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CHAPTER 17

Asian elephants in Peninsular Malaysia

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Abstract: Peninsular Malaysia is considered as one of the strongholds for globally significant populations of wild Asian elephants (*Elephas maximus*), estimated around 1,223 – 1,677 individuals, that spread across seven states: Perak, Kelantan, Terengganu, Kedah, Negeri Sembilan, Pahang and Johor. In the past, wild elephants used to roam throughout Peninsular Malaysia, but at present only ~ 45% of the area still have wild elephants. The wild elephant populations are threatened by illegal killing (i.e. poaching, poisoning), human-elephant conflict, habitat lost and fragmentation that impedes elephant movement and result in vehicle collisions. Efforts by the Department of Wildlife and National Parks (PERHILITAN), academia, and non-profit organisations to manage threats to Asian elephants include collaboration and working with stakeholders on the ground to transform conflict to harmonious coexistence, and carry out education outreach, awareness, scientific research, and wildlife law enforcement. There are also wider efforts by other governmental agencies like the Forestry Department and PLANMalaysia to protect Peninsular Malaysia's remaining forest complexes and establish functional ecological linkages via the Central Forest Spine Masterplan. Continuous monitoring efforts on the ground and scientific research are needed to protect and elevate knowledge on Asian elephants' behaviour and ecology in the Sundaic region.

INTRODUCTION

There are only three extant species of elephants (Order Proboscidea, Family Elephantidae) globally, with two species in Africa, namely the African savanna elephant (*Loxodonta africana*) and African forest elephant (*Loxodonta cyclotis*), and one species in Asia, the Asian elephant (*Elephas maximus*). The Asian elephant is categorised into four recognised subspecies: the Sri Lankan elephant (*E. m. maximus*), the Indian elephant (*E. m. indicus*), the Sumatran elephant (*E. m. sumatranus*), and the Borneo elephant (*E. m. borneensis*). Historically, the Asian elephant's range covers the continent of Asia, from Turkey, Iraq and Iran in the West (Lister *et al.* 2013), and span across India, Indochina, southern China, and Southeast Asia (IUCN 2019). It is estimated that the Asian elephant has lost ~95% of its historical range and its wild populations are currently found across 13 countries in Asia, with transboundary shared populations (Sukumar 2003; Fernando and Pastorini 2011; IUCN 2019; Mahmood *et al*. 2021).

The Asian elephant (Figure 1) is listed as Endangered on IUCN Red List of Threatened Species, with an estimated number ~45,600 to 49,000 individuals globally (IUCN 2019). In Peninsular Malaysia, the population estimation is around 1,223 – 1,677 individuals distributed across 7 out of 11 states: Perak, Kelantan, Terengganu, Kedah, Negeri Sembilan, Pahang, and Johor (Saaban *et al.* 2011). Although this is considered a fairly acceptable number in terms of genetics for a long-term viable population, but it requires protecting connectivity between habitats to allow elephant movement and the acceptance of a harmonious human-elephant coexistence to minimise local extinction.

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Figure 1. A portrait of a male Asian elephant (Photo credit: K. Gukaaneswaran/MEME).

The IUCN SSC Asian Elephant Specialist Group (AsESG) monitors elephant ranging areas to assess the status of Asian elephants across range countries. In 2013 to 2015, a survey carried out in Peninsular Malaysia found a loss of 68% of elephant range in human-occupied areas within 40 years (one to two generations) (Tan 2016). A recent update of the elephant presences map with PERHILITAN and other stakeholders' data, expanded the 5km × 5km occupancy grid to include forested areas, found an overall estimation of ~45% area in Peninsular Malaysia that still harbour elephant presences (Salman Saaban *et al*., in review). Considering that, historically, the whole of Peninsular Malaysia has wild elephant presences, the reduction in roaming range is of concern. Currently, elephants are managed within dedicated Managed Elephant Ranges (MERs). These habitats are centred around three primary landscapes: the Belum-Temenggor, the Taman Negara-Greater Kenyir, and Endau-Rompin forest complexes (Department of Wildlife and National Parks 2023).

