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News and Briefs
Gajah 59 (2025) 86-114

Recent Publications on Asian Elephants

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

[1]*Elephant Care International, Hohenwald, TN, USA*
[2]*Department of Evolutionary Anthropology, University of Zürich, Zürich, Switzerland*
[3]*Centre for Conservation and Research, Tissamaharama, Sri Lanka*
**Corresponding author's e-mail: smikota@elephantcare.org*

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.

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.

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.

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.

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.

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.

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.

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.

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.

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 nonlinear 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.

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 sea-

sons 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. © 2025 The Authors.

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.

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 μm^3 and parts of the hemisphere with a resolution of 26 μm^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.

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 *Kililuma 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 *Kililuma* 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.

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.

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.

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, inter-calving 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.

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.

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.

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 dif-

fer. 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.

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.

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. © 2025 The Authors.

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. © 2025 The Authors.

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.

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.