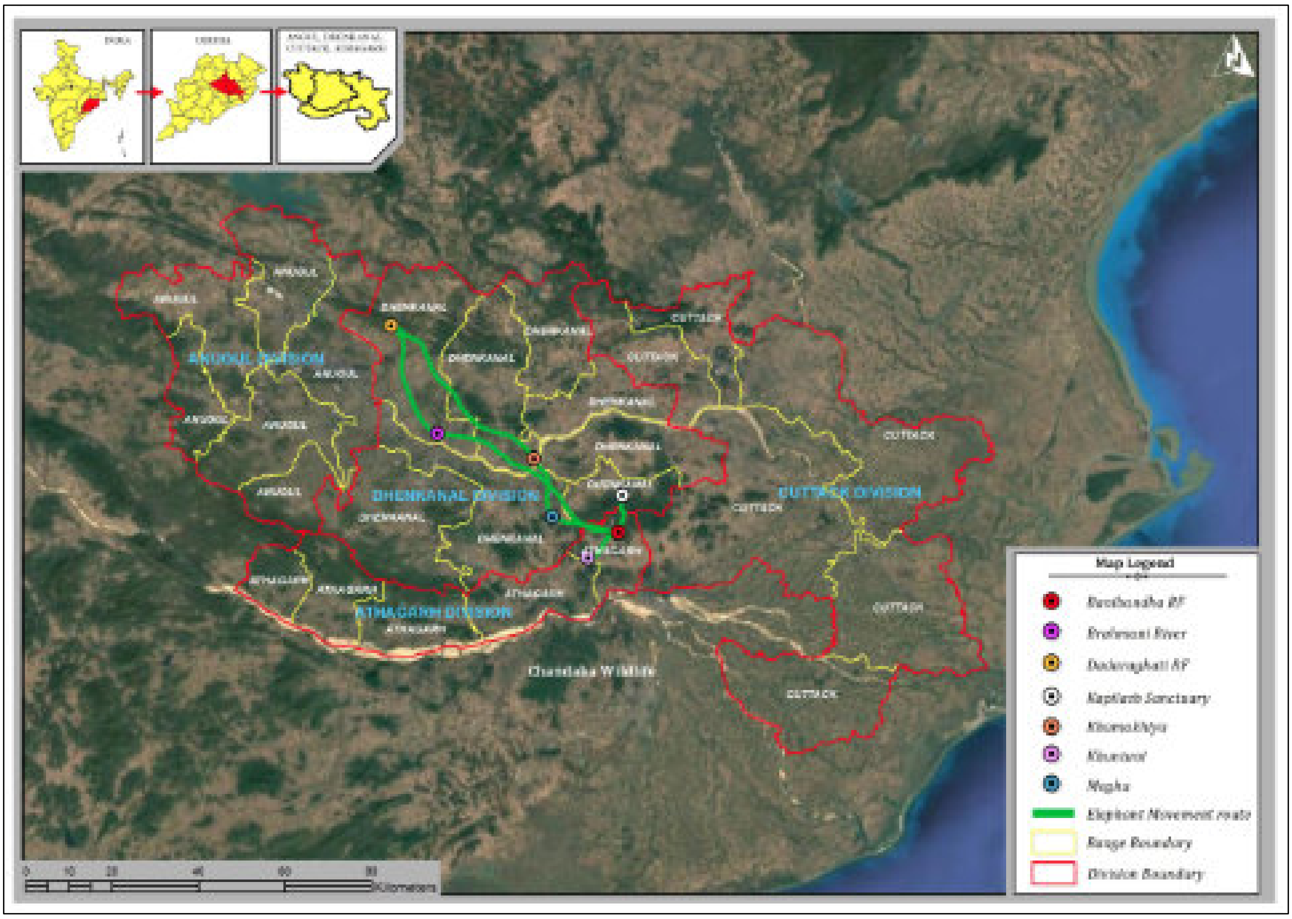


**Figure 1.** Movement data of elephants, based on sightings.

Kapilash Sanctuary inside Attagarh Division. There was another group of 17 elephants at the time, but the 3 elephants were moving separately. The Attagarh Division squad tried to drive the elephants back to the forest when they entered the Khuntuni habitation but were unsuccessful. The elephants continued to stay in small forest patches in the fringes of the town.

The female in the city was tranquilised by the City Forest Division at Jagatpur Industrial estate with the help of the Nandankanan Zoo veterinary team headed by Dr. Gupta on the 28th September around 4:30 pm.

The next day early morning, she was loaded onto a truck (Fig. 2), using a crane and belts, and brought to Kapilash Rescue Centre and put into a kraal (Fig. 3). She measured 238 cm at the shoulder. She came out of sedation and was active on 29th September morning and tried to break out. She took water but did not eat the *Ficus bengalensis* feed provided. On 29th evening she fed on banana stems and leaves. On the 30th she was relatively calm and ate more. She had a cut injury on the lower portion of the trunk and several superficial abrasions on the body, probably inflicted when she broke through a barbed wire fence, which were treated. She was lactating and it was noted that milk had oozed out of the mammary glands while strapping and lifting her at Jagatpur. She was kept in the kraal until 3rd October when she was moved out for release.

### Rescue of the calf

The calf was initially left out in Jagatpur and kept under observation. It moved from Jagatpur

**Figure 2.** Loading the adult female.

**Figure 3.** Unloading the adult female from the truck and moving her into the kraal.

on 28th September evening to the Haripur Dam area and entered the Kapilash Sanctuary from Chattigarh side on 30th September night. At about 3 am on 1st October it moved close to a resident group consisting of 2 females and a calf less than 1 year and followed them. At about 7 pm it entered paddy fields at Sorisipada village bordering the sanctuary. After about one hour it moved towards the north and entered Ramei RF passing through Jamunali village, moving along a village road. The calf moved along the villages of Jamunali and Deojhar and reached the Gundraposi Dam back waters. From here it moved into paddy fields and fed. It stayed in the fields till about 5 am and then started retracing its path back and reached Gundraposi dam dyke, from where it entered some cashew fields inside Ramai RF by daybreak.

It was then decided to capture the calf. In the evening of 2nd October, it was expected that the calf would once again move along the previous day's path to the paddy fields. A spot was identified where the elephant was expected to cross a culvert over a canal, to reach the paddy fields. The team consisting of DFO Dhenkanal, ACF, Veterinarian Dr. Kishore Sahoo and a biologist were positioned at the culvert by 5:30 pm. The calf came out of the cashew fields around 6 pm and took the path towards the culvert. It was expected the calf would enter the culvert and a shot could be taken on the left thigh. But as it became dark, a torchlight had to be focussed on the calf, and it charged towards the team. Consequently, he was shot on the right shoulder. After the shot, the calf moved for about 150 m before becoming immobilised. The needle was firmly lodged in the shoulder and could not be pulled out. The pliers with the team did not help. Therefore, an incision was made, and the needle was finally removed using needle-nose pliers. The incision site was stitched immediately. The process was done during lateral recumbency of the animal. The calf was walked in sedation with the help of a JCB (loader-excavator machine) on to a truck and taken to Kapilash Rescue Centre. The calf reached the rescue centre by 8:30 pm, was kept chained about 15 m from the kraal with the female and showered with water.

## Observation on the behaviour of the calf

After coming out of sedation, the calf tried to pull itself free from the chains. It succeeded in removing the screw of one of the chains by using its trunk. It calmed down when a sub-adult male elephant was brought near it (Fig. 4). The calf was fed *Ficus bengalensis*, banana stems and leaves and thereafter slept in lateral recumbency for 3 hours. It made stomach rumblings which were responded to by the adult female and by a male that was held in a boma at the rescue centre (a tusker which killed about 30 humans and was captured from Talcher Forest Division 3 years ago and kept in a 3-ha area). After the calf was brought, the adult female stopped feeding and tried to reach the calf. It was not

**Figure 4.** Calf interacting with other captive elephants.

known if the calf belonged to the dead or the captured female. However, the captured female was lactating and the behaviour of the elephants indicated that the calf was likely hers.

**Decision to release the elephants in the wild**

A number of locations for the release of the elephants were considered.

*1. Near the last forest area elephants were located, at the boundary of the Kapilash Sanctuary and Maniabandha RF*

This site was very close to the rescue centre. But the landscape was highly fragmented and National Highway 55, Railway lines and an industrial area were adjacent. The elephants had moved out from this area and entered Khuntuni town. It was thought that if they were released here, they may once again enter human habitations. Also, the possibility that they were unlikely to belong to this landscape and the failure of a previous attempt to release elephants here because of public protests were considered.

*2. To release in a distant place at Kandhara RF of Hindol Range with the adjacent landscape of Olaba RF and Satkosia Tiger Reserve*

Here a previous elephant release was successful. The forest had plentiful vegetation and perennial water. With a large extent of forest area, the elephants were thought unlikely to stray into human habitations immediately after the release. The public could not interfere with the release as the site was interior. However, the site was in a different landscape. Since the female elephant was about 35 years old, there was a possibility that she may try to return to her original home-range.

*3. Release back at Dadraghati forest where they were previously identified*

These forests were the landscape the elephants were from. The area was highly fragmented and there was high crop depredation. They would have to be transported 120–150 km and since it was Durga puja time, several traffic congestion points would have to be negotiated in the transport. The transport and release could not be kept secret and there was every likelihood the public would stage protests and not allow the release of the elephants.

Considering the above options, it was decided to release the elephants in Kandhara RF. The site had perennial streams and bamboo, climbers, grasslands, and diverse trees. There was an existing ramp for release of the elephants. If the elephants started to move away from Kandhara Forest there were connecting corridors, which they could use without coming into conflict. The site was about 75 km from the rescue centre and the transportation could be done in 2 hours.

The transportation was planned for 3rd October night. It was decided to load the elephants on to the vehicles by 11 pm and start moving by 12 midnight. The site of release could then be approached by around 3 am and the animals released by 5 am.

**Preparation for the transportation**

Only 4 persons were intimated on the release planning: DFO Prakash Ch. Gogineni, ACF Subrat Patra, Dr. Kishor Ku. Sahoo veterinarian and Swarup Fullonton zoo biologist. The ACF was involved in the preparation of the vehicles for carrying the elephants. Two trucks were hired and modified by removing the back door and welding hooks for chaining. A veterinarian and biologist monitored the elephants' feeding the whole day. The body temperature, respiration rate, blood oxygen saturation, signs of any external injuries and overall health conditions were checked, a trunk wash done and blood collected for analysis.

A Dan-inject tranquilising gun and a 10 ml dart was used to dart the calf. Additional drug delivery to the female and the calf was done by Dan-inject Jab stick.

**Tranquilisation and loading of the elephants on to the vehicles**

The calf was tranquilised and loaded on to the vehicle by pulling with ropes and chains. The operation started at 10 pm and was completed by 11 pm. Then the female was tranquilised and loaded on to another vehicle (Fig. 5). The process was completed at 12:30 am. Both the elephants were marked with a small white identification mark and microchipped behind the left ear lobe. Meanwhile it was noticed that the calf was in lateral recumbency, and the body temperature had risen, due to a lapse in showering with water while the female was being loaded. Immediately the calf was showered with water, upon which it stood up and all the parameters were found to be normal. The team was ready to move by 1 am.

Figure 5. Female loaded on the truck.

**Transportation of the elephants**

The two vehicles with the elephants were accompanied by 5 additional vehicles with Forest Department staff, totalling about 25 persons. On the way the vehicle was stopped thrice for monitoring the health of the animals. The ACF had coordinated with the Electricity Department to switch off the power in stretches as the vehicles moved to prevent any mishaps. The vehicle platform height was about 2.1 m. making the total height of the elephant while on the vehicle about 4.9 m. If it extended its trunk, it could reach a height of around 6.7 m. This would potentially put village electric supply lines on roadsides within reach of the elephant, particularly because sagging of electric wires occurred in some areas.

The vehicles stopped between Dhenkanal and Bhapur road as the power was not switched off and the personnel in charge were not responding. As the vehicle stopped, the female elephant became restless, started trumpeting and got excited and another dose of tranquilisation drugs was given. After a 25 min halt the vehicles started to move again. The rest of the trip was completed without any problem and the forest road at Kanaka was reached at about 5 am. Meanwhile there was drizzle from 2 am onwards and the intensity of rain increased as the vehicles climbed the road with increasing elevation. The vehicle carrying the calf skidded off the track and the tyre sank into soft earth (Fig. 6). Efforts were made for an hour to try and move the vehicle out but failed. Meanwhile the rain became heavier, and the road became very dangerous for any further movement of the vehicles. A JCB was procured for pulling the vehicles out but could not reach the stuck vehicle for some time because the earth adjacent to the road was very soft. Since 5 am the animals were active, and health parameters were checked. Another round of tranquilising drugs was given to keep them calm while the JCB was working. After the JCB reached the stuck vehicle, all efforts were made to move it out, but the JCB also failed. At 10 am the decision was made to release the animals.

**Release of the elephants**

At this time the vehicles were about 2 km away from the intended release site. The location of the vehicles was in a flat area and the nearest water sources were at about 2 km away uphill and 5 km down-hill. It was not possible to move the vehicles further as the heavy rain had made the road dangerous for movement of heavy vehicles. The JCB started on making a ramp with soil dug from adjacent to the road at about

Figure 6. Vehicle stuck on the road.

10 am. First the ramp was made for the vehicle with the calf and then for the other. Each took about 25–30 min.

The calf was once again given a tranquilising dose and then brought down the ramp. While bringing down, the calf fell sideways, and its chest region hit the edge of the truck. The fall happened because there was a sight gap between the ramp and the truck body, which was not noticed. The calf stopped breathing, and the doctor immediately injected the revival injection and heart pumping was done. After about 2 min the calf began respiration and stood up. Relieved, the team got back to work. The calf was fastened to a nearby tree and was slowly becoming active (Fig. 7).

Meanwhile the ramp for the female was completed. The female was tranquilized, moved down the ramp (Fig. 8) and antidote administered at about 12 noon.

**Observation after the release of elephants**

The calf which had become very active was freed without any restraint. The calf turned towards the female, crossed the other vehicles and reached her. On seeing the calf, the female moved towards it, taking a few steps while sedated (Fig. 9). The calf lost balance and lay down in lateral recumbency while the female stood adjacent to the calf and felt it with the trunk. The doctor confirmed both individuals were in good health and the calf was breathing properly.

After 2 hours the female became quite active, and the team decided to leave the site. A group of 4 persons were left behind to observe the animals.

**Figure 7.** Calf being tied to a tree.

**Figure 8.** Unloading the adult female.

The observers at the site reported that the calf woke up from sleep at about 9 pm and moved uphill towards the intended release site along the forest road. In the morning the staff once again reported both animals were sighted near the Nalah at Vejia.

**Post release tracking and behaviour**

Both the individuals were observed and tracked in the ensuing days. The animals on the second day moved actively and travelled around 8 to 10 km, exploring Kandhara RF. They stayed together the next week near a water body in Kandhara RF. Two resident herds were present nearby, but they did not mix with the herd. After about 15 days they moved south into Attagarh division of Olaba RF. The last sighting was reported after 2 months from Nuagad RF in Attagarh Forest Division near a village when they were seen feeding on the edge of a crop

**Figure 9.** Female and calf after release.

field, about 30 km from the release site towards the south and near the Satkosia Sanctuary.

**Details of drugs used**

*Male calf*

With respect to its size, the male calf was estimated to have a body mass of around 650 kg.

For capture, the calf was immobilised with 150 mg Xylazine HCl (1.5 ml, "*Xylamed 100 mg/ml – Bimeda*") and 100 mg Ketamine HCl (1.0 ml, "*Ketamina 100 mg/ml – Biowet Pulawy*"). Both drugs were administered as a mixture by Dan-inject dart projector, intramuscularly at 6:20 pm. The calf showed clear signs of sedation by 6:40 pm.

Antibiotic treatment consisted of 6750 mg Ceftriaxone and Tazobactam ("*Intacef-Tazo 3375mg – Intas*") and 3200 mg Enrofloxacin (32 ml, "*Flobac SA – Intas*"), both administered intramuscular by hand injection through a 20 ml syringe. As anti-inflammatories 75 mg Flunixin Meglumine (15 ml, "*Flunimeg – Zydus AH*") was given by intramuscular route by hand injection. The skin lesion created by darting was topically treated by infusing 6 ml of Penicillin Ointment ("*Pendistrin SH – Zydus AHL*"). Sedation was reversed by injecting 15 mg Yohimbine (1.5 ml, "*Yohimbe – Equimed USA*") intramuscularly.

After reversal at 7:00 pm, it took the calf 3.5 h to fully recover.

For loading on the truck, the calf was sedated with 120 mg Xylazine HCl, 80 mg Ketamine HCl and 1.8 mg atropine sulphate (3.0 ml, "*Tropin 0.6 mg/ml – Neon lab Ltd*"). All the above drugs were administered intramuscularly as a cocktail through a jab stick at 10:15 pm. The elephant was completely under standing sedation within 15 min.

Furthermore, 12 mg of Dexamethasone (3.0 ml, "*Dexona Vet – Zydus AHL*"), 300 mg Etofylline & Theophylline (6.0 ml, "*Deriphyllin – German Remedies*") and 2 mg Adrenaline Bitartrate (2.0 ml, "*Vasocon – Neon*") were administered by intramuscular route. Sedation was reversed by injecting 12 mg Yohimbine intramuscularly. Full recovery took 3 h.

The male calf was unloaded from the truck at 10:45 am on the following day. During release the elephant was again sedated by the use of 100 mg Xylazine HCl, 100 mg Ketamine HCl and 16 mg Hyaluronic acid (2 ml, "*Hytas One – Intas*") administered as cocktail by jab injection. In addition, 1000 mg Ceftiofur Sodium injection (1 g, "*Xyrofur 1 – Intas*"), 3200 mg Enrofloxacin and 75 mg Flunixine-meglumine were administered intramuscularly. Rehydration was achieved by intravenous administration of 500 ml normal saline infusion.

*Female elephant*

The adult female's body mass was estimated to be around 4000 kg.

For capture and loading, the adult female was sedated with 350 mg Xylazine HCl and 150 mg Ketamine HCl by intramuscularly as cocktail through jab stick at 11:05 pm. The elephant showed signs of complete sedation at 11:20 pm. During transportation, a top-up of the sedatives was done by jab stick injection consist of 300 mg Xylazine HCl and 200 mg Ketamine HCl for smooth transportation.

For the process of unloading and release, the female was sedated again using 300 mg Xylazine HCl, 300 mg Ketamine HCl and 24 mg Hyaluronic acid by intramuscular jab stick injection. Sedation was reversed with 30 mg yohimbine intramuscularly. Reversal took about 2 h.

**Acknowledgements**

We thank the PCCF Wildlife Odisha and all the staff of Dhenkanal Forest Division for their support and assistance. We thank the Veterinarian, Similipal Tiger Reserve, Dr. Abhilash Acharya. We also thank Saifudin Mallik for supporting us with the preparation of maps. We especially thank all the elephant mahouts and para-elephant squad members who helped during this rescue and release operation.

DOI: 10.2305/ZZBQ5124
Research Article Gajah 59 (2025) 24-28

# Classification of Elephants in Indian Elephantology: A Review with Special Reference to the *Mātaṅgalīlā*

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**Abstract.** Elephant-classification is a central theme in ancient Indian elephantology. Sanskrit texts use a range of criteria from physical attributes to behaviour, in classifying elephants. This paper provides an overview of elephant-classification in ancient times, with particular reference to the *Mātaṅgalīlā* of Nīlakaṇṭha.

## Introduction

The Indian elephant (*Elephas maximus indicus*) is one of four subspecies of Asian elephant, the others being the Sri Lankan elephant (*Elephant maximus maximus*), the Sumatran elephant (*Elephant maximus sumatranus*) and the Bornean elephant (*Elephant maximus borneansis*). The Indian elephant occurs in mainland Asia, while the other three are island populations. Elephants of these regions are animals of cultural, religious, and social importance in the Asian region, and they are very closely associated by people with many purposes.

Studying the different aspects of human life and its interconnectedness with the environment was central to ancient Indian civilisation, resulting in field of study named *śāstra* (science). It included various disciplines such as religious rituals, philosophical teachings, statecraft, medicine, erotica, paintings and theatre. One of these disciplines was *Āyurveda* which is commonly known as 'Indian medicine'. *Āyurveda* was not confined to human medicine but included that of animals (*paśvāyurveda*) as well as botany (*vṛkṣāyurveda*). The main focus of *paśvāyurveda* was elephants, horses and cattle, as they were used in warfare, transportation, and cultivation. Hence, it was of vital importance to breed, tame, bring up, train, nurture, and treat them systematically. This led to the development of three different '*śāstras*' pertaining to the three animals, *gajaśāstra*, concerning elephants, *aśvaśāstra*, concerning horses and *gośāstra*, concerning cattle. The scope of *gajaśāstra* or elephantology, included capturing, breeding and training elephants.

## Indian elephantology

Early Vedic literature refers to elephants as *mṛga-hastin* or 'animal with a hand' (Müller 1877; Roth & Whitney 1924). However, the elephant is ubiquitous in the subsequent literature and has been referred to by many terms, such as *gaja*, *kuñjara*, *ibha*, *nāga*, *mātaṅga* and *hastin* (Burrow 1955). References to this animal are found scattered in the post-Vedic literature as well. Later a different literary genre on elephantology was developed and many texts were produced. Among them the *Hastyāyurveda*, *Gajaśāstra*, *Mātaṅgalīlā*, *Gajaśikṣā*, and *Gajagrahaṇaprakāra* are prominent. The focus of this article will be mainly on the *Mātaṅgalīlā* since it is the most comprehensive, concise but self-contained, and charming and eloquent *gajaśāstra*-text in the Sanskrit literature.

## Classification of elephants

Classification of elephants is one of the main themes in Indian elephantology. There are a number of methods used classifying elephants in ancient Sanskrit texts, such as on the basis of caste, physical characteristics, mental qualities, humours, physical strength and capacity, and trainability.

Classification of elephants into four casts, is very common in Indian elephantology. These four castes are *brāhmaṇa* (brahmin), *kṣatriya*


Manuscript Editor: Prithiviraj Fernando

(warrior), *vaiśya* (artisan), and *śūdra* (serf). This division is found in the *Arthaśāstra* (Kangle 1960), *Yuktikalpataru* (Sastrī 1917), and *Gajaśāstra* (Śāstri 1958). This classification was considered to have a hereditary basis, but was seemingly based on physical and mental characteristics, and capacity of elephants. The physical characteristics mainly included colour and smell while the mental characteristics included un/kindness, un/gratefulness, anger and calmness. Skills in warfare, endurance, working ability etc. are considered to be the capacity of elephants. In another classification, elephants were considered to be successors of eight divine elephantine species namely *Airāvata*, *Puṇḍarīka*, *Supratīka*, *Vāmana*, *Kumuda*, *Añjana*, *Puṣpadanta*, and *Sārvabhauma* (Sastrī 1917; Śāstri 1958). This classification originated from mythology and was adapted to correspond with some physical and mental characters. For instance, the *Airāvata* class of elephants is said to possess a long trunk, small and stout penis, ears and teeth of white colour, and large body while a *Puṇḍarīka* class elephant is courageous, clever, passionate, and uncontrollable.

In the *Gajaśāstra*, elephants are also classified into different categories based on physical and mental characteristics and capacity similar to that mentioned above. According to one categorisation, elephants were classified into three main categories: *bhadra* (excellent), *manda* (slow), and *mṛga* (beast) with an additional category called *miśra* or *saṃkīrṇa* (mixed) (Śāstri 1958) for elephants bearing the characteristics of more than one main category. These four types are mentioned in *Arthaśāstra* as well (Kangle 1960). The *miśra* type of elephants are again divided into nine: *bhadramanda*, *bhadramṛga*, *mandamṛga*, *mandabhadra*, *mṛgabhadra*, *mṛgamanda*, *bhadramandamṛga*, *mandamṛgabhadra*, and *mṛgabhadramanda* (Śāstri 1958).

In another classification given in the *Gajaśāstra*, elephants are divided into seven groups based on physical characteristics peculiar to different gods (Śāstri 1958). They are *brahmāṃśaka*, *prājāpatyaṃśaka*, *indrāṃśaka*, *dhanadāṃśaka*, *varuṇāṃśaka*, *śaśāṃkāṃśaka*, and *agnyaṃśaka*. This classification also originated from mythology.

Based on various physical qualities, the *Gajaśāstra* classifies elephants into a few other groups and names them after different beings of different realms such as *deva*, *gandharva*, *vipra*, *kṣatriya*, *vaiśya*, *śūdra*, *piśāca*, *bhujaṅga* and *rākṣasa*. The *Gajaśāstra* also divides elephants into four groups as deva, *dānava*, *yakṣa*, and *gandharva* (Śāstri 1958).

In one of the classifications in the *Yuktikalpataru* all elephants are divided into two main groups: virtuous (*śuddha*) and vicious (*bhīma*). There are twelve types of elephants in the virtuous category: *ramya*, *bhīma*, *dhvaja*, *adhīra*, *vīra*, *śūra*, *aṣṭamaṅgala*, *sunanda*, *sarvatobhadra*, *sthira*, *gambhīravedin*, and *varāroha* and twelve types in the vicious category: *dīna*, *kṣīṇa*, *viṣama*, *virūpa*, *vikala*, *khara*, *vimada*, *dhmāpaka*, *kāka*, *dhūmra*, *jaṭila*, *ajinī*, *maṇḍalī*, *śvitrī*, *hatāvarta*, *mahābhaya*, *rāṣṭraha*, *muṣalī*, *bhālī*, *niḥsattva* (Sastrī 1917). According to the level of strength elephants possess, they are also classified into three groups as *uttama*, *madhyama*, and *hīna* in the *Gajaśāstra* (Śāstri 1958).

In the *Arthaśāstra* the ability to be trained or tamed, which is a very important factor in warfare and other work, hence is relevant to statecraft, is used for classification of elephants into four types: *damya* (tameable), *sannāhya* (war elephant), *aupavāhya* (riding elephant), and *vyāla* (rogue) (Kangle 1960).

The *Gajaśāstra* also classifies elephants on the basis of their colour into three groups: *śuddha*, *vyāmiśra*, and *antarvarṇa*. The *śuddha* type is again divided into three categories as *harita*, *rakta*, and *kṛṣṇa*. *Vyāmiśra* is also divided again into three: *harikṛṣṇa*, *śvetarakta*, and *kṛṣṇarakta*. The *antarvarṇa* type is also threefold: *antaḥpāṇḍaralohita*, *antaḥpāṇḍarakṛṣṇa*, *antarlohitasita* (Śāstri 1958).

**Elephant classification in the *Mātaṅgalīlā***

The *Mātaṅgalīlā* discusses many types of elephants under different classifications. They are scattered throughout the text. These classifications are not very different from what is found in other texts, but at times, there are slight differences in naming as well as interpretation.

Elephant classifications in the *Mātaṅgalīlā* consists of those based on character, sensitivity, humours and a fourfold classification.

*Classification based on character*

This is based on behavioural traits and classifies elephants into eight groups: *deva* (god), *dānava* (demon), *gandharva* (divine musician), *yakṣa* (devil), *rākṣa* (ogre), *mānava* (human), *piśāca* (goblin), and *uraga* ([divine] serpent). They are given these names as they possess the qualities of those supernatural beings and human beings. Their traits of characters are as follows (Sâstrî 1910; Edgerton 1931).

- *Deva* – Beauty, odour of white-water lily or sandalwood, *Alstonia scholaris* or orange tree or lotus (*padma*) or *Cathartocarpus fistula*, beams in face, interest of a young elephant, cry of a *koil*
- *Dānava* – Doing reprehensible things, much delight in fighting, mean nurtured, heartless, odour of *Vitex negundo* berry or aloes or fish, killing others
- *Gandharva* – Odour of *Gaertnera racemosa* or *yuktīkā* (a kind of jasmine) or lotus (*abja*) or *Rotteleria tinctoria* or *nāga* or yellow sandal, fondness of songs, excellent gait, handsome tusks, eyes, temporal bosses, head, trunk, trunk tips, few spots on the body
- *Yakṣa* – Radiance, impatience, favoured well, pleasant aspect, spirit, erected ears
- *Rākṣa* – Odour of cow or ape or ass or camel or cat or urine or dung or putrefaction, slaying other animals, violence at night, eating sour foods, meat, drinking blood, undisciplined, ingratitude, refractory behaviour
- *Mānava* – The *mānava*-type of elephants are again divided into four as is the case, according to Indian tradition, with human beings. They are named after the castes namely *vipra* (brahmin), *kṣatriya*, *vaiśya*, and *śūdra*. Their traits are given as follows:
    - *Vipra* – Purity, fragrance of honey or milk or sacrificial rice concoction or ghee or mango flower, fondness of peace, friendliness to all elephants, composedness, fondness of bathing, right mindedness
    - *Kṣatriya* – Odour of sandalwood or butter or yellow orpiment or red arsenic or bdellium, skilful in warlike operations, bravery in battle, heroics in weapon handling
    - *Vaiśya* – Odour of *Pentapetes phoenicea* or rice or sesame or *ketaki*-flower or jasmine, spots in uvula, patience in pain, eating flesh, fondness of kind words, ability to be appeased quickly
    - *Śūdra* – Delight in leftovers, getting frightened easily, having sour acrid odour or odour of goat or bones crab, wrath, treacherousness, cowardliness, ingratitude
- *Piśāca* – Solitude, odour of corpse or red goat, straying away, wandering at night, deep roar, violence enragement on the days of moon's change, stupidity
- *Uraga* – Odour of fish or water grass (*śaivala*) or a type of basil (*phaṇirjaka*) or mud or brandy or raw fish, fright, enragement at night, delight in water and dust

*The fourfold classification*

The fourfold classification of elephants in the *Mātaṅgalīlā* consists of *bhadra* (excellent), *manda* (slow), *mṛga* (beast) and *saṅkīrṇa* (mixed).

- *Bhadra* – Elephants with a fat body but not over-stout, and meaningful sensitivity, having rosy colour, significant girth and length, cloud-like roar, and tawny eyes and tusks, who are mountain ranging and enduring, good caravanners, resolute, energetic, heroic, and loved by cows. These elephants were born in the *kṛtayuga* in the spring.
- *Manda* – Elephants with ability to range both rivers and mountains, are dispirited, not very long, slow in motion, characterized by dullness, dark in colour, and lustful, who have short ears, stout round body, and large curved tusks, whose eyes have yellow glint, whose phlegm predominates itself, and who responds only to harsh stimuli. These elephants were born in the *tretāyuga* in the winter season.

- *Mṛga* – These are smallish elephants with minor girth and length, leaning body, greyish colour, high sensitiveness, large eyes, short tail, who is violent, who eats much, ranges in rivers, whose mind is unstable and gets angry easily, and in whom the bile predominates. These elephants were born in the *dvāparayuga* in the rainy season.
- *Saṅkīrṇa* – The *Mātaṅgalīlā* does not specifically give any characteristics of this type of elephants and merely mentions that they have mixed characteristics that belong to the other three types mentioned above. These are the elephants that are born in the *kaliyuga*.

The *kṛtayuga*, *tretāyuga*, and *dvāparayuga* relate to ages which have already passed. Therefore, even though this classification is based on physical characteristics, only the last type of elephants now exists in the world and the other three types of elephants: *bhadra*, *manda*, and *mṛga* are not present anymore.

*Classification based on sensitivity*

The sensitivity of elephants varies. Hence elephants respond in different ways to stimuli i.e. commands by the elephant-driver by goad, feet, with hook or by shouting. Accordingly, elephants are classified into seven groups: *atyarthavedī* (extreme-feeler), *uttānavedī* (shallow-feeler), *gambhīravedī* (deep-feeler), *anvarthavedī* (conformably meaning-feeler), *pratyarthavedī* (contrarily meaning-feeler), *karkaśavedī* (harsh-feeler) and *siddhavedī* (perfect-feeler) (Sâstrî 1910; Edgerton 1931).

- *Atyarthavedī* – This type of elephant is frightened of goad, hook, or stick even from afar and trembles when touched with them.
- *Uttānavedī* – The elephant who feels the impact of the sharp goad or hook at its first contact with the elephant's skin or hair.
- *Gambhīravedī* – Even when the hook pierces the skin or draws the blood out of the elephant, it does not feel the impact. This type of elephant feels it only after the hook pierces the flesh.
- *Anvarthavedī* – This type of elephant understands commands well. It is sensitive to the guidance made by feet or with the goad but is neither frightened nor confused.
- *Pratyarthavedī* – The one who functions contrarily to commands, these elephants go backward when guided forward and vice versa.
- *Karkaśavedī* – The elephant who does not have proper sensitivity and capability to act on its own and when guided, acts contrarily, and shows excessive vice.
- *Siddhavedī* – This is the best. This elephant is gentle all the time in all conditions and all its feelings. It does not show vice at all.

*Classification based on humours*

According to *Āyurveda*, there are three main dynamic forces, which are known as *tridoṣas* (three humours), in the physical body of all humans and animals (Bujarbarua 1979; Jaggi 1981). These are *vāta* (air), *pitta* (bile), and *kapha* (phlegm). When any of these three exceeds any of the other two or both, the body becomes sick. Therefore, it is essential to keep these three in balance in order to maintain the health of the body. As per the *Āyurveda* teachings, one of these three humours essentially predominates each and every physical body and it is an innate feature of a being. This predominant humour is responsible for the healthiness and basic characteristics of the being in concern. Accordingly, elephants are also classified into main three groups as *vātika* (windy), *paittika* (bilious), and *ślaiṣmika* (phlegmatic). Their characteristics are given as follows (Sâstrî 1910; Edgerton 1931).

- *Vātika* – The elephant in which 'air' predominates and who suffers from disease of wind, is lacking courage, not enduring, stiff, mournful, quick, stupid, and undependable in work, and has broken nails, unstable mind, contrary sensitivity, rough skin, little hair, visible veins, rough tusks, and ugly eyes and trembling feet.
- *Paittika* – The elephant in which 'bile' predominates and who suffers from disease of bile is angry, much eating, red-eyed, feeble, very false, loving shade, and without much beauty, has weak eyes, and shallow sensitivity, and dislikes heat, discharges must-fluid with little delay, and tends to a wasted state. The trunk, tusks, skin, nails, ears, hair, neck,

fore parts, hind parts, and feet of this elephant are all thin.

- *Ślaiṣmika* – The elephant in which 'phlegm' predominates, who suffers from disease of phlegm is very amiable, not oversusceptible to anger, fearless, steadfast, free from instability, fond of instrumental music and songs, very calm, very slow in moving, and lustful, has yellow eyes, very large toes, trunk, head frontal bosses etc., slow bodily fire of digestion, deep sensitivity, stout and smooth tusks.

Apart from the above classifications, the influence of air, bile, and phlegm on elephants are also discussed elsewhere in the *Mātaṅgalīlā* (Sâstrî 1910; Edgerton 1931). All the humours are well-balanced in *bhadra* elephants; hence these elephants are very healthy. The phlegm predominates in *manda* elephants; hence they are slow and dull. As a result of predominance of bile in *mṛga* elephants, they get angry easily. Further, humours give some particular colours to elephants. For instance, elephants become tawny, and yellow as a result of mingling the blood with bile, and phlegm respectively. Elephants get black if the bile is predominant in them. Similarly, they become white if the phlegm is predominant in them. Furthermore, the *Mātaṅgalīlā* divides the eight types of elephants based on character, into three groups. Namely *sattva* (harmony), *rajas* (passion), and *tamas* (darkness). *Sattva* is the type of elephant in which the 'air' predominates. Elephants who belong to the *kṣatriya*, *gandharva*, *deva*, and *brāhmaṇa* categories are *sattva*-elephants. If the 'bile' predominates in elephants, they are called *rajas*. These elephants belong to *vaiśya*, and *śūdra* categories. Finally, if the 'phlegm' predominates, they are the tamas-elephants and all the other categories i.e., *dānava*, *yakṣa*, *rākṣasa*, *piśāca*, and *uraga* belong to that.

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DOI: 10.2305/XAYO2484
Research Article
*Gajah 59 (2025) 29-36*

# Elephant Training in Karnataka

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**Abstract.** I examined the training methods of captive elephants at Sakrebyle and Dubare Elephant Camps in Karnataka and describe the basic training of captive-born elephants, wild-captured elephants, and training of elephants for tourism. Captive-born elephants adapted faster than wild-captured elephants to training and to cooperate with mahouts. This is likely due to the early training they received, where both mothers and calves formed close associations with single mahouts and were fed by them, making the training process faster and easier..

## Introduction

The Asian elephant (*Elephas maximus*), is classified as 'endangered' and exists in a number of fragmented populations in South and Southeast Asia (Williams *et al*. 2020). India is home to an estimated 26,000–28,000 wild elephants, constituting nearly 60% of the global population (Bist 2002). Elephants are of significance in India's religions, myths, historical narratives, and cultural heritage.

The practice of capturing and taming elephants dates back to the Indus Valley Civilisation more than 4,000 years ago (Sukumar 2003). Historically, elephants have been utilised in wars, circuses, logging, and construction (Sukumar 2003). Presently, the primary reason for capturing elephants is human-elephant conflict, where elephants causing crop damage and human fatalities are captured. Additionally, elephants fallen into wells or pits and rescued, orphaned calves and those with health issues are also brought into captivity.

In India, captive elephants are managed under private ownership, temples or the Forest Department. Karnataka hosts eight elephant camps, housing over 100 elephants, run by the State Forest Department. Elephants of both sexes are maintained in forest camps and allowed to forage in surrounding forests. Consequently, captive females in forest camps breed regularly with wild or captive males. Both captive-born and captured elephants undergo training for wildlife monitoring, jungle safaris, and other tourism-related activities.

I investigated the basic training of captured wild elephants and captive-born elephants, and training of elephants for tourism-related activities.

## Materials and methods

The study was primarily conducted in the Sakrebyle Elephant Camp, situated in the Shivamogga District of Karnataka, approximately 14 km from Shivamogga city (Fig. 1). Additional observations were done at the Dubare Elephant Camp in Coorg, Karnataka. Sakerebyle Elephant Camp is adjacent to the Shettihalli Wildlife Sanctuary and is proximal to the Gajanur dam, ensuring a perennial water supply (Fig. 1). It offers training for elephants captured in Karnataka and is managed by the Karnataka Forest Department (Madur 2017). Dubare Elephant Camp is located in Kodagu District, Karnataka, and is managed by Jungle Lodges and Resorts Ltd. an institution, established in 1980 and owned by the Karnataka government to promote wildlife tourism in Karnataka (Harini 2014).


Manuscript Editor: Prithiviraj Fernando

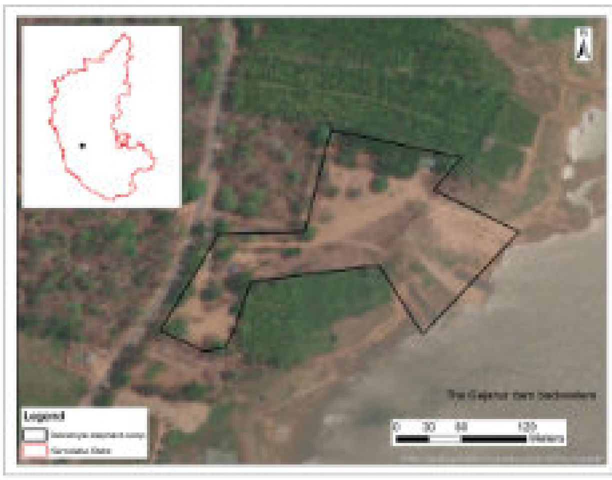

**Figure 1.** Map of the Sakrebyle Elephant Camp, Karnataka.

Every day from 7:00 am to 11:00 am the Sakerebyle camp elephants perform tourism related activities such as giving blessings, playing football with children, elephant bathing and elephant rides. Then they feed till 12:30 pm and are released to the Shettihalli Wildlife Sanctuary for foraging and resting till the next day. While in the sanctuary, the right front and back legs are bound with a drag chain, approximately 10 feet long to restrict movement and slow them down.

