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CHAPTER 18

Status, threats, and conservation strategies for Bornean elephants in Sabah

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Abstract: Once widespread, the Bornean elephant is now confined to fragmented landscapes in Central Sabah, Tabin, and the Lower Kinabatangan, with an estimated population of about 1,000 individuals. Habitat loss and fragmentation, driven by deforestation, agricultural expansion, and infrastructure development, remain the primary threats, alongside human -elephant conflict, poaching, and poisoning. The paper synthesises current knowledge on elephant ecology, distribution, and population trends, and highlights key conservation interventions, including ecological corridors, joint patrols, landscape-level conflict management, and community-based initiatives. A case study from the Tabin landscape demonstrates the effectiveness of multi-stakeholder collaboration in reducing conflict and improving coexistence. The manuscript concludes with policy recommendations to strengthen certification frameworks, integrate biodiversity safeguards into infrastructure planning, and enhance habitat connectivity to secure the long-term survival of Bornean elephants.

INTRODUCTION

The Bornean elephant—the smallest and perhaps the most elusive of all Asian elephant subspecies—roams only through the northeastern landscapes of Borneo. Once widespread across the island's lush lowland forests, they are currently confined mainly to Central Sabah, Tabin, and the Lower Kinabatangan, with a small population reaching into North Kalimantan. Their present distribution has been reshaped by deforestation, expanding agriculture, and infrastructure development, which have reduced and fragmented their habitats and pushed them into closer contact with people.

Today, only about a thousand Bornean elephants remain, their survival threatened by habitat loss, fragmentation, human-elephant conflict, and poaching. Yet amid these challenges, conservation partners, government agencies, plantation owners, and local communities are working together to manage human-elephant conflict, reconnect forest landscapes, strengthen patrols, and implement joint management strategies in their efforts to protect this iconic species and nurture a future where people and elephants coexist in a shared and resilient landscape.

Taxonomy

Bornean elephants are generally smaller, with distinct skull features compared to those from Sumatra and mainland Asia (McLean *et al.* 2024). Genetic analyses indicate they belong to an ancient lineage isolated for over 300,000 years (Fernando *et al*. 2003; Sharma *et al.* 2018). The Bornean elephant (*Elephas maximus borneensis*) is now recognised as a unique subspecies of the Asian elephant, distinct from its mainland relatives due to its physical and genetic characteristics (McLean *et al.* 2024).

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Legal status and protection

The Bornean elephant was recently listed as Endangered on the IUCN Red List of Threatened Species, highlighting its dwindling numbers and small population size (McLean *et al.* 2024). In Sabah, the species is afforded the highest level of protection under Schedule 1 of the Wildlife Conservation Enactment 1997, which strictly prohibits hunting, capturing, or killing. Offences involving the killing or possession of elephant parts, such as tusks, skin, or bones, carry severe penalties, including fines ranging from RM50,000 to RM250,000 and imprisonment of six months to five years (Sabah Wildlife Department 2020).

DISTRIBUTION AND POPULATION SIZE

The Bornean Elephant is found only in the northeastern part of Borneo, spanning the border between Sabah, Malaysia, and North Kalimantan, Indonesia. In Sabah, long-term satellite tracking has revealed that these elephants primarily occupy three Managed Elephant Ranges (MERs): the Lower Kinabatangan, Tabin, and Central Sabah (Cheah *et al.* 2022; Sabah Wildlife Department 2020; Figure 1), with a smaller population extending into North Kalimantan (Sukmantoro *et al.* 2021).

Their distribution appears linked to the availability of essential minerals like kaolin clay, which they consume to detoxify plant matter (Payne *et al.* 2020). However, decades of human expansion and land-use change have greatly reduced and fragmented their habitat, confining elephants to smaller, isolated areas, resulting in the loss of more than 60% of their historical range over the past 40 years (Gaveau *et al.* 2014; Sabah Wildlife Department 2020). Today, their remaining habitat covers roughly 30,600 km^2, with only about 15,200 km^2 actually occupied by elephants (McLean *et al.* 2024).