Globally, more effort is required to halt and reverse species extinction and the trend of wildlife population number loss as the biomass for wild mammals (including both terrestrial and marine) amount to just ~ 5% of the world's total biomass of mammals, compared to the

humans (~34%), cattle (~35%), pigs (~12%), buffaloes (~5%), goats (~3%), sheep (~3%), and horses (~2%) (Bar-On *et al.* 2018; Ritchie and Spooner 2025). As one of the world's biologically megadiverse countries, Malaysia harbours a rich diversity of wild species of flora and fauna, and has in the past and still much needed for the present and future, to shoulder important responsibilities towards the protection and conservation of Asian elephants, other wildlife, and their habitats.

Prehistoric elephants in Sundaic region or Sundaland

Genomic mapping of extinct and living elephants found exchange of genes between our living (modern) elephants and extinct ancestors such as the straight-tusked elephants (Genus *Palaeoloxodon*) and mammoths (Genus *Mammuthus*) (Palkopoulou *et al.* 2018). In Malaysia, most Proboscidea fossils recovered from archaeological sites were identified to be Genus *Elephas*, and although straight-tusked elephants' fossils were found in Thailand and Kalimantan, Indonesia but none were confirmed so far for Malaysia (Tshen 2013). Hence, the first discovery of a tooth belonging to *Stegodon* sp. (Order Proboscidea, Family Stegodontidae) at a limestone cave in Perak, deposited during the middle Pleistocene, has generated a lot of interest and excitement (Amiruddin *et al.* 2025). Further research is needed to identify the species and the paleoenvironment surrounding the *Stegodon*.

There has been prolonged debate on the state of environment during the Pleistocene in the Southeast Asia region, when the sea level is ~ 62 meter lower, and the land mass of Peninsular Malaysia is connected to Borneo, Philippines, Sumatra and Java islands, which is known as the Sundaic region or Sundaland (Woodruff 2010). Paleontology and paleoenvironment studies debated whether there was extensive grassland in the middle of the region known as the north-south savanna corridor (Bird *et al.* 2005; Louys and Roberts 2020), which was eventually taken over by rainforest, or was the region predominantly forest all along (Hamilton *et al*. 2024). Perhaps, a consensus would be that the environment is more heterogeneous than previously accepted, which then allowed the migration of hominin populations from the North into the region (Rabett 2017; Cheng *et al.* 2023). The repeated rising and lowering of sea level, and the expansion and recession of the forest during the Quaternary Period, spanning 2.6 million years ago, had influenced the landscape and biodiversity in Southeast Asia, especially in the Sundaland region (Woodruff 2010; Badam 2013; Sheldon *et al.* 2015).

Role of Asian elephants in the sundaic forest

The Asian elephant plays an important role in dispersing seeds of fruit trees (Figure 2), especially for large fleshy megafruits (width ≥ 40mm). In the recent decade, there has been studies in Peninsular Malaysia examining elephant's and other wildlife ecological role in dispersing seeds in the rainforest, especially in the Belum-Temengor Forest Complex in Perak (Terborgh *et al.* 2018; Ong *et al.* 2021, 2023; Tan *et al.* 2021). Long-term monitoring of fruit seeds in elephant dung by Management & Ecology of Malaysian Elephants (MEME) found that fruits in the rainforest are seasonal and sporadic sources of food for elephants and other wildlife (Tan *et al*. 2021). As generalists, Asian elephants in the rainforest and edge areas would consume leaves, bark and stems from monocots (i.e. grasses, palms and bamboos), pioneer plants, liana, and other plants (Yamamoto-Ebina *et al*. 2016; Terborgh *et al*. 2018; Ong 2021; Abdullah-Fauzi *et al*. 2022; Ong *et al.* 2023). By comparing herbivorous megafauna (> 500kg) from Pleistocene to the present day, to the presences of megafruit species across the larger tropical Asia region, the regional diversity of megafruit species is found to be positively related to megafaunal diversity in the area, both when considering extant megafauna species only and when including both extant and extinct megafaunal species (McConkey *et al.* 2022). Peninsular Malaysia is considered as one of the regions with high megafauna and high megafruit diversity (McConkey *et al*. 2022).



Figure 2. Fruit tree seedlings in Belum-Temengor forest germinating after dispersal by a wild elephant (Photo credit: MEME).