Mahouts bring the elephants back to the camp around 6:00 am. In the camp, the elephants are scrubbed and bathed by their caretakers. Each elephant has its own space to rest and is fed by its mahouts with a ball consisting of 10 kg of grass, 500 g jaggery, 3 coconuts and mixed grains. Supplements such as vitamins and any prescribed medicines are also mixed into the grass ball.

The study extended from September 2016 to April 2017. Information on camp elephants and elephant training was collected through observations and interviews of staff and mahouts. The Sakrebyle Elephant Camp was visited three days per week, and observations conducted from 9:00 am to 12:00 noon. Information on wild elephant training was obtained from visiting the Dubare Elephant Camp, three days per week, from 9:00 am to 3:00 pm, for a total of eight days in November and December 2016. A total of 48 hours were spent in the Dubare Elephant Camp.

The study on training of captive-born elephants, was based on a 2-year-old female named Hemavati undergoing training during the study period. Hemavati was born in 2014 at Sakrebyle Elephant Camp to a pregnant female elephant, captured due to crop raiding the same year.

The study of tourism activity training was based on a 45-year-old female elephant named Kunti and a 4-year-old male named Arjuna.

## Results and discussion

The Sakrebyle Elephant Camp housed 25 elephants comprising of 12 females and 13 males (Table 1). They included elephants that were born at the camp, captured from the wild, and transferred from other captive centres (Table 2). A newborn wild calf was brought to the camp from Yellapur and two elephants, Kapila and Indri aged 80 and 82 years, respectively, died during the study period.

### *Training of captive-born elephants*

Training of captive-born elephants commenced at the age of two years, as young calves demonstrate rapid comprehension and responsiveness to commands. The training focused on instilling a "learning to learn" mindset, using rewards by a trainer.

### *Mother and calf separation*

The initial step was separating the calf from its mother. Firstly, the mother was tethered to a tree using chains, while two to three adult captive elephants were positioned to prevent the

**Table 1.** Elephants in Sakrebyle Elephant Camp by age and sex.

| Age (years) | Male | Female | Total |
|---|---|---|---|
| <10 | 2 | 2 | 4 |
| 10–20 | 4 | 1 | 5 |
| 20–30 | 0 | 2 | 2 |
| 30–40 | 3 | 1 | 4 |
| 40–50 | 2 | 2 | 4 |
| 50–60 | 1 | 1 | 2 |
| 60–70 | 0 | 0 | 0 |
| 70–80 | 0 | 1 | 1 |
| Death | 1 | 2 | 3 |
| Total | 13 | 12 | 25 |

**Table 2.** Detailed information on elephants currently (December 2024) held at the Sakrebyle Elephant Camp.

| Name | Sex | Age (years) | Birth | Place of birth | Year of capture | Training duration (months) |
|---|---|---|---|---|---|---|
| Indri* | Female | 82 | Wild | Kakanakote | 1968 | 20 |
| Kunti | Female | 47 | Wild | Hassan | 2014 | 16 |
| Kapila* | Female | 80 | Wild | Kakanakote | 1971 | 21 |
| New tusker | Male | 51 | Wild | Shettihalli Sanctuary | 1974 | 12 |
| Gange | Female | 72 | Wild | Kakanakote | 1971 | 18 |
| Geetha | Female | 55 | Wild | Coorg | 1971 | 20 |
| Bhanumati | Female | 42 | Wild | Hassan | 2014 | 16 |
| Sagar | Male | 32 | Wild | Sagar | 1978 | 19 |
| Davangere Ganesha | Male | 47 | Wild | Assam | 2006 | Trained in other centre |
| Ranga** | Male | 33 | Wild | Shettihalli Sanctuary | unknown | 24 |
| Manikanta | Male | 37 | Wild | Bangalore | unknown | Trained in other centre |
| Bangalore Ganesha | Male | 42 | Wild | Anekal | unknown | Trained in other centre |
| Arjuna | Male | 11 | Wild | Hassan | 2014 | 16 |
| Bhaskara | Male | 11 | Wild | Hassan | 2014 | 16 |
| Wild calf | Male | 7 | Wild | Yellapur | 2016 | Not trained |
| Hemavati | Female | 9 | Captive | Sakrebyle | unknown | 6 |
| Amrutha | Female | 23 | Captive | Sakrebyle | unknown | 12 |
| Aale | Male | 16 | Captive | Sakrebyle | unknown | 6 |
| Ragvendra | Male | 40 | Captive | Mantralaya | unknown | Trained in other centre |
| Netra | Female | 29 | Captive | Sakrebyle | unknown | 8 |
| Shiva | Male | 8 | Captive | Sakrebyle | unknown | Not trained |
| Parvati | Female | 8 | Captive | Sakrebyle | unknown | Not trained |
| Surya | Male | 13 | Captive | Sakrebyle | unknown | 8 |
| Kirana | Female | 10 | Captive | Sakrebyle | unknown | 6 |
| Subhdra (private) | Female | 32 | Captive | Udupi | unknown | Trained in other centre |

*Died in 2017; **Died in 2020 (killed by a wild elephant)

calf from seeing its mother. Subsequently, a rope was fastened around the calf's neck and feet, and it was pulled away from the mother. This process required the assistance of 10–20 people. As a result of the distress caused by the process, the mother and calf experienced difficulty in feeding properly for 2–3 days afterward.

*Enclosure*

Next, the calf was kept in a 10 x 10 m open enclosure with an earth floor and shaded by trees, where direct contact between the restrained calf and the trainer/mahout was allowed.

*Training in enclosure*

During training, the calf was loosely tied with ropes to its neck and front feet and trained to sit, sleep, eat, and walk using commands (Table 3). The mahout repeatedly called out a command until the calf showed a positive action towards the command, sometimes the calf was rewarded with bananas and coconuts when it responded with the correct action. If the calf failed to respond correctly the mahout shouted, scolding the calf. Wooden sticks were used to control the calf's behaviour. The training period was from 7:00 am to 12:00 noon. Afterwards, the calf was allowed to roam freely within the enclosure. The position of the calf was changed every day during training, for cleaning and to obtain positive responses from the calf.

The training usually took 15–20 days. After 15 days, the calf developed trust in its trainer and was comfortable with him. Then, the calf was allowed to roam inside the camp, and training continued outside the enclosure.

*Free-ranging in forest*

After 20 days of training the calf was allowed to go into the forest for foraging with its mother from noon till the next morning at 6:00 am.

**Table 3.** Commands used for training elephants in Sakrebyle Elephant Camp.

| Command | Action |
|---|---|
| Maar | To walk |
| Beth | To sit |
| Ti re | For lying |
| Dhalai | To lift the trunk up |
| Tol | To lift forefeet up |
| Hadi tol | To lift hind feet up |
| Up | Lifting both legs up |
| Kule beth | Backside sitting |
| Bhar sab | Filling water in the trunk |
| Fook | Spraying water from the trunk |
| So maar | To get up after lying |
| Sarak | Sideways movement |
| Dhalai maar | To bring down the object using the trunk |
| Dhal piche | To go backward |
| So beth | To sit up after lying |
| Dubb | To dip the whole body inside a water |
| Dhar | For feeding |
| Pi | To drink water |
| Bol | To trumpet |

Daily training sessions continued from 8:00 am to 11:00 am for the next six months, during which the calf learned all commands.

*Commands used to train elephants*

The most common language used for elephant training in India are Hindi and Urdu; however, it differs from one camp to another. Commands used in the Sakrebyle Elephant Camp were in Urdu (Table 3).

*Training of wild-caught elephants*

Training ranged from three to six months, depending on the elephant's behaviour.

*Enclosure*

Captured elephants were brought to the camp in a heavy vehicle. They were unloaded, directed and pushed into a kraal using 4 to 5 trained, experienced camp elephants. The kraal was an enclosure made of wooden logs, where the movement of the elephant was restricted. Direct contact between the elephant and mahout was not allowed during this period (Fig. 2). The size of the kraal was 5.2 x 5.3 m and the posts were 3.5 m high. Only one elephant was kept in the kraal at a time, and they remained there for up to three months (Fig. 3). During this period, a designated mahout tried to communicate with the elephant and draw the elephant's attention to his commands.

**Figure 2.** Kraals used in wild elephant training.

In the first few days, wild elephants showed aggressive behaviour and tried hard to break out of the enclosure. Elephants were tied inside the kraal with ropes around their neck and legs and

**Figure 3.** Elephant inside the kraal.

were prevented from breaking out by scaring them by shouting loudly and tapping sticks on the ground to create noise. Sometimes the elephants were stabbed with non-pointed sticks, which could cause wounds when done forcefully and repeatedly. Being unable to break out of the enclosure, the elephant broke down and slowly adjusted to the situation.

Then the elephant trainer started calling the elephant gently and entered the enclosure to provide food and clean the enclosure. With this process, elephants started building trust with the trainer and finally responded positively to training.

After 1–2 months in the enclosure, the elephant was moved out of the enclosure for 2–3 hours daily, under control of other trained elephants. Four to five trained elephants covered the captured elephant from all directions, leaving no chance to escape while roaming outside the enclosure.

Occasionally, during the training, the mahout received injuries such as broken skin, wounds, and fractures due to actions of the elephant. A mahout was designated for each elephant and remained for the whole training process.

*Provision of food and water*

Food and water were regularly provided two times a day at 11:00 am in the morning and 5:00 pm in the evening to the elephant inside the enclosure. The food comprised 10 kg rice, 10 kg grass, 500 g jaggery, 100 g salt, and three coconuts daily. In addition, a special diet of mixed and boiled grains is given twice a week. Water was provided by a 60 cm deep hole dug in the ground in close proximity to the enclosure, which was accessed by the elephant with the trunk.

After three months, the mahout was able to make direct contact and enter the enclosure to provide food directly to the elephant by hand. This helped to gain the trust of the elephant and develop a close companionship. Bathing of the elephant was done only after it was released from the enclosure.

*Habituating elephants to crowds*

From the 2nd to the 3rd month, around 12–15 people surround the kraal and make noise by shouting loudly and lighting firecrackers for one hour each day over a span of 30 days. Tourists were allowed to observe wild-caught elephants inside the enclosure facilitating their habituation. The elephants were kept inside the enclosures, and there was no direct contact with people.

*Imprinting of elephant's name*

Once the elephant is named, a mahout starts using it frequently, which results in the elephant's positive response to it. Repetitive calling of the elephant by its name results in imprinting of its name in the elephant's mind.

*Free-ranging in the forest area*

After completing training, the elephant was allowed to go to the forest for foraging and resting under the observation of a mahout, who accompanied the elephant for four to five weeks and observed its behaviour. Elephants initially free-ranged inside the forest for 3–4 hours a day. Then, they were allowed to range from 2:00 pm to 6:00 am next morning. The commands and procedure used for further training of wild-caught elephants were similar to captive-born elephants.

*Transporting of trained elephants*

Following training, elephants were kept in the camp for tourism and entertainment purposes. Trained elephants were transferred to various captive centres according to government requirements. This requires the learning of commands used at different centres. To introduce new commands, the trainer increases the frequency of using the new commands while reducing the usage of old commands.

*Drawbacks of training*

Occasionally, both elephants and mahouts suffer severe injuries, ranging from minor scratches and wounds to significant fractures, which can result in fatalities of persons or elephants. Training a pregnant elephant or mother with her calf presents considerable challenges. If an elephant shows any abnormal behaviour such as aggression, stereotypic movements, or ferocity, it undergoes the same training process again, after completing its initial training.

*Unnatural behaviour of Bangalore Ganesha*

Bangalore-Ganesha, born in 1981 in the Anekal range of Bannerghatta National Park, commenced training at the age of two in the Bannerghatta Elephant Camp. At the age of seven, he killed his mahout. Subsequently, he was relocated to the Sakrebyle Elephant Camp, where he killed his mahout in 1994 and two drivers in the Sakrebyle Elephant Camp. Presently, Bangalore-Ganesha was kept within the forest of Shettihalli Wildlife Sanctuary, tethered with a single chain 300 ft in length, loosely tied to his front and back left feet, with the other end secured to a tree which restricts mobility, preventing him from exhibiting natural roaming behaviour. Food and water were provided within his reach. To prevent entanglement, the mahout inspects daily to make sure the chain does not have any obstacles. Direct interactions with mahouts and Bangalore Ganesha were avoided due to its unpredictable behaviour.

*Training period for elephants*

The training duration of wild-caught elephants averaged 17.4 ± 3.25 months, making it longer than that of captive-born elephants, which averaged 10.4 ± 2.33 months (Table 2). These figures refer to general training for handling and management and not tourism-based training.

For captive-born elephants, initial training begins 20 days after the calf was separated from its mother. This initial phase focuses on basic commands and acclimatisation to human interaction. However, comprehensive training continues beyond this period until the elephant was Ill-trained to all required commands. Captive-born elephants became trained quicker than wild-caught elephants. This could be attributed to the fact that elephants born in captivity are used to mahouts, as the mother and calf are both

**Figure 4.** Elephants giving blessing to tourists.

cared for by the same mahout. This continuous human presence fosters familiarity and trust, facilitating more efficient learning. Furthermore, captive-born elephant training begins at two years and younger animals learn more swiftly.

In contrast, wild-caught elephants often have varied training durations due to differences in age and prior experiences. Elephants involved in human-elephant conflict are captured following a government order, hence are of varying age and their training commences immediately post-capture. Older elephants generally require a longer taming period compared to younger ones.

*Training of elephants for tourism*

The elephants undergo training in various activities including playing football and cricket, elephant riding, giving blessing (Fig. 4), being bathed (Fig. 5), and shaking hands.

**Figure 5.** Elephant bathing.

**Table 4.** Commands used in football training.

| Commands | Actions |
|---|---|
| Dhalai maar | To hit a football with the trunk |
| Dhalai | To lift the trunk up |
| Pair uttha | To lift feet up |
| Thok | To kick |
| Thok maar | To kick a football by feet |
| Le Maar | To kick a football again |

*Football and cricket training*

Elephants received such training at four years of age. During the training they were taught various commands to play football and cricket (Table 4, Fig. 6). The mahout repeatedly used commands for distinct actions, rewarding the elephant with bananas and coconut for executing the correct response. For instance, the mahout demonstrated kicking a football and then tossed the football towards the elephant while repeatedly giving the command "dhalai maar", which means 'hit the football with trunk', until the elephant does it. The mahout would shout and employ a stick to control the elephant if responses were incorrect.

*Elephant ride training*

The primary attraction of the camp for tourists is riding elephants. Elephants begin ride training at ten years of age. Initially, they were taught to bear loads, approximately 180 kg, secured to their backs with ropes and undergo training to maintain a stationary posture for approximately 3–4 hours, with additional tethering to trees to prevent movement beyond the designated area.

To prepare for elephant rides, the namada (base kept on the elephant) was positioned on the elephant's back, followed by the placement of the gaddi (cushiony cover) on top of the namada (Fig. 7). Subsequently, a charzama, a carrier designed for people to sit in, was affixed using a rope around the tail, while a chamada (a leather belt aimed at preventing rope-induced wounds) was employed to provide abdominal support.

Once the elephant gets used to bearing heavy loads, an individual rides on its back for approximately 20 minutes around the camp. Over time, the number of riders were gradually increased to four (Fig. 7). Initially, the elephant moves slowly as the load increases, but with time, it adapts and moves freely. The training process typically lasts for about one month.

## Conclusions

Elephant training plays a vital role in safeguarding the welfare of individual elephants. Trained elephants can also contribute to human-elephant conflict mitigation by assisting in crop protection, relocating problem elephants, and conducting patrols to deter elephants from encroaching into human settlements. Trained elephants could also be utilised in rescue operations following natural disasters or wildlife-related accidents.

Despite the advantages of training, there are also animal welfare and ethical concerns, and controversies associated with the practice. Training methods such as mother and calf sep-

**Figure 6.** Football training.

**Figure 7.** Elephant ride training.

aration may inflict physical and psychological suffering on elephants.

Initiatives are currently being pursued both in India and internationally to advocate for the ethical and compassionate treatment of elephants in captivity. These efforts encompass the establishment of guidelines for elephant management, the enforcement of wildlife protection legislation, and the encouragement of alternative livelihoods for communities reliant on elephants for economic sustenance.

**Acknowledgments**

I express our gratitude to the Karnataka State Forest Department for granting us permission, to our guide, Dr. Vijaya Kumara, for his supervision and guidance and the Dept. of Wildlife and Management, Kuvempu University, for their valuable guidance, support, and encouragement. Our thanks go to the staff members of Sakrebyle Elephant Camp who helped with fieldwork. I also acknowledge the help of Yashaswini M P for her valuable suggestions and efforts in completing this work.

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DOI: 10.2305/RLET6443
Research Article Gajah 59 (2025) 37-55

# Field Investigation Report on Captive Asian Elephants in China

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**Abstract.** Due to the limited public access to information on captive Asian elephants in China, there is a general lack of understanding regarding the status of this population. To address this gap, a national census was initiated through an ongoing field investigation beginning in 2022 and continuing through 2030. This paper presents a summary of all information compiled to date, including profile data for 148 elephants and the 35 families or kinship groups. It also examines major welfare concerns, insufficient living space, and unregulated tourist feeding, as well as the inefficiency of current breeding programs.

## Introduction

Based on the 2024 statistics shared by volunteers, 312 captive Asian elephants (*Elephas maximus*) are housed across ~76 facilities in ~64 cities in 29 provinces of China (Figure 1, Table 1). Yet limited information has impeded a comprehensive understanding of their distribution, profile information, living conditions, and family/kinship group structures. Thus, a national census is essential to inform future conservation efforts and improve captive welfare. Since August 2022, a long-term field investigation has been conducted, aiming to document every individual elephant kept in captivity by 2030.

This paper provides a summary of data collected and catalogued through an ongoing field investigation conducted between August 2022 and June 2025, supplemented by limited official information and information shared by volunteers who are dedicated to long-term field observation. It offers an overview of the current status of captive Asian elephants in China by examining major welfare concerns that compromise their well-being and discussing the inefficiency of breeding programs.

## Materials and methods

Five field investigation trips were conducted between August 2022 and June 2025: 1–22 Au-

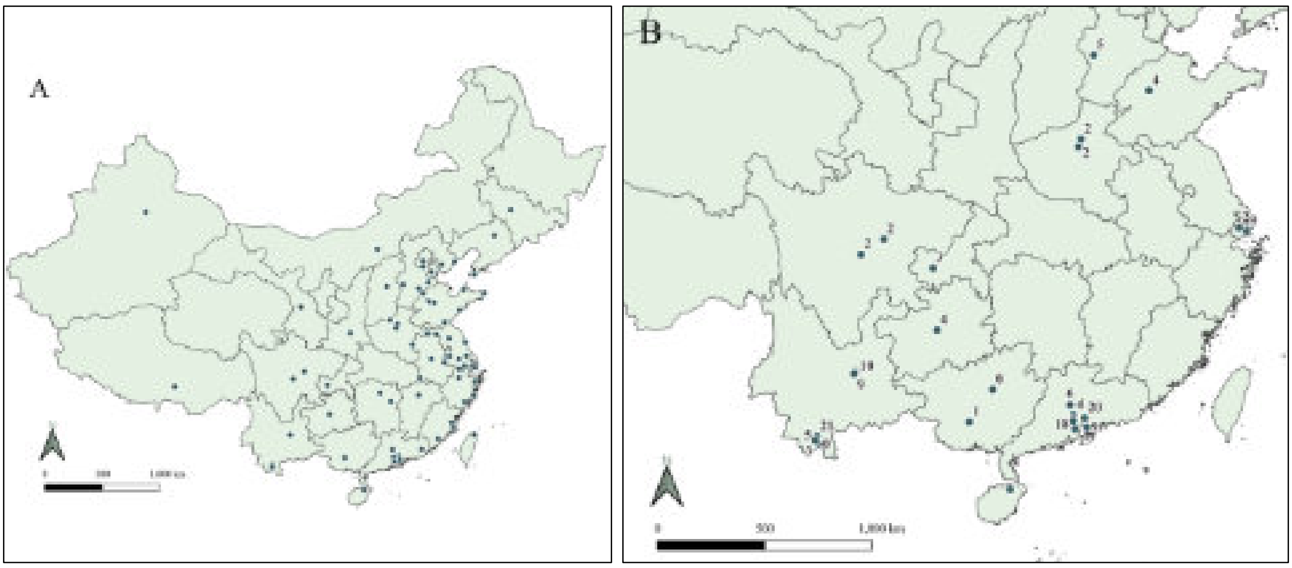


**Figure 1.** Distribution of 76 elephant keeping facilities in 29 provinces and municipalities (A) and facilities visited with number of documented elephants (B). Some points overlap due to proximity.

 Manuscript Editor: Christian Schiffmann

**Table 1.** Asian elephant-keeping facilities in China and the number of documented elephants (N) if the facility has been visited.

| Province | City | Facility | N |
|---|---|---|---|
| Anhui | Fuyang | Linquan Magic Zoo | |
| | Hefei | Hefei Wildlife Park | |
| | Huaibei | Huaibei Zoo | |
| | Maanshan | Anhui Daqingshan Wild Animal World | |
| Beijing | Beijing | Beijing Wildlife Park | |
| | Beijing | Beijing Zoo | |
| Chongqing | Chongqing | Chongqing Zoo | 3 |
| Fujian | Fuqing | Fuqing Yonghong Wild Animal World | |
| | Fuzhou | Fuzhou Zoo | |
| | Zhangzhou | Mount Tianzhu Happy Animal Kingdom | |
| Gansu | Lanzhou | Lanzhou Wild Animal Zoo | |
| Guangdong | Dongguan | Dongguan Xiangshi Zoo | 20 |
| | Foshan | Chuanlord Fairy Tale Kingdom of Animals | 3 |
| | Guangzhou | Guangzhou Chimelong Safari Park | 18 |
| | Guangzhou | Guangzhou Zoo | 4 |
| | Jieyang | Chaoshan Wangtian Lake Wild Animal Zoo | |
| | Qingyuan | Qingyuan Chimelong Forest Kingdom | 6 |
| | Shenzhen | Shenzhen Safari Park | 9 |
| | Zhongshan | Zimaling Zoo | 2 |
| Guangxi | Nanning | Nanning Zoo | 1 |
| Guizhou | Guiyang | Guizhou Wildlife Park | 4 |
| Hainan | Haikou | Hainan Tropical Wildlife Park and Botanical Garden | 1 |
| Hebei | Cangzhou | Cangzhou Zoo | |
| | Hengshui | Hengshui Wildlife Park | |
| | Qinhuangdao | Qinhuangdao Safari Park | |
| | Shijiazhuang | Shijiazhuang Zoo | 5 |
| | Tangshan | Tangshan Zoo | |
| Henan | Qinyang | Qinyang Hesheng Forest Zoo & Fun | |
| | Qinyang | Qinyang Swan Lake Ecological Park | |
| | Zhengzhou | Enjoy Animal Kingdom | 2 |
| | Zhengzhou | Zhengzhou Zoo | 2 |
| Hubei | Huanggang | E Dong Animal Kingdom | |
| Hunan | Changsha | Changsha Ecological Zoo | |
| | Hanshou | Changde Wildlife World | |
| Jiangsu | Changzhou | Dinosaur Land | |
| | Huaian | Huaian Zoo | |
| | Nanjing | Hongshan Forest Zoo | |
| | Nanjing | Ziqing Lake Wildlife World | |
| | Nantong | Nantong Forest Safari Park | |
| | Suzhou | Suzhou Shangfangshan Forest Zoo | |
| | Xuzhou | Xuzhou Jiudingshan Wildlife Park | |
| | Yancheng | Yancheng Dafeng Port Zoo | |
| Jiangxi | Nanchang | Nanchang Zoo | |
| Jilin | Changchun | Changchun Zoological and Botanical Park | |
| Liaoning | Dalian | Dalian Forest Zoo | |
| | Shenyang | Shenyang Forest Zoological Garden | |
| Nei Mongol | Hohhot | Hohhot Zoo (formerly Daqingshan Safari Park) | |
| Shaanxi | Xi'an | Qinling Wildlife Park | |
| Shandong | Dezhou | Dezhou Zoological and Botanical Garden | |
| | Dezhou | Quancheng All Love Park Animal Kingdom | |
| | Jinan | Jinan Wildlife World | |
| | Jinan | Jinan Zoo | 4 |
| | Linyi | Linyi Zoological and Botanical Garden | |

**Table 1.** Asian elephant-keeping facilities in China and the number of documented elephants (N) if the facility has been visited (continued).

| Province | City | Facility | N |
|---|---|---|---|
| Shandong | Qingdao | Qingdao Forest Wildlife World | |
| | Weihai | Shendiaoshan Wildlife World | |
| | Yantai | Longkou Zoological and Botanical Park | |
| Shanghai | Shanghai | Shanghai Wild Animal Park | 9 |
| | Shanghai | Shanghai Zoo | 2 |
| Shanxi | Taiyuan | Taiyuan Zoo | |
| Sichuan | Chengdu | Chengdu Zoo | 2 |
| | Yaan | Bifengxia Safari Park | 2 |
| Taiwan | Taipei | Taipei Zoo | |
| Tianjin | Tianjin | Tianjin Zoo | |
| Tibet | Lhasa | Jingtu Animal Protection Zoo | |
| Xinjiang | Ürümqi | Xinjiang Tianshan Wild Zoo | |
| Yunnan | Jinghong | Manting Imperial Garden | 5 |
| | Jinghong | Wild Elephant Valley Scenic Area | 21 |
| | Jinghong | Xishuangbanna Tropical Zoo | 3 |
| | Kunming | Kunming Zoo | 10 |
| | Kunming | Yunnan Nationalities Village | 9 |
| Zhejiang | Hangzhou | Hangzhou Safari Park | |
| | Hangzhou | Hangzhou Zoo | |
| | Huzhou | Longemont Animal World | |
| | Ningbo | Ningbo Wildlife Park | |
| | Taizhou | Taizhou Bay Wild Animal Park | |
| | Wenzhou | Wenzhou Zoo | |
| 29 | 64 | 76 | 148 |

gust 2022, 15–18 January 2023, 23–29 June 2023, 16–20 June 2024, and 24–29 June 2025. Revisits to three facilities are also conducted on other independent days. During these trips, photographs and videos were taken at 26 facilities (Table 1) to document elephant numbers, individual characteristics, and to assess their living environments.

Notably, 2 facilities I visited, Xishuangbanna Dai Garden and Liuzhou Zoo, are not included in Table 1, as they no longer housed elephants at the time of my visit. These two sites were visited to help identify previously held individuals. Not all elephants housed at the surveyed facilities were documented during each visit, as some individuals were not exhibited outdoors due to various factors. Therefore, the exact count of individuals for certain facilities could not be confirmed. To mitigate this limitation, several sites were revisited, and changes were recorded across multiple visits.

For every facility visited, profile information was compiled for each recorded individual, together with the family or kinship structures that have formed following the introduction of the founder elephants. The compilation was derived from three sources: (1) the field investigation described above, (2) limited official information released by elephant-keeping facilities, and (3) data shared by volunteers engaged in long-term field observations and historical information collection. The limited official information from these facilities consisted of few social media posts published by facilities, oral accounts from keepers, and onsite information boards.

## Results

Profile data were compiled for 148 individuals out of a total of more than 193 individuals housed across the 24 facilities (Table 2). For each facility visited, information on family/kinship group structures, exhibit characteristics, and specific notes (e.g., cases of obesity and tourist feeding) is presented where available.

In total, 35 family and kinship group structures are illustrated through diagrams. The information of members in these family or kinship structure diagrams is presented in terms of birth,

**Table 2.** Individual profile of captive Asian elephants in Chinese Zoos.

| N | Facility | Name | Gender | Date of birth | Age | Origin |
|---|---|---|---|---|---|---|
| 1 | Dongguan Xiangshi Zoo | Ge La | F | ~1989 | Adult | Myanmar |
| | | Cu Tui | F | ~1988 | Adult | Laos |
| | | Gao Mi | F | unknown | Adult | Myanmar |
| | | #3 | M | unknown | Adult | Laos |
| | | #6 | F | unknown | Adult | Probably Laos |
| | | #9 | F | unknown | Adult | Myanmar |
| | | #12 | F | unknown | Adult | Laos |
| | | Ding Ding | F | unknown | Adult | Probably Laos |
| | | Ming Ming | F | ~2005 | Adult | Born at the zoo |
| | | Niu Niu | F | 2008/2009 | Adult | Born at the zoo |
| | | Dang Dang | F | 2014/2015 | Subadult | Born at the zoo |
| | | Unknown #1 | M | 29 Aug 2018 | Juvenile | Born at the zoo |
| | | Zhu Mei | F | Aug 2024 | Calf | Born at the zoo |
| | | Fei Zai | M | 26 Jan 2022 | Calf | Born at the zoo |
| | | Unknown #2 | M | Aug 2018 | Juvenile | Born at the zoo |
| | | Hao Cao Zai | M | 30 Jan 2022 | Calf | Born at the zoo |
| | | Tuan Tuan | M | ~2017 | Juvenile | Born at the zoo |
| | | Da Ge Zai | M | Oct 2021 | Juvenile | Born at the zoo |
| | | Yuan Yuan | F | 2019/2020 | Juvenile | Born at the zoo |
| | | Unknown #3 | F | unknown | Juvenile | Unknown |
| | | Unknown #4 | F | unknown | Juvenile | Unknown |
| 2 | Kunming Zoo | Ya Ming | F | 16 Jan 1990 | Adult | Born at the zoo |
| | | Mo Po | F | 1980s | Adult | Wild in Yunnan |
| | | Zhong Bo | M | 1980s | Adult | Wild in Yunnan |
| | | Ya Ling | F | 31 Mar 2012 | Subadult | Born at the zoo |
| | | 520 | M | 20 May 2017 | Juvenile | Born at the zoo |
| | | Ya Se | M | 15 Oct 2021 | Juvenile | Born at the zoo |
| | | Kun Kun | F | 30 Apr 2004 | Adult | Born at the zoo |
| | | Mo Li | F | 20 Mar 2016 | Juvenile | Born at the zoo |
| | | Jiu Ban | M | 1990s | Adult | Laos |
| | | Jiu Jiu | M | 28 Sept 2021 | Juvenile | Born at the zoo |
| 3 | Yunnan Nationalities Village | Long Lin | F | Unknown | Adult | Thailand |
| | | Akang | M | Unknown | Adult | Thailand |
| | | Nan Feng | F | ~1990 | Adult | Thailand |
| | | Sai Bo | F | Unknown | Adult | Thailand |
| | | An An | F | 16 Feb 2007 | Adult | Wild Elephant Valley S.A. |
| | | Qiu Chen | F | 2011 | Subadult | Born at the facility |
| | | Yang Yang | M | 21 Nov 2015 | Subadult | Born at the facility |
| | | Huan Huan | F | 5 Nov 2016 | Juvenile | Born at the facility |
| | | Ai Ni | F | 30 Apr 2020 | Juvenile | Born at the facility |
| 4 | Wild Elephant Valley Scenic Area | Yi Nen | F | ~1998 | Adult | Myanmar |
| | | Ge Lan | F | ~1998 | Adult | Myanmar |
| | | Lu La | F | ~2000 | Adult | Myanmar |
| | | Yi Shuang | F | 22 Dec 2017 | Juvenile | Born at the facility |
| | | Yi Wa | F | 27 Dec 2018 | Juvenile | Born at the facility |
| | | Xiao Ba | F | 13 Nov 2019 | Juvenile | Born at the facility |
| | | Unknown #1 | M | unknown | Juvenile | Born at the facility |
| | | Unknown #2 | F | unknown | Adult | Myanmar/Laos |
| | | Unknown #3 | F | unknown | Adult | Myanmar/Laos |
| | | Unknown #4 | F | unknown | Adult | Myanmar/Laos |
| | | Unknown #5 | F | unknown | Adult | Myanmar/Laos |
| | | Wang Wang | F | 11Mar 2010 | Adult | Born at the facility |
| | | Yi Shuai | F | unknown | Subadult | Laos |
| | | Wen Mi | F | unknown | Subadult | Laos |
| | | Xi Guo | M | unknown | Adult | Myanmar |

**Table 2.** Individual profile of captive Asian elephants in Chinese Zoos (continued).

| N | Facility | Name | Gender | Date of birth | Age | Origin |
|---|---|---|---|---|---|---|
| 4 | Wild Elephant Valley Scenic Area | Duo Duo | M | unknown | Adult | Myanmar |
| | | Ban Ben | M | unknown | Adult | Myanmar |
| | | Fen Da | M | unknown | Adult | Myanmar |
| | | Yan Lei | M | unknown | Adult | Thailand |
| | | Unknown #6 | M | unknown | Adult | Myanmar/Laos |
| | | Unknown #7 | M | unknown | Adult | Myanmar/Laos |
| 5 | Manting Imperial Garden | Yu En | F | ~1994 | Adult | Laos |
| | | Tong Han | M | 1994 | Adult | Laos |
| | | Nian Nian | F | Jan 2021 | Juvenile | Born at the facility |
| | | Xiao Bao | M | ~2018 | Juvenile | Laos |
| | | Ya Nan | M | 27 Feb 2009 | Adult | Kunming Zoo |
| 6 | Xishuangbanna Tropical Zoo | Yu Huan | F | unknown | Adult | Laos |
| | | Little Prince | M | 26 Feb 2022 | Calf | Born at the facility |
| | | Xiao Bei | M | 2018/2019 | Juvenile | Laos |
| 7 | Chengdu Zoo | Ji Sheng | M | 2 Aug 1978 | Adult | Beijing Zoo |
| | | Mo Jia | F | 12 Jun 2012 | Subadult | Kunming Zoo |
| 8 | Bifengxia Safari Park | Guo Zha | F | ~1990 | Adult | Thailand |
| | | Mo Guo | M | 1997 | Adult | Kunming Zoo |
| 9 | Chongqing Zoo | Bo Bo | M | 1980 | Adult | Myanmar |
| | | Xi Xi | M | 19 Mar 1998 | Adult | Born at the facility |
| | | Xiao Xiao | F | 16 Aug 2008 | Adult | Born at the facility |
| 10 | Guangzhou Zoo | Bao Long | M | 25 Apr 1976 | Adult | Born at the facility |
| | | Yue Long | M | 5 Nov 1980 | Adult | Born at the facility |
| | | Man Ling | F | 1985 | Adult | Myanmar |
| | | Er Wang | F | 2006 | Adult | Nanning Zoo |
| 11 | Guangzhou Chimelong Safari Park | Ji Gu | F | ~1987 | Adult | Malaysia - Peninsular |
| | | Adina | F | ~1988 | Adult | Malaysia - Peninsular |
| | | Mudd | F | ~1980 | Adult | Malaysia - Borneo |
| | | Simone | F | ~1990 | Adult | Malaysia - Borneo |
| | | Indon | F | ~1990 | Adult | Malaysia - Borneo |
| | | Foley | F | 1989/1990 | Adult | Malaysia - Borneo |
| | | Kane | F | 1992 | Adult | Malaysia - Borneo |
| | | Nobie | F | 1989/1990 | Adult | Malaysia - Borneo |
| | | Levy | M | ~1986 | Adult | Malaysia - Peninsular |
| | | Long Long | F | 4 Apr 2005 | Adult | Born at the facility |
| | | Annie | F | 30 May 2015 | Subadult | Born at the facility |
| | | Julie | F | ~11 Oct 2007 | Adult | Born at the facility |
| | | Maria | F | 25 Aug 2009 | Adult | Born at the facility |
| | | Nina | F | 18 May 2010 | Adult | Born at the facility |
| | | Juan Juan | M | 30 Apr 2020 | Juvenile | Born at the facility |
| | | Wei Wu | M | 1 Mar 2021 | Juvenile | Born at the facility |
| | | Wei Wang | M | 23 May 2021 | Juvenile | Born at the facility |
| | | Wei Feng | F | 28 Dec 2021 | Juvenile | Born at the facility |
| 12 | Shenzhen Safari Park | Lu Weng | F | ~1988 | Adult | Myanmar |
| | | Long Long | F | 1988/1989 | Adult | Myanmar |
| | | Guo Shun | F | ~1990 | Adult | Myanmar |
| | | Guo Lai | F | ~1990 | Adult | Myanmar |
| | | Guo Pan | F | ~1990 | Adult | Myanmar |
| | | A Mai | M | 1988 | Adult | Myanmar |
| | | Bo Shi | M | 9 Jun 2002 | Adult | Born at the facility |
| | | Xin Xin | F | 3 Nov 2007 | Adult | Born at the facility |
| | | Qing Qing | F | 25 Apr 2007 | Adult | Born at the facility |
| 13 | Zhengzhou Zoo | Kang | F | ~1997 | Adult | unknown |
| | | Bu Yang | M | 1997 | Adult | unknown |

**Table 2.** Individual profile of captive Asian elephants in Chinese Zoos (continued).

| N | Facility | Name | Gender | Date of birth | Age | Origin |
|---|---|---|---|---|---|---|
| 14 | Enjoy Animal Kingdom | Ya Long | F | 1960s | Adult | Myanmar |
| | | Mo Fang | M | 1990s | Adult | unknown |
| 15 | Shijiazhuang Zoo | Mai | F | 1978 | Adult | Myanmar |
| | | Na Tu | M | 1981 | Adult | Myanmar |
| | | Du Wang | M | 1983 | Adult | Myanmar |
| | | Ao Bao | F | 20 Oct 2007 | Adult | Kunming Zoo |
| | | Ao Dong | M | 15 Dec 2021 | Juvenile | Born at the facility |
| 16 | Jinan Zoo | Sa Kuan | F | 1985 | Adult | Myanmar |
| | | Ya Kun | M | 16 Mar 1986 | Adult | Kunming Zoo |
| | | Mai Mang | F | 1980s | Adult | Laos |
| | | Mai Kun | F | 1980s | Adult | Laos |
| 17 | Shanghai Zoo | Ba Mo | M | 1961 | Adult | Myanmar |
| | | Duo Duo | F | 2002 | Adult | Myanmar |
| 18 | Shanghai Wild Animal Park | Ma Qie | F | ~1960s | Adult | Myanmar |
| | | A De | F | 1994 | Adult | Laos |
| | | A Lian | F | 2008 | Adult | Laos |
| | | A Xing | F | 1997 | Adult | Laos |
| | | Mi Mi | F | 1997 | Adult | Laos |
| | | Ling Dang | F | 2009 | Adult | Laos |
| | | Nan Di | F | 2004 | Adult | Laos |
| | | Ya Nu | M | Oct 2005 | Adult | Born at the facility |
| | | Tian Cai | M | 2004 | Adult | Laos |
| 19 | Hainan Tropical Wildlife Park and Botanical Garden | Zhuang Bu | F | 1982/1983 | Adult | unknown |
| 20 | Nanning Zoo | Ning Ning | F | 1983 | Adult | Myanmar |
| 21 | Guizhou Wildlife Park | Bo En | F | unknown | Adult | Laos |
| | | Xi Lun | M | unknown | Adult | Laos |
| | | Anna | F | unknown | Adult | Laos |
| | | Li Chun | F | 4 Feb 2021 | Juvenile | Born at the facility |
| 22 | Qingyuan Chimelong Forest Kingdom | Wei Da | F | ~1980 | Adult | Malaysia - Peninsular |
| | | Ella | F | 26 Jul 2007 | Adult | Born at the facility |
| | | Jimmy | F | 18 Sept 2010 | Adult | Born at the facility |
| | | Tony | M | 2 Mar 2008 | Adult | Born at the facility |
| | | Nice | F | 12 May 2020 | Juvenile | Born at the facility |
| | | Tonn | M | 2 Apr 2022 | Calf | Born at the facility |
| 23 | Zimaling Zoo | Duo Mi | F | ~1980s | Adult | unknown |
| | | Da Yun | M | 25 Nov 2010 | Adult | Shenzhen Safari Park |
| 24 | Chuanlord Fairy Tale Kingdom of Animals | Yu Jiao | F | 1984/1985 | Adult | unknown |
| | | Yu La | F | 1990/1991 | Adult | unknown |
| | | Zhuang Zhuang | M | 23 Mar 2019 | Juvenile | Born at the facility |

historical transfers, and current location or death. For example, "b. 1988, Laos" indicates that the individual was born in Laos in 1988, while "Sept 2016, Dongguan Xiangshi Zoo" refers to the elephant's arrival at Dongguan Xiangshi Zoo in September 2016. Furthermore, a black box surrounding an individual indicates deceased status, whereas blue text denotes individuals currently present at the corresponding facility.