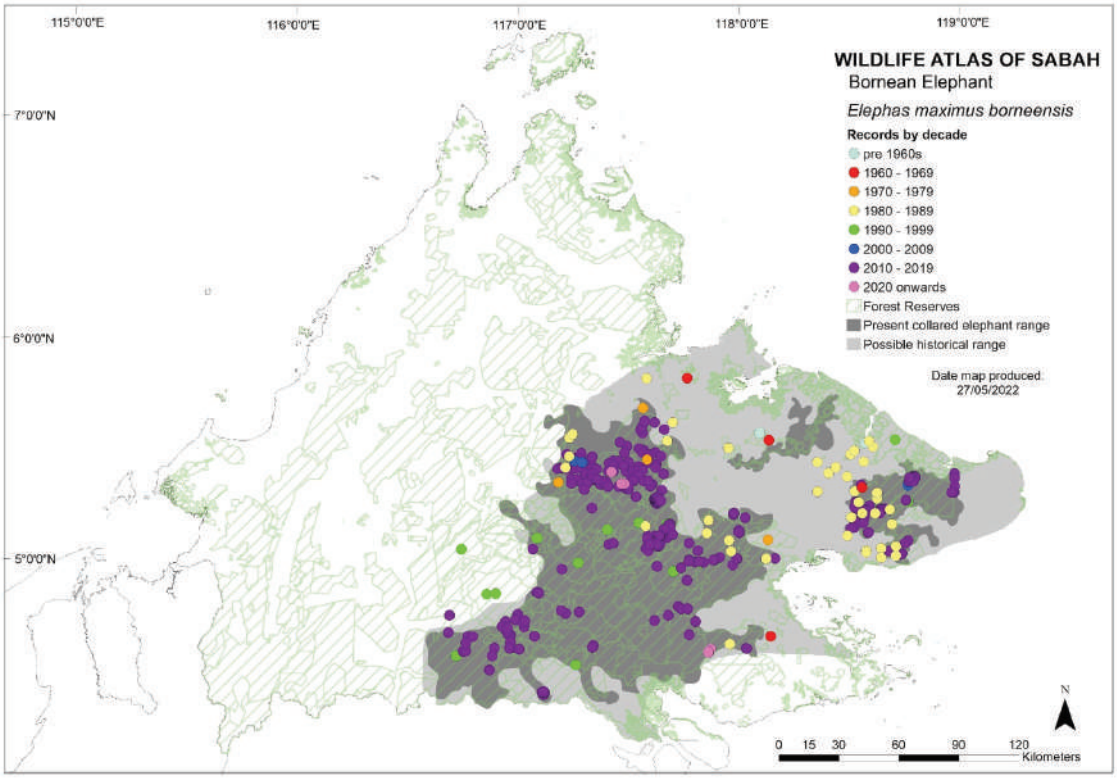

Figure 1. Probable historical range and present range of the Bornean Elephant in Sabah (Source: Cheah *et al.* 2022).

In the early 1990s, Payne and Andau (1991) provided the first population estimate of Bornean elephants in Sabah, suggesting between 500 and 2,000 individuals based on limited field data and questionnaire surveys. Since then, more robust survey methods, including distance sampling and dung count techniques, have produced more reliable estimates. The latest Red List assessment in 2023 estimated approximately 1,000 elephants remaining across their MERs, with a small transboundary group of about 12 individuals in Northeast Kalimantan (McLean *et al.* 2024). The assessment reports around 541 elephants in Central Sabah (Cheah and Yoganand 2022; McLean *et al.* 2024), 245 in Tabin (Andau 1997), and about 200 in the Lower Kinabatangan range (McLean *et al*. 2024). Although the early and current figures are not directly comparable due to differences in methodology, recent mortality data raise concern. Between 2010 and mid-2019, Sabah recorded at least 131 elephant deaths—a staggering loss that represents about 13% of the entire population in less than a decade (Sabah Wildlife Department 2020).

HABITAT AND ECOLOGY

Bornean elephants primarily inhabit low-lying areas where movement is less constrained, generally avoiding steep and rugged terrain. Studies by Evans *et al.* (2018) and de la Torre *et al*. (2022) indicate that they show a preference for secondary forests, forest gaps, regenerating areas, and newly established plantations. Interestingly, elephants are mostly found outside protected areas (PAs), often inhabiting landscapes along the peripheries (de la Torre *et al.* 2022). They primarily feed on grasses and bamboos from the Poaceae family, which thrive in riverine and open grassland habitats, along with palms and gingers (English *et al.* 2014). They are also known to consume young oil palm shoots, the pith of felled palms, and various cultivated fruits (Othman *et al.* 2019; Cheah *et al.* 2022). This adaptable yet opportunistic feeding behaviour often brings them into conflict with people. Bornean elephants have vast home ranges, averaging between 150 to 200 km^2 (Evans *et al.* 2020), reflecting their need for large, connected habitats to meet their ecological needs.

MAJOR THREATS

The Bornean Elephant Action Plan (2020 – 2029) highlights four major threats to the subspecies in Sabah: habitat loss and fragmentation, retaliatory killings linked to human -elephant conflict (HEC), poisoning, and poaching for ivory (Sabah Wildlife Department 2020). Habitat loss remains a significant concern. The ongoing Pan Borneo Highway, for example, cuts through key elephant habitat within the Central Sabah MER, further isolating sub-populations and heightening risks of vehicle collisions and poaching (Othman *et al.* 2019). Retaliatory killings often arise when elephants venture into oil palm landscapes.