*1. Dongguan Xiangshi Zoo*

Twenty elephants were documented across four visits to the Dongguan Xiangshi Zoo on 1 August 2022, 4 August 2022, 17 January 2023, and 24 June 2025. 17 individuals were observed during the first three visits. It is known that two returned to the zoo in 2024, and one was born in August 2024. On the fourth visit, the three previously recorded individuals, Da Ge Zai, Fei Zai, and Hao Cao Zai, were not present.

Through captive breeding at Dongguan Xiangshi Zoo, one kinship group (led by Ge La) and two family groups (led by Cu Tui and Gao Mi, respectively) have been formed. Charts outlining the structure of each group, along with profile information for each group member, are provided in Figure 2.

The outdoor area is rudimentary, with a concrete floor under the roof and compacted soil outside. Almost no enrichment was observed. The facility consisted of three main exhibits, one designated for an adult male. By the time of my first visit, the adult male Wen Rou had already been transferred to other facilities, a situation related to the limited availability of outdoor enclosures for adult males.

In May 2022, the facility ceased elephant performances; however, by my fourth visit, riding and feeding services for tourists were still ongoing. For the riding program, Niu Niu and Dang Dang were separated from the rest of the herd and confined to another concrete enclosure for the entire duration of visiting hours.

*2. Kunming Zoo*

Ten elephants at the facility were recorded across four visits: 7 August 2022, 8 August 2022, 26 July 2024, and 29 July 2024. Through captive breeding at Kunming Zoo, two kinship groups (each led by Ya Long and Mo Po, respectively) and one family group (led by Xiangdong) have been formed. Figure 3 presents diagrams outlining the structure of each group, along with profile information for each group member.

Ya Kun and Ya Nan, from the kinship led by Ya Long, as well as Mo Guo, from the kinship led by Mo Po, were transferred to other facilities at a young age, in part due to insufficient outdoor exhibit space. During the third and fourth visits, Mo Po, Mo Li, and Ya Se were observed to be obese, likely associated with excessive food intake and inadequate exercise.

*3. Yunnan Nationalities Village*

Nine elephants were documented across two visits on 8 August 2022 and 29 July 2024. An

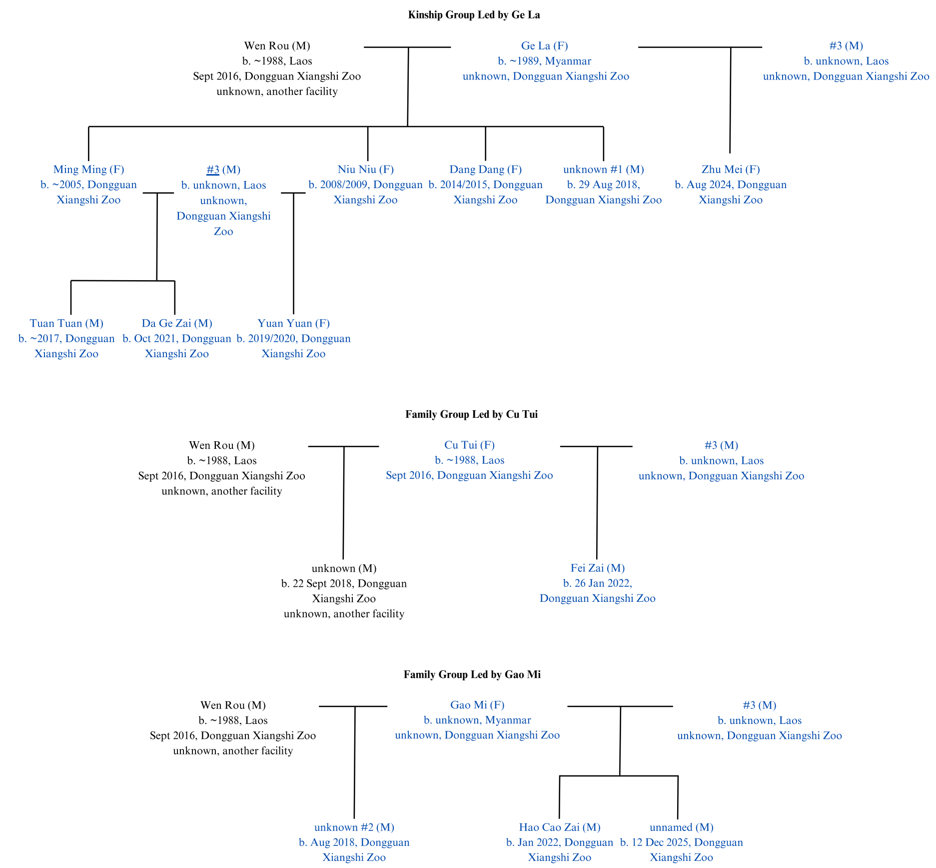


**Figure 2.** Family and kinship group structures at Dongguan Xiangshi Zoo.

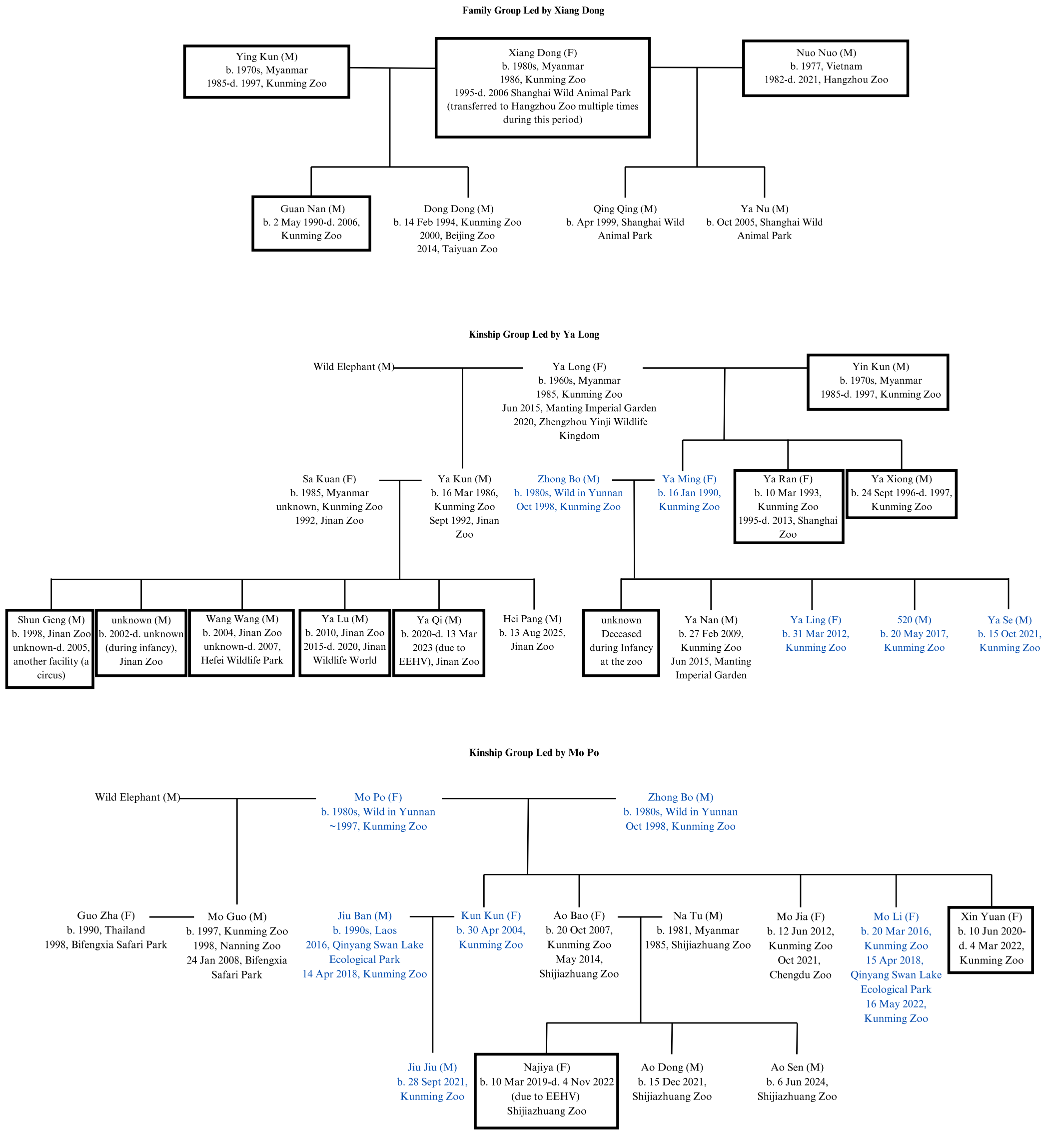


**Figure 3.** Family and kinship group structures at Kunming Zoo.

adult female elephant, An An, had already returned to the Wild Elephant Valley by the time of the second visit. Through captive breeding at Yunnan Nationalities Village, two family groups (led by Nan Feng and An An, respectively) have been formed. Figure 4 presents diagrams outlining the structure of each group, along with profile information for each group member.

The floors of both the outdoor exhibit and the performance area were entirely concrete, with no enrichment provided other than water pools. At the first visit, the facility offered elephant performances, riding, and feeding. By July 2023, performances had ceased, although feeding was still ongoing as observed during the second visit. Whether riding activities had been discontinued could not be confirmed.

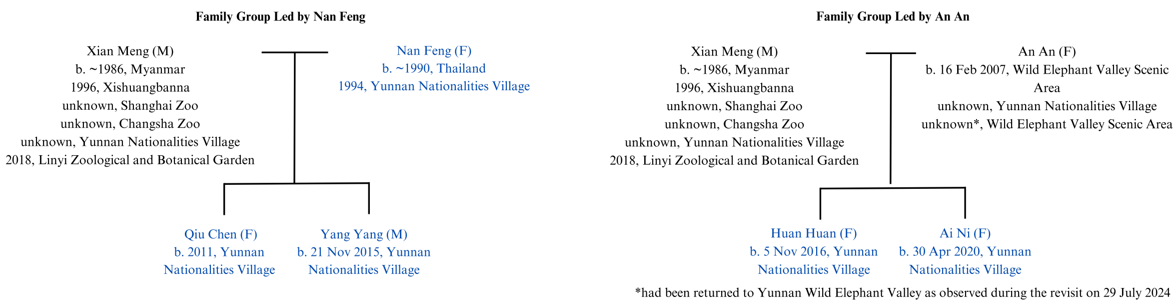


**Figure 4.** Family group structures at Yunnan Nationalities Village.

### *4. Wild Elephant Valley Scenic Area*

Because not all elephants were on display, the exact number present at the facilities remains uncertain. According to Yang *et al*. (2022), approximately 47 elephants inhabit the Wild Elephant Valley Scenic Area, with 21 individuals documented as of the observation on 10 Aug 2022. After the visit, three male elephants were born in 2022, August 2023, and February 2024, respectively; in April 2025, eight were transferred to Shanghai Wild Animal Park; one adult female elephant from Yunnan Nationalities Village had already returned by 29 July 2024.

Through captive breeding at Wild Elephant Valley Scenic Area, six family groups (led by Pin Zai, Future, Ran Ran, Yi Nen, Ge Lan, and Lu La, respectively) have been formed. Figure 5 presents diagrams outlining the structure of each group, along with profile information for each group member.

During the visit, the facility offered elephant performances, riding, and tourist feeding activities. All enclosures housing captive elephants had compacted soil floors. Four elephants were rotated into a separate area to provide feeding interactions with tourists. Due to the large number of visitors, feeding sessions continued for hours without break. The food provided consisted of fruits and vegetables, including bananas, carrots, cucumbers, and apples. Elephants were observed to be obese, a condition associated with excessive consumption of these treats, the restricted size of the feeding area, and the

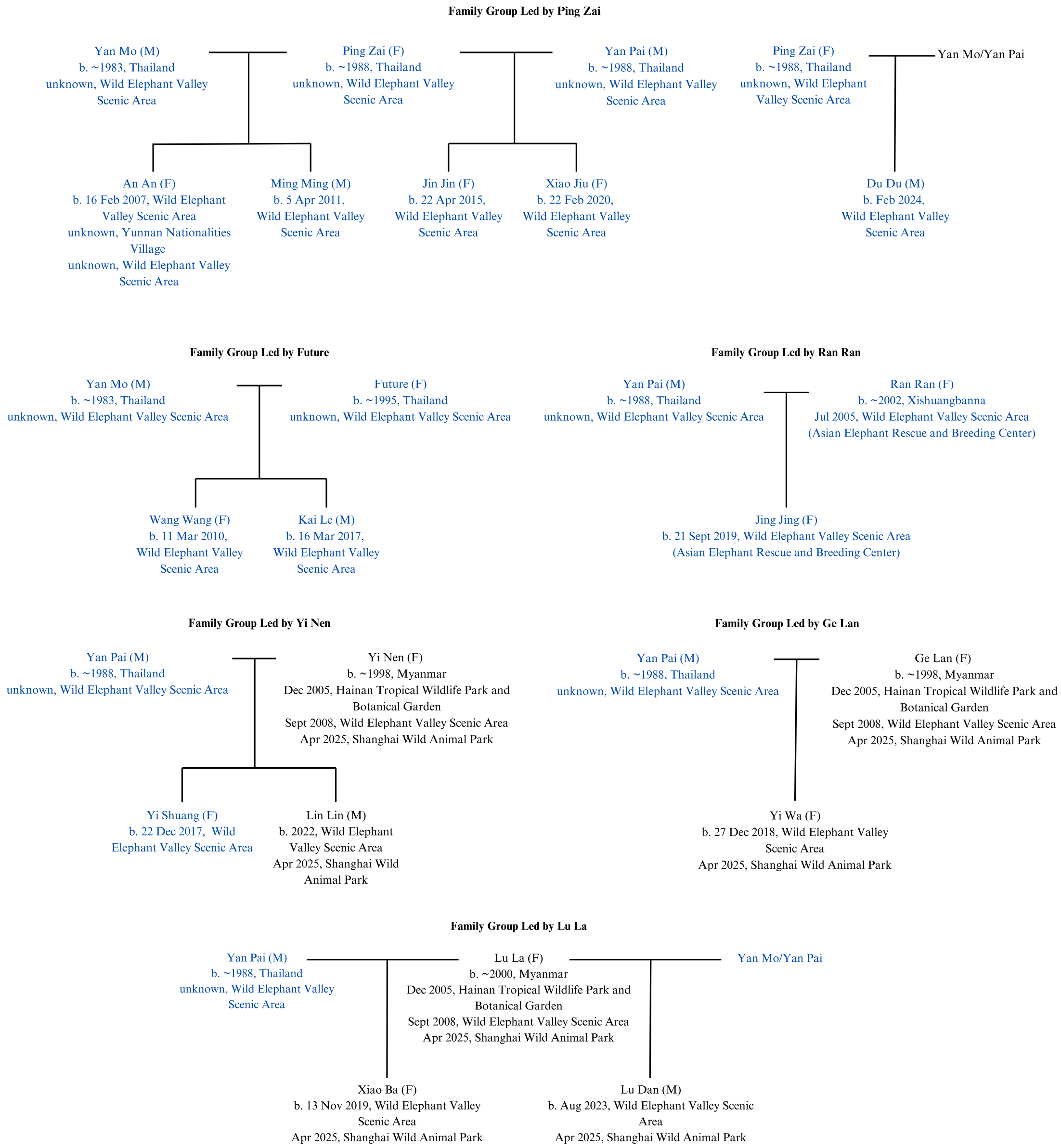


**Figure 5.** Family group structures at Wild Elephant Valley Scenic Area.

lack of opportunities for other physical activity during feeding hours. By July 2023, elephant performances had ceased; however, it remained unclear whether riding and feeding activities were still ongoing.

*5. Manting Imperial Garden*

Five elephants were observed and documented on 12 and 13 Aug 2022. Through captive breeding at Manting Imperial Garden, one family group (led by Yu En) has been formed. Figure 6 presents diagrams outlining the structure of the group, along with profile information for each group member.

There was no outdoor exhibit, only a performance area, and at the time of visit the facility offered elephant performances, feeding, and riding. The performance area consisted entirely of concrete flooring. Around May 2023, elephant performances ceased; however, it remained uncertain whether riding and feeding activities were still being conducted.

*6. Xishuangbanna Tropical Zoo*

Three elephants were observed and documented on 13 Aug 2022. Through captive breeding at Xishuangbanna Tropical Zoo, one family group (led by Yu Huan) has been formed. Figure 7 presents a diagram outlining the structure of the group, along with profile information for each group member.

By the time of the visit, elephant performances had ceased, although the exact date of discontinuation was uncertain. The facility, however, continued to provide feeding services. Adult female Yu Huan and the calf Xiao Bei were observed either preoccupied with tourist feeding

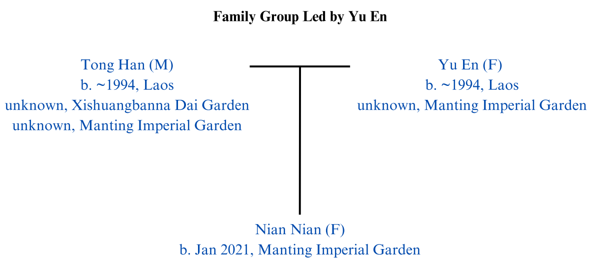


**Figure 6.** Family group structure at Manting Imperial Garden.

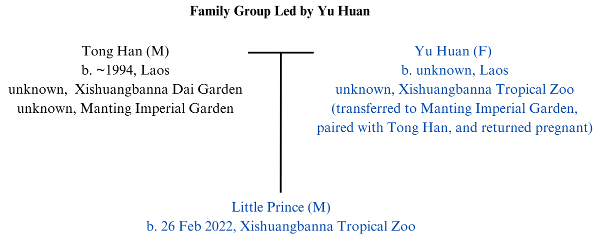


**Figure 7.** Family group structure at Xishuangbanna Tropical Zoo.

or competing for dominance over the limited food resources offered by visitors. As a result, Yu Huan's son, Little Prince, was often left to engage in solitary play or to imitate the food-begging behaviour. The exhibits consisted entirely of concrete flooring.

*7. Chengdu Zoo*

Two elephants were observed and documented across two visits on 19 and 21 August 2022. Through captive breeding at Chengdu Zoo, one family group (led by Xian Nai) has been formed. Figure 8 presents a diagram outlining the structure of the group, along with profile information for each group member. The information on the kinship group to which Mo Jia belongs is illustrated in Figure 3. Liu Yi was transferred to another facility before reaching two years of age, partly due to the availability of only one outdoor exhibit for male elephants.

*8. Bifengxia Safari Park*

Two elephants were observed and documented on 20 Aug 2022. Guo Zha and Mo Guo currently have no offspring. The information on the kinship group to which Mo Guo belongs is illustrated in Figure 3.

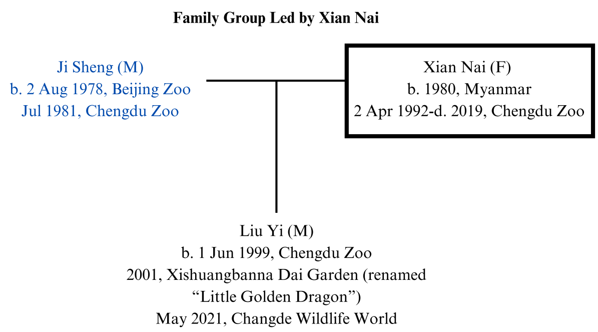


**Figure 8.** Family group structure at Chengdu Zoo.

*9. Chongqing Zoo*

Three elephants were observed and documented on 22 Aug 2022. After the visit, one adult male elephant was transferred to Changchun Zoological and Botanical Park in May 2024. Through captive breeding at Chongqing Zoo, one family group (led by Yi Li) has been formed. Figure 9 presents a diagram outlining the structure of the group, along with profile information for each group member.

*10. Guangzhou Zoo*

Four elephants were observed and documented at Guangzhou Zoo across two visits on 15 January 2023 and 28 June 2025. Between the two visits, a male elephant, Bao Long, passed away in July 2024. Through captive breeding at Guangzhou Zoo, one family group (led by Yi Long) has been formed. Figure 10 presents a diagram outlining the structure of the group, along with profile information for each group member. Er Wang was observed to be obese, which is associated with the excessive quantities of food provided by the facility and insufficient exercise.

*11. Guangzhou Chimelong Safari Park*

18 were observed and documented across two visits to the facility on 16 January 2023 and 25 June 2025. On the first visit, 29 were known to be present at the facility, but not all individuals were on display outdoors. After the first visit, one baby female elephant passed away on 12 June 2023, and seven were transferred to Qinggyuan Chimelong Forest Kingdom in 2024. The first generation and part of the second-generation elephants are identified by English names, but only their transliterated Chinese names are officially known. Consequently, their English names are proposed and are not official.

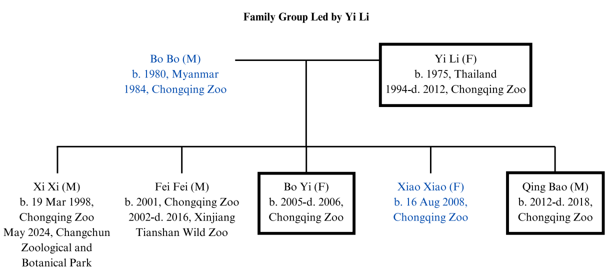


**Figure 9.** Family group structure at Chongqing Zoo.

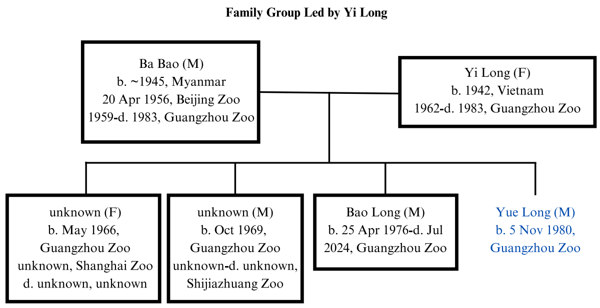


**Figure 10.** Family group structure at Guangzhou Zoo.

Through captive breeding at Guangzhou Chimelong Safari Park, four kinship groups (each led by Ji Gu, Nobie, Simone, and Pam, respectively) and four family groups (each led by Adina, Mudd, Foley, and Kane) have been formed. Figure 11 presents diagrams outlining the structure of the groups, along with profile information for each group member.

By the time of first visit in January 2023, four male elephants were kept in separate indoor enclosures (with access to a very small outdoor area), entirely removed from public view. The four comprise three adult elephants and one juvenile elephant (Levy, Kowie, Stanley and Harry) experiencing complete social isolation. Upon a second visit in June 2025, only Levy was observed in an outdoor exhibit. Such situation partly attributes to insufficient numbers of outdoor exhibits the facility provided to the bull.

At the end of March this year, the male calves Wei Wu and Wei Wang, along with the juvenile male Juan Juan, were separated from the herd. The main reasons were: (1) aggression toward females resulting in injuries, and (2) sexual mounting attempts, particularly by Juan Juan. According to the Ji Gu family kinship records, An Ni was born on 30 May 2015, and her earliest possible pregnancy was estimated around February 2020, when she was not yet five years old. Although official information listed her mate as the adult male Stanley, volunteers who had conducted long-term observations at the facility believed her actual mate was her brother Liu Yi, who was eight years old at the time.

According to a keeper at the facility, there was an additional reason for separating the young males from the herd at such an early age beyond the two mentioned above: early separation allows them to gradually establish their own social hierarchy based on ability. If separation were delayed, intense fighting to determine dominance would likely occur, which in turn would require the facility to stagger their release into the outdoor exhibit so that only one could be displayed at a time.

By the time of the second visit, female elephants Ji Gu, Adina, Mudd, Simone, Indon, Folie, Kane, Nobie, Julie, and Maria were observed to be obese, which is associated with the excessive quantities of food provided by the facility and insufficient exercise.

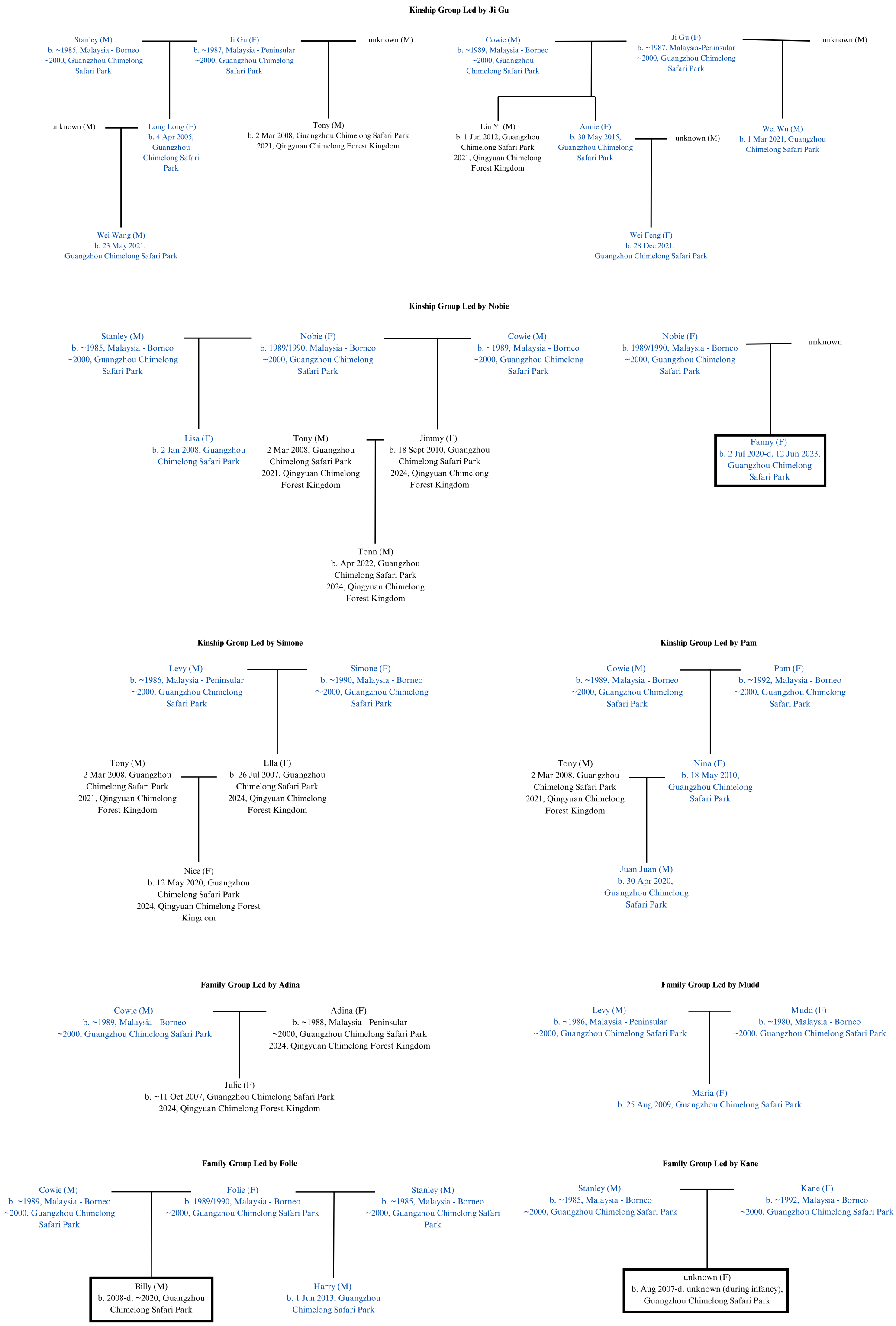


**Figure 11.** Family and kinship group structures at Guangzhou Chimelong Safari Park.

*12. Shenzhen Safari Park*

Nine elephants were observed and documented during two visits to the facility on 18 January 2023 and 16 August 2024, as not all individuals were on display outdoors. Ten were known to be present at the facility on the first visit, while one adult elephant was transferred to the Chaoshan Wangtian Lake Wild Animal Zoo around October 2023. Note that Long Long is not the same individual as the one in Guangzhou Chimelong Safari Park. Through captive breeding at Shenzhen Safari Park, three family groups (led by Lu Weng, Guo Shun, and Lu Mai, respectively) have been formed. Figure 12 presents diagrams outlining the structure of the groups, along with profile information for each group member.

During the January 2023 first visit, the adult male A Mai was displayed outdoors, while his eldest son remained in the indoor enclosure and his second son Da Yun had already been transferred to another facility. Around October 2023, A Mai himself had been moved to the Chaoshan Wangtian Lake Wild Animal Zoo. One reason for the transfers was the lack of outdoor exhibits to accommodate multiple males.

There were two types of outdoor exhibits: One close to visitors, with a mostly concrete floor, and another at a higher elevation, farther from public view, which has a soil surface. By the first visit, elephant performances had already been discontinued, though the exact timing was uncertain. Feeding services, however, continued across both visits. Lu Weng and A Mai were observed to be obese, a condition associated with a high intake of treats provided during tourist feeding and/or the limited size of the exhibit, which restricted opportunities for physical activities.

*13. Zhengzhou Zoo*

Two elephants were observed and documented on 23 and 25 June 2023. Kang and Bu Yang currently have no offspring.

*14. Enjoy Animal Kingdom*

Two elephants were observed and documented on 24 June 2023. The information on the kinship group to which Ya Long belongs is illustrated in Figure 3.

*15. Shijiazhuang Zoo*

Five elephants were observed and documented on 26 June 2023. After the visit, one male elephant was born on 6 June 2024. Through captive breeding at Shijiazhuang Zoo, one family

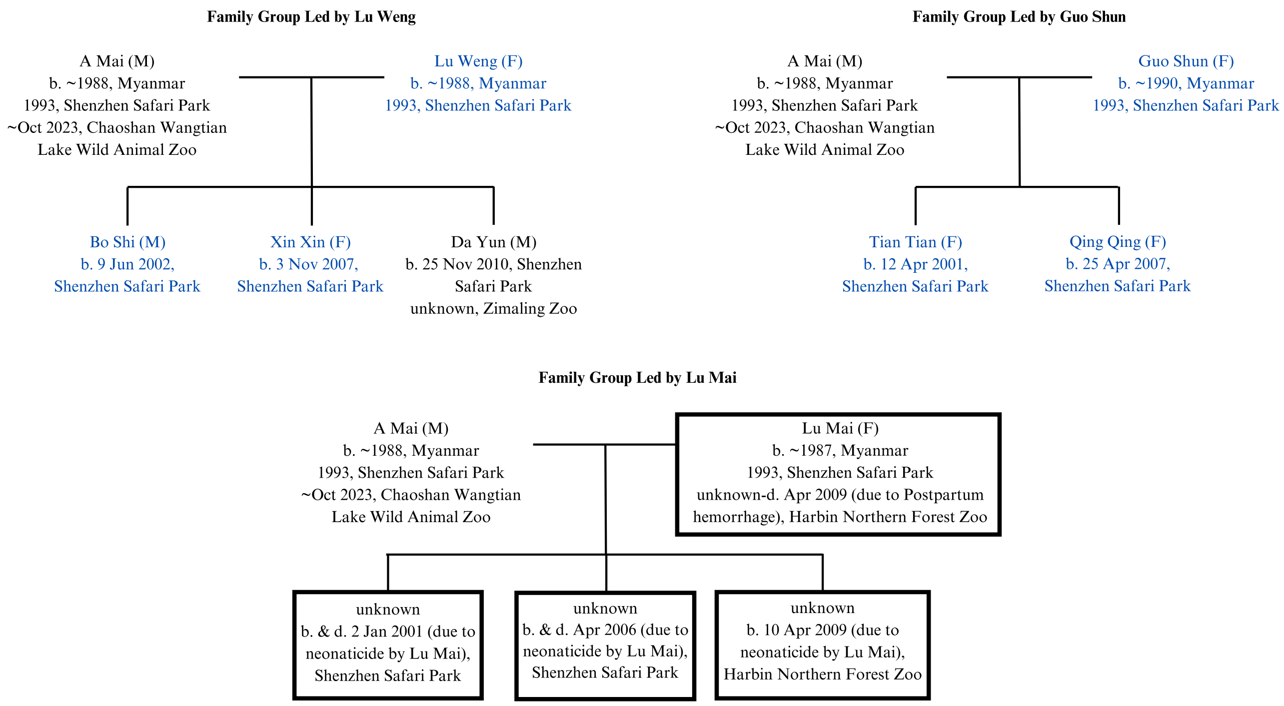


**Figure 12.** Family and kinship group structures at Shenzhen Safari Park.

group (led by Ao Bao) has been formed. As Ao Bao belongs to the kinship group led by Mo Po at Kunming Zoo, the information on this family has been integrated with the kinship group led by Mo Po described in Figure 3 to better illustrate the lineage.

Na Tu was one of the few male captive elephants in China that could be housed with females and calves in the same indoor enclosure and outdoor exhibit. At present, the facility maintains two outdoor exhibits, one of which is provided to the male Du Wang. As the male Ao Dong grows older, the facility needs to add an independent living area for him, unless he is transferred at an early age.

*16. Jinan Zoo*

Four elephants were observed and documented on 27 June 2023. Through captive breeding at Jinan Zoo, one family group (led by Sa Kuan) has been formed. Sa Kuan's breeding partner, Ya Kun, is from the kinship group formerly led by Ya Long at Kunming Zoo, and thus the structure of the family, along with profile information for each group member, has been integrated with the kinship group led by Ya Long described in Figure 3 to better illustrate the lineage.

During the visit, Ya Kun and Mai Mang were observed to be overly obese, which is associated with the excessive quantities of food provided by the facility and the limited size of the exhibit, which restricted opportunities for physical activities.

*17. Shanghai Zoo*

Two elephants were observed and documented on 28 June 2023. Through captive breeding at Shanghai Zoo, one kinship group (led by Ban Na) has been formed. Figure 13 presents the diagram outlining the structure of the group, along with profile information for each group member. During the visit, Duo Duo was observed to be overly obese, which is associated with the excessive quantities of food provided by the facility and insufficient exercise.

*18. Shanghai Wild Animal Park*

Of the 15 elephants present, nine were observed and documented on 29 June 2023, as not all individuals were on display outdoors. After the visit, one male elephant was transferred from the Park to Hangzhou Zoo in December 2023; one adult male elephant passed away, date unknown; eight were transferred to the park from Wild Elephant Valley in April 2025.

Through the collaborative breeding program between Shanghai Wild Animal Park and Hangzhou Zoo, a family group led by Xiang Dong has been established. Prior to this program, in which Xiang Dong was paired with Nuo Nou, Xiang Dong had previously formed a family with Yi Kun at Kunming Zoo. To better illustrate, the two lineages are now combined under Xiang Dong in one chart. The group structure and individual profiles are presented in Figure 3. During the visit, of the six male elephants at the facility, only Tian Cai and Ya Nu were observed outdoors, and the size of their exhibits

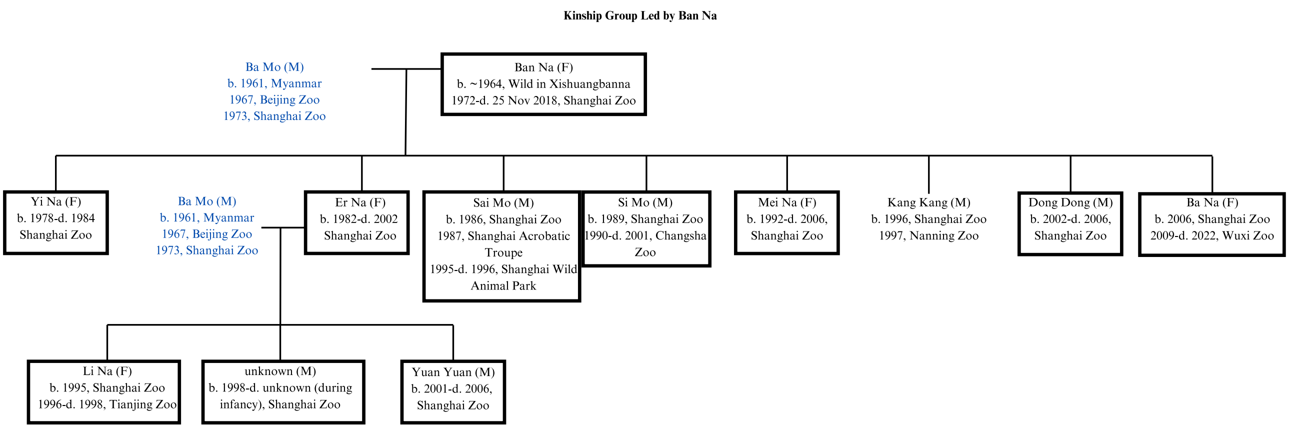

**Figure 13.** Kinship group structure at Shanghai Zoo.

was particularly limited. The remaining males were kept in indoor enclosures. It appears that the facility has provisioned three outdoor exhibits for male elephants.

*19. Hainan Tropical Wildlife Park and Botanical Garden*

One elephant was observed and documented on 16 June 2024. At the end of December 2005, Ku En, Xi Guang, Yi Nen, Ge Lan, and Lu La were rescued from illegal trade at the China-Myanmar border by forest police in Yunnan and transferred to this facility for drug withdrawal treatment. Zhuang Bu accompanied them until their departure in 2008. Since then, Zhuang Bu has lived alone for the following 17 years. By the time of the visit, the facility offered feeding activity for tourists.

*20. Nanning Zoo*

Of the nine elephants present, only one was observed outdoors during the visit on 18 June 2024. This display arrangement has been in place for an extended period. After the visit, one adult male elephant passed away in February 2025.

Through captive breeding at Nanning Zoo, two family groups (led by Ning Ning and Tu Su, respectively) have been formed. Figure 14 presents the diagrams outlining the structures of the groups, along with profile information for each group member. Kang Kang, the breeding partner of Ning and Tu Su, is also a member of the kinship group led by Ban Na at Shanghai Zoo. The information on this kinship group is provided in Figure 13.

*21. Guizhou Wildlife Park*

Four elephants were observed and documented on 20 June 2024. After the visit, one female elephant was born in August 2024. Through captive breeding at Guangzhou Guizhou Wildlife Park, one family group (led by Bo En) has been formed. Figure 15 presents the diagram outlining the structure of the group, along with profile information for each group member.

By the time of the visit, the facility continued to provide feeding services. Bo En and Xi Lun were observed to remain focused on obtaining food from visitors, while their calf, Li Chun, appeared to be neglected. The adults did not respond to the calf's attention-seeking behaviours.

*22. Qingyuan Chimelong Forest Kingdom*

Of the nine elephants present, eight were observed, as one adult male was not exhibited outdoors on the day of the visit. Among the eight, two had been previously documented during the visit to Guangzhou Chimelong Safari Park on

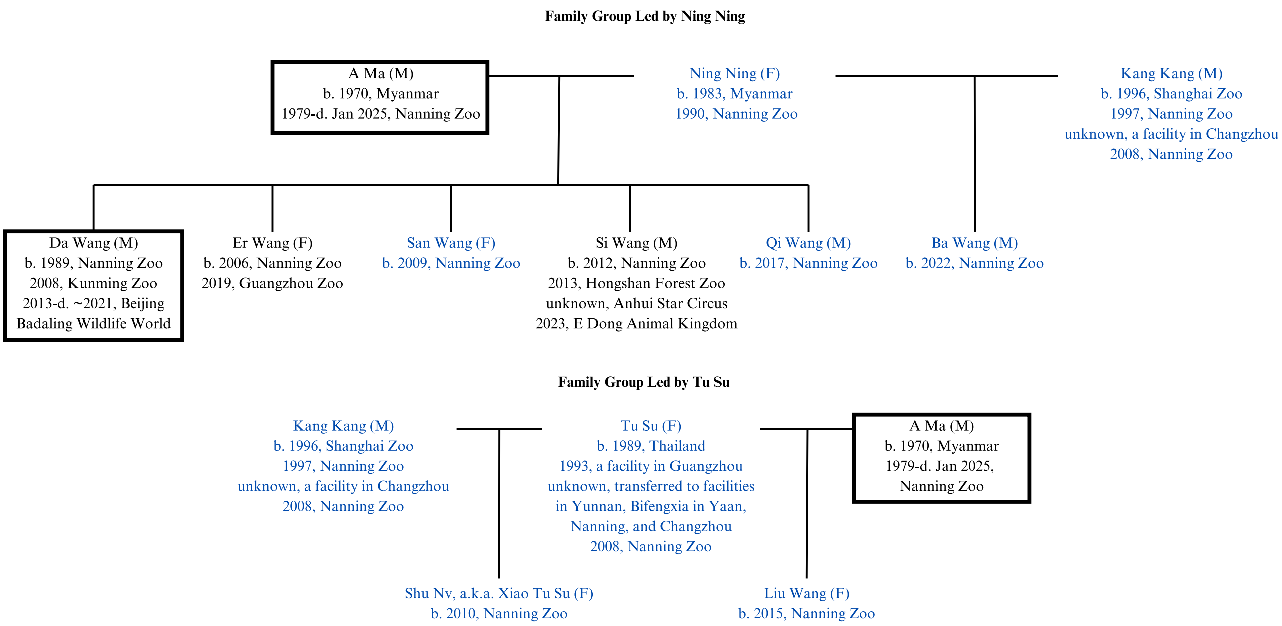


**Figure 14.** Family group structures at Nanning Zoo.

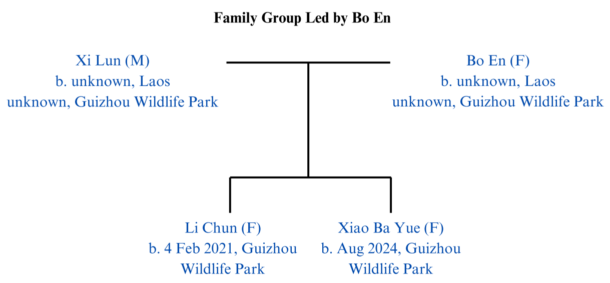


**Figure 15.** Family group structure at Guizhou Wildlife Park.

16 January 2023; thus, six individuals were newly recorded.

Three family groups (led by Adina, Ella, and Jimmy) are present. They were transferred from Guangzhou Chimelong Safari Park. Ella and Jimmy are from the kinship groups led by Simone and Nobie, respectively. Thus, the structure of the family, along with profile information for each group member, can be seen in Figure 11.

During the visit, the adult male Tuo Ni was observed in the outdoor exhibit, while Liu Yi was kept in the indoor enclosure. The facility staggers their access to the outdoor area so that only one male is outside at a time. This practice is primarily due to fights between Tuo Ni and Liu Yi over dominance. Even if barriers were in place, they would likely still engage in aggressive interactions.

Only one outdoor exhibit is provided for male elephants. Although it is located far from public view, its size appears very finite, as the elephants were observed only pacing or standing in a limited area.

*23. Zimaling Zoo*

Two elephants were observed and documented on 27 June 2025. The information on the family group to which Da Yun belongs is illustrated in Figure 12. During the visit, the facility provided feeding services. The adult male Da Yun's exhibit was very confined (Fig. 16), where the electric fencing restricted him to repeated circular pacing, indicative of stereotypic behaviours, and resulted in a lack of exercise.

The adult female Duo Mi was observed to remain exclusively within a small area with concrete flooring adjacent to the tourist feeding platform. During hours of observation, she did not move to the three quarters of the exhibit with a red soil substrate and wooden post. Although a small amount of Napier grass was provided once later in the observation, Duo Mi expressed limited interest in eating despite being underfed. Instead, she persisted in a stereotypic circling movement, disrupted only when tourists entered the feeding area. Her body is relatively obese, which is associated with high proportion of treats in the diet and lack of exercise.

*24. Chuanlord Fairy Tale Kingdom of Animals*

Three elephants were observed and documented on 29 June 2025. No adult male elephant is currently present at Chuanlord Fairy Tale Kingdom of Animals, making it unclear with whom Yu La formed a family and gave birth to her son, Zhuang Zhuang. Nevertheless, to illustrate the group structure and provide known profile information for each member, a diagram is included, although the group may not have formed at this facility (Fig. 17).

During the visit, feeding services were provided to a large number of tourists (Fig. 18). No restrictions were placed on feeding duration, and carrots supplied by tourists constituted the sole food source for the elephants. Yu La exhibited

**Figure 16.** Adult male elephant Da Yun at Zimaling Zoo.

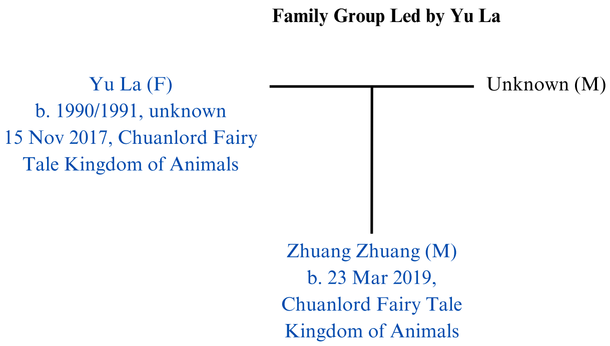


**Figure 17.** Family group structure at Chuanlord Fairy Tale Kingdom of Animals.

**Figure 18.** Adult female elephant Yu La at Chuanlord Fairy Tale Kingdom of Animals

signs of heightened anxiety, demonstrated through stereotypic pacing and food-begging behaviours. She was seldom observed interacting with her six-year-old son, Zhuang Zhuang, except when guarding food, during which she repelled him by whipping when he approached. Moreover, the buffer zone separating elephants and visitors is notably narrow. Visitor interactions are poorly regulated, with minimal supervision or warning against teasing behaviours. Such actions have elicited signs of frustration in the elephants, posing a serious risk to visitor safety.

*25. Xishuangbanna Dai Garden and Liuzhou Zoo*

Though elephants are no longer kept in Xishuangbanna Dai Garden and Liuzhou Zoo, it can be inferred that at least three males had been housed in Xishuangbanna Dai Garden: Tong Han, Xiao Kang Mien, and Little Golden Dragon, and at least two males had been housed in Liuzhou Zoo: Yan Long and Zhang Bo. Their information, as well as their current location, is presented in Table 3. Individuals other than Tong Han (also listed at Manting Imperial Garden) are not included in the total number of Asian elephants documented, as they were not present during the visit.

## Discussion

Field investigations have revealed significant concerns regarding the welfare practices and reproductive management of captive Asian elephants in China. This discussion highlights three major issues identified during the visit: Insufficient living areas for bulls; the unregulated practice of tourist feeding; and the inefficiency of current breeding programs.

*Insufficient living area for bulls*

Due to conflicts for dominance status and the mating behaviours, elephant-keeping facilities need to provide separate living areas (both outdoor exhibits and indoor enclosures) for these male elephants. Moreover, in captivity, the emergence of aggressive and sexual mounting behaviours around the age of four in male elephants presents a challenge for these facilities in reallocating the living areas and adding new ones.

Thus, the limited availability of living space directly affects the welfare of male elephants in captivity. In China, most facilities are equipped

**Table 3.** Profiles of elephants that once inhabited Xishuangbanna Dai Garden and Liuzhou Zoo.

| Name | Current location | Date of birth | Age | Origin |
|---|---|---|---|---|
| Tong Han | Manting Imperial Garden | ~1994 | Adult | Laos |
| Xiao Kang Mien | Changde Wildlife World | Unknown | Adult | unknown |
| Little Golden Dragon (formerly named Liu Yi) | Changde Wildlife World | 1 Jun 1999 | Adult | Chengdu Zoo |
| Yan Long | Dezhou Zoological and Botanical Garden | Unknown | Adult | unknown |
| Zhang Bo | Probably deceased at Liuzhou Zoo | Unknown | Adult | Thailand |

with either one indoor enclosure and outdoor exhibit or multiple indoor enclosures and no more than two outdoor exhibits for males in need of independent spaces. Consequently, additional male elephants are transferred to other facilities, sometimes at a very early age, or confined indoors for extended periods, away from public view.

One factor contributing to the disproportion between male elephants and available outdoor exhibits is the historical practice of elephant performances in some facilities. During the day, male elephants could remain in the designated performance areas. Following the discontinuation of such performances, these males – lacking outdoor exhibits – were either transferred or confined indoors. Another factor is the increase in male elephant populations resulting from breeding within these facilities.

Most facilities visited do not open public access to indoor enclosures, so no records were made during the trip regarding their sizes. Yet, it can be concluded that the outdoor exhibit at most facilities visited falls far below the minimum standard of 154 $m^2$ recommended in the "Guidelines on the Management and Welfare of Captive Asian Elephants Used in Tourism" (Roberts *et al.* 2022). Restricted exhibit areas may contribute to the development of stereotypic behaviours and have a significant positive correlation with obesity (Tang *et al.* 2024).

Therefore, it is proposed that the relevant administrative departments establish a minimum standard for the size of bull living areas. Facilities that do not meet this requirement should expand their living area and allow every male elephant to freely access both the indoor enclosure and the outdoor exhibit. Otherwise, these elephants should be transferred to facilities with sufficient space to accommodate them. Additionally, the relevant departments should set a minimum age for out-transfer of bulls, and, if needed, facilities must provide independent living areas for males below this age.

In parallel, the management capacity of elephant keepers should be enhanced through targeted training, with particular emphasis on managing bulls with relatively aggressive temperaments, enabling multiple males to be released into their corresponding outdoor exhibits in the meantime.

*Unregulated practice of tourist feeding*

Feeding the elephant is the most common paid service offered by elephant-keeping facilities in China. As a significant source of revenue, particularly for privately owned institutions, many facilities prioritise maximising tourist participation, often at the expense of elephant welfare. This is primarily achieved through three means: replacing fodder with treats, disrupting dietary plan, and inappropriate exhibit design.

The feeding baskets or sticks provided to tourists typically consist of treats such as carrots, apples, bananas, and cucumbers. In the absence of regulations limiting the quantity of treats provided, these items have, in some cases, become the primary or even sole food source for the elephants during the day. This dietary imbalance poses considerable health risks, particularly due to deficiencies in essential nutrients such as fibre from roughage like elephant grass.

More severely, the diet plan is changed to encourage tourist feeding. Specifically, the provision of fodder is deliberately reduced, thereby coercing the elephants into maintaining attention on visitors. This manipulation of dietary needs by introducing hunger undermines the natural behavioural expression and promotes stereotypical behaviours. Affected individuals remain in close proximity to visitors for a long time, engaging in food-begging behaviour such as raising their trunks in the direction of the visitors. Their movements are often limited to standing still or pacing along a repetitive path to ensure immediate responsiveness to approaching tourists.

Food deprivation may induce a state of heightened anxiety, wherein the elephant becomes narrowly fixated on receiving food from visitors while exhibiting numbness to other environmental stimuli.

Such anxiety can be particularly detrimental to elephants' highly social nature, as it suppresses healthy social interactions and distorts the social learning processes critical to calf development.

In addition to the disrupted diet plan, the exhibit design of the feeding area, including full concrete substrates, lack of enrichment, and narrow buffer zone, further compromises elephant welfare and presents significant safety risks. No rules have been informed, and teasing behaviours from tourists are rarely cautioned against, which has been observed to induce frustration in elephants.

Therefore, it is proposed that the relevant administrative departments should prohibit tourist feeding to safeguard both the fundamental welfare of captive elephants and the safety of visitors.

*Inefficiency of current breeding programs*

Unlike previous years, only two officially reported births have occurred in China's captive Asian elephant population in 2025. This stagnation occurs despite a number of individuals being in reproductive age. Breeding opportunities remain limited due to facility-level decision-making. As a result, many elephants in their reproductive age have not been afforded the opportunity to breed. Notable examples include Zhuang Bu (Hainan Tropical Wildlife Park and Botanical Garden), Mo Fang (Enjoy Animal Kingdom), Ya Nan (Manting Imperial Garden), Da Yun (Zimaling Zoo), Anna (Guizhou Wildlife Park), Bo Bo (Chongqing Zoo), Xiao Xiao (Chongqing Zoo), and Du Wang (Shijiazhuang Zoo). Among them, in the facilities where Zhuang Bu, Mo Fang, Bo Bo, and Xiao Xiao are housed, there are no other reproductively compatible individuals. Du Wang has been unsuccessful in competing with Na Tu for access to the breeding females, while Anna's mating attempt was rejected by Xi Lun.

These cases raise concerns that the reproductive potential of this population is overlooked, thereby hindering the effective utilisation of valuable genetic resources critical to sustaining the captive population in China. Moreover, pairs like Mo Guo and Guo Zha, which have not produced offspring despite cohabiting for over 13 years, should be re-evaluated and considered for reassignment.

Therefore, it is proposed that the relevant department assume a centralised role in managing the population of breeding age. Government-led coordination would be instrumental in dismantling existing barriers between the facilities. This approach is essential for optimising reproductive success and supporting the long-term conservation of the species in China.

**Conclusion**

It is recommended that, in the future, provincial-level facilities be established in suburban areas to provide expansive habitats for captive elephants. Such environments would enable individuals to remain within family or kinship units and express natural behaviours. Additionally, these facilities could serve as platforms for effective public education, fostering an accurate understanding of the species and promoting conservation efforts.

**Acknowledgements**

The author gratefully acknowledges the elephant-enthusiast volunteers in China who have shared valuable information via social media.

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DOI: 10.2305/XJDZ4881
Research Article Gajah 59 (2025) 56-62

# Intestinal Impaction Caused by *Saccharum bengalense* in a Captive Juvenile Asian Elephant: Implications for Captive Management

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**Abstract.** Intestinal impaction is a common and clinically significant condition in captive Asian elephants, often triggered by fibrous plant ingestion, dehydration and reduced mobility. This case study reports a 3-year-old female elephant in Dudhwa Tiger Reserve presenting with anorexia, abdominal distension, and absence of defecation. Clinical evaluation confirmed gastrointestinal obstruction. Management included fluid therapy, anti-inflammatory medication, rectal enema, and manual disimpaction. Faecal analysis revealed undigested *Saccharum bengalense* grass. The case underscores the importance of timely intervention, experienced mahouts, field-adapted clinical protocols, and supervised foraging to reduce gastrointestinal health risks in semi-captive elephants.

## Introduction

Intestinal impaction is a gastrointestinal disorder marked by the partial or complete obstruction of the intestinal tract, often caused by the accumulation of undigested food, sand, foreign bodies, or other ingested materials (Fowler & Mikota 2008). This condition is particularly concerning in herbivorous mammals, where high-fibre diets and complex digestive processes can predispose individuals to such obstructions (Plummer 2009). This condition often results in severe abdominal discomfort, inappetence, lethargy, and if left untreated, intestinal impaction can result in severe colic, systemic compromise and death (Fowler & Mikota 2008). The condition poses a significant health risk in captive wildlife, often exacerbated by limited access to natural diets, inadequate hydration and restricted mobility (Mikota *et al.* 1994).

In elephants, intestinal impaction is a significant health concern, especially in captive settings where captive feeding, restricted movement, and environmental factors may lead to digestive complications in individuals (Chandrasekharan *et al.* 2009).

Although elephants possess a simple stomach, their gastrointestinal anatomy is highly specialised. They have a distinct pharyngeal pouch terminating in a sphincter located above the larynx, which regulates the passage of food and water into the oesophagus and may assist in thermoregulation and water storage during dehydration (Fowler & Mikota 2008). Elephants lack a gallbladder but possess a large, sacculated bile duct that facilitates continuous bile secretion to aid lipid digestion (Shoshani *et al.* 2006). As hindgut fermenters, elephants rely on extensive microbial fermentation in the cecum and colon to break down fibrous plant material (Clauss *et al.* 2003; Eertink *et al.* 2020).

The intestinal tract is voluminous and elongated, with the small intestine averaging 2.1 m, the large intestine approximately 12.8 m, and the cecum ranging from 0.6 to 1.5 m in adult individuals. Despite this capacity, elephants exhibit a relatively fast digesta passage rate and low digestive efficiency for coarse, low-quality forage (Loehlein *et al.* 2003; Godron *et al.* 2019). This rapid transit, combined with factors such as reduced water intake or inadequate dietary fibre, predisposes elephants to gastrointestinal blockages and impaction (Chandrasekharan


Manuscript Editor: Christian Schiffmann

*et al.* 2009; Greene *et al.* 2019). Dehydration further exacerbates the risk by promoting intestinal stasis, which slows down gut motility and facilitates the accumulation of ingested material. Several other factors, such as sudden dietary changes, poor-quality roughage, low water intake, ingestion of indigestible material, or limited physical activity, can disrupt normal digestive processes, resulting in impaction (Nigam *et al.* 2022).

A healthy elephant typically defecates 15–20 times a day (Cheeran 2009). A marked reduction or absence of defecation is a critical indicator of gastrointestinal dysfunction and warrants immediate attention.

Asian elephants (*Elephas maximus*), an endangered species with declining wild populations and growing numbers in captivity, have increasingly been reported to suffer from gastrointestinal disorders, including intestinal impaction (Khadpekar *et al.* 2020). In captive environments, such as zoos, rescue centres and forest camps, limited access to diverse forage, confinement, stress, and inadequate hydration have been recognised as contributing factors (Nigam *et al.* 2022). In these settings – whether zoos, elephant camps, or rescue centres – impaction is frequently associated with suboptimal diets, ingestion of indigestible materials (such as plastic, sand, or rope), lack of exercise, or sudden dietary transitions (Khadpekar *et al.* 2020; Teodoro *et al.* 2023). Reluctance to drink water, a behaviour occasionally seen in stressed or ailing elephants, further predisposes them to this condition. Clinical signs often include inappetence, lethargy, bloating, restlessness, and a significant decrease in or absence of faecal output (Khadpekar *et al.* 2020). Compared to their African counterparts, Asian elephants often face different husbandry practices and management challenges, potentially influencing the frequency and severity of such conditions.

Several case reports from India and Southeast Asia have detailed instances of intestinal impaction in captive Asian elephants, emphasising the need for prompt diagnosis and intervention to prevent fatal outcomes (Khadpekar *et al.* 2020). Diagnosis approaches range from physical examination, rectal palpation, ultrasonography and behavioural observation to post-mortem findings in fatal cases (Teodoro *et al.* 2023). The treatment protocols typically include fluid therapy, administration of laxatives and stool softeners, rectal enemas, and supportive medications such as prokinetics (Greene *et al.* 2019). In severe cases, surgical interventions may be considered, though with a variable prognosis. However, outcomes vary depending on the timing of intervention, severity of impaction and the overall health of the animal.

Despite its clinical relevance and recurring occurrence in captive populations, comprehensive research on the causative factors, diagnostic challenges and management strategies for intestinal impaction in captive Asian elephants remains sparse. This paper aims to contribute to this critical area by presenting a detailed case study of intestinal impaction in a captive Asian elephant, highlighting clinical presentation, diagnostic findings, treatment strategies and implications for husbandry and preventive care.

## Case details

### *Case background*

The case involves the treatment of a 3-year-old female Asian elephant (Fig. 1) from a camp in Dudhwa Tiger Reserve in Uttar Pradesh, India. The elephant was born and raised in captivity and weighed ~900 kg during the case. This weight was based on the formula: Body Weight = {Height X (Chest Girth)2}/10,000, where Height = 4π (Radius of pad mark of forelimb) (Kanchanapangka *et al.* 2007).

The regular diet of this elephant consisted of gram (500 g), soyabean (100 g), rice (1 kg) and clarified butter (50 g) in the morning, and rice (3 kg), jaggery (500 g) and salt (100 g) in the evening, accompanied with daily green fodder both the times. The camp has two adult female elephants apart from the affected individual. The daily green fodder provided to the three individuals weighed ~1,500 kg for the three individuals and consisted of 'gajhad' or elephant/ Napier grass (*Cenchrus purpureus*), which is a soft and juicy, ideal for animal feed (Vanitha *et*

**Figure 1.** Affected 3-year-old juvenile.

*al*. 2008). The exact amount of daily green fodder consumed by the individual in this case is not confirmed. Besides the provided diet, the elephant used to consume several wild herbs, shrubs, tree barks, leaves of various species, while on its routine daily movement for monitoring across the forest or when it was left for free grazing in the vicinity of the camp. The water was kept available to the elephant at all times. Therefore, it is expected that the elephant consumes an adequate quantity of water (i.e., 70–100 litres/day) every day. The recent travel by elephant involved its walk in the surrounding forest of the camp, which was ~10 km. The elephant did not have any previous medical history or health issues.

On 14 December 2024, the mahout (elephant handler/caretaker) reported that the elephant was exhibiting inappetence/anorexia (reluctance to food) and absence of defecation. According to the mahout, the elephant had not ingested any feed since the evening of 13 December 2024 and had not passed dung since the morning of 14 December 2024. Concurrently, the animal displayed signs of abdominal distension and restlessness since the morning of 14 December 2024, including repeated changes in posture and increased movement, suggestive of discomfort. These clinical signs persisted for approximately 12 hours, while anorexia continued for over 24 hours.

*Diagnostic work-up*

Clinical evaluation commenced on the evening of 14 December 2024. On physical examination, the elephant presented with a visibly distended abdomen and signs of discomfort and agitation, characterised by persistent shifting of weight, lack of stillness, and abnormal stance. No water consumption during the treatment, multiple unsuccessful defecation attempts, and straining were also observed during the diagnosis. Notably, the maintenance of a widened hind limb posture was observed. Anorexia was ongoing at the time of examination.

Rectal temperature was recorded at 37.2°C and respiration was recorded at 10 breaths/minute. The mucous membranes were observed to be pink and moist. However, heart rate measurement and abdominal auscultation could not be performed due to unavailability of the stethoscope and pulse oximeter. A per rectal examination was conducted using full-length AI gloves lubricated with a soap and water solution and inserting the hand deep inside the rectum. Due to their unavailability on the field, we could not use antiseptic lubricants (e.g., Cetrimide cream). The examination revealed an empty rectum with no palpable faecal boluses, supporting the clinical suspicion of gastrointestinal dysfunction.

Based on the anamnesis and clinical presentation – namely anorexia, abdominal distension, restlessness and absence of faecal output – a preliminary diagnosis of ‘intestinal impaction’ was made.

*Treatment and management*

Physical activity was encouraged initially by walking the elephant for several minutes to stimulate gut motility, but there was no relief from bloating, and the rectum remained empty.

An injection of Flunixin meglumine (Megludyne®, 50 mg/ml; Virbac Animal Health India Pvt. Ltd.) was administered intramuscularly at 1 mg/kg (18 ml) to reduce inflammation and pain. Syrup Gastoken (Liquid paraffin, milk of magnesia, and sodium picosulphate; Medflex Healthcare Pvt. Ltd.) and Syrup Lactulose (Welacto solution, 10 mg/15 ml; Wellgo Pharmaceutical Ltd.) were offered orally, but the elephant refused to consume them. An enema was administered using 1 litre of liquid paraffin mixed with 20 litres of lukewarm water. Two intravenous fluids – 3 litres of Ringer's Lactate (RL; Swaroop Pharmaceutical Pvt. Ltd.) and 2 litres of Dextrose Normal Saline (DNS; Swaroop Pharmaceutical Pvt. Ltd.) – were administered along with Tribivet® (50 mg Vitamin $B_1$ + 50 mg Vitamin $B_6$ + 500 $\mu$g Vitamin $B_{12}$ per ml; Intas Pharmaceuticals Pvt. Ltd.) at a dose of 20 ml to support hydration and electrolyte balance. The treatment lasted for 3 hours. No complications or signs of secondary infection were observed during the treatment.

The mahout was advised to attempt administering the syrups orally during the night. The regular diet was made available to the elephant for the following night. The syrups were administered by the mahout at night, but the elephant still had not passed dung. However, there was a mild reduction in bloating, and the animal had passed urine.

A second per rectal examination in the same manner was carried out the next morning i.e., on 15 December 24, for 1 hour. The elephant was given time to rest periodically during this time. The per rectal temperature was recorded at 36.9°C. The examination revealed a stuck faecal bolus deep inside the rectum. Manual removal was attempted and successfully carried out by breaking the bolus into smaller portions (Fig. 2). A total of five faecal boluses were manually extracted. Notably, during bolus removal, a noticeable reduction in abdominal distension was observed.

*Outcome and follow-up*

Faecal analysis revealed the presence of large, undigested fragments of *Saccharum bengalense* (syn. *Saccharum munja*) (Fig. 3), a coarse, woody and fibrous grass commonly found in the region. While occasional ingestion of *S. bengalense* may occur without clinical consequence, the impaction in this case is suspected to have resulted from excessive intake or inadequate mastication and digestion of the fibrous material. The structural rigidity and high lignocellulosic content of *S. bengalense* likely contributed to gastrointestinal dysfunction and subsequent intestinal impaction.

Within an hour after the manual removal, the elephant passed two additional boluses on her

**Figure 2.** Manually breaking down the bolus and its removal from the rectum.

**Figure 3.** Munja grass (*S. bengalensis*).

own. The abdominal bloating was fully resolved, and the animal resumed normal feeding behaviour.

The elephant was orally offered 200 ml of Brotone® syrup (Virbac Animal Health India Pvt. Ltd.; liver tonic fortified with yeast and vitamins) once daily for the next 5 days to aid digestion. The elephant was advised to be monitored closely to prevent recurrence, especially by avoiding access to the aforementioned grass species, especially ‘munja’ grass. There was no recurrence of the condition thereafter, and no long-term complications were observed.

**Discussion**

Intestinal impaction is a relatively infrequent but clinically significant condition in Asian elephants, often resulting from ingestion of indigestible or poorly digestible plant material, dehydration, or reduced physical activity (Fowler & Mikota 2008). The present case describes a gastrointestinal impaction in a juvenile, captive-born female Asian elephant, with clinical resolution following a combination of supportive therapy and manual extraction of obstructive faecal material.

Comparable reports in both captive and free-ranging elephants have described impactions associated with ingestion of fibrous plant species, such as *Saccharum spontaneum*, bamboo, or other high-lignin-content vegetation (Liyanage *et al*. 2021). In this case, faecal analysis revealed undigested fragments of *S. bengalense*, a coarse, woody grass known for its high lignocellulosic content (Srivastava *et al*. 2024). This grass is not included in the regular fodder provided at the elephant camp, which primarily consists of *Cenchrus purpureus* (Napier grass), a species that is soft, palatable, and considered suitable for captive elephant diets. The camp elephants had been routinely allowed to graze freely in the vicinity of the camp, and it is postulated that the affected elephant had inadvertently consumed a substantial quantity of *S. bengalense* during a regular foraging period or while on a monitoring walk. The implicated *S. bengalense* was most likely ingested during routine forest walks, highlighting a common management challenge in semi-captive elephant systems where unrestricted foraging behaviour increases dietary heterogeneity and associated health risks, particularly in juveniles and calves, which exhibit limited dietary selectivity due to their inexperience (Koirala *et al*. 2016).

The absence of any prior medical history and the acute onset of clinical signs, including anorexia, abdominal distension, and absence of defecation, was particularly instructive in this case. The relatively rapid onset, coupled with a lack of response to initial conservative management (oral syrups and induced movement), underscored the severity of the impaction and justified escalation to manual intervention.

The treatment strategy in this case was largely effective, involving a multi-modal approach combining anti-inflammatory medication (Flunixin meglumine), supportive intravenous fluids (RL and DNS), and nutritional supplementation (Tribivet and Brotone). While oral medications were initially refused by the elephant, subsequent overnight administration by the mahout indicated the importance of caretaker familiarity and behavioural conditioning in therapeutic compliance. Notably, the use of per rectal examination not only facilitated diagnosis but was also critical for therapeutic intervention. Manual disimpaction, though labour-intensive, was successful in relieving the obstruction and restoring normal gastrointestinal function.

This case also highlights the practical challenges in field-based elephant medicine, such as the absence of advanced diagnostic tools (e.g., ultrasonography, endoscopy) and the need for pragmatic alternatives and a frugal innovation approach, in absence of required equipment. The use of lubricated soap-water solution instead of standard antiseptic lubricants for per rectal procedures represents a field-adapted protocol.

From a management perspective, a key lesson drawn from this case is the importance of monitoring for non-standard dietary intake during unsupervised grazing or routine forest movements. Even in otherwise healthy individuals with balanced diets and adequate hydration, the ingestion of inappropriate forage can precipitate serious gastrointestinal conditions (Mikota *et al*. 1994). Therefore, mahouts and veterinary staff must remain vigilant during the elephants' free-ranging activities and educate caretakers to recognize early signs of digestive disturbances.

Going forward, dietary intake during forest excursions should be observed more closely, and foraging areas known to contain *S. bengalense* and other high-fibre grasses should be avoided or access minimized. Additionally, this case demonstrates the value of early detection and timely intervention in preventing more severe outcomes, such as intestinal rupture or systemic toxemia, which have been reported in advanced cases of impaction (Mikota *et al*. 1994).

## Conclusions

This case highlights the importance of instant diagnosis, timely clinical intervention, and a comprehensive supportive treatment regimen in the successful management of intestinal impaction in Asian elephants. It highlights the necessity for site-specific management protocols and routine monitoring of diet and foraging behaviour, particularly in semi-captive settings where elephants may have access to potentially harmful plant species. Camp environments situated within or adjacent to wild habitats should be regularly assessed to prevent the consumption of fibrous, indigestible vegetation such as *S. bengalense*, which may contribute to gastrointestinal disturbances. Juvenile elephants, due to their exploratory feeding behaviour and immature digestive systems, should be closely supervised during grazing and foraging activities to minimise risk.

The critical role of the mahout, especially one with long-term familiarity with the individual elephant, was evident in this case, both in recognising early clinical signs and in facilitating treatment compliance.

This case also highlights the pressing need for improved access to diagnostic resources in remote field settings, alongside the development and systematic documentation of field-adapted clinical protocols.

Furthermore, regular monitoring of molar progression, should be emphasised as a key preventive measure to ensure effective mastication and digestion. Routine oral inspections must be incorporated into elephant training for oral examination and drug administration. Periodic oral inspections and assessments of faecal fibre length, as proposed by Schiffmann *et al*. (2023) can help identify dental anomalies early. Such practices can serve as simple yet reliable indicators of chewing efficiency and overall gastrointestinal health. These measures are essential to enhancing health management and emergency response capabilities in elephant conservation programs.

## Acknowledgements

We sincerely pay our gratitude to the Field Director, Dudhwa Tiger Reserve, and the Deputy Director, Dudhwa National Park. We would also like to thank the Department of Environment, Forestry and Climate Change, Uttar Pradesh, GoI. We thank the Mahouts and caretakers of the captive elephants at Dudhwa National Park, Uttar Pradesh, India, for their support during the treatment.

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DOI: 10.2305/SSYF2704
Short Communication Gajah 59 (2025) 63-66

# First Record of Rare White Elephant in the Wild from Bangladesh

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**Abstract.** We report the first record of a white elephant in the wild from Bangladesh. The white elephant is estimated to be approximately one month old and is part of a herd consisting of nine individuals. This elephant herd inhabits the fragmented, human-dominated forest landscapes of the south-eastern Chittagong Hill Tracts, a region increasingly impacted by habitat loss and human-elephant conflict. Our finding represents a significant addition to the records of white elephants in the wild and may have broader implications for understanding rare pigmentation traits and their occurrence in wild populations.

## Introduction

White elephants, often inaccurately referred to as albino elephants, represent a rare phenotypic variant of the Asian elephant (*Elephas maximus*) characterised by partial or complete loss of pigmentation (McCardle 2012). The term "white elephant" originates in Southeast Asia, particularly in Thailand (formerly Siam), where such individuals have historically been venerated as sacred symbols of royal authority and divine favour (Vincent 1874; Min & Thida 2020). Their skin typically exhibits a reddish-brown hue that lightens to pink when wet, and they are distinguished by features such as pale eyelashes and light-coloured body hair (Dharmarathne & Wijesinghe 2020). True albinism, defined by the complete absence of melanin, is exceedingly rare; most so-called white elephants instead exhibit hypopigmentation resulting from specific genetic mutations (Pawelek & Körner 1982). The cultural and religious significance of white elephants continues to influence their fate across much of Southeast Asia. In countries such as Myanmar and Laos, they are almost invariably captured and made lifelong captives.

The wild resident population of elephants in Bangladesh is composed of several fragmented subpopulations, with an estimated national count of approximately 268 individuals (range: 210–330), primarily distributed across the south-eastern regions of Chattogram, Cox's Bazar, and the three hill districts. The south-eastern hill districts support geographically isolated elephant groups inhabiting Lama (estimated at 23–39 individuals), the Bandarban region (9–14 individuals), the southern Chittagong Hill Tracts region (22–33 individuals), and the northern Chittagong Hill Tracts region (13–21 individuals) (IUCN Bangladesh 2016).

The south-eastern hill districts of Bandarban, Rangamati, and Khagrachhari – collectively known as the Chittagong Hill Tracts – form a rugged, mountainous region bordering the Indian state of Mizoram and Myanmar's Rakhine State. The Chittagong Hill Tracts are characterised by elevations exceeding 300 m above sea level and a mosaic of semi-evergreen forests interspersed with bamboo groves and shrubs. A significant hydrological feature of the region is the Kaptai Lake, an artificial reservoir formed by damming the Karnafuli River near Kaptai town during 1960s. The lake lies entirely within Rangamati District and spans several upazilas, including Rangamati Sadar, Kaptai, Naniarchar, Langadu, Baghaichhari, Barkal, Juraichhari, and Belaichhari. The lake's shoreline and basin exhibit highly irregular geomorphology (Chowdhury 2021).

Historically, the Chittagong Hill Tracts supported a substantial population of Asian elephants, particularly prior to the inundation caused by the formation of Kaptai Lake. In recent years, a resident elephant herd continues to range across


Manuscript Editor: Prithiviraj Fernando

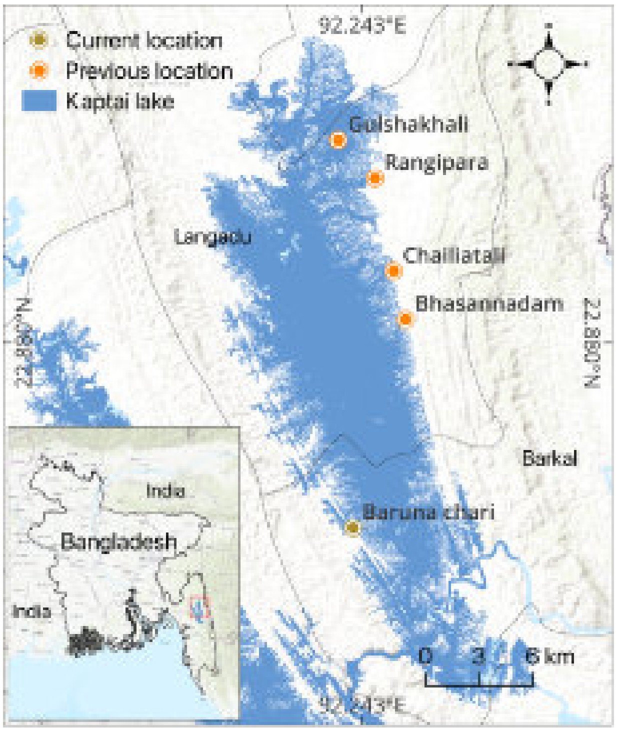


**Figure 1.** Observed locations of the herd with white calf in Rangamati District.

forest patches and human-dominated landscapes in Barkal Upazila (sub-district) (Fig. 1). This sub-district encompasses an area of 761 km², including portions of Kaptai Lake, bounded by Baghaichhari Upazila to the north, Langadu and Rangamati Sadar Upazilas to the west, Juraichhari Upazila to the south, and the

**Figure 2.** The white calf underneath its mother.

Indian state of Mizoram to the east. The human population inhabiting the area consists predominantly of ethnic communities, with approximately 71% belonging to Chakma, Marma, and Pankhoa, while the remainder comprises of settler communities (Rahman 2023).

During a field expedition on 16 June 2025, we observed an elephant calf exhibiting a pale pink body coloration within a herd roaming the forest fragments of Barkal Upazila (Fig. 2). The calf, estimated to be approximately one month old, was part of a group (Fig. 3) consisting of nine

**Figure 3.** The white calf with other members of the herd.

individuals. There has been no prior documentation of such individuals in either wild or captivity within the country.

We documented each individual in the herd by taking photographs and assigned age-sex following the scale developed for Asian elephants (Fernando *et al*. 2022). A total of nine elephants were confirmed in the group: two adult males, four adult females, one female of size class IV, one juvenile size I, and the youngest, a white calf (juvenile size I). Notably, the white calf's skin appeared entirely pink when wet, particularly after swimming – highlighting the hypopigmented phenotype. According to local residents, one of adult male elephants is occasionally observed associating with this herd, although it typically remains solitary and ranges independently, which we found in another isolated island apart from the herd. One female, who was larger and distinguished by widespread depigmentation on the head and trunk, was presumed to be the matriarch (Fig. 4). The mother of the white calf exhibited normal pigmentation.

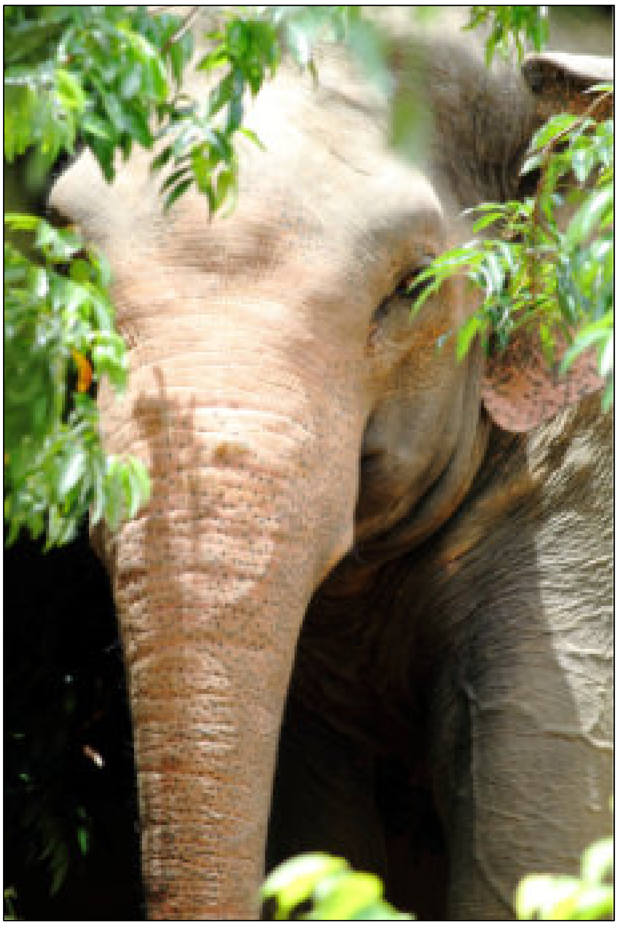

**Figure 4.** Presumed matriarch of the herd.

In the morning, we observed the herd resting in horticultural plantations on a hilly island encircled by water. The interconnected islands in this area cover several hectares and are characterised by a mix of temporary and permanent human settlements surrounded by orchards and planted vegetation. Within the herd, several adult elephants were observed lying down while others remained alert, standing guard around the group. By midday, the herd began moving along the island's periphery for feeding. Notably, the white calf – accompanied by its presumed mother and another adult female with the other size I juvenile – remained concealed within dense vegetation, displaying secretive behaviour throughout the day.

While white elephants are culturally and historically associated with Thailand and Myanmar – where they are traditionally kept in captivity – such individuals are exceedingly rare in the wild. In 1993, Sri Lanka reported the presence of a white elephant for the first time, which, to date, remains the only known individual of its kind documented living freely in the wild (CCR 2004; Holden 2004). Our record represents the first occurrence of a white elephant, either in the wild or in captivity, in Bangladesh.