Efforts to reduce such conflicts, like translocation or the installation of electric fences by individual plantation companies, often restrict elephant movements, exacerbating long-term conflict. Meanwhile, local communities lacking the means for costly preventive measures sometimes resort to killing elephants as an immediate solution. Poisoning may be deliberate or unintentional due to potential chronic exposure to agricultural chemicals in plantations where elephants forage (McLean *et al.* 2024). Poaching for ivory has become an increasing concern, with reports of tusks being smuggled from Sabah to Kalimantan, where they are prized as traditional wedding dowries among Indonesian Timorese communities (Sukmantoro and Suyitno 2023).

CONSERVATION INITIATIVES

Reducing further habitat loss and fragmentation

Government agencies, plantation owners, and conservation NGOs have collaborated to create ecological corridors in oil palm landscapes to facilitate elephant movement between fragmented habitats (Othman *et al.* 2019; Cheah *et al*. 2021). Sabah Softwoods Berhad (SSB) exemplifies this approach, setting aside 1,067 hectares in 2012 to connect the Ulu Kalumpang and Ulu Segama forest reserves. With WWF-Malaysia's support, SSB implemented strategic fencing to protect vulnerable areas while allowing elephant access elsewhere. This coexistence strategy effectively reduced conflicts and costs by more than 90% (Cheah *et al*. 2021, 2022).

Combatting poaching and smuggling

To curb elephant poaching, government agencies and NGOs in Sabah have initiated joint patrols and task forces to improve coordination and intelligence sharing. The Sabah Wildlife Department (SWD) has also established an intelligence unit to strengthen enforcement (Cheah *et al.* 2022) and launched a 10-Year Action Plan on Combating Wildlife Crime for Sabah (2024–2035) focused on law enforcement, interagency collaboration, and sustainable conservation to combat wildlife crime (Sabah Wildlife Department 2024). Furthermore, wildlife protection has been greatly strengthened through the use of the SMART Mobile application, enabling SWD to establish a standardised method to monitor poaching incidents and identify wildlife crime hotspots with greater accuracy.

Management of HEC at the landscape level

Landscape-level working groups comprising multiple stakeholders have been formed to implement joint strategies (Cheah *et al*. 2021: Othman *et al*. 2022). Achieving coexistence with elephants requires collaboration with the agricultural sector for improved land-use planning and strong community engagement to empower people to live alongside elephants and to become active stewards of conservation. As many plantations undergo replanting, coordinated electric fencing and spatial planning are vital, alongside community-based initiatives such as those established in Kinabatangan (Cheah *et al*. 2022).

CASE STUDY

A landscape approach to managing human-elephant conflict and fostering coexistence

In 2021, a multi-stakeholder working group was established in the eastern part of Sabah's Tabin Landscape to manage HEC through collaborative action. The group, comprising the Lahad Datu District Office, SWD, Sabah Forestry Department, other government agencies, plantation companies, community representatives, and WWF-Malaysia, focused on coordinating a joint electric fencing initiative among neighbouring plantations. This initiative has since reached 95% completion, with efforts now centred on fence maintenance to ensure long-term effectiveness.

At the same time, a community-based voluntary team was formed in Kg. Teburi, with technical support from SWD and WWF. The team is tasked with safely diverting elephants to forested areas and receives training from SWD and WWF to enhance communication and safety in the field. To support their work, siren fences were installed at key conflict hotspots, providing early warnings of elephant presence. Awareness programmes were also held to help local communities better understand elephant behaviour and adopt safer practices.

An annual perception survey conducted in Kg. Teburi has shown encouraging results. In 2024, community members reported a stronger sense of safety and a more positive outlook on coexistence, with 30% agreeing it is achievable—up from just 7% in 2023 (Nahun 2024). Some respondents credited the joint electric fencing initiative among plantations for reducing the frequency of elephants entering community areas. These outcomes demonstrate the value of a landscape approach and continued community engagement in fostering human-elephant coexistence in the Tabin Landscape.

CHALLENGES AND OPPORTUNITIES

Challenges

Investigating the cause of elephant deaths suspected to be from chronic poisoning remains a major challenge. The wide-ranging movement of elephants and the multitude of chemicals used in plantations make it difficult to pinpoint the source of toxins. Although cadmium was detected in elephant carcasses in 2021, authorities have yet to identify its origin (Vanar 2021).