The remaining forest habitats in the study site are highly fragmented, with only a few degraded patches managed by the Bangladesh Forest Department, while most of the islands have been converted into human settlements and horticultural plantations (BFD 2017). During monsoon, these islands become further isolated by rising water levels in Kaptai Lake, significantly restricting the available habitat for elephants. However, when water retreats in winter, the herd moves to areas such as Bhasannadham, Chailiatali, Rangipara and Gulshakhali on the other side of the lake (Fig. 1) (Aziz 2002, 2011). The dominance of fruit crops such as mango (*Mangifera indica*), lychee (*Litchi chinensis*), jackfruit (*Artocarpus heterophyllus*), and Indian gooseberry (*Phyllanthus emblica*) has made these areas attractive for foraging, thereby intensifying human-elephant conflicts. The limited availability of natural forests and the absence of intact wild vegetation have forced the herd to increasingly depend on cultivated areas, leading to frequent confrontations with local communities. This poses significant conservation challenges for elephants in the region.

To ensure the long-term survival of this elephant population – including the unique white individual – it is essential to monitor herd movements, feeding behaviour, and interactions with local communities through field surveys and camera-trapping. The data collected will guide habitat management and conflict mitigation strategies for the herd. Moreover, active engagement of local communities in conservation and conflict mitigation efforts will be critical for ensuring the survival of this isolated herd. The unique nature of this animal could be used to generate public interest and further elephant conservation in Bangladesh.

**Acknowledgements**

We thank both the former and current Divisional Forest Officers of Chittagong Hill Tracts-North, Md. Rezaul Karim Chowdhury and Mohammad Hossain, as well as Md. Shariful Islam, Forest Ranger of the Bangladesh Forest Department, for their local support during the study. We are also grateful to Pruthu Fernando and Jenifer Pastorini of the Centre for Conservation and Research, Sri Lanka, for reviewing our photographs and confirming the identification of the white elephant.

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DOI: 10.2305/VATJ1777

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# Report on the 12th Meeting of the IUCN Asian Elephant Specialist Group

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## Introduction

The IUCN SSC Asian Elephant Specialist Group (AsESG) meeting is a consultative meeting of the members of the IUCN Asian Elephant Specialist Group, government officials of the elephant range countries and other conservation organisations to identify priorities and challenges at a country and range level and ways to address them and also to devise best practices for the conservation of elephants in the wild and in captivity. The AsESG meeting is an opportunity to foster a closer relationship among range countries and members of the AsESG to deliberate and plan a way ahead as a specialist group to promote the long-term conservation of Asian elephants in 13 range countries.

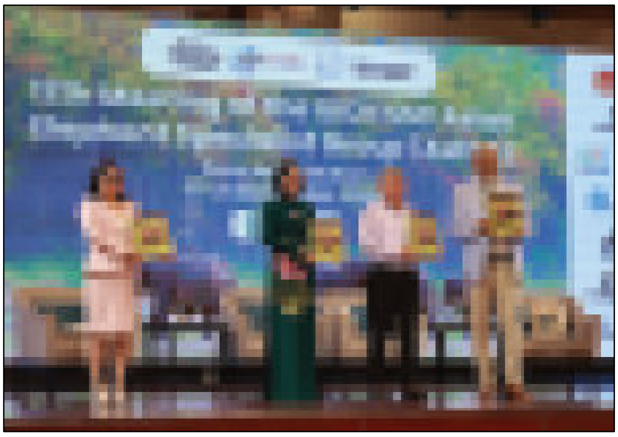
The AsESG hosts the meeting of its members and range country officials every 18 months to deliberate on various issues related to conservation of elephants in Asia. The previous three AsESG meetings i.e. the 9th AsESG Meeting was held at Bangkok, Thailand in April 2018; the 10th AsESG meeting at Kota Kinabalu, Sabah, Malaysia in December 2019 and the 11th AsESG meeting at New Delhi and Corbett National Park in India in March 2023.

Aiming to bring together Asian elephant conservationists from across the range, the 12th meeting of the AsESG was held in Bien Hoa, Vietnam. The meeting was organised from 17th to 19th September 2025 at the Mira Central Park Hotel and was jointly organised in partnership with the Ministry of Agriculture and Environment, Government of Viet Nam and Humane World for Animals.

The meeting had participation of over 100 individuals, including 70 AsESG members, representatives from all 13 Asian elephant range countries, six conservation partner organisations, special invitees, and organisers from the Ministry of Agriculture and Environment, Government of Viet Nam, and the Wildlife Trust of India. A total of 45 plenary presentations were delivered, with AsESG members actively engaged as presenters, session chairs, and co-chairs.

The event was inaugurated by Mr. Doan Hoai Nam, Deputy Director General, Viet Nam Administration of Forestry, Ministry of Agriculture and Environment; Ms. Nguyen Thi Hoang, Vice Chair; and Mr. Vivek Menon, Chair of the AsESG, along with Ms. Tham Hong Phuong,

Country Director, Humane World for Animals International/Viet Nam and other distinguished guests. During the inaugural session, the second edition of "Action Elephant" – including National Elephant Action Plans from ten Asian elephant range countries – was launched. The "Impact Report", highlighting the AsESG's outputs and outcomes over the past decade, was also released, alongside the first volume of the compendium of AsESG working report titled, "Gajah Guidelines".



**Chair's summary on AsESG's achievements**

Mr. Vivek Menon thanked the Government of Viet Nam, Humane World for Animals (HWA) and all the Conservation Partners for facilitating the organisation of the meeting and presented the report of AsESG activities since the last meeting held at India. The updates on the 14 Working Groups working to assess, plan and act in this quadrennium (2021–2025) were discussed.

*Assess*

In terms of assessment, the team finalised elephant distribution maps for 10 Asian elephant range countries: Bangladesh, Bhutan, China, Cambodia, Indonesia, Lao PDR, Malaysia, Nepal, Sri Lanka, and Thailand. A Working Group led by Dr. Christy Williams revised the IUCN Red List assessment of the Asian elephant (*Elephas maximus*), which was published in 2020. In addition, the Specialist Group led by Dr. Adrian Lister completed the national Red List assessment of the Borneo elephant (*Elephas maximus borneensis*) in 2023.

*Plan*

The AsESG provided technical and coordination support to the development, review, and adoption of National Elephant Conservation Action Plans (NECAPs) across Asian elephant range states. NECAPs serve as nationally endorsed strategic frameworks guiding elephant conservation, management, and human-elephant coexistence at the country level, while contributing to regional and global conservation objectives. As of 2025, ten Asian elephant range states have formally adopted NECAPs, representing a significant step toward harmonised conservation planning across the species' range. The countries with adopted NECAPs are:

- Bangladesh
- Bhutan
- Cambodia
- Indonesia
- Lao PDR
- Malaysia (Peninsular Malaysia and Sabah)
- Nepal
- Sri Lanka
- Thailand
- Viet Nam

Two editions of Action Elephant were produced as part of ongoing efforts to document progress, share experiences among range states, and disseminate information related to Asian elephant conservation planning and implementation. The first edition was released during the 11th AsESG meeting in India including six NECAPs. At the 12th AsESG meeting in Vietnam, the second edition of Action Elephant was released with inclusion of five additional or updated NECAPs, namely:

- Peninsular Malaysia (2023)
- Indonesia (updated, 2023)
- Viet Nam (2024)
- Nepal (2025)
- Thailand (2025)

Between 2021 and 2024, working groups developed and published seven technical guidelines and reports addressing priority conservation, management, and welfare issues for Asian elephants:

- Guidelines for Creating Artificial Water Holes in Elephant Habitats (2021)
- Protecting Asian Elephants from Linear Infrastructure (2021)

- Guidelines on Management and Care of Captive Elephants in Musth (2022)
- Guidelines for the Welfare and Use of Elephants in Tourism (2022)
- Guidelines on Emerging Diseases Affecting Asian Elephants (2023)
- Guidelines for the Reintroduction of Captive Elephants into the Wild as a Possible Restocking Option (2024)
- Handbook to Mitigate Impacts of Roads and Railways on Asian Elephants (2024)

These documents provide technical guidance to range states and contribute to the establishment of standardised best practices.

Linear infrastructure, policy uptake and capacity building: In line with commitments under the Siem Reap Declaration (2025), national-level workshops were undertaken in Bhutan and Sabah Malaysia to support the integration of best practices on linear infrastructure into national frameworks. These workshops aimed to facilitate policy uptake and practical application of regional recommendations. To enhance accessibility and national use, the guidelines on linear infrastructure were translated into national languages of Indonesia, Sri Lanka and Thailand. A regional online webinar on linear infrastructure and Asian elephants was conducted in September 2024, with participation from all Asian elephant range states. The working group convenor presented updates on these activities at the Third Asian Elephant Range States Meeting in February 2025. Further national consultation workshops are planned for 2026 in Indonesia and Cambodia to support continued guideline adaptation and implementation.

*Act*

Technical Support for Elephant Habitat Management in Cox's Bazar, Bangladesh: In 2019, technical support was provided to address conservation and management challenges affecting Asian elephant habitats in Cox's Bazar, Bangladesh, resulting from the rapid establishment of settlements for displaced Rohingya communities. The scale humanitarian response and associated infrastructure development resulted in significant pressure on elephant movement corridors, habitat connectivity, and traditional ranging areas.

Support activities focused on identifying priority elephant habitats and movement pathways within and around settlement areas, and on advising relevant authorities and partner organisations on measures to reduce habitat degradation and human–elephant conflict. This included guidance on maintaining functional corridors, managing high-risk interface zones, and integrating elephant considerations into site planning and habitat restoration efforts.

These technical inputs strengthened coordination among conservation agencies, government authorities, and humanitarian actors, with the aim of balancing urgent human needs with the conservation requirements of Asian elephants and the mitigation of conflict risks in a complex emergency context.

*Network*

The Membership Advisory Committee is operating in accordance with its mandate and will continue its work until the end of the quadrennium. During the current quadrennium, five meetings have been organised, resulting in the addition of 40 new members. The Specialist Group now comprises 130 members, with representation from all 13 Asian elephant range countries.

*Communicate*

Since 2015, the editorial board of the journal Gajah has published 17 issues. Each issue has been printed and made available online through the AsESG's website, with Gajah 58 now accessible at www.asesg.org. One of the key challenges faced by the journal has been the limited number of manuscript submissions, and the editorial board has encouraged members to contribute their work for publication.

The Communications Advisory Group has been active, and AsESG activities are now being regularly shared through social media platforms, including X, LinkedIn, and Instagram.

*Activities of the AsESG representatives*

The Chair reported that, of the 130 AsESG members, 56 are engaged in working groups established for the preparation of reports and guidelines, and 44 members are actively participating in the 12th AsESG meeting as chairs, co-chairs, moderators, or presenters.

The SSC Chair confirmed Ms. Heidi Riddle as Chair of the AsESG for the new quadrennium (2026–2029). During the previous term, the Chair participated in several major international meetings and events. These included attendance at CITES CoP19 in Panama in September 2022, where a side event on the Kathmandu Declaration was organised with the participation of range countries and conservation partners. The Chair also presented at the 78th WAZA Annual Conference in the United States in 2023, attended UNFCCC CoP28 in Dubai in 2023, and presented at the Association of Zoos and Aquariums (AZA) conference in the United States in 2023. In addition, the Chair attended the IUCN SSC Leadership Meeting in Abu Dhabi in 2024 and participated in the International Congress for Conservation Biology (ICCB) meetings held in Rwanda in 2023 and Brisbane in 2025.

Several AsESG members participated in the 19th International Elephant Foundation (IEF) Conference held in Chiang Mai, Thailand, in 2023. Members also attended the 16th Conference of the Parties (COP16) to the Convention on Biological Diversity (CBD) in Cali, Colombia, in 2024. In addition, AsESG members from Malaysia participated in and delivered presentations at the Malaysia Biodiversity Forum in 2024.

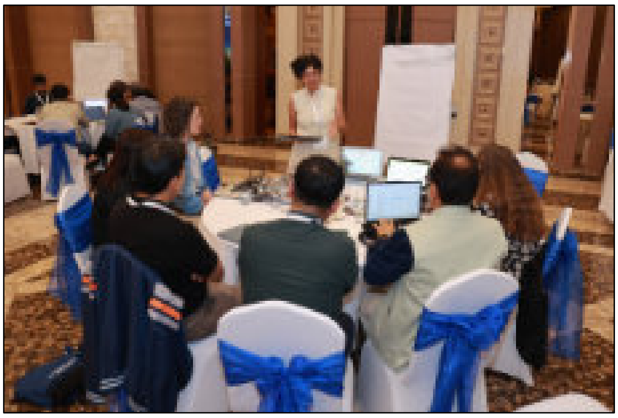
*Fourth Asian Elephant Range States Meeting*

The Fourth Asian Elephant Range States Meeting was held from 24–26 February 2025 in Siem Reap, Cambodia, bringing together government representatives from all Asian elephant range states, along with regional experts, partner organizations, and observers. The meeting provided a platform to review progress in the implementation of National Elephant Conservation Action Plans (NECAPs), exchange experiences on priority conservation challenges, and strengthen regional cooperation for Asian elephant conservation.

Key thematic areas discussed included habitat connectivity, human-elephant coexistence, impacts of linear infrastructure, captive elephant management, and emerging threats such as climate change. AsESG members participating in the meeting included Mr. Salman Saaban, Dr. Donny Gunaryadi, Ms. Alexandra Zimmermann, Ms. Megan English, Dr. Rachel Crouthers, and Mr. Sereivathana Tuy.

The meeting culminated in the adoption of the "Siem Reap Declaration", which was signed by all 13 Asian elephant range countries and reaffirmed collective commitments to coordinated action for the long-term conservation of Asian elephants. In addition, the final report of the Third Asian Elephant Range States Meeting, held in Kathmandu, was prepared and circulated.

Separately, the AsESG submitted a report on "Asian Elephants: Status, Threats, and Conservation Actions" to the 74th IUCN SSC Standing Committee in November 2021. The group has also published the document "Protecting Asian Elephants from Linear Transport Infrastructure", in collaboration with the IUCN WCPA Connectivity Conservation Specialist Group.



**AsESG Meeting**

*Day 1*

Day 1 of the 12th AsESG Meeting focused on technical deliberations led by the AsESG Working Groups. The morning technical session featured presentations by working group convenors, who provided overviews of recently completed and ongoing reports and guidelines, highlighting key findings, recommendations, and their relevance to national conservation and management priorities. These presentations facilitated a shared understanding of available technical resources and their application across Asian elephant range states.

The afternoon was dedicated to working group breakout sessions, during which participants engaged in focused discussions organised around key thematic areas, including the Green Status of Asian elephants, elephant translocation, mapping the distribution of Asian elephants across range states, the range-wide Asian Elephant Action Plan, and guidelines on human-elephant conflict. The breakout sessions provided an opportunity for range state representatives, technical experts, and partners to discuss implementation challenges, share national experiences, and identify priority actions and knowledge gaps to guide future working group activities.

Ms. Heidi Riddle chaired a parallel session on the stocktaking of the Siem Reap Declaration. This focused on the follow up to be done on the Siem Reap Declaration 2025.

A partners roundtable meeting was organised with all the conservation partners to discuss on the way forward to support the AsESG activities.

*Day 2*

The technical sessions focused on examining the threats and challenges affecting the conservation of Asian elephants, as well as the guidelines and action plans being developed by the AsESG and range countries to support the conservation and welfare of elephants in both the wild and in captivity.

Discussions on the first day centred on country presentations from all 13 Asian elephant range states, delivered by ex-officio representatives and AsESG members. Ex-officio members provided national overviews covering the status of wild and captive elephant populations, key conservation issues and threats, the presence of national action plans, and ongoing management and conservation interventions. This was followed by presentations by AsESG members on CSS centres and other issues of elephant conservation.

*Day 3*

On the last day of the AsESG meeting, AsESG members shared their work, experience and studies on various topic from across different Asian countries on elephant conservation.

DOI: 10.2305/YJSQ1142

 *Gajah 59 (2025) 72-74*

# Fourth Asian Elephant Range States Meeting Successfully Convened in Siem Reap, Cambodia

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Government representatives from the 13 Asian elephant range countries, members of the IUCN SSC Asian Elephant Specialist Group (AsESG), and of the Center for Species Survival: Asian Elephant (CSS Asian Elephant), convened for the Fourth Asian Elephant Range States Meeting in Siem Reap, Cambodia, from February 5–7, 2025. The meeting was hosted by the Government of Cambodia and facilitated by the AsESG, with funding support from the CSS Asian Elephant, a collaborative partnership between IUCN Species Survival Commission, Columbus Zoo and Aquarium, Wildlife Trust of India, and the Forest, Environment and Climate Change Department of Odisha.

Over three days, the meeting included 14 technical sessions, bringing together participants to discuss key conservation challenges, exchange solutions, and explore collaborative strategies. The first day began with country presentations, where government representatives provided updates on the conservation status of elephants in their respective countries. This was followed by sessions that delved into critical issues such as elephant corridor management, habitat connectivity, minimising the impact of linear infrastructure, human-elephant conflict mitigation, and management of captive elephants.

Discussions also focused on the development of national elephant conservation action plans, enhancing transboundary collaboration, securing sustainable funding for conservation efforts, and harnessing technology to advance elephant conservation. Delegates examined best practices for conducting elephant population surveys, emphasising the use of modern technologies such as genetic databases, infrared cameras, drones, and AI to more effectively monitor and manage elephant populations. A dedicated session on the Asian Elephant Database addressed the challenges faced by the range countries, particularly in data collection, sharing, and standardisation. Participants engaged in discussions on strengthening data-driven conservation, improving regional coordination, and supporting informed decision-making.

The meeting concluded with the launch of the 2025 Siem Reap Declaration for Asian Elephant Conservation, reaffirming the commitment of participating countries to continued regional collaboration. Expanding on the foundation of the 2022 Kathmandu Declaration for Asian Elephant Conservation, the updated 2025 declaration provides a comprehensive framework for range-wide conservation efforts, ensuring the long-term protection of wild elephant populations and their habitats across Asia.

The launching ceremony featured remarks from His Excellency Dr. Kim Nong, Undersecretary of State and Chair of the Technical Working Group on Elephants, Ministry of Environment, Government of Cambodia. He highlighted the significance of the Asian Elephant Range States Meeting as a platform for dialogue and collaboration in conserving this endangered species. He also shared the Government of Cambodia's vision and ongoing efforts to enhance the management and conservation of Asian elephants.

A comprehensive meeting report can be downloaded at <https://asesg.org/PDFfiles/2025/Fourth%20Asian%20Elephant%20Range%20States%20Meeting%20Report%20(1).pdf>. We are grateful to the Government of Cambodia for hosting this important meeting, and we thank AsESG members, in particular those from Cambodia, for helping to facilitate the meeting discussions.

## *The Siem Reap Declaration for Asian Elephant Conservation Siem Reap, Cambodia February 7, 2025*

We, the representatives of the government agencies from Asian Elephant Range States including the People's Republic of Bangladesh, the Kingdom of Bhutan, Kingdom of Cambodia, People's Republic of China, Republic of India, Republic of Indonesia, Lao People's Democratic Republic, Federal Democratic Republic of Nepal, Democratic Socialist Republic of Sri Lanka, Republic of the Union of Myanmar, Malaysia, Kingdom of Thailand, and the Socialist Republic of Vietnam, declare our common goal to conserve the Asian Elephant within its Range States, and:

Recognizing that the Asian Elephant, a seriously endangered species and one of the most iconic animals, faces a challenging future with the loss of its habitat, fragmented populations, high levels of human-elephant conflict, illegal killing, as well as other factors that have resulted in population declines in some of the Range States, and that we should have a common vision to promote Asian Elephant conservation;

Acknowledging that the Asian Elephant is a keystone species and an umbrella species whose conservation helps ensure the conservation of myriads of other species. Asian Elephants are also culturally significant across Asia. A failure to protect Asian Elephants and their habitat will therefore not only result in the loss of elephants but also the loss of biological and cultural diversity and the tangible and intangible benefits provided by elephants and the ecosystems they inhabit;

Noting that while elephant conservation is primarily a national responsibility, there is an urgent need to synergize national actions with international cooperation amongst the Range States for the long-term conservation of Asian

Elephants. The reversal of the crisis facing Asian Elephants is additionally dependent upon political, financial, and technical support from the international community;

Understanding the role of international agreements on the conservation of biological diversity and protection of endangered species, including the Asian Elephant, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on the Conservation of Migratory Species of Wild Animals (CMS), and to align with the global targets for 2030 of the Kunming-Montreal Global Biodiversity Framework of the Convention on Biological Diversity (CBD);

Acknowledging the presence and support of other governments, international organizations, non-governmental organizations, and other supporters of Asian Elephant conservation;

Building upon the Declarations for Asian Elephant Conservation of the Asian Elephant Range States Meetings of 2017 and 2022;

*Thus, we declare:*

- To enhance cooperation between the 13 Range States both bilaterally and multilaterally, promoting transboundary conservation of the Asian Elephant, and sharing and learning to enhance national conservation measures;
- To promote coexistence by minimizing the negative impacts of humans on Asian Elephants and their habitats, address the root causes of human-elephant conflict, and develop long term solutions to minimize such conflict; engage with local communities to gain their participation in biodiversity

conservation and land-use planning; and provide sustainable and alternative livelihoods through financial support, technical guidance and support, and other measures;
- To ensure effective law enforcement across the species' range to prevent illegal killing of Asian Elephants and the illegal trade in live Asian Elephants, ivory and its derivatives, and other elephant body parts;
- To promote and ensure the welfare of captive elephants is maintained at all times;
- To strengthen international collaboration, coordination, cooperation and communication based on bilateral and multilateral agreements where relevant, involving specialized expertise from national and international organizations, including but not limited to AsESG, IUCN SSC, CITES, INTERPOL, CBD, CMS, UNEP, ASEAN-WEN, SAWEN, and UNODC;
- To set up through appropriate mechanisms an Asian Elephant Fund, accessible to Range States and Range State civil society, to promote conservation of the species and its habitat;
- To develop an appropriate data sharing mechanism among Range States;
- Commit to develop, where necessary, and where applicable implement National Asian Elephant Conservation Action Plans that include, but are not limited to, the priorities listed in the annex to this Declaration.

And call upon the international community to join us in addressing the challenges facing Asian Elephants and achieving a harmonious coexistence between humans and Asian Elephants.

*Annex: Priority Commitments by 2030*
*(In order to align with Target 4 of the Global Biodiversity Framework)*

- Promote the maintenance and connectivity of large Asian Elephant conservation landscapes where new permitted developmental activities such as linear infrastructures are elephant- and biodiversity-appropriate;
- Promote the development of national guidelines on wildlife friendly linear infrastructure, including elephant, based on those developed by the Asian Elephant Specialist Group of the IUCN SSC and Connectivity Specialist Groups after Range States consultations;
- Develop bilateral transboundary agreements, protocols or understandings in relevant countries to ease movement of Elephants through appropriate corridors and transboundary protected areas;
- Collectively develop, where relevant, and coordinate captive Asian Elephant registration programs in relevant countries, based on scientific research including, where appropriate, microchipping and/or DNA-based systems, and ensure cross-border movements of captive Asian Elephants are in compliance with all national and international laws and regulations;
- Ensure that all Range States have a National Asian Elephant Conservation Action Plan;
- Promote, where applicable, the development of national guidelines on Human Asian Elephant Conflict mitigation based on those developed by the Asian Elephant Specialist Group of the IUCN SSC after Range States consultations;
- The Range States support the development of a range-wide Asian Elephant Conservation Plan by the Asian Elephant Specialist Group of the IUCN SSC;
- The Range States initiate the establishment of national Asian Elephant Databases where applicable, and with the technical support of the Asian Elephant Specialist Group of the IUCN SSC develop a standardized data sharing mechanism for countries;
- The Range States jointly initiate the creation of an Asian Elephant Fund based on identified priority actions and assisted by the Asian Elephant Specialist Group of the IUCN SSC;
- Build capacity of Range States towards the aforementioned actions as appropriate;
- Report on progress towards such actions at the stocktaking session to be held during the next Asian Elephant Range States Meeting.

DONE in Siem Reap, Cambodia, on the Seventh Day of February in the Year Two Thousand and Twenty-Five, in a single original copy in the English language.

DOI: 10.2305/FVGI9963

*Gajah 59 (2025) 75-77*

# Report on the Ninth Elephant Conservation Group Workshop

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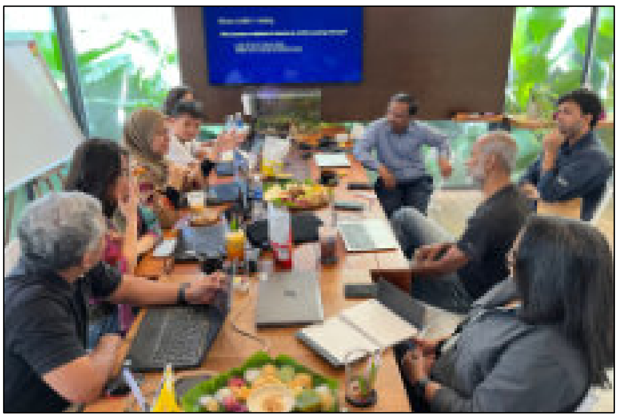
## Introduction

The Elephant Conservation Group (ECG) is an informal network of researchers from Asian elephant (*Elephas maximus*) range countries that meets every two years – often adjacent to the IUCN SSC Asian Elephant Specialist Group's meeting. On 15th and 16th September 2025, a short ECG meeting was held in Bien Hoa in Vietnam. It brought together 11 researchers from five range countries. The meeting focused on discussing actionable conservation strategies to balance the needs of elephants and those of human communities. It highlighted the importance of cross-country and interdisciplinary exchange amidst growing challenges. Most participants gave presentations of their work, each being followed by spirited discussion among the members. ECG intends to continue having bi-annual meetings, aiming for networking among members to discuss their research, issues and lessons learnt, and discussions on cross cutting themes, in order to promote Asian elephant conservation in the range countries.

## Presentations and discussions

Wishnu Sukmantoro from the **Indonesia** Elephant Conservation Forum presented human-elephant conflict (HEC) management through participatory spatial planning, focusing on threats to Sumatran elephants like land conversion. The MP2CE initiative aims to develop effective spatial strategies to reduce conflicts caused by habitat encroachment, lack of awareness, and retaliatory actions. The study proposes an integrated approach with five components: monitoring elephant movements, planning corridors, conflict control, stakeholder education, and habitat restoration. Results showed a 50% reduction in conflict across 20,000 hectares. The process involved collaborative mapping of elephant routes and habitats, with the "Free, Prior, and Informed Consent (FPIC)" legal framework enhancing community involvement. The goal is to improve spatial planning and conflict mitigation for better human-elephant coexistence, despite ongoing conservation challenges. Future plans include data collection and stakeholder engagement. Insights from India and Sri Lanka highlighted the importance of understanding elephant movements to avoid misplacing of corridors.

Nishant Srinivasiah from the Indian Institute of Science, **India**, studied male elephant mortality rates and their impact on social hierarchy in the Hosur-Ramnagara region of the Eastern Ghats, bordering Tamil Nadu and Karnataka. Poaching of targeted males was a major issue in the fragmented northern part of the study area, while the southern, less fragmented area saw increased male presence and conflicts with farmers as farmers shifted to multi-crop farming from pumping. In Ramnagara, near Bannerghatta National Park, about 30 elephants near the Bangalore-Mysuru highway were impacted by urb-



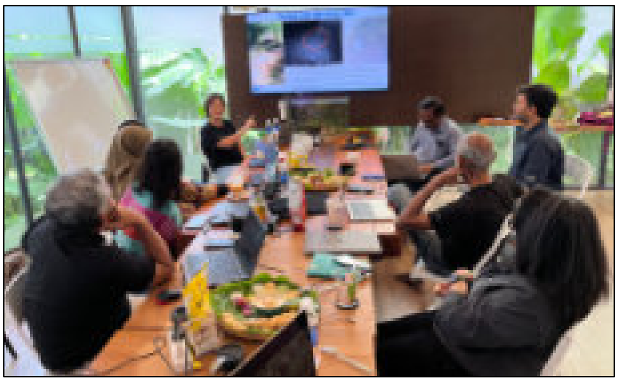
anisation, with 43% of elephants aged 10–12 years involved in crop damage. Young males joined up into groups in urban areas, highlighting hierarchical dynamics. The study showed that crop-protection fencing improved farmer incomes, indicating that shifting the management focus from capturing elephants to promoting community-based fences was more relevant and developing elephant movement models was important to understanding underlying issues.

Ananda Kumar of the Nature Conservation Foundation studied elephant-human interactions in two regions in southern **India**: Valparai, where no barriers obstruct elephant movement across the landscape, and Hassan, where solar fences around coffee estates have displaced elephants into villages, increasing crop damage and deaths. The expansion of highway NH75 further restricted elephant habitat, raising conflicts in 140 villages. Valparai saw fewer fatalities thanks to conservation efforts, early warnings, and community involvement, while Hassan's fatalities dropped from five yearly (2010–2018) to two (2018–2025) due to monitoring and alerts. Nonetheless, new fatalities occur where fencing has displaced elephants. The study urges redesigning fences, building overpasses or underpasses on NH75, and expanding early warning systems in these areas.

Based on their work in **Sri Lanka**, where 70% of elephant range is outside protected areas, Prithviraj Fernando and Jennifer Pastorini from the Centre for Conservation and Research discussed habitats used by elephants, elephant range and what is considered as habitats/range that elephants should and should not be allowed to use by managers. They discussed the carrying capacities of different habitats used by elephants, ranging from primary forest to grasslands and the increasing gradient in elephant densities. They also discussed the relationship between elephant numbers, HEC and conservation and which types of elephants raided crops and why. The analysis provided a foundation for elephant management and HEC mitigation.

Mai Nguyen from Humane World for Animals discussed research on elephants in Dong Nai, **Vietnam** and national level initiatives. Vietnam's elephants are critically endangered, with about 100–150 individuals in small populations in five provinces. Three initiatives were conducted: camera traps to assess demographics and body condition, grid-based distribution surveys and HEC monitoring. The camera trap work was based on identifying individual elephants. Results from the three initiatives identified the pitfalls of management, such as constructing linear electric fences and shifting of conflict areas as a result of range loss. The success of the Dong Nai work led to methodology being incorporated into the National Action Plan for Vietnam (VECAP 2022) to be implemented across the five provinces in Vietnam with elephants, over the next few years.

Thien Le Quoc shared WWF Vietnam's elephant conservation efforts in Dak Lak, **Vietnam** including the Regional Asian Elephant Action Strategy of WWF and WWF-VN plans. Over 13 years, illegal poaching has been low, but snares still threaten wildlife in Dak Lak. Faecal DNA estimates Dak Lak's elephant population at about 28, with plans for more dung collection in 2026. It is hoped to develop a GPS-collaring programme shortly. So far no elephants have been collared, but a recent workshop discussed piloting GPS-collaring of an injured elephant in



a semi-wild situation. WWF is developing a conservation plan focusing from 2025–2030 based on DNA analysis, GPS collaring, and photo collection.

Malaysian forests host stable elephant populations, but understanding their habitat use and conflicts is essential for effective conservation strategies. The study from Ee Phin Wong (University of Nottingham Malaysia) in **Peninsular Malaysia** examined habitat selection and HEC involving elephants in Johor, focusing on rainforest and agricultural environments. Using the Resource Selection Function and Generalised Linear Mixed Models (GLMM), the study considered individual elephants as random effects within areas impacted by human activity. Over seven years, conflict hotspots were identified, with oil palm plantations suffering the most damage. The research measured elephant home ranges, averaging 245 km$^2$ and analysed movements in relation to habitat variables during day and night. A questionnaire survey across four locations examined factors like age, gender, and education to assess moral responsibility in conservation. Stakeholder mapping included 16 participants in a workshop, identifying key agencies involved in elephant conservation.

Cheryl Cheah from WWF Malaysia's **Sabah** Landscapes Programme stated that the Pan Borneo Highway project now involves wildlife experts to ensure better protection for wildlife. Critical areas have been identified, leading to

recommendations for wildlife overpasses and underpasses to facilitate the movement of Bornean elephants. WWF proposed a realignment based on preliminary findings, noting that further analysis could yield different results. A workshop focused on creating wildlife-friendly structures and assessing costs and benefits was held. A Tabin Landscape case study, home to 250–300 elephants, provided information for land use planning in the area.

Nurzhafarina Othman from Seratu Aatai, studying Bornean elephants for over a decade, found that the **Sabah** population has dropped to about 1,000 due to poaching, habitat loss from oil palm and highway construction, also threatening other species like orangutans. Since 2011, elephants have increasingly appeared in oil palm plantations. Research includes GPS collaring of males and analysing heavy metals in post-mortem samples. Research is ongoing to assess elephant genetics via microsatellites.

DOI: 10.2305/OGKN7833
News and Briefs
*Gajah 59 (2025) 78-80*

# International Workshop on Asian Elephant Conservation and the Development of a New Asian Elephant National Park in China

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## Introduction

China is home to a small but growing population of wild Asian elephants (*Elephas maximus*), representing less than 1% of the global total. These elephants inhabit Southwest Yunnan, where they are divided into two geographically and genetically distinct populations. The larger population, found in Xishuangbanna and Pu'er, constitutes approximately 95% of China's elephants and belongs to the $\alpha$ genetic clade. Over the past three decades, this population has doubled in size and expanded its range significantly, marking a notable conservation success. In contrast, the smaller population in Lincang, belonging to the $\boldsymbol{\beta}$ clade and numbering fewer than 20 individuals, has remained stable or slightly declined. The growth of the elephant population in Xishuangbanna and Pu'er has increased spatial overlap between elephants and humans, intensifying human-elephant conflict. Additionally, some elephants in Xishuangbanna exhibit transboundary home ranges, moving regularly between China and Laos, highlighting the need for international collaboration in their conservation.

Recognising the ecological and cultural importance of Asian elephants, the Chinese government, in partnership with various stakeholders, has implemented significant conservation efforts. These include strict wildlife protection laws, an elephant monitoring and early warning system, and an economic compensation scheme for affected communities. The government is also advancing the establishment of a new protected area under China's National Park system. The proposed Asian Elephant National Park aims to protect Southwest Yunnan's tropical seasonal evergreen forests – the largest stretch of tropical forest in China – and conserve the region's wild elephant population.

To support these initiatives, the Xishuangbanna Tropical Botanical Garden (XTBG), part of the Chinese Academy of Sciences, collaborated with the Asian Elephant Research Center (AERC) of the National Forestry and Grassland Administration (FGA) the and the International Fund for Animal Welfare (IFAW) to organise the 2025 International Workshop on Asian Elephant Conservation and the Development of the Asian Elephant National Park. Held on April 20–24, 2025, the workshop facilitated knowledge exchange and gathered expert recommendations on conserving China's wild elephants and developing the National Park. It included a 2.5-day field visit to Pu'er and Xishuangbanna, followed by a 1.5-day indoor session at XTBG. This report summarises the workshop's activities and outcomes, emphasising the value of international collaboration in advancing elephant conservation, habitat protection, and human-elephant coexistence.

## Workshop participants

The workshop involved 60 participants, including 13 members of the IUCN's SSC Asian Elephant Specialist Group (AsESG) from six range countries: Sri Lanka, India, Nepal, Malaysia, Laos, and China. Local participants included staff from various levels of China's FGA – national, provincial, and prefectural offices – as well as representatives from universities, research centres, NGOs, local communities, and the private sector.

## Field Visit to Pu'er and Xishuangbanna

The field visit began in Pu'er City, where Pu'er's FGA introduced the history and current status of the local elephant population and ongoing conservation and human-elephant conflict mitigation efforts. Elephants disappeared from Pu'er in the second half of the 20th century but returned around 1992. Today, an estimated 60 elephants reside permanently in Pu'er, while other 140 may move between Pu'er and Xishuangbanna.

On April 21, a group of 30 delegates visited Pu'er's Jiangcheng County to learn about the drone-based elephant monitoring system developed by the Chinese government (Figs. 1 & 2). This system integrates data from field rangers, drones, camera traps, and AI to monitor elephant presence and activities. It uses social media, loudspeakers, and road signs to warn people of elephant movements, reducing the likelihood of encounters and providing valuable data on elephant behaviour.

**Figure 1.** Learning about the drone-based monitoring in Jiangcheng county, Pu'er.

**Figure 2.** Drone-view of wild elephants in Jiangcheng county, Pu'er.

On April 22, the delegates visited the Mengyang sub-reserve of the Xishuangbanna National Nature Reserve (Fig. 3), which served as a refuge for elephants during the population bottleneck of the 1980s and 1990s. The day began with a visit to an "elephant canteen" near Guanping, designed to provide supplementary food in an area frequently used by elephants in their movements across valleys. The delegation then visited a Hani village, where they learned about community-based efforts led by IFAW, including honey production as an alternative livelihood (Fig. 4) and cost-effective electric fencing. Next, they visited Xiang Yan Qing, a village fully enclosed by a permanent metal fence to prevent elephant access (Fig. 5). The day concluded at Wild Elephant Valley, where delegates met researchers and staff from the Xishuangbanna Asian Elephant Conservation and Management Center and observed Mengyang's forest via a walkway and a cable car.

**Figure 3.** Introduction to elephant conservation in Xishuangbanna.

**Figure 4.** 'Hani Honey' as an alternative source of income in human-elephant conflict areas.

**Figure 5.** Permanent metal fence around the village Xiang Yan Qing.

**Indoor sessions**

On April 23, the workshop featured a full-day public session (Fig. 6). Opening remarks by XTBG's Deputy Director, Professor Quan Rui-Chang, were followed by ten bilingual presentations (English and Chinese) from AsESG members and other experts. The presentations provided insights into elephant conservation and human-elephant conflict mitigation across much of the species' range, sparking active questions and discussions among participants.

The workshop concluded on April 24 with a discussion among government officials, foreign visitors, and organisers. Key topics included balancing efforts to protect elephants and tropical forests, addressing questions about the implications of mixing $\alpha$ and $\boldsymbol{\beta}$ clade populations, managing population growth and associated human-elephant conflict, handling "problem elephants," and extending China-Laos collaboration for transboundary elephant management.

**Conclusions**

This workshop was a valuable experience for both local and visiting participants. Foreign experts gained firsthand insights into China's elephant conservation efforts, including the innovative use of technology to promote human-elephant coexistence. The issues discussed will be compiled into policy recommendations for elephant management and the development of the new National Park, aiming to ensure the long-term conservation of China's elephants and tropical evergreen forests in harmony with local communities.

**Figure 6.** Participants of the 2025 International Workshop on Asian Elephant Conservation and the Development of China's Asian Elephant National Park.

DOI: 10.2305/IHHB9249
News and Briefs
*Gajah 59 (2025) 81-83*

# Workshops to Disseminate the Handbook to Mitigate the Impacts of Roads and Railways on Asian Elephants

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## Introduction

Linear infrastructure has been identified by Asian elephant range countries as a significant threat to elephant conservation. In the 2017 Jakarta Declaration, range states committed to reducing habitat impacts from infrastructure and incorporating elephant movement into development planning. In response, the Asian Elephant Transport Working Group (AsETWG), a joint initiative of the IUCN World Commission on Protected Areas (WCPA) Connectivity Conservation Specialist Group (CCSG) and the IUCN Species Survival Commission (SSC) Asian Elephant Specialist Group (AsESG), was formed in 2018 to support Asia's 13 elephant range countries in integrating wildlife-friendly considerations into linear infrastructure development. A key output of the AsETWG was the Handbook to Mitigate the Impacts of Roads and Railways on Asian Elephants, published in 2024.

This handbook provides the first set of guidelines for designing elephant-specific crossing structures and offers strategies to reduce wildlife-infrastructure conflict. It offers practical, evidence-based recommendations for minimising harm to elephants throughout the lifecycle of infrastructure projects. Key components include avoidance measures (such as alternative siting or rerouting of the transport corridor) and mitigation solutions (including underpasses and overpasses designed for elephants).

Following the handbook's release, the AsETWG has engaged partners and governments across Asia to share knowledge, build capacity, promote research, and support conservation initiatives addressing the impacts of linear transport infrastructure on elephants. The group briefed representatives from 13 range countries on the handbook's recommendations to minimise the negative impacts of linear infrastructure on Asian elephants at the 4th Annual Asian Elephant Range States meeting in Siem Reap, Cambodia in February 2025; to AsESG and range state forest officials in Vietnam in September 2025; and to transport experts and government officials at the 3rd Asia Transportation Ecology Forum in Beijing in October 2025.

Workshops form a central part of this effort, bringing practitioners together to apply the handbook's recommendations in local contexts. As part of this goal to socialise the handbook in Asian elephant range countries, two in-person workshops were held, one in Bhutan and the other in Sabah, Malaysia, in early 2025. The workshops brought together government agencies, infrastructure planners, engineers, researchers, and conservation partners with the aim of advancing wildlife-friendly infrastructure planning and implementation across range countries. The first two workshops were held through a collaboration between the AsETWG, the Center for Large Landscape Conservation, WWF-Bhutan, WWF-Malaysia, and government agencies from the two host countries. The workshops aimed to apply the handbook's principles and strengthen technical capacity among stakeholders to support infrastructure development that balances conservation and development objectives.

**Workshop in Bhutan**

From March 25–27, 2025, Bhutan hosted its first Wildlife-Friendly Infrastructure Training Workshop in Thimphu. Around 50 participants from 27 institutions attended (Fig. 1), including highway engineers involved in major national projects such as the Gelephu Mindfulness City, as well as representatives from government departments, NGOs, and funding agencies. The workshop, which focused on wildlife-friendly infrastructure at a national level, included technical sessions led by the AsETWG on the handbook's content, current evidence on the impacts of linear infrastructure on wildlife, and examples of mitigation measures and best practices.

The Bhutan Highways Connectivity Master Plan to 2040 was presented by the Department of Surface Transport, outlining the country's approach to improving transport connectivity while maintaining ecological integrity. Discussions focused on integrating wildlife-friendly infrastructure into policy and planning frameworks, and participants collaboratively identified national capacity needs and outlined priority actions. The workshop concluded with a session in which participants proposed a roadmap for short-, medium-, and long-term actions, including capacity building and the development of national guidelines for mitigating the impacts of linear infrastructure on wildlife to support Bhutan's sustainable development objectives.

**Workshop in Sabah, Malaysia**

From May 6–9, 2025, the Workshop on Constructing Wildlife-Friendly Infrastructure was held in the Maliau Basin Conservation Area in Sabah, Malaysia. The event brought together 45 participants (Fig. 2) representing government agencies, non-governmental organisations, and an environmental consultancy agency. The workshop, which was largely focused on reducing the impacts of the Phase 3 of the Pan Borneo Highway, provided a platform for sharing cross-sectoral experiences related to sustainable road infrastructure, including presentations by the Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN) and the Public Works Department, drawing on mitigation measures and monitoring data from Peninsular Malaysia.

The workshop included a field visit to existing wildlife crossing structures within the Maliau Basin Conservation Area, as well as to high-biodiversity sites along a single-lane road scheduled for upgrading under Phase 3 of the Pan Borneo Highway Project in Sabah. This project aims to connect the towns of Tawau and Keningau, crossing remote districts of Kalabakan and Pensiangan, which traverse protected areas with primary forest and important elephant movement corridors. As planning and

**Figure 1.** Workshop participants in Thimphu, Bhutan (Photo: WWF-Bhutan).

budget allocation for Phase 3 had not yet taken place, discussions focused on co-developing preliminary recommendations for wildlife-friendly design options for the project.

The workshop concluded with a synthesis of recommended mitigation measures, including extended elevated highway sections (viaducts or flyovers) at critical locations along Phase 3 of the Pan Borneo Highway Project. Broader recommendations for government action were also identified, including early stakeholder engagement, project feasibility assessments, cost–benefit analyses, improved data sharing between NGOs and government agencies, and adaptation of the AsETWG handbook guidelines to the Sabah context.

**Lessons learned and next steps**

The workshops focused on disseminating the handbook and facilitating discussion on wildlife-friendly infrastructure with key stakeholders. With core objectives aligned, the workshop agendas were adapted by local counterparts to national contexts, structuring the flow to enable sharing, feedback, disagreement, and consensus building. In Bhutan, discussions emphasised the integration of wildlife-friendly infrastructure into higher-level policy frameworks and the identification of national capacity needs. In Sabah, discussions focused primarily on Phase 3 of the Pan Borneo Highway Project, reflecting lessons learned from previous infrastructure projects and highlighting the importance of addressing environmental considerations and budgeting for biodiversity safeguards early in the planning process.

Plans are underway to further disseminate the handbook across Asia and to support the implementation of wildlife-friendly infrastructure in elephant range countries. Additional workshops are planned in other range states, and the handbook is being translated into several Asian languages in response to interest from government representatives. Through these efforts, as well as through continued technical advice on infrastructure projects, the AsETWG will continue to support improved planning and design of linear infrastructure to reduce impacts on Asian elephants, other wildlife, and their habitats.


**Figure 2.** Workshop participants at the Maliau Basin Conservation Area in Sabah, Malaysia (Photo: WWF-Malaysia).

DOI: 10.2305/QUWS5445

 *Gajah 59 (2025) 84-85*

## Obituary

## Jayantha Jayewardene (27.3.1944 – 30.7.2025)

Prithiviraj Fernando

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Jayantha Jayewardene, one of our most senior and best loved members of the AsESG, passed away on the 30th of July 2025, bringing the curtain down on the end of an era.

Born in 1944, he was educated at Trinity College, in Kandy, the hill capital of Sri Lanka. A sportsman of repute, with his admirable physique he excelled in the rough and tumble game of rugby, leading the college team and earning the coveted 'Trinity Lion'. He was also a force to reckon with in the club rugby scene, playing for the Kandy Sports Club and performed a pivotal role in rugby administration in the country. After leaving school, like many a young gentleman of note of that era, he took up planting. His career as a planter spanned two decades, during which time he was stationed at a number of hill stations in charge of the tea plantations there.

Jayantha then joined the Mahaweli Development Project, which was headed by his close friend, Minister Gamini Dissanayake. The project was the largest and most ambitious development project undertaken in Sri Lanka. Damming the longest river in Sri Lanka the 'Mahaweli', to create a series of reservoirs that became the lynchpin of hydro-power generation, its flow was then diverted to the dry zone for irrigated agriculture. Originally planned to be executed over 30 years, it was compressed into six short years by the then government. The project covered almost one sixth of the island. Over 100,000 ha of the dry zone were cleared of forests for irrigated agriculture and extensive infrastructure facilities were put in, including roads and canals. A massive re-settlement program moved hundreds of thousands of families into the newly developed areas.

The project completely changed forever the dry zone landscape of the country and in its wake created a massive conflict with elephants. Jayantha was one of the earliest to take note of the brewing conflict between man and elephant. His series of publications titled 'Elephant conservation amidst development - parts 1-9' published in the FAO Journal 'Tigerpaper' from 1984–1999, documented and drew attention to the issue, discussing in great detail the complexities of attempting to conserve elephants while changing the landscape at an unprecedented scale and tempo. A keen observer, possessed with an enquiring mind and unafraid to speak out, he was also the first to go against the prevailing conventional wisdom and point out the failure of elephant drives as a human-elephant conflict mitigation measure in his landmark note titled 'Elephant drives in Sri Lanka' and published in the AsESG's journal Gajah in 1994. Jayantha was also a member of the committee that drew up the National Policy for the Management and Conservation of Sri Lankan elephants in 2006.

By and by Jayantha transformed into a complete naturalist and conservationist by the 1990s. He took up the cause of Sri Lankan elephants and

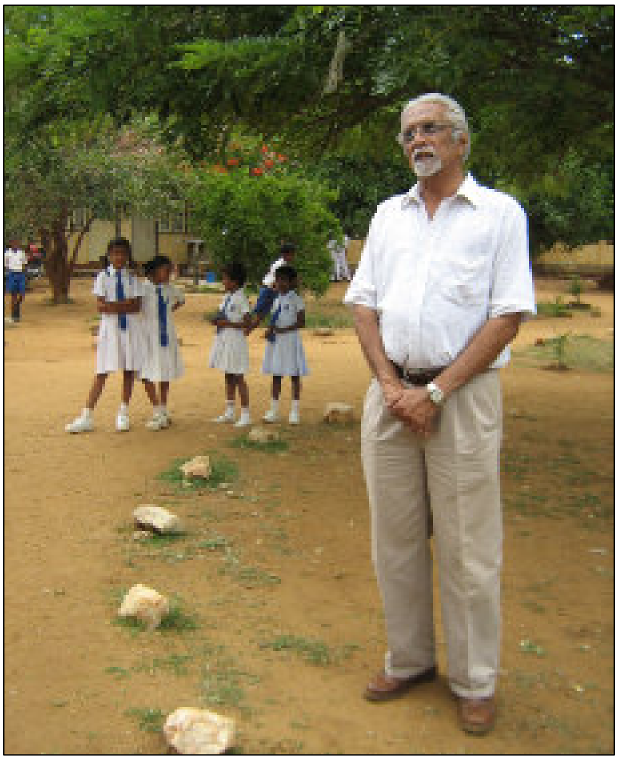
filled a major gap in publication and discussion in that era. His magnum opus titled, what else but, 'The Sri Lankan Elephant', brought together all aspects pertaining to the Sri Lankan elephant and stands out as a highly readable and popular tome on Sri Lanka's elephants, that created a point of reference that was sorely lacking until then. It was also translated into Sinhalese and Tamil languages later, making it widely accessible to all Sri Lankans. While championing the conservation of elephants in Sri Lanka, Jayantha also conducted many studies and published a number of papers on elephants in captivity. Another area of interest of his was the plight of those who suffered losses due to elephants.

Jayantha set up the Biodiversity and Elephant Conservation Trust (BECT) in 1998, which mainly focused on two aspects, the welfare of those who suffered from elephants, particularly children that lost a parent, and awareness about elephants and elephant conservation. The assistance program included provision of financial support, schoolbooks, and in some cases housing for those negatively impacted by elephants. Through his able lieutenant Sudath Abeysinghe, BECT conducted over 3,000 awareness programs in schools and held a number of awareness programs on human-elephant conflict for communities in elephant areas. BECT also conducted training programs for veterinarians and facilitated study tours for wildlife veterinarians.

In 2003 Jayantha organised the 'International Symposium on Human-Elephant Relations and Conflicts' the first and last elephant focussed symposium to be held in Sri Lanka. The symposium brought together researchers, managers and elephant enthusiasts from all over the world, the proceedings of which were also published by him subsequently.

Always the man for a crisis, when the AsESG was in turmoil and the journal Gajah was left rudderless due to the resignation of Prof. Charles Santiapillai as editor, Jayantha rose to the occasion and steadied the ship. He served as the editor of Gajah from 2007 to 2014, during which time we worked very closely together. When he finally gave up the reins, he inducted Dr. Jennifer Pastorini as the new editor, ensuring the progression of the journal.

There never was a dull moment when Jayantha was around. Many are the fond memories that I have of sitting at the back of a conference or even at AsESG meetings with Jayantha and listening to his running commentary on the goings-on, tempered with his irrepressible if cutting sense of humour. When someone was waxing eloquent about their achievements he would say "Pruthu, there are two types of elephants in this world – those who haul logs and those who go on parade". Another time discussing some colleague or other who had a difference of opinion, he would say "Machang (a Sinhala term meaning 'buddy'), it is better to have the guy in your tent and pissing outside than standing out and pissing in"! Jayantha was always larger than life and brought a spark that illuminated the dreary and made it interesting. You are very much missed, my friend.



DOI: 10.2305/LFNR4770
News and Briefs *Gajah 59 (2025) 86-114*

# Recent Publications on Asian Elephants

Compiled by Susan Mikota[1]* and Jennifer Pastorini[2,3]

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If you need additional information on any of the articles, please feel free to contact us. You can also let us know about new (2026) publications on Asian elephants.

K.A.M. Abir, B. Dey, M. Redowan, A. Haque & R. Ahmed
**Predicting suitable habitats for Asian elephant (*Elephas maximus*) in tropical Asia under changing climatic scenarios**
*Geography & Sustainability 6 (2025) e100279*
**Abstract.** Protecting rare, endemic, and endangered species requires careful habitat evaluation to set strategic plans for mitigating biodiversity loss and prioritizing conservation goals. The endangered Asian elephant exemplifies the urgent need for targeted conservation efforts, given its challenging habitat conditions. This study examines the impact of climate and land use changes on the suitable habitat distribution of Asian elephants. Utilizing ten predictor variables, including climatic, topographic, and land use data, and employing six ensemble Species Distribution Models (SDMs) alongside Coupled Model Intercomparison Project Phase 6 data, the study estimates spatial changes and potential habitat expansions for Asian elephants across Tropical Asia. Occurrence data were gathered from field surveys in Bangladesh and the Global Biodiversity Information Facility database for Sri Lanka, Myanmar, Bhutan, Cambodia, India, Laos, Nepal, Thailand, and Vietnam. To evaluate habitat suitability, the analysis considered two distinct socioeconomic pathways (SSP 245 and SSP 370) across two future periods (2041-2060 and 2061-2080). Results reveal a strong correlation between isothermality and habitat suitability, with higher isothermality enhancing the habitat conditions for Asian elephants. Among the SDMs, the random forest model demonstrated the highest performance. Projected scenarios indicate significant habitat fragmentation by 2061-2080, heightening the risk of species' vulnerability. Specifically, in SSP 245, the north zone is anticipated to experience a higher rate of habitat loss (588.443 $km^2$/year), whereas, in SSP 370, the west zone is expected to face a more severe rate of habitat loss (1798.56 $km^2$/year). The eastern zone, which includes Cambodia, Vietnam, Laos, Thailand, and southern Myanmar, is notably at risk, with an estimated habitat loss of 14.8 million hectares. Anticipated changes in climate and land cover will impact the availability of essential resources such as food, water, and shelter, potentially driving the species to relocate to different elevation belts. The outcomes of the consensus map highlighting critical habitats and future fragmentation scenarios will support effective conservation and management strategies for the species. © 2025 The Authors.

M. Ackermann, J. Kubacki, S. Heaggans, G.S. Hayward & J. Lechmann
**Epidemiological, serological, and viral genomic analysis of an outbreak of elephant hemorrhagic disease in Switzerland**
*PLoS ONE 20 (2025) e0301247*
**Abstract.** Elephant hemorrhagic disease (EHD), caused by several elephant endotheliotropic herpesviruses (EEHV), represents a frequently lethal syndrome, affecting both captive and free-living elephants. In the summer of 2022, three young Asian elephants succumbed to EHD in a zoo in Switzerland, despite considerable preventive efforts and early detection of EEHV1A viremia. In this communication, we describe the extent of preventive measures in terms of prior virus detection, active survey of viremia, and antibody status. The results show

that: (1) A previously undetected EEHV1A strain had remained unrecognized among these elephants. Probably, the virus re-emerged after almost 40 years of latency from one of the oldest elephants in the zoo. (2) While two of the three affected animals had prior immune responses against EEHV1, their strain-specific immunity proved insufficient to prevent EHD. The complete genomic DNA sequence of the EEHV1A strain involved was determined, and detailed comparisons with multiple EEHV1 strains were made, revealing a much greater extent of divergence and level of complexity among the encoded proteins than previously described. Overall, these data confirmed that all three EHD cases here had been infected by the same novel strain of EEHV subtype 1A. © 2025 The Authors.

R.B. Adhikari, M.A. Dhakal, P.B. Ale, G.R. Regmi & T.R. Ghimire

**Prevalence of intestinal parasites in captive Asian elephants (*Elephas maximus* Linnaeus, 1758) in Central Nepal**

*Veterinary Med. and Science 11 (2025) e70310*

**Abstract.** The Asian elephants, despite their larger physical structure and strength, are often attacked by microorganisms, like gastrointestinal (GI) parasites, resulting in higher morbidity and mortality. The current study aimed to determine the prevalence and diversity of GI parasites in the endangered Asiatic elephants reared in captivity in and around Chitwan National Park in Central Nepal. With age and sex variants, 63 fresh faecal samples were collected non-invasively and transferred to the research laboratory for microscopic examination. Our findings showed a 95.2% prevalence rate, along with 17 identified diverse species of GI parasites, including protozoa (6 spp.) and helminths (11 spp.) and two unknown species (1 protozoan and 1 helminth). The prevalence of protozoa (84.1%) was higher than that of helminths (77.8%). Female/cows and old-age elephants were reported to harbour a higher rate of parasites. Sharing overlapping niches with domestic and wild animals, irregular medication and the existence of critical stressors were speculated to be the major risks for parasitosis. The captive elephant population in Central Nepal harbours a greater prevalence and huge diversity of GI parasites, most of which are implicated with serious pathological conditions and zoonotic potentiality. The presence of GI parasites must be considered a challenging threat. Thus, government bodies, non-governmental organizations, elephant owners and conservationists need to participate in strategic medication and seek measures to lessen the probable health risk for sustainable conservation and welfare of the endangered species in Nepal. © 2025 The Authors.

A. Anaswara, S. Arun, R. Geethu, N.C. Sreenidhi, S. Suriya, S. Harshit, P. K. Binoy, V. Anju, C.K. Deepa, K.G.A. Kumar & R. Ravindran

**Molecular identification of *Pseudodiscus collinsi* from wild Indian elephant (*Elephas maximus indicus*) based on ITS-2**

*Helminthologia 62 (2025) 254-258*

**Abstract.** Domestic and wild animals can contract amphistomosis, a disease caused by digenetic trematodes belonging to the superfamily Paramphistomoidea. The importance of these flukes is underestimated worldwide due to their ubiquity and abundance among hosts. *Pseudodiscus collinsi* is a member of the family Paramphistomatidae that infects the colon of equines and elephants. In the present study, the flukes were recovered from the colon of a dead wild Indian elephant. The flukes were stained using acetyl alum carmine and morphologically identified as *P. collinsi* based on the presence of oral pouches and position of the testes. The polymerase chain reaction (PCR) for amplification of the internal transcribed spacer 2 (ITS-2) region and sequence analysis were performed. The phylogenetic analysis using the Maximum Likelihood (ML) method, based on the Kimura 2-parameter model, revealed the separation of *P. collinsi* (elephant) as a distinct species from the other amphistomes of different hosts. This is the first molecular marker of *P. collinsi* to be presented. © 2025 The Authors.

O. Anchal, & K.P. Singh

**Effect of schistosomiasis on captive elephants in Madhya Pradesh, India**

*J. of Threatened Taxa 17 (2025) 27540-27543*

**Abstract.** Schistosomes are parasitic flukes that reside in blood vessels and various host organs. Health monitoring of 51 captive elephants in tiger reserves of Madhya Pradesh revealed a 35% overall incidence of blood flukes. The highest levels of *Bivitellobilharzia nairi* eggs were recorded in elephants in Satpura (67%), Kanha (47%), Bandhavgarh (33%), Pench (25%), and the lowest in Panna Tiger Reserve (14%). Infected animals showed decreased haemoglobin (7.5–11.8 g/dl), and elevated aspartate aminotransferase (65–102 U/L), alanine aminotransferase (85–105 U/L), and blood urea nitrogen (46–65 mg/dl). They also showed symptoms that included dullness/depression and emaciated body condition, which were especially evident in elephants with high *B. nairi* egg counts > 1200-2300 eggs/g. © 2025 The Authors.

N.R. Anoop, P.K. Muneer, M. Madhavan, A. Hathwar & T. Ganesh
**Multi-source photographic evidence to assess corridor use, crop-raiding behaviour and body injuries in Asian elephants**
*Current Science 128 (2025) 262-268*
**Abstract.** No permission to print abstract.

N.R. Anoop, A. Samrat & T. Ganesh
**Historical context and drivers of forest cover change in Wayanad plateau: A key elephant landscape in India's Western Ghats**
*Biodiversity and Conservation 34 (2025) 1597-1628*
**Abstract.** No permission to print abstract.

M. Ashokkumar, C. Sakthivel & K. Sudhakar
**Determinants of human-elephant conflict in tropical forest of South India**
*Israel Journal of Ecology & Evolution 71 (2024) 33-42*
**Abstract.** No permission to print abstract.

N.R. Avicena, Y.Y. Loo, T. Maul, N. Thong, C.C.T. Wong, S. de Silva, S. Saaban & E.P. Wong
**Living with elephants: Deep learning models performance in examining Asian elephant (*Elephas maximus*) sounds from Sri Lanka and Malaysia with considerations for application**
*Biological Conservation 309 (2025) e111272*
**Abstract.** Human-elephant conflict (HEC) affects people and wild elephants negatively, and support for harmonious coexistence is needed. With the current human footprint, wildlife is displaced, and people living near wildlife want safe interactions. Conservation interventions are needed to manage human-elephant coexistence in realtime. This research, using deep learning models, provides the fundamental mechanics for acoustic detection of elephants in an automated early-warning system, currently under development. We examine the use of convolutional neural networks (CNNs) for classifying Asian elephant sounds and non-elephant sounds. The results demonstrated the ability of CNNs to process bioacoustics data across various sample sizes, with the best-performing model achieving 98.45 % average test accuracy (balanced sample sizes, a k-fold approach with 10 % for testing). But when we infer CNN models built with Sri Lankas elephant vocalizations with unseen Malaysias elephant vocalizations, the performance of the models dropped to an average of 67.93 % accuracy and F1 score between 0.67 and 0.81, regardless of the initial training dataset size. We used Principal Component Analysis to compare 15 sound parameters extracted from spectrograms of elephant calls from Sri Lanka and Malaysia, and found that the sound characteristics between the two subspecies largely overlapped but with some differences. We conclude that the CNN models can detect elephant sounds but perform best with local data. The use of bioacoustic monitoring and automated detection can potentially support harmonious coexistence between humans and elephants, but for endangered species targeted by poachers, safeguards are needed. Additionally, we need discourse on research ethics and local communitys rights. © 2025 The Authors.

C. Bader, R. Gilardet, N. Rinder, V. Herridge, J.R. Hutchinson & A. Houssaye
**Long-bone microanatomy in elephants: Microstructural insights into gigantic beasts**
*Zoological Journal of the Linnean Society 204 (2025) zlaf008*
**Abstract.** No permission to print abstract.

A. Banerjee, A. Chatterjee & S.K. Acharya
**Mental modeling of human elephant conflict using fuzzy cognitive mapping and decision ecology for conflict resolution**
*Environment Systems & Decisions 45 (2025) e33*
**Abstract.** No permission to print abstract.

L. Bates, V.L. Fishlock, J. Plotnik, S. de Silva & G. Shannon

**Knowledge transmission, culture and the consequences of social disruption in wild elephants**

*Royal Society Philosophical Transactions Biological Sciences 380 (2025) e 20240132*

**Abstract.** Cultural knowledge is widely presumed to be important for elephants. In all three elephant species, individuals tend to congregate around older conspecifics, creating opportunities for social transmission. However, direct evidence of social learning and cultural traditions in elephants is scarce. Here, we briefly outline that evidence then provide a systematic review of how elephant societies respond to the loss of potentially knowledgeable individuals or opportunities for knowledge transfer, which we characterize as social disruption. We consider observations from 95 peer-reviewed, primary research papers that describe disruption to elephant societies or networks via the removal or death of individuals. Natural deaths were mentioned in 14 papers, while 70 detailed human-caused deaths or disruption. Grouping descriptions according to consequences for behaviour and sociality, and demography and fitness, we show that severely disrupted populations are less cohesive, may exhibit reduced fitness or calf survival and respond inappropriately to threats and predators. We suggest that severe social disruption can inhibit or break potential pathways of information transmission, providing indirect evidence for the role of social transmission in elephants. This has implications for elephant conservation amid increasing anthropogenic change across their habitats. © 2025 The Authors.

M. Bercier, M.B. Brooks & E. Latimer

**Reference intervals for d-dimer concentration, fibrinogen concentration, and automated platelet count in juvenile Asian (*Elephas maximus*) and African (*Loxodonta africana*) elephants without elephant endotheliotropic herpesvirus**

*Journal of Zoo and Wildlife Medicine 56 (2025) 337-345*

**Abstract.** No permission to print abstract.

B. Bhandari, K.C. Nishan, N. Chaudhary, S. Gautam, B. Dhami, G.C. Aashish & B. Neupane

**Community perspectives on elephant conservation in eastern Nepal**

*Banko Janakari 35(2) (2025) 25-36*

**Abstract.** Understanding people's attitudes towards elephants is crucial for formulating appropriate policies for species conservation and mitigating human-elephant conflict (HEC). Therefore, this study aimed to assess attitudes and perceptions toward elephant conservation in Udayapur District, eastern Nepal. Based on information from key informants (n = 10) and focus group discussions (n = 3), a total of 97 households were selected for a semi-structured questionnaire survey to collect data on human-elephant incidents. Half of the respondents (50%) identified crop damage as the primary issue caused by wild elephants, and nearly half (46%) reported an increase in HEC over the past five years (2016-2020). The majority (60%) claimed habitat encroachment as a major cause of HEC in the study area. Approximately 46% of respondents use fire-related techniques to mitigate such conflicts. Moreover, more than half of the respondents (62%) showed a low willingness to conserve elephants, which was significantly influenced by their education level [$chi^2(2) = 9.43$, $p < 0.001$] and occupation [$chi^2(2) = 7.81$, $p < 0.05$]. The findings of this study will help develop management interventions that benefit communities and elephants through effective HEC mitigation. © 2025 Forest Research and Training Centre.

C. Chaisongkram, N. Bangkaew, B. Siriporn, K. Por-armart, P. Charoenchai, N. Mahaveero & T. Purisotayo

**Enhancing genetic management in captive Asian elephants: Evaluation of mitochondrial single-nucleotide polymorphism markers for improved breeding and conservation in the Elephant Kingdom, Thailand**

*Veterinary World 18 (2025) 565-572*

**Abstract.** Maintaining genetic diversity and preventing inbreeding depression in captive Asian elephants are crucial challenges that require effective breeding management and conservation strategies. This study aimed to assess genetic diversity and evaluate the effectiveness of currently available molecular markers as breeding management tools in captive Asian elephant populations at the Elephant Kingdom (EK) in Thailand. Data were collected from identification certificates of elephants at the EK, including age, sex, parentage, and genotypes of 16 mitochondrial single-nucleotide polymorphisms (mtSNPs). An observation-based pedigree was constructed to estimate pedigree-based kinship coefficients, which were compared to molecular-based kinship coefficients. Population and genetic diversity indices were analyzed. Pedigree-based and molecular-based kinship coefficients were compared to evaluate marker efficiency. The population had a balanced sex ratio of 0.97:1 (male : female). Based on the 16 mtSNPs, the mean observed heterozygosity and expected heterozygosity were 0.445 and 0.528, respectively, indicating a heterozygous deficit. The pedigree-based and molecular-based kinship coefficients differed significantly and negatively correlated ($r = -0.28$, $p < 0.05$). The molecular-based method estimated higher kinship coefficients than the pedigree-based method. Evaluation of mtSNP markers highlights their utility in assessing genetic diversity and kinship in captive Asian elephant populations in EK, Thailand. However, the observed discrepancies between pedigree-based and molecular-based kinship estimates underscore the limitations of the current mtSNP panel. The findings emphasize the need for integrating nuclear SNPs to enhance the precision of genetic management strategies, enabling better-informed decisions to preserve genetic diversity and mitigate inbreeding risks in breeding programs, not only for the EK but also as a framework for broader conservation efforts. © 2025 The Authors.

S. Chakraborty (2025)

**Ecological assessment and community perceptions of the Mahananda-Kolabari-Tukriajhar elephant corridor in northern West Bengal, India: Challenges and conservation strategies**

*Contemporary Problems of Ecology 18 (2025) 784-799*

**Abstract.** No permission to print abstract.

L. Chama, S.M. Siachoono & D. Phiri

**Nutrient deficit rather than distance of farming activities from the boundary of protected areas drives crop raids by elephants**

*Ecology and Society 30 (2025) e32*

**Abstract.** Human-wildlife conflicts resulting from the raiding of agricultural crops by elephants are among the major challenges affecting the conservation of this flagship species. Several studies have pointed at human activities, such as farming nearer to protected areas boundaries, as the main driver of these conflicts. Studies comparing the quality of food between agricultural crops and the natural vegetation in the elephants' natural habitats as the potential key driver of these conflicts, are almost non-existent. We tested if there were differences in the incidences of crop raids with distance of farming away from protected area boundaries. Further, we compared the food quality of agricultural crops to the natural vegetation in the mammals' habitat in and around Kasanka National Park in Zambia. Surprisingly, there was no difference in the incidences of crop raids relative to the distance of farming away from the protected area boundary. Further, the results show higher protein, energy, and moisture composition in the often-raided agricultural crops than the natural vegetation. However, the natural vegetation had higher ash, vitamin C, and fiber composition relative to agricultural crops. Broadly, our results suggest that the natural vegetation in the wild may not necessarily have all the key nutrients in adequate proportions to meet the body requirements of elephants. Therefore, elephants raid the crops to compensate this nutrient deficit, irrespective of how far the farms may be situated from the boundaries of protected areas. © The Authors.

J. Chen, Z. Chen, B. Xu, Z. Huang & C. Zhang

**Skin microbiome of Asian elephants with skin diseases during seasonal transitions**

*Microbial Pathogenesis 206 (2025) e107832*

**Abstract.** Wild Asian elephants, which are an endangered species, often suffer from skin diseases during seasonal transitions, which seriously affect their health. Understanding the pathogenesis of such skin diseases is critical for their prevention and treatment. It is known that skin microorganisms are closely related to host skin health. To compare the microbiotas and microbiomes of diseased and healthy skin of Asian elephants. DNA was extracted from skin swab samples from diseased and healthy Asian elephants for metagenomic sequencing. Various bioinformatic tools were used to process the raw sequencing data and identify gene sequences for functional annotation and species identification as well as to determine species abundance. Antibiotic resistance genes and virulence factors were also identified using DIAMOND. Staphylococcus was highly enriched in the microbiota of diseased skin, whereas *Leuconostoc* predominated in that of healthy skin. Moreover, substantial differences existed between the two elephant skin groups in terms of metabolic pathways related to ATP-binding cassette transporters and TCSs and the abundance of antibiotic resistance genes and *Staphylococcus*-associated toxins. The substantial difference in *Staphylococcus*-related virulence factors was likely due to the significant enrichment of Staphylococcus in the diseased skin samples, suggesting that this bacterial genus is the causative agent of skin diseases in Asian elephants. Additionally, *Leuconostoc mesenteroides*, which was enriched in the healthy skin samples, has anti-inflammatory, antimicrobial, and other beneficial effects that have promising applications in the prevention, diagnosis, and treatment of skin diseases. This study reveals the cause of skin diseases in Asian elephants and provides a theoretical basis for improving the skin health of wild animals and expanding conservation methods and technologies. © 2025 The Authors.

X. Chen, J. Li, X. Cao, Y. Yang, C.A. Chapman, X. Li, R. Qiao, X. Wang, F. Yang & D. Kong

**A ERSF-VIPA framework: Scalable wildlife movement modelling for conflict mitigation**

*Movement Ecology 13 (2025) e78*

**Abstract.** Effective conservation planning and conflict mitigation can hinge on accurately modelling wildlife movement paths (WMPs), yet progress is hindered by both a shortage of reliable methods and limited data. The critical challenge, therefore, is to devise limited-data models that faithfully reproduce elusive species' movements and deliver actionable insights for human-wildlife conflict management. We introduce the Enhanced Resource Selection Function-Vector-network Iterative Pathfinding Algorithm (ERSF-VIPA), a novel framework for simulating WMPs with limited data. Drawing on historical occurrence records of Asian elephants, we assume individuals make rational, goal-driven decisions based on local environmental knowledge. The ERSF employs a random forest on a hexagonal grid to estimate non-linear resource-selection probabilities, while VIPA conducts an iterative, node-to-node search across that hexagonal vector network-scoring each candidate by combining selection probability with cubic distance coefficients to ensure ecological validity and energetic efficiency. The model demonstrates high accuracy, with 90.3% of the 68 simulated paths approximating the observed paths with an average maximum deviation of 418 m. These findings underscore the model's robustness and its capacity to translate limited tracking data into actionable insights for conservation. ERSF-VIPA operates using only coarse, non-continuous historical data that lack precise timestamps or spatial accuracy. By operating with minimal data requirements, it demonstrates exceptional extensibility and broad applicability for reconstructing movement paths of elusive wildlife species. Its proven accuracy in simulating Asian elephant paths further positions it as a potentially powerful decision-support framework for real-time animal monitoring and proactive human-wildlife conflict mitigation. © 2025 The Authors.

U. Das & B. Behera

**Habitat suitability assessment of Asian elephant using fuzzy AHP method: The case study of Buxa Tiger Reserve, India**

*J. for Nature Conservation 86 (2025) e126928*

**Abstract.** No permission to print abstract.

S. Dash, S. Ghosh, R. Das, D. Das, S. Nandy, T. Das & G. Sonker

**Human-elephant conflict: Attitudes of local people toward elephants and the conflict management authority in a shared landscape of India**

*Human Dim. of Wildlife 30 (2025) 304-319*

**Abstract.** Human-elephant conflict (HEC) is one of the major conservation challenges for elephants. To address this issue, understanding the ecological and sociological perspectives of HEC is crucial. In North Bengal, India, we explored 25 electrocution cases of Asiatic elephants and surveyed the attitudes of 209 local people toward elephants and the HEC management authority (forest officials). We used open-ended and closed-ended questionnaires in the surveys and binomial logistic regressions to analyze the datasets. We observed that electrocutions primarily occurred during cropping seasons and adult elephants mostly died in these incidences. Despite experiencing high HEC, most respondents had a positive attitude toward elephants. However, they felt differently about the forest officials. Key factors driving their attitudes include cultural, emotional, and economic associations with elephants, HEC-related costs, and perceptions of HEC management. Community participatory approaches and financial and technical support are recommended for local people in HEC management. 

S. de Silva, P. Davidar & J.-P. Puyravaud
**Don't feed the elephant: A critical examination of food-provisioning wild elephants**
*Ecological Sol. and Evidence 6 (2025) e70060*
**Abstract.** Wildlife food provisioning may benefit tourism as it can increase sightings of cryptic species, bringing economic returns to local communities. However, food-conditioned animals can become dangerous, resulting in the injury and death of wildlife, people or both. These negative impacts counteract potential benefits. Here, we examine the observed and potential impacts of food provisioning on wild Asian elephants by tourists to evaluate whether it can become a regulated activity. We present observations of wild Asian elephants in Udawalawe National Park (UNP) Sri Lanka, between 2007 and 2024 and the Nilgiri Biosphere Reserve (NBR) in southern India between 2007 and 2022, documenting negative outcomes of food-provisioning by tourists. We also describe a successful de-habituation effort for one elephant in the NBR. At UNP, 66 male elephants (9%-15% of the estimated male population) were observed seeking food from people at a boundary electric fence. Fourteen were seen at the fence in 11 or more years, and 52 were seen in 8 or fewer years. There were significant positive correlations between the tendency to be seen at the fence and the overall number of sightings per individual across years. Fatalities of at least three elephants and one person occurred near the fence. At NBR, 11 males were food habituated by tourists out of which four died through anthropogenic causes. We describe behavioural changes across years by one male at UNP and one male at NBR. Practical implications. Considering the possible social transmission of problematic behaviours, there is an urgent need to curb them before they spread among wild animal populations. We maintain that food provisioning of wild elephants by tourists cannot be a regulated activity and bans must be strictly enforced. In the long term, working with local stakeholders to educate tourists and habitat restoration are needed to discourage food provisioning by people and food seeking by elephants. 

A.H. Dewolf, J.G. Genin, P.A. Willems & N.C. Heglund
**Locomotion efficiency of elephants: Mechanical work and energetics**
*Journal of Experimental Biology 228 (2025) jeb250928*
**Abstract.** No permission to print abstract.

K.L. Edwards, C.J. Wheaton, J.L. Brown, A.M. Dimovski, K.V. Fanson, A. Ganswindt, S.B. Ganswindt, N. Hagenah, T. Keeley, E. Möstl, B. O'Hara, L.M. Penfold, S.A. Shablin & R. Palme
**Development of an 11-oxoetiocholanolone mini-kit for the quantification of faecal glucocorticoid metabolites in various wildlife species**
*Conservation Physiology 13 (2025) coaf074*
**Abstract.** As part of its mission to advance the field of wildlife endocrinology, the International Society of Wildlife Endocrinology aims to develop cost-effective antibodies and enzyme immunoassay kits that support research across a diverse range of species and sample matrices. To provide additional options for the quantification of faecal glucocorticoid metabolites (fGCMs), an antibody against 11-oxoetiocholanolone-17-carboxymethyl oxime (CMO) was generated in rabbits, and an enzyme immunoassay incorporating a horseradish peroxidase-conjugated label and 11-oxoetiocholanolone standard has been developed, designed for use with anti-rabbit IgG secondary antibody coated plates. This mini-kit was used to quantify glucocorticoid metabolites with a 5 beta-3 alpha-ol-11-one structure in faecal extracts from 23 species: African and Asian elephants, Alpine chamois, American bison, Bengal tiger, blue wildebeest, blue-and-yellow macaw, brushtail possum, cape buffalo, fat-tailed dunnart, Florida manatee, ghost bat, giraffe, golden langur, Gould's wattled bat, hippopotamus, Leadbeater's possum, mandrill, okapi,

roan antelope, samango monkey, short-beaked echidna, and western lowland gorilla. Pharmacological (adrenocorticotropic hormone challenge) and biological (inter-zoo translocation, wild capture, social disruption, illness/injury and veterinary intervention) challenges resulted in expected increases in fGCM concentrations, and in a subset of species, closely paralleled results from a previously established immunoassay against 11-oxoetiocholanolone-17-CMO. Two additional species tested, Krefft's glider, which showed contradictory results on this assay compared to a previously validated enzyme immunoassay (EIA) and Ankole cow, where the magnitude increase post-event did not quite reach the 2-fold change criteria, highlight that differences in excreted faecal metabolites across species mean that no EIA will be suitable for all species. This assay provides a valuable new option for assessing adrenal activity across taxa using a group-specific antibody. Future studies should put similar emphasis on validation to determine optimal assay choice for measuring fGCMs in a variety of species. Glucocorticoid hormones (cortisol, corticosterone) are useful indicators of the stress response, but for many wildlife species, non-invasive approaches and appropriate tools for measurement of excreted metabolites are required. Here, we report the development and validation of a group-specific enzyme immunoassay to quantify glucocorticoid metabolites in the faeces of 23 species. © 2025 The Authors.

C. Fang, A. Schnurpfeil, L. Eigen, O. Heise, T. Pottek, J. Alkofer, T. Hildebrandt, T. Salditt, R.K. Naumann & M. Brecht

**Assessment of elephant claustrum by combined histological analysis and high-resolution micro-CT**

*Neuroscience 587 (2025) 131-138*

**Abstract.** Analysis of the brain architecture of the three extant elephant species is challenging, because of the vast size of their brains. We identified the elephant claustrum in histological Nissl-stained sections from small parts of an Asian and an African savanna elephant brain. We find that the elephant claustrum is organized into islands of widely differing volume and cell numbers. We attempted to resolve these islands in virtual elephant brain sections from a 3 T Magnetic Resonance (MR) scanner, but found that the resolution was insufficient for such an analysis. We then transferred one hemisphere of an adult female African elephant brain into an ascending alcohol series. After degassing, we scanned the entire hemisphere in a microcomputed tomography (micro-CT) scanner with a resolution of 67 mm$^3$ and parts of the hemisphere with a resolution of 26 mm$^3$. Such scans provided sufficient resolution to estimate the total volume of the elephant claustrum in one hemisphere: 1453 mm$^3$, corresponding to 0.22 % of cortical gray matter volume. In conjunction with our histological data, we estimate that the elephant claustrum in the same hemisphere contains 7.61 million neurons, or 0.27 % of cortical neurons (2869.86 million neurons). These values fit well with known corticoclaustral allometric relationships. Although elephant claustrum structure is widely distributed and organized into irregular islands, its volume follows the typical mammalian pattern, and micro-CT scans provide sufficient resolution to resolve small structures in large brains. © 2025 The Authors.