The HEC situation is currently further complicated by the ongoing replanting phase in many oil palm estates, where newly established palms are vulnerable to elephant damage. Without proper land-use planning at the landscape level and proper maintenance of electric fences, conflicts are likely to intensify. A study by Othman *et al.* (2022) found that current plantation certification standards fall short in guiding companies on managing HEC effectively. In some cases, auditors interpret any elephant deaths on estates as non-compliance, potentially jeopardizing a company's certification status (Othman *et al.* 2022). Moreover, the high operational costs associated with preventing crop damage in newly replanted areas discourage plantation companies from accommodating elephants within their landscapes.

Meanwhile, infrastructure projects such as the Pan Borneo Highway, while promising socio-economic growth, also threaten key elephant habitats. Conservation experts are often consulted too late in the project cycle, as seen in Phase 1B of the highway through Tawai Forest Reserve; by the time advice was sought, critical mitigation measures could no longer be integrated due to finalised budgets and alignments.

Opportunities

Despite the growing challenges, there remain promising opportunities to balance biodiversity conservation with human development. A recent advance is the release of the *Handbook to Mitigate the Impacts of Roads and Railways on Asian Elephants* (Dodd *et al.* 2024). Launched during a multi-stakeholder workshop in Sabah (Cheah 2025), the handbook outlines detailed design guidelines for elephant-friendly infrastructure such as viaducts, overpasses and bridges. With these technical references now available, infrastructure planners and engineers can work hand in hand with conservation NGOs, research institutions, companies, communities, and multi-sectoral government agencies to strategically place wildlife crossings and enhance their effectiveness as safe elephant passages.

Conservation NGOs and plantations are also exploring innovative coexistence measures, such as habitat enrichment or "elephant food banks". One pioneering project by Bringing Back Our Rare Animals (BORA) established 20 hectares of nutrient-rich grass along the periphery of the Tabin Wildlife Reserve to attract elephants away from nearby oil palm estates. By providing supplementary food and minerals, such initiatives may help reduce crop damage by elephants.

Conservation-based tourism offers a promising pathway for coexistence. In the Lower Kinabatangan, elephants frequently feed along riverbanks at dusk, providing exceptional wildlife-viewing opportunities for visitors (Othman *et al.* 2019). When managed responsibly, such tourism can create local jobs and generate income to help offset losses from crop and property damage. However, clear guidelines and best practices need to be developed with the tourism industry to ensure the safety of people as well as to minimise disturbance to elephants and other wildlife.

POLICY RECOMMENDATIONS

Enhancing the role of certification bodies in managing HEC

The Roundtable on Sustainable Palm Oil (RSPO) and Malaysian Sustainable Palm Oil (MSPO) certification have guided the palm oil industry toward greater sustainability by promoting stronger environmental stewardship, social responsibility, and improved management systems. However, their effectiveness ultimately depends on robust implementation and enforcement. Despite more than a decade of certification, HEC continues to occur within certified areas, demonstrating that standards alone cannot resolve such complex challenges.

Nonetheless, these certification bodies remain critical in transforming industry practices. Through closer collaboration with NGOs and government agencies, they can strengthen compliance such as ensuring that oil palm plantation companies notify wildlife authorities before replanting or installing electric fences, as such activities can exacerbate the conflict situation. Compliance frameworks should also recognise proactive efforts by landowners to make their landscapes wildlife-friendly, such as restoring riparian areas, sealing open pits or any areas that may endanger elephants, storing chemicals safely, and following guidelines when encountering elephants. Additionally, training auditors to identify persistent HEC risks will help ensure plantations adopt wildlife-friendly practices and reduce conflict more effectively.

Embedding biodiversity safeguards in road infrastructure planning

For future infrastructure projects, it is crucial to embed the mitigation hierarchy within development policies to ensure roads and highways are elephant-friendly, climate-resilient, and cost-effective. Where avoidance of sensitive habitats is impossible, impacts must be minimised by realigning routes or incorporating wildlife-friendly designs such as viaducts and underpasses to mitigate the impacts. Cost-benefit analyses should be conducted at the feasibility study stage to ensure that environmental, climate change, social, and economic considerations are fully integrated. This is to ensure that a project's benefits truly outweigh its costs. Lessons from Phase 1B of the Pan Borneo Highway highlight the need for biodiversity safeguards to be included at the earliest planning and budgeting stages, not as an afterthought.

Connecting fragmented forests for long-term survival of elephants

Although Sabah retains more than 50% forest cover and aims for 30% Totally Protected Areas by 2025, many of these forests remain small and fragmented. Given the Bornean elephant's extensive range, and increasing drought risks due to climate change (Advani 2015), connecting these fragmented habitats through ecological corridors is vital to maintain genetic diversity and support climate adaptation. Strengthening habitat connectivity should therefore be a key conservation priority integrated into state policies. Private landowners can also play a pivotal role by setting aside land for corridors or providing access through riparian buffers (already a legal requirement) that link forest patches, ensuring the long-term survival of the Bornean elephant in a shared and changing landscape.

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