C.M. Geldenhuys & T.R. Niesler

**Learning to rumble: Automated elephant call and sub-call classification, detection and endpointing using deep architectures**

*Bioacoustics 34 (2025) 307-354*

**Abstract.** We consider the problem of detecting, isolating and classifying elephant calls in continuously recorded audio. Such automatic call characterisation can assist conservation efforts and inform environmental management strategies. In contrast to previous work, in which call detection was performed for audio signals several seconds in length, we perform call activity detection at discrete time instants, which implicitly allows call endpointing. For experimentation, we employ two annotated datasets, one containing Asian and the other African elephant vocalisations. We evaluate several shallow and deep classifier models, and show that the current best performance can be improved by using an audio spectrogram transformer (AST). Furthermore, we show that transfer learning leads to improvements both in terms of computational complexity and performance. Finally, we consider automated subcall classification using an accepted vocalisation taxonomy, a task which has not previously

been considered, and for which the transformer architectures again provide the best performance. Our best classifiers achieve an average precision (AP) of 0.962 for binary call activity detection, and an area under the receiver operating characteristic (AUC) of 0.957 and 0.979 for call classification (5 classes) and sub-call classification (7 classes), respectively. These represent new benchmarks or improvements on previously best systems. © 2025 The Authors.

S. Ghosh, M. Mandal, V. Vijayaprakash, D. Pandey & S.K. Gayen

**Geospatial analysis of elephant mortalities by electrocution from northern districts landscape of West Bengal, India**

*Environmental Monitoring and Assessment 197 (2025) e1124*

**Abstract.** No permission to print abstract.

E.A. Gjerdseth

**Regular crush and burn: How the destruction of ivory fails to save elephants**

*World Development 185 (2025) e106766*

**Abstract.** No permission to print abstract.

A.R. Glassman, P.M. DiGeronimo, E.L. Willis, E. Ward, W. Thepapichaikul & J. Brandao

**Comparison of a point-of-care and standard laboratory analyzers to determine prothrombin and activated partial thromboplastin times in Asian elephants (*Elephas maximus*)**

*Journal of Zoo and Wildlife Medicine 56 (2025) 577-585*

**Abstract.** No permission to print abstract.

Q. Guo, W. Zhang, X. Li, B. Wang, C. Xiong, Y. Tian, T. Luo, W. Wang & J. Zhou

**Fecal DNA metabarcoding reveals the diet of Asian elephant in China during the dry season: Implications for adaptation to habitat resources and conservation**

*Ecology and Evolution 15 (2025) e72398*

**Abstract.** The Asian elephant is a flagship species of the tropical forest ecosystem in Asia, playing a crucial role in maintaining ecological stability. Investigating the dietary composition of Asian elephants is essential for developing effective conservation and management strategies. In this study, 107 fecal samples from different Asian elephant populations in China were analyzed using chloroplast rbcL DNA metabarcoding to systematically examine the dietary composition and diversity of the species. The results show that the foraged resources of the Asian elephant encompass eight classes, 43 orders, 77 families, and 154 genera. At the order level, Poales, Fabales, Rosales, and Zingiberales have the highest proportions, whereas at the family level, Poaceae, Fabaceae, Cyperaceae, Moraceae, and Musaceae dominate. Diversity and ecological niche width analyses indicate that there are differences among populations, with geographical variations in diet that are likely related to the availability of habitat resources. This study reveals the dietary composition and differences among different populations of Asian elephants, providing important scientific evidence and practical guidance for optimizing the food structure of captive populations and the development of food resource bases. © 2025 The Authors.

B. Gurung, R. Mendelsohn, S.A. Queenborough, D.P. Rai & M. Chaudhary

**Assessing the costs of human-wildlife conflict in the Khata wildlife corridor, Nepal**

*European J. of Wildlife Research 71 (2025) e52*

**Abstract.** No permission to print abstract.

M.H. Hamad, W. Junsiri, T. Sumpanpae, D. Narapakdeesakul & P. Taweethavonsawat

**Metabarcoding characterization of gastrointestinal strongyle nematodes in captive Asian elephants (*Elephas maximus*) and white rhinoceroses (*Ceratotherium simum*) in a private zoo, Thailand**

*Infection Genetics and Evolution 134 (2025) e105817*

**Abstract.** Gastrointestinal strongyle nematodes pose significant health risks to captive megaherbivores, including Asian elephants and white rhinoceroses. Traditional diagnostic methods often fail to accurately identify species due to morphological similarities, limiting understanding of parasite diversity and host-specificity. This study is among the first in Southeast Asia to apply high-throughput internal transcribed spacer-2 (ITS-2) rDNA metabarcoding to characterize strongyle nematode communities in these endangered hosts. Fecal samples from six rhinoceroses and four elephants housed in a private zoo in Thailand were processed using flotation, larval culture, and DNA extraction protocols. Amplicon sequencing was conducted on the Illumina MiSeq platform, and taxonomic assignments were performed using the DADA2 pipeline and NCBI/GenBank databases. Our results revealed the presence of strongyle infections. *Murshidia* spp. were detected in both host species, while *Kiluluma ceratotherii* was found exclusively in rhinoceroses. Phylogenetic analysis based on ITS-2 rDNA sequences demonstrated clear host-associated clades and suggested potential cryptic species within *Kiluluma* and *Murshidia* lineages. These findings provide new genetic evidence of host specificity and evolutionary divergence among strongylid nematodes in captive wildlife. The study underscores the utility of DNA metabarcoding for non-invasive parasite surveillance and highlights the urgent need to expand molecular databases for better taxonomic resolution in wildlife parasitology. © 2025 The Authors.

J. Haycock, T. Maehr, A. Dastjerdi & F. Steinbach

**Asian elephant interferons alpha and beta and their anti-herpes viral activity**

*Frontiers in Immunology 16 (2025) e1533038*

**Abstract.** The type I interferons (IFNs) are a group of key cytokines of the vertebrate innate immune system that induce an antiviral state in uninfected cells. Experimental in-vitro and in-vivo data have proven the fundamental role these cytokines possess in the protective response to a wide variety of pathogens, including herpesviruses. In a clinical setting, IFNs have been an important treatment in humans for several decades and increasing evidence demonstrates their potential in controlling viral haemorrhagic fevers when administered early in disease. In juvenile Asian elephants, elephant endotheliotropic herpesvirus haemorrhagic disease (EEHV-HD) often proves fatal when an effective adaptive immune response cannot be mounted in time, suggesting that an enhancement of the innate immune response could provide protection. This study sequenced six members of the Asian elephant type I IFNs, most closely related to sequences from the African elephant and Florida manatee. Subsequently, recombinant Asian elephant IFN alpha and IFN beta proteins were expressed and assessed for bioactivity in-vitro, relative to recombinant human IFNs, using a novel infection model incorporating primary Asian elephant fibroblasts and bovine alphaherpesvirus 1 (BoHV-1) as a surrogate for EEHV. In a dose-dependent manner, both Asian elephant IFNs and human IFN alpha 2a protected cells from BoHV-1 infection in this proof-of-concept study, even if applied up to 24 hours post-infection in-vitro. © 2025 The Authors.

T.E. Hoornweg, W. Schaftenaar, J. Ijzer, M.M.P. Mulder, M. Lugtenburg, A. van Beest, C.A.M. de Haan & V.P.M.G. Rutten

**Elevated IL-6, IL-10, and IFN-γ levels in fatal elephant endotheliotropic herpesvirus - hemorrhagic disease cases suggest an excessive proinflammatory cytokine response contributes to pathogenesis**

*Frontiers in Immunology 16 (2025) e1645752*

**Abstract.** Hemorrhagic disease developed as a consequence of an EEHV infection (EEHV-HD) is the leading cause of death of young Asian elephants in Zoos worldwide and also affects elephants in range countries. Although a cytokine storm has long been suggested to underlie disease pathogenesis, there is little evidence and the role of cytokines in EEHV-HD pathogenesis remains unclear to date. In the current study, we compared mRNA levels of eight different cytokines between blood and tissue samples of EEHV-HD cases (n=11) and controls (n=12) in order to determine whether cytokines may contribute to EEHV-HD pathogenesis. We show the presence of significantly elevated mRNA levels of IFN-gamma, IL-6 and IL-10, cytokines typically associated with cytokine storms, in blood or tissues with high viral loads (heart and liver) of EEHV-HD cases. Comparable cytokine inductions were not observed in tissues with lower viral loads (tongue, lung and kidney), indicating an association between viral replication and cytokine induction, and suggesting damage observed in these tissues is likely collateral. In conjunction with pathological findings, including acute systemic inflammation and multiple organ dysfunction, we propose that a pathogen-induced cytokine storm indeed underlies EEHV-HD pathogenesis, which would support investigation into the use of anti-inflammatory therapies to control disease. © 2025 The Authors.

S.F. Hope, S. Dittakul, M. Yindee, T. Angkawanish & J.M. Plotnik

**Do Asian elephants plan for mutually-exclusive outcomes?**

*Animal Cognition 28 (2025) e93*

**Abstract.** The ability to prepare for mutually-exclusive outcomes is critical for future planning. Recently, the thought that this ability may be unique to humans has been questioned. Even if non-human animals cannot individually plan for mutually-exclusive outcomes, groups of individuals may be able to coordinate their behavior to do so collectively. Here, we tested 12 Asian elephants, both individually and in pairs, using a forked tube task-adapted from one used with children and non-human apes-where a food reward is dropped down a tube and exits from one of two openings. The consistent, simultaneous covering of both openings to obtain the reward is evidence of an understanding of mutually-exclusive outcomes. One elephant-Nammei-learned to manipulate her trunk in a scooping motion to autonomously cover both openings, and then performed this behavior relatively consistently to successfully obtain the food reward at a rate significantly greater than chance (61.5%). In addition, pairs of elephants obtained the food reward at a rate significantly greater than that at which individuals could do by chance (i.e., either elephant ate the food in 60.1% of pair trials). However, Nammei eventually reverted to covering only one opening, and pairs did not achieve complete coordination-in fact, both openings were covered in only 35.0% of pair trials. Therefore, our results fall short of providing compelling evidence for either individual or collective planning for mutually-exclusive outcomes in elephants. However, the interesting behaviors that we observed suggest that this is a promising area for future research. © 2025 The Authors.

S.F. Hope, K.R. Willgohs, S. Dittakul & J.M. Plotnik

**Do elephants really never forget? What we know about elephant memory and a call for further investigation**

*Learning & Behavior 53 (2025) 44-64*

**Abstract.** No permission to print abstract.

H. Huguet, M.W. Seltmann, W. Htut, M. Briga, C. Lynsdale & V. Lummaa

**Tusks, testosterone and personality in male Asian elephants (*Elephas maximus*)**

*Royal Society Open Science 12 (2025) e250490*

**Abstract.** Male Asian elephants exhibit phenotypic diversity in tusk development, with long, short and tuskless bulls varying in frequency among different populations. Although the factors that maintain tusk variation in Asian elephants remain unclear, tusks are considered a secondary sexual characteristic probably influenced by sexual selection. In this study, we examined the relationship between tusk diversity, faecal testosterone metabolite (FTM) and personality in male Asian elephants aged 5-60 years living in semi-captive conditions within their native habitat in Myanmar. Males with different tusk types did not display differences in FTM levels or in scores for the three main personality factors, but there were some distinctions in the trait loadings within each factor: attentiveness, activity and dominance loaded more strongly for long-tusk males, while traits like obedience, slowness and aggression showed stronger associations in short-tusk males. Our study suggests that the differences between long- and short-tusk males in testosterone levels and personality traits were, respectively, negligible and nuanced, emphasizing the complexity of tusk expression and evolution in Asian elephants. © 2025 The Authors.

P. Inthawong, S. Huaijantug, T. Plangsangmas, K. Piyarungsri, T. Angkawanish, W. Langkaphin, W. Kosaruk, C. Pabutta, S. Kijpraiboon, M.M. Mitchell, P. Wattananit & C. Thitaram

**Transcutaneous ultrasonography for visualization of the kidneys in captive Asian elephants (*Elephas maximus*): A quantitative assessment of echogenicity and echotexture in comparison with the liver and spleen**

*BMC Veterinary Research 21 (2025) e376*

**Abstract.** Kidney transcutaneous ultrasonography can be used to assess renal condition and is less invasive than transrectal ultrasonography, which typically requires intensive restraint, sedation, or general anesthesia. To date, this less invasive technique has not been evaluated in Asian elephants. The gray level histogram technique associated with transcutaneous ultrasonography is a quantitative approach to objectively measure echogenicity and echotexture. This study utilized gray-level histograms

(GLH) to assess echogenicity and echotexture of the kidneys, spleen, and liver of 49 captive Asian elephants via transcutaneous ultrasonography, to obtain a baseline for healthy animals and to compare various internal organs as a reference for quantitative analyses. Retroperitoneal fat was the most hyperechoic region identified, followed by the spleen. The renal medullas and the left cortex were the three most homogenous tissues. No significant differences were found between the sexes or age groups. This study found that transcutaneous ultrasonography could be used to quantitatively measure echogenicity and echotexture in captive Asian elephants using the GLH technique. Baseline GLH references were developed for healthy captive Asian elephants for renal, hepatic and splenic transcutaneous ultrasonography. © 2025 The Authors.

S.L. Jacobson, S. Dittakul, M. Pla-ard, S. Sittichok, M. Yindee & J.M. Plotnik

**Wild elephants vary in their attraction to novelty across an anthropogenic landscape gradient**

*Royal Society Open Science 12 (2025) e250896*

**Abstract.** Research on how wild animals respond to novelty is becoming more relevant as the overlap between natural habitats and human-dominated landscapes increases. Wild Asian elephants spend more time in anthropogenic landscapes as their habitat is converted to agriculture. Greater neophilia and exploration may allow elephants to successfully access agricultural resources, which may cause negative interactions with people. We compared wild elephant reactions to novel objects in two different landscapes in Thailand (near agriculture and deep inside a protected sanctuary). We also assessed consistency in measures for individuals exposed to different objects to determine whether their reactions could be considered personality traits. Elephants tested near agriculture were more neophilic and exploratory than those inside the sanctuary. However, the limited sample of elephants exposed to both novel objects did not demonstrate consistency in their reactions, and thus we could not determine whether neophilia or exploration were personality traits in this population. Neophilic and exploratory elephants likely benefit from high-quality agricultural resources, but at a potential cost to both elephants and humans. Knowledge about the elephants' behaviour and attraction to particular landscapes could aid in human-elephant conflict mitigation efforts that consider the needs of both species and aim for more stable coexistence. © 2025 The Authors.

M.M. Jadav, Karmbir & V. Joshi

**Saliva as alternative diagnostic biofluid for non-invasive health and disease appraisal in domestic and wild animals: A review of salivary biomarkers and sialochemistry**

*Acta Veterinaria Hungarica 73 (2025) 264-276*

**Abstract.** No permission to print abstract.

M.I.M. Jamaluddin, K.Z. Abidin, S.M. Nor, A. Shukor, A.I. Zainuddin, R. Illias & M.S. Mansor

**Ecological corridors enhance adaptation success of translocated conflict elephants: A case study of a sub-adult male in Hulu Terengganu, Peninsular Malaysia**

*Ecol.l Solutions and Evidence 6 (2025) e70049*

**Abstract.** Human-elephant conflict (HEC), a common conflict between human and wildlife is increasing in occurrence. To mitigate HEC, the typical final option is the translocation of conflict elephants into better-protected areas. This study tracked a sub-adult male elephant, fitted with a satellite collar, to see how it adapted to its new habitat after being translocated over 100 km away from its previous conflict zone. After 90 days, the elephant showed adaptation to its new environment. It spent 48% of its home range and 66% of its time within an ecological corridor near the translocation site. The individual preferred secondary forest, with 78.9% of its home range within secondary forest. Based on its home range, hotspots, habitat use and wildlife corridor usage, we concluded that the elephant had adapted well to its new habitat without causing conflict or exhibiting any homing behaviour. Practical implication: To enhance the success of conflict elephant translocation, we recommend relocating only sub-adult males into selected protected natural habitats to minimize the risk of future conflicts. © 2025 The Authors.

R. Jarungrattanapong & N. Olewiler

**Ecosystem management to reduce human-elephant conflict in Thailand**

*Environment Development and Sustainability 27 (2025) 15005-15024*
**Abstract.** No permission to print abstract.

H.-L. Jim, S. Yamamoto, P. Bansiddhi & J.M. Plotnik
**Asian elephants (*Elephas maximus*) recognise human visual attention from body and face orientation**
*Scientific Reports 15 (2025) e32623*
**Abstract.** Visual attention has mostly been studied in primarily visual species, such as non-human primates. Although elephants rely more on acoustic and olfactory cues, they also use visual displays and gestures to communicate. Smet and Byrne (2014) showed that African savanna elephants recognise human visual attention based on face and body orientation, but this has not been investigated in Asian elephants. We tested ten captive female elephants in Thailand and analysed the frequency of experimenter-directed signals in a food-requesting task based on the experimenter's body and face orientation. Elephants gestured most when both the experimenter's body and face were oriented towards them, and body orientation appeared to be a stronger visual cue than face orientation, but this effect was only observed when her face was also oriented towards the elephant. This suggests that elephants are not sensitive to face or body orientation alone and rely on a combination of body and face cues to recognise human visual attention. These findings suggest that Asian elephants understand the importance of visual attention for effective communication, contributing to our understanding of cognitive abilities across the elephant taxon and visual attention in animals. © 2025 The Authors.

A. Kamdar, S. Ali, H.K. Baishya, K. Barua, R. Basumatary, P. Kakati, N. Kalita, B. Mazumder, R. Saikia, A. Sarmah, K.K. Sharma, D. Smith & N. Sekar
**Two observations of rescue behavior in wild Asian elephants**
*Biotropica 57 (2025) e13414*
**Abstract.** We report two instances of rescue behavior in wild Asian elephants in Northeast India. Adult males assisted adult females sedated during GPS-collaring efforts, pushing them away from perceived threats. These behaviors meet the criteria for rescue behavior, providing evidence of prosocial and cognitively complex actions in elephants. © 2024 The Authors.

J. Kappelhof, E. Diepeveen, M.F.L. Derks, O. Madsen, R. Rogers, B. Goossens, R. Sharma, M.A.M. Groenen, J.J. Windig & M. Bosse
**Genomics reveals distinct evolutionary lineages in Asian elephants**
*Ecology and Evolution 15 (2025) e72019*
**Abstract.** This study introduces, for the first time, whole-genome sequencing (WGS) data from predominantly wild-born Asian elephants currently housed in European zoos, covering the distribution range of Asian elephants. With this WGS data, we aim to validate the current designation of Asian elephant subspecies and address currently discussed ambiguities about their origin, particularly concerning Bornean and Sri Lankan elephants by analyzing population structure, determining divergence times, and exploring ancient and recent bottlenecks. Understanding the evolutionary history of the Asian elephant subspecies is essential for developing targeted conservation strategies and mitigating risks to their survival. Analysis reveals a clear population structure with relatively recent splits, delineating three distinct genetic clusters: Borneo, Sumatra, and Asian Mainland, with Sri Lanka forming an additional group. We estimated the divergence time between Bornean and Sumatran elephants to be around 170,000 years ago. The divergence of the Sri Lankan elephant from the mainland is estimated to have occurred around 48,000 years ago, with Sri Lankan elephants predominantly clustering with those from Myanmar, possibly due to historical trade networks. The genome of the Bornean elephant exhibited signatures of severe bottlenecks as recently as 8 and 38 generations ago, further supporting hypotheses of their introduction. Our data reflect the current Asian elephant subspecies designation. Additionally, for the first time, the Sumatra elephant is confirmed as a distinct subspecies with genomic data. Furthermore, the study discusses genetic management strategies for ex-situ populations, emphasizing the importance of implementing cluster-specific conservation measures. © 2025. The Authors.

J. Kappelhof, R. Sharma, J. Windig, M.A.M. Groenen & M. Bosse
**Connecting captive Asian elephants with**

**their endangered wild relatives through their genomes**
*Global Ecology and Conserv. 63 (2025) e03889*
**Abstract.** The Asian elephant is classified as an endangered species, comprising four recognized subspecies: Indian, Sri Lankan, Sumatran, and Borneo. Elephant populations in Southeast Asia, though small and fragmented, face high risks of extirpation due to habitat loss, poaching, human-wildlife conflict, and climate change. These factors jeopardize their survival and highlight the urgent need for targeted conservation efforts. Despite these challenges, Asian elephants possess crucial genetic diversity that needs to be maintained for future adaptive potential, making their conservation a high priority. Genetic studies are essential for informing conservation strategies. This review aims to compile and summarize the relevant literature on the genetic data of Asian elephants, specifically focusing on their phylogenetic relationships, historical biogeography, and phylogeography, while emphasizing the need for acquiring genomic data. In addition, we explore how important captive populations have been in acquiring genomic data for this endangered species. It also highlights the importance of genetically monitoring captive populations to maintain sufficient genetic variation for conservation and research purposes. We discuss how understanding the elephants' evolutionary history from a genomic perspective can offer insights into subspecies recognition and provide a data-driven foundation for planning management strategies, such as reintroduction, translocation, and captive breeding. Ultimately, these efforts will enhance conservation strategies and secure the survival of this iconic species in the face of ongoing anthropogenic and environmental challenges. © 2025 Elsevier B.V.

Y. Khadpekar, S. Govind, N. Dahe, J. Soares, N. Fernández, T.L. Lachenpa, S. Patil, A. Ghatare, V. Viswam, N. Thongtip, J. Ahmed & N. Sarma
**Endoscopic visual anatomy of urogenital tract in female Asian elephants (*Elephas maximus*)**
*Theriogenology Wild 6 (2025) e100121*
Populations of Asian elephants have been declining in the wild, mostly due to the habitat loss and conflicts with humans. The elephants under human care thus become a very important source and opportunity to study this species, as well as for the future conservation efforts through captive breeding and conservation programs. Although a lot of work has been done on the reproductive physiology of Asian elephants, there is a limited information available on the detailed anatomy of the reproductive tract. Endoscopy offers a direct visual observation of internal organs and examination of anatomy in live animals. We examined urogenital tracts of 30 female Asian elephants under standing sedation, with the flexible endoscope. The examinations were carried out as part of urogenital tract health assessment, and treatment of infections and pathologies. The distances of different parts from the external vulva opening, were measured. Detailed description of the visual anatomy of each of the urogenital tract parts has been provided in this study. © 2025 The Authors.

S. Klinhom, C. Kunasol, S. Sriwichaiin, S. Kerdphoo, N. Chattipakorn, S.C. Chattipakorn & C. Thitaram
**Characteristics of gut microbiota profiles in Asian elephants (*Elephas maximus*) with gastrointestinal disorders**
*Scientific Reports 15 (2025) e1327*
**Abstract.** Colic and diarrhea are common gastrointestinal (GI) disorders in captive Asian elephants, which can severely impact health and lead to mortality. Gut dysbiosis, indicated by alterations in gut microbiome composition, can be observed in individuals with GI disorders. However, changes in gut microbial profiles of elephants with GI disorders have never been investigated. Thus, this study aimed to elucidate the profiles of gut microbiota in captive elephants with different GI symptoms. Fecal samples were collected from eighteen elephants in Chiang Mai, Thailand, including seven healthy individuals, seven with impaction colic, and four with diarrhea. The samples were subjected to DNA extraction and amplification targeting the V3-V4 region of 16S rRNA gene for next-generation sequencing analysis. Elephants with GI symptoms exhibited a decreased microbial stability, as characterized by a significant reduction in microbiota diversity within individual guts and notable differences in microbial community composition when compared with healthy elephants. These changes included a de-

crease in the relative abundance of specific bacterial taxa, in elephants with GI symptoms such as a reduction in genera Rubrobacter, Rokubacteria, UBA1819, Nitrospira, and MND1. Conversely, an increase in genera Lysinibacillus, Bacteroidetes_BD2-2, and the family Marinifilaceae was observed when, compared with the healthy group. Variations in taxa of gut microbiota among elephants with GI disorders indicated diverse microbial characteristics associated with different GI symptoms. This study suggests that exploring gut microbiota dynamics in elephant health and GI disorders can lead to a better understanding of food and water management for maintaining a healthy gut and ensuring the longevity of elephants. © The Authors 2025.

V. Kolipakam, H. Matta, S.K. Muliya, M.V. Markad, L. Kawlni, U. Kumar, B. Pant, S. Sharma, S. Mondol, R.K. Pandey & Q. Qureshi
**Estimating Asian elephant abundance: A comparative analysis of dung counts and genetic SECR in a known population of Kodagu, Karnataka, India**
*BMC Ecology and Evolution 25 (2025) e106*
**Abstract.** The Asian elephant, a keystone species of immense ecological and evolutionary significance, is under intensifying threat from habitat fragmentation and human-elephant conflict. Reliable population estimates are critical for effective conservation planning and understanding demographic processes, yet traditional methods like dung counts can be skewed by detectability issues and environmental variability. Here, we compared conventional line-transect dung counts with a non-invasive genetic spatially explicit capture-recapture (genetic SECR) approach in Kodagu, Karnataka, using high-throughput microsatellite sequencing (SSR-Seq). Our study area harbours a known population of 34 elephants (0.21 elephants/$km^2$), providing a rare opportunity to evaluate the accuracy and bias of estimation methods against a field-validated reference point. Dung counts yielded an elephant density of 1.27(±0.32) elephants/$km^2$, overestimating the true population by 6 times. In contrast, genetic SECR based on genotypes from 131 fecal samples estimated a density of 0.23 elephants (±0.03)/$km^2$ individuals), closely aligning with the known density. Genetic analysis also revealed substantial allelic richness and potential population substructure. Conclusions These results demonstrate that genetic SECR not only reduces estimation bias but also reveals evolutionary relevant insights into genetic diversity and population structure. While genetic methods require greater per-unit investment compared to dung counts, a hybrid strategy may be most practical: periodic genetic SECR surveys to calibrate and validate easier methods (like dung counts or camera traps) used more frequently. As technology advances, costs of fecal DNA analysis are likely to decrease further. This hybrid framework optimizes resource allocation while maintaining scientific rigor, particularly important for large-scale monitoring programs across diverse landscapes. © 2025. The Authors.

C.A. LaDue, R.P.G. Vandercone & R.J. Snyder
**Representations of human-elephant interactions on YouTube: Analyzing content and engagement to inform sustainable practices for wildlife tourism**
*Biological Conservation 308 (2025) e111240*
**Abstract.** No permission to print abstract.

J.A. Landolfi, L. Howard & P. Ling
**Tissue and cellular tropism of elephant endotheliotropic herpesvirus (EEHV)1A in hemorrhagic disease**
*Plos One 20 (2025) e0330631*
**Abstract.** Elephant endotheliotropic herpesviruses (EEHVs) cause EEHV hemorrhagic disease (EEHV-HD), an acute, multisystemic, often fatal hemorrhagic syndrome with profound implications for elephant population growth and sustainability. A greater understanding of the pathogenesis of EEHV-HD is essential to elucidate susceptibility and develop tools for disease management and prevention. This study utilized RNAscope (R) in situ hybridization (ISH) to detect EEHV1A DNA polymerase and terminase genes in archival tissues (heart, lung, tongue, spleen, liver, kidney, lymph node, stomach, small intestine, large intestine, salivary gland, and brain or spinal cord) from Asian elephants (n = 12) that died of EEHV-HD to determine and describe tissue and cellular tropism of the virus. Tissue and cellular specific ISH signal were recorded and semi-quantitatively graded using light microscopy. Positive hybridization signal for EEHV1A terminase and DNA polymerase was detected in tissues from all

twelve study cases. In all tissues, positive signal was limited to endothelial cell nuclei. No signal was detected in epithelial cells, leukocytes or mesenchymal cells other than endothelial cells. Signal detection frequency was as follows: heart (12/12), liver (11/12), tongue (10/12), lymph node (10/12), spleen (9/11), stomach (9/12), small intestine (9/10), large intestine (9/10), lung (7/10), salivary gland (1/8), kidney (1/12), brain/spinal cord (0/10). Tissue signal amount varied among cases but generally was most abundant in heart and liver. Results confirmed that in Asian elephant cases of EEHV1A-HD, the viral cellular target and site of replication is exclusively capillary endothelial cells. Differences in viral tissue tropism with EEHV1A-HD are likely a consequence of endothelial cell heterogeneity across tissues. Understanding tropism in cases of active EEHV-HD can serve as a foundation for investigation of EEHV tropism in other stages of the infection (e.g. initial infection, dissemination, latency, shedding) and contribute to defining pathogenesis. © 2025 The Authors.

L.-L. Li, R.-C. He, C. Chen & R.-C. Quan
**Asian elephants are associated with a more robust mammalian community in tropical forests**
*J. of Animal Ecology 94 (2025) 1866-1878*
**Abstract.** Megaherbivores are experiencing a global extinction crisis before we fully understand their ecological functions. While the role of megaherbivores as ecosystem engineers – enhancing environmental structure complexity and facilitating seed dispersal – is well-documented, their influence on animal community assemblies remains less explored, especially in tropical forests. This knowledge gap is crucial for effective, functional-oriented conservation planning. Therefore, we investigated the association between Asian elephants and mammalian community assemblages-from community to species level-in tropical forests of Southwest China, using long-term monitoring data from camera traps. Our results revealed that the presence of Asian elephants was associated with a more robust co-occurrence network within mammalian communities. Additionally, elephants were positively correlated with the abundance of mammal species, especially ungulates and primates. At the species level, while some mammals temporarily avoided Asian elephants, most retained their diel activity patterns, presumably because they were neither in a predator-prey relationship nor intense competitors. Our results show that Asian elephants not only affect vegetation but also are associated with a more robust mammalian community. Consequently, protecting elephants is a pivotal conservation action towards maintaining robust animal communities in Asian tropical forests. © 2025 The Authors.

X. Liang, T. Chen, H. Xiao & Y. Xie
**The impact of human-elephant conflicts on farm households' land lease behavior: The case of Yunnan Province, China**
*Land Use Policy 153 (2025) e107532*
**Abstract.** No permission to print abstract.

X. Lu, J. Wang, Z. Huang, Z. Fang, M. Ali, A. Ashraf, S. Yuan & Y. Bai
**Long-distance corridors facilitate Asian elephant adaptation to climate change**
*Integrative Conservation 4 (2025) 57-70*
**Abstract.** Amid ongoing habitat degradation and fragmentation, along with the disruption of traditional moving routes, the Kunming-Montreal Global Biodiversity Framework underscores the urgent need to enhance species connectivity to improve their adaptability to climate change. Recent instances of long-distance movements by Asian elephants have raised concerns about the potential for such events to become more frequent under future climate scenarios. A landscape adaptation strategy is urgently needed to improve the connectivity and integrity of Asian elephant habitats to meet their long-distance movement requirements. However, large-scale ecological networks for Asian elephants that incorporate long-distance corridors remain lacking. This study employs species distribution models and minimum resistance models to construct current and future multi-scenario ecological networks, aiming to elucidate key features of climate adaptability and priority corridor strategies for Asian elephants. Our findings indicate that long-distance corridors identified under future climate scenarios play an integral part in maintaining connectivity within the priority network. The study identifies 162 priority long-distance corridors, accounting for 25.5% of the overall network,

whose lengths and importance are expected to increase. Additionally, 37.2% of these priority corridors pass through protected areas, providing guidance for optimizing existing reserves and addressing conservation gaps that cover 61.2% of the study area. The study highlights the need for habitat conservation strategies for Asian elephants to fully consider the uncertainties of dynamic spatiotemporal changes. It emphasizes the global significance of macro-scale ecological network design and the critical role of constructing long-distance corridors. Furthermore, the integration of protected areas with long-distance ecological corridors is identified as a key measure to address future uncertainties and achieve lasting biodiversity conservation. © 2025. The Authors.

T. Maehr, J. Lopez, G. Drake, F.M. Ferreira, R. Fraser, R. Mckown, R. Kailath, S. Morris, A. Chambers, L.P. Graves, S.L. Walker, A. Dastjerdi, K.L. Edwards, H.I. Nakaya & F. Steinbach

**A safe, T cell-inducing heterologous vaccine against elephant endotheliotropic herpesvirus in a proof-of-concept study**

*Nature Communications 16 (2025) e8374*

**Abstract.** We report the results of the world's first trial of a vaccine against elephant endotheliotropic herpesvirus (EEHV) in elephants. EEHV-induced haemorrhagic disease is a major threat to juvenile Asian elephants. A vaccine preventing severe disease and death would support conservation efforts for this endangered species. We developed a heterologous, recombinant modified vaccinia virus Ankara prime and adjuvanted protein boost vaccine, containing regulatory protein EE2 and major capsid protein. Vaccine design targeted Th1 and cytotoxic T cell responses, crucial for herpesvirus immunity. In a proof-of-concept trial, safety and immunogenicity were tested in adult elephants. A modified interferon-gamma release (IFNG) point-of-care vaccine-specific whole blood assay was established to avoid sample transport-related loss of immune readouts and determine T cell responses by RT-qPCR first. Subsequently, RNA sequencing was utilised to investigate transcriptomic changes post-vaccination. No adverse reactions were observed following heterologous vaccination. IFNG responses to candidate antigens were detected against the pre-existing latent immunity in adult elephants. Over-representation analysis revealed induction of T cell-associated pathways. Thus, we show that the vaccine has a favourable safety profile and stimulates EEHV-specific T cell-biased immune responses, warranting further evaluation. © 2025 Crown.

B. Maharjan, P. Jain & N.P. Koju

**Zoonotic risks and conservation challenges: Gastrointestinal parasites in wild mammals of Chitwan National Park, Nepal**

*International Journal for Parasitology: Parasites and Wildlife 26 (2025) e101041*

**Abstract.** Gastrointestinal parasites (GIPs) pose a significant threat to wildlife health and biodiversity, impacting reproductive activities, behavior, survival, and population dynamics. Identifying parasitic infections in wild animals can help to mitigate extinction risk and support conservation efforts. This study investigates the prevalence, diversity, and zoonotic risks of GIPs in six large wild mammals in Chitwan National Park, Nepal. Fresh fecal samples were collected between December 2022 and April 2023 and examined using direct wet mount and concentration methods. By analyzing 63 fecal samples: Royal Bengal tiger (n = 7), Asian elephant (n = 9), one-horned rhinoceros (n = 10), sloth bear (n = 9), spotted deer (n = 25), and rhesus monkey (n = 3), we identified 19 GIP types: 3 protozoan species (*Balantioides coli*, *Isospora* spp., and coccidia) and 16 helminth species, revealing an 85.7% infection rate. Helminths had a higher prevalence (85.7%) than protozoans (22%). Among helminths, nematodes were the most prevalent (69.8%) followed by trematodes (38.0%) and cestodes (17.4%). Eleven types of nematodes, three types of cestodes, and two types of trematodes were recorded. Multiple infections were more common than single infections. The high prevalence of GIPs indicates a major health issue that could affect species survival and conservation efforts in Chitwan National Park, highlighting the need for proactive conservation and health monitoring strategies for conservation. © 2025 The Authors.

J. Morrison, M. Chatterjee, K. Ramkumar, S. Tiwari, S.L. Walker, S. Wilson & A. Zimmermann

**Spatiotemporal distribution of negative human-elephant interactions in Wayanad district, Kerala, India**

*Global Ecology and Conserv. 62 (2025) e03742*

**Abstract.** Negative human-elephant interactions (HEI) present a significant threat to the long-term conservation of Asian elephant populations and negatively impact the psychological well-being of local communities. The Brahmagiri-Nilgiri Eastern Ghats complex in Kerala is a key landscape for Asian elephant conservation and supports the largest single breeding population across their range. However, negative encounters between people and elephants are increasing in frequency. Despite this, the use of predictive distribution models to map the spatio-temporal patterns of human-elephant interactions across the landscape remains poorly explored. Compiling 1942 individual conflict incidents from compensation records, we dynamically extracted 16 ecological and anthropogenic variables identified in the literature as important drivers of interactions between people and Asian elephants. Using an ensemble modelling framework incorporating 10 algorithms, we constructed predictive distribution models for the wet and dry seasons from 2011 to 2023 to map the spatiotemporal distribution of regions at consistent risk of negative human-elephant interactions. Final consensus models achieved a mean accuracy of 0.91 (AUC) and 0.73 (TSS) respectively and suggested that the top predictor in influencing interactions is human population density. Regions within and adjacent to the Wayanad Wildlife Sanctuaries (I and II) have the highest predicted likelihood of interactions, however risk-level differs according to season. During the dry season, areas including Kidanganad, Nulpuzha, and Pulpalli, within the Kurichiat, Muthanga, and Sulthan Battery Forest ranges, were identified as having the largest land area at risk. Conversely during the wet season, the Tirunelli and Trisshaleri areas in the Tholpetty forest range demonstrated the highest risk. Results provide valuable insights to inform effective mitigation strategies at the landscape-level. © 2025. The Authors.

A. Mukhopadhyay, I. Pal, J.P. Hati, N. Pramanick, R. Acharyya, G.S.V.S. Bharadwazdata & M. Pramanick

**Elephant habitat modeling in Sai Yok National Park using high-resolution Pléiades data**

*Landscape and Ecological Engineering 21 (2025) 443-459*

**Abstract.** No permission to print abstract.

A. Nabavizadeh

**Of tusks and trunks: A review of craniofacial evolutionary anatomy in elephants and extinct Proboscidea**

*Anatomical Record 308 (2025) 2843-2862*

**Abstract.** No permission to print abstract.

H. Nandar, L.-L. Li, Z.M. Oo, Y.H. Lwin & R.-C. Quan

**Younger semi-captive Asian elephants constitute suitable repository for conservation translocation**

*Conserv. Science and Practice 7 (2025) e70041*

**Abstract.** Interdisciplinary efforts are fundamental for achieving successful conservation translocations. However, behavioral information is usually lacking to guide conservation translocations for social animals. This is particularly significant for the conservation of endangered Asian elephants. Therefore, by tracing the long-term behavioral logbook records in the southern central part of Myanmar, our study highlighted that younger semi-captive elephants (male $\leq$ 21 years old; female $\leq$ 42 years old) were identified as suitable candidates for translocations since they were more easily accepted by the wild population, with fewer fighting events and higher mingling probability. Furthermore, we recorded 136 present data combining field surveys and collection from literature, and we identified 4349.69 km$^2$ of suitable habitat in this region located around 10 km away from the villages, closer to managed forests and water. This study integrated ecological and behavioral information to support reinforcement conservation for Asian elephants in Southeast Asia, where most of the semi-captive elephants are distributed. These insights could guide more effective reinforcement projects by considering age and sex for improved success in integration. Additionally, our study emphasizes the importance of habitats near human-dominated areas, which are preferred by elephants, offering practical implications for habitat management and human-elephant conflict mitigation efforts. © 2025. The Authors.

L. Natarajan, P. Nigam & B. Pandav
**Human-elephant conflict in expanding Asian elephant range in east-central India: Implications for conservation and management**
*Oryx 59 (2025) 256-264*
**Abstract.** Chhattisgarh, India, harbours a metapopulation of 250-300 Asian elephants that has expanded its range from neighbouring states since 2000. Elephants in the state occur across a mosaic of forests interspersed with agricultural settlements, leading to frequent interactions with people, some of which culminate in conflict. We assessed patterns of crop losses as a result of elephant incursions, at two spatial scales. We found widespread crop losses, with 1,426 settlements in and around 10 forest divisions and four protected areas reporting elephant-related crop losses during 2015-2020. At the landscape scale, spanning c. 39,000 km$^2$, intensity of habitat use by elephants, forest cover and number of forest patches explained variations in intensity of crop losses. At a finer spatial scale, covering c. 1,200 km$^2$ of forest-agriculture matrix in Surguja, probability of crop loss was low near roads but high close to forest patches and was also affected by patch heterogeneity. Both male and female elephant groups fed on crops. As areas with high crop losses are also areas used intensively by elephants, management to increase elephant occupancy in relatively large and connected forest patches is imperative, to minimize crop losses and improve elephant conservation. Concomitantly, expansion of elephant range into agricultural areas that lack forests should be discouraged. In forest divisions, options to reduce negative human-elephant interactions include institutionalizing elephant monitoring, transparent and prompt ex gratia payment for crop losses, and the use of portable physical barriers. © 2025 The Authors.

G. Nepal, B. Devkota, G. Gautam, H. Luitel, C.R. Pathak, A. Sadaula, B.K. Shrestha, K.P. Gairhe & K.R. Rijal
**Key reproductive insights of captive female Asian elephants (*Elephas maximus*) in Nepal**
*Theriogenology Wild 6 (2025) e100124*
**Abstract.** Asian elephants are classified as endangered by IUCN. Its population has declined by an estimated 50% over the past 75 years and captivity is one of the several reasons. This study aimed to assess key reproductive parameters of captive Asian elephants in Nepal, including fertility status, age at first calving, intercalving interval, calving seasonality, calf sex ratio, and associated reproductive issues. Data were collected between May and October 2024 from 96 captive female elephants in five protected areas using standardized questionnaire surveys and retrospective records from 1985 to 2024. Among these, only 76 elephants were found matured (10–82 years of age) and became part of this study. A total of 50 % elephants had a history of conception and calving, producing 100 calves. The earliest calving age was 11 years, with a maximum of seven parities observed in a single elephant, and one case of twin births. The average age at first calving was 5447 ± 1344 days, while the average inter-calving interval was 1543 ± 771 days. The male-to-female calf ratio was 1.5, and calf survivability was 85 %. Calving was the highest in spring (31 %), followed by autumn (26 %), winter (23 %) and summer (20 %). Dystocia, abortions and neonatal mortality were the major reproductive complications. These findings provide critical insights into the reproductive dynamics of captive Asian elephants, offering valuable information for improving their management and addressing reproductive challenges to support conservation efforts. © 2025. The Authors.

S.A. Padur, S. Dhanapal, M. Valliyappan, D.J.H. Shyu & T.N. Parthasarathy
**Intestinal microbiome diversity and disparity between wild and captive endangered Asian elephants (*Elephas maximus indicus*) in southern India**
*Antonie Van Leeuwenhoek International 118 (2025) e191*
**Abstract.** No permission to print abstract.

R.K. Pandey, S.P. Yadav, K.M. Selvan, L. Natarajan & P. Nigam
**Elephant conservation in India: Striking a balance between coexistence and conflicts**
*Integrative Conservation 3 (2024) 1-11*
**Abstract.** In the human-dominated epoch of the Anthropocene, nations worldwide are trying to adopt a variety of strategies for biodiversity conservation, including flagship-based approaches. The Asian elephant plays a pivotal role as a flagship species in India's biodiversity conservation efforts, particularly within its trop-

ical forest ecosystems. As the country harboring the largest Asian elephant population among the 13 range countries, India's conservation strategies offer valuable insights for other range countries. This study elucidates India's elephant conservation paradigm by outlining a historical account of elephant conservation in the country and examining the current administrative and legal frameworks. These are instrumental in implementing strategies aimed at maintaining sustainable elephant populations. Our study also analyzes trends in elephant populations and negative human–elephant interactions, drawing upon data from a centralized government database. Our findings indicate that the elephant population in India is reasonably stable, estimated at between 25,000 and 30,000 individuals. This figure constitutes nearly two-thirds of the global Asian elephant population. India's elephant population occupies ~163,000 $km^2$ of diverse habitats, comprising 5% of the country's land area, with their distribution spread across the northern, northeastern, east-central, and southern regions. This distribution has shown fluxes, particularly in the east-central region, where large-scale elephant dispersals have been observed. Between 2009 and 2020, human-elephant conflicts have resulted in an average annual loss of 450 ± 63.7 human lives. During the same period, the central and state governments paid an average of US$ 4.79 million annually as ex gratia for property losses. Recognizing the critical nature of these conflicts, India has implemented various measures to manage this pressing conservation challenge. Overall, sustaining the world's largest extant population of wild elephants in the midst of India's human-dominated landscapes is enabled by a robust institutional policy and legal framework dedicated to conservation. This commitment is further reinforced by strong political will and a deep-rooted cultural affinity towards elephants and nature, which fosters a higher degree of tolerance and support for conservation efforts. © 2024 The Authors.

U. Panja & B. Mistri

**Human-elephant conflict risks in the forest-dominated areas of West Bengal, India**

*Environmental Monitoring and Assessment 197 (2025) e659*

**Abstract.** No permission to print abstract.

B.V. Perera, A. Silva-Fletcher, C. Thitaram, W. Kosaruk & J.L. Brown

**Rapid post-release adaptation of released orphan elephants from a rescue centre to a national park in Sri Lanka based on faecal glucocorticoid metabolite analyses**

*Conservation Physiology 13 (2025) coaf044*

**Abstract.** Rewilding and species reintroductions are increasingly important conservation strategies, with the goal of restoring ecosystems and supporting populations of threatened species. Over the past 30 years, the Elephant Transit Home in Sri Lanka has rescued and rehabilitated more than 150 orphaned elephant calves that were subsequently released back into the wild. Understanding how rehabilitation and release processes affect the welfare status of these calves can provide valuable information on factors affecting release outcomes. This study evaluated patterns of faecal glucocorticoid metabolite (fGCM) concentrations as a physiological indicator of stress in 10 orphaned elephants (six males, four females) rescued at < 1 year of age and released back into Udawalawe National Park after rehabilitation at the Elephant Transit Home (release age, 6 to 8 years). Faecal samples (similar to 2/week) were collected for 9 months pre- (n = 53 samples) and 16 months post- (n = 153 samples) release. Mean fGCM concentrations during the early post-release period (first 17 days) were significantly higher than in pre- and later post-release periods, with no differences between males and females. Results indicate elephants adapted quickly after release, likely aided by being released in a small group (n = 10) of socialized cohorts. In fact, fGCM normalized to concentrations lower on average than at the Elephant Transit Home in the months preceding release. Understanding the stress response of elephants during and after translocations is crucial for well-being and successful integration into the wild. Minimizing stress through appropriate protocols, such as selecting strong social units, is essential. Hormonal monitoring is a valuable tool that should be considered long-term to assess the adaptation, survival and eventual reproductive success of rewilded elephants. © 2025 The Authors.

S. Phalke, C. Sarabian, A.C. Hughes & H.S. Mumby

**"Decoding ambiguity": Asian elephants' (*Elephas maximus*) use previous experiences and sensory information to make decisions regarding ambiguity**
*Applied Animal Behaviour Science 283 (2025) e106525*
**Abstract.** Animals rely on sensory information from the environment to make optimal decisions. However, animals are often faced with incomplete or ambiguous information. Some species use sensory information and previous experiences to generate expectations about ambiguity. To test this, we used a cognitive bias test experimentally modified for Asian elephants to investigate how they respond to ambiguous cues after positive (rewarded) and negative (unrewarded) experiences. We manipulated the degree of ambiguity by associating the spatial position and colour of the cues to either previously experienced positive or negative experiences. We demonstrate that elephants use previous experiences, and the valence (affective value) attached to those experiences to make decisions regarding ambiguity. Elephants show a positive bias by opening the ambiguous positive box three times as often and twice as quickly compared to the negative cue. Conversely, they are less likely to open and slower to respond to the ambiguous negative cue. These results are consistent with responses of farm animals and captive wild mammals when faced with unconditioned ambiguous cues with perceptual overlaps. Our findings indicate that when making decisions under ambiguity, animals rely on cognitive and sensory mechanisms. A greater understanding of decision-making mechanisms could aid in understanding animals' responses to their immediate environment with potential implications for conservation and welfare. © 2025. The Authors.

S.S. Pokharel, A.K. Chettri, S. Chatterjee, P.B. Seshagiri & R. Sukumar
**Physiological responses in free-ranging Asian elephant populations living across human-production landscapes**
*Scientific Reports 15 (2025) e32365*
**Abstract.** Monitoring the physiology of elephants living in human-production landscapes has become increasingly important for understanding how they cope with various challenges that affect their overall fitness. We assessed physiological stress by measuring faecal glucocorticoid metabolite (fGCM) levels and metabolic states using faecal triiodothyronine (fT3) across three free-ranging Asian elephant populations (one in Central India and two in Northeastern India) whose home ranges encompass varying extents of disturbance in human-production landscapes. We present landscape disturbance metrics to characterize variations in fragmentation and anthropogenic pressures across the study landscapes and use faecal carbon and nitrogen (C/N) ratio as a proxy for dietary quality, with higher C/N values indicating poorer-quality diets. Elephants living in more fragmented habitats in Central India had higher fGCM and lower fT3 levels compared to the Northeastern populations, as well as when compared (only fGCM levels) with a previously-studied Southern Indian elephant population. A positive relationship was observed between faecal C/N ratio and fGCM levels across the populations, except for the Central population. These findings suggest that elephants in highly fragmented landscapes and experiencing significant anthropogenic disturbances have (i) higher adrenal activity to cope with and (ii) reduced metabolic rates to conserve energy in emerging challenging contexts. While elephants may adapt to living in human-modified landscapes to some extent, they may experience high stress levels beyond a threshold of disturbance which can be physiologically costly. This warrants systematic assessments to evaluate how these biological costs impact their fitness, and a re-evaluation of conflict management practices. © 2025 The Authors.

S. Prasad, V. Aditya, J. Solomon & K.K. Karanth
**Community mitigation decisions in elephant conflict zones of southern India depend on environmental and socio-economic drivers**
*Scientific Reports 15 (2025) e34693*
**Abstract.** Human-elephant conflict is a major threat to people and elephants across Asia. Understanding the factors influencing people's decision to implement mitigation measures is crucial to devise better conflict mitigation measures. We surveyed 507 rural communities in elephant dominated landscapes, across four districts in southern India using snowball and opportunistic sampling. Fourteen covariates were

analysed through a mixed-methods approach, using Classification and Regression Trees (CART) for quantitative analysis, and thematic analysis for qualitative insights. Three key drivers: rainfall, land ownership and proximity to water bodies shaped mitigation decisions. The CART revealed two distinct decision paths. In Path 1, households with lower rainfall and smaller landholdings had a 68% likelihood of adopting mitigation measures. In Path 2, households experiencing higher rainfall and bigger landholdings, closer to water bodies, had a 7% likelihood of adopting mitigation measures. Notably, trenches were linked to elephant injuries, while solar and electric fencing were associated with elephant deaths, indicating poor design and maintenance of these mitigation measures resulting in elephant casualties. Despite the conflict, communities expressed sadness over elephant casualties, reflecting strong cultural ties. Our findings underscore the necessity for proactive measures, including early warning systems, patrolling networks and regenerative agricultural practices to promote biodiversity. As global interest in conflict mitigation grows, integrating local knowledge is essential for community-based management in shared landscapes. © 2025 The Authors.

D.K. Quainoo, P. Chalermwong, P. Muangsuk, T.H.D. Nguyen, T. Panthum, W. Singchat, T. Budi, P. Duengkae, W. Suksavate, A. Chaiyes, S. Sanannu, W. Tipkantha, N. Bangkaew, S. Sripiboon, N. Muangmai, K. Han, P. Maneeorn, M. Kaewparuehaschai, G. Leamsaard, C. Kanchanasaka & K. Srikulnath

**Genetic insights for enhancing conservation strategies in captive and wild Asian elephants through improved non-invasive DNA-based individual identification**

*Plos One 20 (2025) e0320480*

**Abstract.** Asian elephant is a key umbrella species that plays a crucial role in maintaining biodiversity and ecological balance. As an iconic symbol of Thailand, it also significantly contributes to the nation's tourism industry. However, human activities pose serious threats to their long-term survival and population health. To tackle these challenges and develop effective conservation strategies, extensive genetic reference data were collected to enhance both captive and wild elephant conservation, improve non-invasive DNA-based individual identification, and assess genetic diversity using 18 microsatellite markers. High genetic diversity was observed across all populations; however, high levels of inbreeding were evident in NEI, EKS, BCEP, and wild elephant populations, except for the MEP population, which recorded low inbreeding levels. Significant variation in the gene pool estimates was observed across different populations, with three maternal haplogroups (alpha, beta 1, and a tentative beta 3) identified. A reduced panel of six microsatellite markers proved highly efficient for individual identification. Additionally, non-invasive DNA samples were tested using 18 microsatellite loci for individual identification. Using only 7 out of the 18 microsatellite loci tested, individuals were successfully identified, demonstrating enough discriminatory power to distinguish between individuals. Among these, four loci were both effective and efficient for reliable individual identification in fecal samples. These findings offer valuable insights for optimizing conservation efforts, including the design of tailored strategies to protect elephants in Thailand and ensure the long-term viability of their populations. © 2025 The Authors.

N.H. Rafaai, H. Husain, S.M. Nor, A.N.M. Nor, A. Amir, M.A. Abas, N.H. Hassin, A. Rosdi, S.B. Jaafar, F.N. Ahmad, F.M. Atan, A.S. Kasim, H. Mahmud, S. Saaban & K. Hambali

**Utilizing spatial modeling to evaluate habitat suitability and develop conservation corridors for effective conservation planning of Asian elephants (*Elephas maximus*) in Jeli, Kelantan, Malaysia**

*Ecological Modelling 502 (2025) e111043*

**Abstract.** No permission to print abstract.

R.P.V.J. Rajapakse, K.J.K. Karunathilake, T.S. P. Fernando, H.T.T. Doan, D. Blair & T.H. Le

**Molecular analysis supports the morphological identification of the amphistome *Pseudodiscus collinsi* (Paramphistomoidea: Platyhelminthes) in wild elephants of Sri Lanka**

*Veterinary Research Communications 49 (2025) e259*

**Abstract.** No permission to print abstract.

A.D.G. Ranjeewa, R.J. Thomas, D.K. Weerakoon, G.H.N.A. Sandanayake & P. Fernando

**How did the elephant cross the fence? Electric fence crossing by elephants in Udawalawe, Sri Lanka**

*Animal Conservation 28 (2025) 197-207*

**Abstract.** No permission to print abstract.

L. Rutherford, L. Murray, L. Holmes & E. Williams

**Personality in Asian elephants (*Elephas maximus*): Temporal stability and methods of assessment**

*Personality and Individual Differences 232 (2025) e112851*

**Abstract.** Personality is the essence of individuality in animals, affecting individual behaviours, perceptions and lived experiences. Being able to reliably assess personality in animals holds the key to understanding individual differences, and application of this knowledge is paramount in the provision of individual-level management of animals to optimise welfare. A key aspect of the definition of animal personality is 'consistency over time'. Yet, despite the range of studies assessing elephant personality, there is a lack of consistency within methodologies and personality is usually assessed at a single point in time. Here, we examine personality data from adult members of the Asian elephant herd at Chester Zoo at five separate time points, across a ten-year period. Data were analysed in terms of the instruments used to measure personality, and changes over time in elephant personality assessment scores. Select personality traits were consistent over multiple time points. Inter-rater reliability across personality adjectives is highest when keepers are involved in scale development, reinforcing the importance of collaboration between scientists and animal caregivers in building tools for evidence-based management decisions over the lifetime of animals. © 2024 The Authors.

C. Schiffmann, L. Schiffmann, E. Müller, V.B. Cowl, D.W.H. Müller & M. Clauss

**Solvable challenges, meaningful lives – Welfare and reproduction in zoo animals**

*Journal of Zoo and Aquarium Research 13 (2025) 245-263*

**Abstract.** In the management and care of farm animals and pets, controlling reproduction is common practice to an extent that its justification is rarely questioned. In zoo population management, limited holding capacity and difficulties in culling so-called 'surplus animals' lead to a widespread use of reproductive control measures. The argument that preventing reproductive behaviour represents a welfare compromise has been put forward repeatedly in dicussions about zoo population management. However, reports on the effect of limiting reproduction on individual or whole group welfare are surprisingly sparse. Here, we focus on welfare-relevant aspects of preventing reproduction. Welfare based decisions regarding the use and choice of reproductive control methods can only be taken if every aspect of a species' reproductive behaviour and physiology is taken into account. To ensure zoo animal welfare, we need not only protect zoo animals from distress, but need to provide a meaningful life with solvable challenges on a continuous basis. Reproductive behaviour may be considered a very appropriate challenge for an individual animal that its species evidently evolved to solve. Considering the lifetime of an individual, reproductive activity may represent a comparatively small portion of its activity budget, or a very large portion of its overall lifespan. When considering reproductive control in zoo animals, one needs to be aware of the entirety of potential positive and negative welfare effects on an individual, and of the possible need to fill the gap in life time no longer occupied by reproductive activity.

M.H. Schmitt, M.S. Rudolph, S.L. Jacobson & J.M. Plotnik

**Differences in olfactory discrimination, but not sensitivity, between African savanna and Asian elephants**

*Ecology and Evolution 15 (2025) e71896*

**Abstract.** While African savanna and Asian elephants split between 4.2 and 9 MYA, they are often regarded as one united group, 'elephants.' This is surprising because, while both are keystone species in their respective habitats, each faces different environmental pressures and has rarely been compared experimentally. In general, African savanna elephants must locate resources that vary spatially and temporally across patchy savannas, while Asian elephants do so within dense, high-biodiversity forests. Both species use olfaction to guide decision-making; however, considering their ecologies, we hypothesize that their olfactory abilities differ. Thus, we investigated the sensitivity limits and discrimination abilities of both savanna and Asian elephants' olfactory systems, and changes in these limits in a complex odor environment. We employed two odor-based choice experiments, using cis-3-Hexenyl acetate-a common green leaf volatile that is emitted by plants globally-as a target odor. While both species correctly detected a target odor, albeit at different concentrations-savanna elephants detected it at 50 parts per million (ppm) and Asian elephants at 100 ppm-only the savanna elephants' limit changed (to 1000 ppm) in the complex odor environment. While we were limited by a small sample size, our data suggest that there may be differences in the olfactory abilities of these two elephant species. © 2025. The Authors.

C. Schwarz, J. Masseloux & S. Hedges

**The elephant in the room: Comparison of species distribution models for human-elephant conflict risk mapping**

*Global Ecology and Conserv. 62 (2025) e03719*

**Abstract.** Human-elephant conflict (HEC) is a pervasive conservation challenge impacting both human and elephant populations where their habitats overlap. Understanding the spatial dynamics of HEC through Species Distribution Models (SDMs) is crucial for devising effective mitigation strategies like proactive land-use planning. While maximum entropy (MaxEnt) models have been widely used, comparative assessments of alternative SDMs remain limited. This study evaluates the performance of five SDMs-generalized linear model (GLM), generalized additive model (GAM), gradient boosting machines (GBM), random forest (RF), and MaxEnt-alongside three ensemble approaches (mean, median, and weighted mean) to predict HEC risk in two regions of Thailand using eight environmental variables. Ensemble models outperformed individual algorithms at predicting HEC risk, effectively mitigating the limitations of single-model approaches. Where ensembles are impractical, MaxEnt models demonstrated robust performance, offering a viable alternative to the overly conservative RF and GBM models. Variable importance analysis revealed context-specific drivers of HEC, with water-related factors being more influential in one study site than the other. These insights highlight the need for adaptive strategies tailored to local conditions. The resulting risk maps provide a crucial foundation for targeted HEC mitigation and inform policy development aimed at fostering human-elephant coexistence. © 2025 The Authors.

M. Shah, O. Heise, P. Buss, L.-M. de Klerk-Lorist, S. Hetzer, J.-D. Haynes, T. Hildebrandt & M. Brecht

**Larger brains and relatively smaller cerebella in Asian elephants compared with African savanna elephants**

*PNAS Nexus 4 (2025) pgaf141*

**Abstract.** Elephants are the largest terrestrial animals, but our knowledge of their brains is limited. We studied brain size, proportions, and development in Asian and African savanna elephants. Specifically, we weighed, photographed, and analyzed postmortem magnetic resonance scans of elephant brains in addition to collecting elephant brain data from the literature. Despite their smaller body size, adult Asian female elephants have substantially and significantly heavier brains (mean 5,346 ± 916 g SD) than adult African savanna female elephants (mean 4,417 ± 593 g SD). In line with their larger body size, adult African savanna male elephants (mean 5,603 ± 1,159 g SD) have significantly heavier brains than African female elephants; the brain weight of the adult male Asian elephant remains unclear. Elephant brain weight increases similar to 3-fold postnatally. This postnatal increase is similar to that of the human brain but is larger than that seen in nonhuman primates. Asian elephants likely have more cerebral cortical gray matter than African ones; their cerebellum is relatively smaller (19.1% of total brain weight) than in African elephants (22.3%). Our data indicate a higher degree of encephalization in Asian than in African savanna elephants. The massive postnatal brain growth of elephants is likely related to prolonged adolescence and the important role of experience in elephant life history. © The Authors 2025.

A. Shahid, S. Iqbal & O. Ilyas

**Bridging borders: Insights into the human-elephant dynamics in the Palamau Tiger Reserve**

*Mammal Study 50 (2025) 73-82*

**Abstract.** No permission to print abstract.

C.P. Sharma, D. Bhatia & R. Singh
**Revealing ivory origin: A novel ATR-FTIR spectroscopic and chemometric approach to distinguish Asian and African variants**
*Science of Nature 112 (2025) e55*
**Abstract.** No permission to print abstract.

C.P. Sharma, D. Bhatia & R. Singh
**Ivory or Bone? discrimination using ATR-FTIR spectroscopy and chemometrics**
*Science & Justice 65 (2025) e101261*
**Abstract.** No permission to print abstract.

K. Sharma, K.G.S. Balaji, G.K. Sharma, A.M. Pawde, S. Mahajan, R. Agrawal, P. Janmeda & K. Mathesh
**Targeted enrichment of elephant endotheliotropic herpesvirus for complete genome sequencing in elephants**
*Journal of Virological Methods 338 (2025) e115230*
**Abstract.** No permission to print abstract.

N. Sharma, S. Kohshima & R. Sukumar
**When the trumpet blows: Age-sex-related differences in the acoustic properties and contexts of high-frequency vocalizations of free-ranging Asian elephants**
*Mammalian Biology 105 (2025) 265-282*
**Abstract.** No permission to print abstract.

M. Shi, Y. Tian, Y. Tang, H. Li, J. Wang, Y. Ma, X. Liu, A. Campos-Arceiz, F. Chen & T. Lan
**Population genetics reveal potential threats from low maternal genetic diversity in wild Asian elephants in China**
*Global Ecology and Conserv. 58 (2025) e03503*
**Abstract.** In China, wild Asian elephants are primarily distributed in three prefectures in Southwest Yunnan, along the border with Laos and Myanmar. These elephants occur in small, fragmented populations and face significant threats from habitat loss and fragmentation. Here, we successfully retrieved 48 mitochondrial genomes, including those from 35 wild Asian elephants in China and those from 13 captive Asian elephants, based on whole genome sequencing data to analyze their maternal population structure and genetic diversity. In addition, we extracted approximately 600 kb of non-coding genomic regions for a comparative analysis of the genetic structure between the nuclear and mitochondrial DNA. Wild Asian elephants in China exhibited extremely low genetic diversity compared to global populations, with only two haplotypes detected in the Chinese population. Despite limited mitochondrial haplotypes, the Xishuangbanna population maintains gene flow with external populations. In contrast, the genetic diversity in the Cangyuan population was even more severely limited, with no evidence of gene flow with the nearest populations in Myanmar. Given the close genetic relationship between the Cangyuan population and populations in other countries, the most promising strategy for introducing genetic diversity to rescue the Cangyuan population may involve translocating Asian elephants from other countries. This study provides a deeper understanding of the genetic status of wild Asian elephants in China and offers important insights for future conservation efforts in China and elsewhere. © 2025 The Authors.

A. Singh & H.N. Kumara
**Choosing crops over natural fodder: Feeding ecology of the Asian elephant *Elephas maximus* in the mosaics of agriculture fields with fragmented forests of South Bengal, India**
*Mammal Research 70 (2025) 255-266*
**Abstract.** No permission to print abstract.

P. Sinovas, C. Smith, S. Keath, N. Chantha, J. Kaden, S. Ith & A. Ball
**Giants in the landscape: Status, genetic diversity, habitat suitability and conservation implications for a fragmented Asian elephant (*Elephas maximus*) population in Cambodia**
*Peerj 13 (2025) e18932*
**Abstract.** Asian elephant populations are declining and increasingly fragmented across their range. In Cambodia, the Prey Lang Extended Landscape (PLEL) represents a vast expanse of lowland evergreen and semi-evergreen forest with potential to support Asian elephant population recovery in the country. To inform effective landscape-level conservation planning, this study provides the first robust population size estimate for Asian elephants in PLEL, based on non-invasive genetic sampling during the 2020-2021 dry season in three protected areas: Prey Lang, Preah Roka and Chhaeb Wildlife Sanctuaries. Further, it provides an assessment of the

species' range, habitat suitability and connectivity within the landscape using Maxent and Fuzzy suitability models. Thirty-five unique genotypes (individual elephants) were identified, of which six were detected in both Preah Roka and Chhaeb Wildlife Sanctuaries, providing evidence that elephants move readily between these neighbouring protected areas. However, no unique genotypes were shared between Preah Roka/Chhaeb and the less functionally connected southerly Prey Lang Wildlife Sanctuary. The estimated population size in the southern population was 31 (95% CI [24-41]) individuals. The northern population of Preah Roka/Chhaeb Wildlife Sanctuaries is estimated to number 20 (95% CI [13-22]) individuals. Habitat loss is prevalent across the landscape and connectivity outside of the protected areas is very limited; however, large swathes of suitable elephant habitat remain. As the landscape holds the potential to be restored to a national stronghold for this flagship species, in turn resulting in the protection of a vast array of biodiversity, we recommend protection of remaining suitable habitat and reduction of threats and disturbance to elephants within these areas as top priorities. Our study offers a model for integrated elephant population and landscape-level habitat modelling that can serve to guide similar research and management efforts in other landscapes. © 2025 The Authors.

T. Sittisak, T. Guntawang, S. Srivorakul, K. Photichai, A. Muenthaisong, A. Rittipornlertrak, V. Kochagul, N. Khamluang, N. Sthitmatee, P. Chuammitri, C. Thitaram, W.-L. Hsu & K. Pringproa

**Evaluation of the immunogenicity of elephant endotheliotropic herpesvirus glycoprotein B (EEHV-gB) subunit vaccines in a mouse model**

*Acta Tropica 263 (2025) e107571*

**Abstract.** No permission to print abstract.

O.K. Sreehari, R.M. Jose, D.B. Menon, M.K. Saranya & T.R. Anilkumar

**Comparative analysis of faecal bacteria in captive Asian elephants of various age groups and musth**

*Indian J. of Microbiology 65 (2025) 1225-1233*

**Abstract.** No permission to print abstract.

M. Szczygielska

**Animating Capture: A microhistory of elephant mobility**

*Osiris 40 (2025) 19-39*

**Abstract.** No permission to print abstract.

M. Szydlowski

**Is your elephant happy? Mahout identification and description of elephant affective states in Nepal**

*Anthrozoos 38 (2025) 17-37*

**Abstract.** The health and welfare of working elephants is directly related to that of their mahout and to the strength and duration of elephant-human bonds. Such bonds are influenced by the ways in which mahouts understand, describe, and respond to elephant communication and dynamic elephant affective states. This study examined how mahout interpretation of elephant communication and affective states influences mahout behavior during interactions and thus influences the development and maintenance of elephant-human working and living relationships. Using in-person, semi-structured interviews with owners and mahouts, biographical and employment data on mahouts and elephants were collected. These interviews were followed by multispecies ethnographic data collection and participant observations among 41 mahouts and 29 elephants. Narrative analysis of mahout interviews, coupled with observations of mahouts and elephants, resulted in the identification of several themes that mahouts felt impacted the elephant-human working relationship, all tied to the development and nurturing of long-term bonds. The first set of themes that emerged is discussed in this paper, which includes "measures of elephant happiness" and "methods of communication." Identifying these themes was crucial to understanding how humans and elephants build and maintain long-term bonds, as well as determining how these bonds (or their breakage) affect working relationships. Communication and bond building may be key to improving the health, welfare, and working conditions for marginalized groups of humans and elephants employed in tourism practice. © 2025. The Authors.

J. Terborgh, L. Ong, L.C. Davenport, W.H. Tan, A.S. Mena, K. McConkey & A. Campos-Arceiz

**Release of tree species diversity follows loss of elephants from evergreen tropical forests**
*Proceedings of the Royal Society B-Biological Sciences 292(2025) e20242026*
**Abstract.** We report on a decade of research on elephant impacts in equatorial evergreen forests in Gabon and Malaysia, comparing sites with (+) and without (-) elephants and documenting major differences in forest structure, tree species composition and tree species diversity. In both regions, we compared sites supporting natural densities of elephants with otherwise undisturbed sites from which elephants had been absent for several decades. Elephant (+) sites supported low densities of seedlings and saplings relative to elephant (-) sites. In Lope National Park, Gabon, 88% of saplings and small trees (<20 cm dbh) were of species avoided by elephants, implicating forest elephants as powerful filters in tree recruitment. In Malaysia, Asian elephants showed strong preferences for monocots over dicots, as we found through both indirect and direct means. Loss of elephants from both Asian and African forests releases diversity from top-down pressure, as preferred forage species increase in abundance, leading to increased density of small stems and tree species diversity. In contrast, loss of other major functional groups of animals, including top carnivores, seed predators and seed dispersers, often results in negative impacts on tree diversity.


L. Wan, G. Liu & X. Su
**Evaluating the socioeconomic and psychological implications of human-wildlife conflict within protected areas in China**
*Ecological Frontiers 45 (2025) 693-700*
**Abstract.** No permission to print abstract.

J. Wang, X. Li, W. Duan, Y. Tian, R. Han, D. Meng, W. Wang & D. Wen
**Multi-scale habitat selection and constraints of a small Asian elephant population in Yunnan Nangunhe National Nature Reserve, China**
*Global Ecology and Conserv. 60 (2025) e03616*
**Abstract.** The Asian elephant populations in Yunnan Nangunhe National Nature Reserve (NNNR) represents the smallest known population in China and geographically isolated from other Asian elephant populations, potentially leading to their gradual extinction over time. Therefore, multi-scale habitat selection and habitat suitability analyses were conducted in this study to understand the key factors influencing the distribution of this population by employing camera-trap monitoring, unmanned aerial survey, and species distribution models. The results showed that elephant groups and solitary elephants exhibited strong selectivity for most habitat factors above 800 m, with elephant groups demonstrating higher vegetation requirements than solitary elephants. There are relatively few areas in NNNR where the habitat suitability for elephant groups and solitary elephants was good and high, primarily located in valley areas near rivers. The primary factors limiting their distribution were the presence of complex terrain and roads in large spaces surrounding the study area. Therefore, facilitating movement and genetic exchange between Asian elephants in this area and other populations by constructing corridors is challenging. Furthermore, based on the findings, it is advisable to adopt ex situ conservation to improve the population development of Asian elephants in NNNR. The insights gained from this research provide valuable guidance for the effective conservation and management of Asian elephants, contributing to their long-term survival and the preservation of biodiversity in the region.


Z. Wang, H. Du, E. Yang, Z. Chang, Y. Xue, M. Zhang, F. Chen, C. Xiong & C. Gao
**Analysis of spatial drivers in human-elephant conflict within human-dominated landscapes of Xishuangbanna, Yunnan Province**
*Journal of Environmental Management 389 (2025) e126156*
**Abstract.** No permission to print abstract.

F. Xie, X. Zhang, J. Zhang, F. Chen & H. Fan
**Interannual dynamics of China's wild elephant habitat revealed by Landsat-based time series land cover and meta-analysis derived habitat preferences**
*Landscape Ecology 40 (2025) e134*
**Abstract.** A long-term and highly dynamic understanding of terrestrial habitats is of extreme importance for enhancing wildlife conservation, habitat management, human-wildlife conflict

mitigation in a timely manner. Currently, however, fine-resolution, multi-decade, and interannual habitat mapping remains rare due to high costs and data scarcity of wildlife presence/absence data. Moreover, the existing land cover datasets used for habitat mapping have high uncertainty in classification systems, which tend to lead to uneven spatial and discontinuous temporal domains. This study aims to explore an ensemble method of long-term annual habitat mapping by integrating yearly land cover maps and wildlife habitat preferences derived by a meta-analysis, and to reveal interannual changes in habitat of China's wild elephant in the context of rapid economic development. Our work innovatively integrates long-term multi-temporal land use/cover data with multi-source environmental factors and applies meta-analysis techniques to overcome habitat mapping and change detection challenges. Random forest (RF) models and hidden Markov model (HMM) were used to produce a highly-accurate annual land cover dataset based on Landsat time series images from 1988 to 2020. Combined with the meta-analysis-derived habitat preferences of wild elephants and multi-temporal remote sensed environmental factors, yearly habitat maps were generated by calculating the habitat suitability index (HSI). The results indicated that the elephant habitat decreased significantly, by 4135.93 $km^2$ in their current range from 1988-2020. The area of habitat loss reached approximately 24.32% (1533.33 $km^2$) and 19.04% (2602.20 $km^2$) in the elephants' native (in the late 1980s) and newly expanded ranges, respectively. Moreover, the degree of habitat fragmentation was higher in the newly expanded range than in the native range. Over the past 33 years, habitat degradation mainly occurred before 2008 in the native range and after 2008 in the newly expanded range. These findings demonstrated that the degree and process of wild elephants' habitat reduction were distinctly different between the native and newly expanded ranges; this highlights the need for different habitat conservation and management policies for different regions. © 2025 The Authors.

Z. Xiong & Y. Wang
**Ambivalent or beneficial? An ecolinguistic study of news reports on the northward migration of a herd of Asian elephants**
*Social Semiotics 35 (2025) 36-53*
**Abstract.** No permission to print abstract.

B. Xu, X. Zhang, J. Zhang & H. Fan
**Reciprocal regulation between rural settlement expansion and human-elephant conflict in China's wild elephant range**
*Geography and Sustainability 6 (2025) 100238*
**Abstract.** Human-wildlife conflict (HWC) and its socioeconomic impacts are a pressing global issue. Accurately quantifying HWCs and their interaction with residential development is crucial for rural revitalization and biodiversity conservation efforts. This study investigates the interplay between rural residential expansion (RRE) with human- elephant conflict (HEC) in southern Yunnan Province using high-accuracy yearly land use/land cover data and Asian elephant accident data. A piecewise regression along with several metrics, including expansion intensity, rate of rural residential land, and residential density, were employed to analyze the spatial-temporal change characteristics of RRE. Then, a geographical detector and a bivariate spatial autocorrelation model were used to reveal the driving mechanisms of RRE, with particular emphasis on the spatial relations between RRE and HECs. The results indicate that HECs had a significant negative impact on RRE, exhibiting higher expansion intensity and rate of rural residential land in non-HEC areas than in HEC areas. High spatiotemporal consistency between accelerated RRE and intensified HECs occurred from 2010 onwards, which aligns with the year when the trend of settlement area expansion changed. RRE activities and ensuing land use conversions led to increased occurrences of HECs, which negatively affected the RRE. Compared to HECs, topography and locational factors exhibited a secondary effect on RRE activities. The findings underscore reciprocal feedback mechanisms between RRE and HECs and the elevated risk of adverse interactions between humans and elephants within the range of China's wild elephants, providing theoretical support for coordinating conservation initiatives for Asian elephants with rural revitalization in the border areas of Southwest China. © 2024 The Authors.

Y. Yang, N. Kittisirikul, W. Langkaphin, T. Angkawanish, P. Comizzoli & K. Chatdarong

**Differentiating the estrous cycle phases using vaginal vestibule pH and cytology in Asian elephants (*Elephas maximus*) in human care**
*Veterinary Journal 311 (2025) e106324*
**Abstract.** No permission to print abstract.

Z. Yang, Y. Wang, Y. Wang, J. Zhou, R. Wang, M. Shi, M. Bao, B. Wang & R. Yuan
**Analysis on gut microbiota diversity of wild Asian elephants (*Elephas maximus*) from three regions of Yunnan Province**
*Scientific Reports 15 (2025) e20692*
**Abstract.** Studying the gut microbiome diversity of Asian elephants is crucial for understanding their environmental adaptability, health status, and conservation needs. In this study, high-throughput sequencing of the 16S rRNA gene was utilized to analyze and compare the microbial community composition and diversity of 50 wild Asian elephants from three regions in Yunnan Province. The results indicated significant differences in gut microbiome richness among the regions, and the lowest diversity observed in the Lincang region. Principal coordinate analysis (PCoA) revealed that the microbial community structure of the Lincang population was markedly different from that of the other two regions. At the phylum level, Firmicutes, Proteobacteria, and Bacteroidetes were the dominant bacterial groups across all three regions. However, in the Lincang region, the abundance of Proteobacteria was the highest and significantly greater than in the other regions. Additionally, the levels of potential pathogenic bacteria, such as Acinetobacter and Stenotrophomonas, were significantly elevated in the Lincang population compared to the other two regions. Therefore, future conservation efforts need to integrate ecological restoration with microbiome monitoring to mitigate the microbial dysbiosis caused by human disturbances. © 2025 The Authors.

X. Yun, J. Wang, X. Li, B. Wang, S. Yang, D. Wen, W. Wang & R. Han
**Unraveling the genetic diversity of Asian elephants (*Elephas maximus*) in China: Implications for the conservation of Asian elephants**
*Ecology and Evolution 15 (2025) e72498*
**Abstract.** The Asian elephant, a crucial flagship and umbrella species in forest ecosystems, possesses significant conservation value. However, it has been categorized as endangered due to several factors, including land use change, human disturbance, and climate change. To evaluate the genetic diversity of Chinese elephant populations and provide a scientific basis for the establishment of the Asian Elephant National Park, microsatellite and mitochondrial DNA (mtDNA) analyses were conducted on seven populations distributed across Yunnan Province, China. A total of 121 unique genotypes and five mtDNA haplotypes were identified. The results revealed that all populations exhibited varying degrees of inbreeding, with the Mengla population showing the highest inbreeding levels. Significant genetic differentiation was observed between the Mengla and other populations. Interestingly, the Yexianggu population exhibits relatively high genetic diversity despite having undergone a population bottleneck and exhibited significant heterozygote excess. Nevertheless, the overall genetic diversity of Chinese elephants remains relatively low compared to that of populations in other countries. To ensure the long-term viability of the Nangunhe population, it is imperative to facilitate gene flow between this and other populations. Finally, based on geographic subdivision analysis, we propose that the seven populations should be considered as three conservation management units, namely unit 1 (Nangunhe), unit 2 (Mengla), and unit 3 (Yexianggu, Mengman, Puwen, Kongge, and Menga). This study provides a solid reference for the scientific conservation of the Asian elephant in the future. © 2025 The Authors.

X. Zhang, A. Campos-Arceiz, F. Chen, W. Yin, F. Xie, J. Zhang & H. Fan
**Reversing net loss but aggravating fragmentation of habitat in the global Asian elephant range in the mid-2010s**
*Biological Conservation 307 (2025) e111189*
**Abstract.** No permission to print abstract.

J. Zhu, M. Hou, S. Zhang, X. Yan & L. Tang
**The first morphological and molecular identification of *Quilonia* sp. (Nematoda: Strongylidae) from wild Asian elephant (*Elephas maximus*) in China**
*Veterinary Research Communications 49 (2025) e98*
**Abstract.** No permission to print abstract.

## Instructions for Contributors

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**References** should be indicated in the text by the surnames(s) of the author(s) with the year of publication as in this example: (Olivier 1978 ; Baskaran & Desai 1996; Rajapaksha *et al*. 2004) Avoid if possible, citing references which are hard to access (e.g. reports, unpublished theses). Format citations in the 'References' section as in the following examples, writing out journal titles in full.

Baskaran N & Desai AA (1996) Ranging behavior of the Asian elephant (*Elephas maximus*) in the Nilgiri biosphere reserve, South India. *Gajah* **15:** 41-57.

Olivier RCD (1978) *On the Ecology of the Asian Elephant*. Ph.D. thesis, University of Cambridge, Cambridge, UK.

Rajapaksha RC, Mendis GUSP & Wijesinghe CG (2004) Management of Pinnawela elephants in musth period. In: *Endangered Elephants, Past Present and Future*. Jayewardene J (ed) Biodiversity & Elephant Conservation Trust, Colombo, Sri Lanka. pp 182-183.

Sukumar R (1989) *The Asian Elephant: Ecology and Management*. Cambridge Univ. Press, Cambridge, UK.

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# GAJAH

NUMBER 59
2025

ISSN (Online) 2773-6989
ISSN (Print) 1391-1996

## Journal of the Asian Elephant Specialist Group

DOI: 10.2305/SJDF1602

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Gajah 59 (2025)