MANAGING THREATS TO ASIAN ELEPHANTS

Across the range countries, threats to Asian elephants include illegal killing, human-elephant conflict (HEC), habitat loss, and habitat fragmentation that impeded elephant movement and resulted in vehicle collisions with elephants. In Peninsular Malaysia, PERHILITAN has captured several poacher groups that specialised in hunting wild elephants and recorded cases of elephant poisoning, suspected due to retaliation caused by HEC. In terms of roadkill, annually the number of elephant-vehicle collisions fluctuates between zero to four cases. Research conducted using GPS satellite collars to monitor elephant movement at Gerik-Jeli highway found that roads bisecting forest can become a barrier to elephant movement (Wadey *et al*. 2018; Wong *et al.* 2018b). Although wildlife crossings can help facilitate the movement of elephants, wildlife may still cross directly over the road, and therefore it is important to instil awareness among drivers to slow down at wildlife corridors (Clements *et al*. 2014; Wong *et al.* 2018a; Ament *et al.* 2021).

Between 2015 and 2024, 175 elephant deaths were recorded (10 – 24 annually), with ~37% due to illegal killing, including poisoning and poaching. State of Perak registered the highest number of elephant fatality averaging 4.5 cases per year, followed by Johor with 4.3 cases per year, Kelantan 3.6 cases per year and others (Saaban *et al.* 2026). In the same period, HEC resulted in 19 human fatalities and 18 injuries, with PERHILITAN assisting victims and their families by facilitating compensation applications through the Social Welfare Department. There were 6,860 cases of HEC (2015 – 2024) with MYR65 million in losses, which averaged ~686 complaints annually (Saaban 2026). In 2024, the Ministry of Natural Resources and Environmental Sustainability expanded the HEC compensation scheme to cover crop and property damage (partially), and the scheme focused on independent smallholders and individual farmers.

As part of HEC mitigation measures, PERHILITAN will translocate elephants as the last resort in conflict areas to protected areas, and deploy other HEC mitigation measures such as trenches, electric fencing, and on-site guarding (Saaban *et al.* 2011; Department of Wildlife and National Parks 2023). Captive elephant management facilities are regulated by PERHILITAN under the Wildlife Conservation Act 2010 [Act 716] and the recorded number of captive elephants is 83 individuals (19 males and 64 females) spread across ten facilities including National Elephant Conservation Center (NECC) in Kuala Gandah, Pahang, other PERHILITAN managed facilities in Terengganu and Johor, and various zoos either managed by state local authorities or private. The captive elephants at NECC are trained to assist PERHILITAN in translocation of conflict elephants and are used for conservation education, awareness, and ecotourism. Recent research on AI-based surveillance systems using cameras, bioacoustics, and drones as early warning systems, are being explored to help alert nearby communities and workers in order to increase safety (Loo *et al*. 2024; Avicena *et al.* 2025). However, clear standard operating procedures and proper training are essential to ensure, once alerted of elephant presences, people do not approach the elephants on their own, as it may result in more injuries and fatalities.

MOVING TOWARDS COEXISTENCE WITH ELEPHANTS

Globally, there are interests to transform the narrative of HEC to human-elephant coexistence and examine the human-dimension of conflict using social sciences and psychology tools (IUCN 2023). Often, HEC is seen as a sensitive topic and ranks high in the concerns of affected stakeholders and government agencies. On the other hand, some communities living within the range of elephants or other wildlife roaming areas, may not view the presence of wildlife as conflict until being interviewed. Hence, the terminology of human -elephant coexistence or human-elephant interactions are often used to allow exploration of neutral and positive interactions between people and elephants without neglecting the negative interactions or the conflict aspect as well (Frank 2016; IUCN 2023). Very often, there needs to be consideration of potential human-human conflict that could emerge from past disputes or due to different goals between stakeholders resulting in disagreements (IUCN 2023).

In both Sabah (orang utans and elephants) and Peninsular Malaysia (elephants), efforts were made to work in collaboration with oil palm plantations to move towards biodiversity or wildlife-friendly plantations that foster safe human-wildlife coexistence (Saaban *et al.*, in review; Tan and Wong, in review). For Peninsular Malaysia, a coalition for Achieving Coexistence with Elephants (ACE) was formed in 2021 with a memorandum of cooperation signed among a few oil palm plantations, non-profits and academia (www.ace-coalition.com). The project focuses on the southern landscape of Peninsular Malaysia, mainly in the state of Johor. Five workshops (Tanjung Leman 27–30 March 2022, Kota Tinggi 7–9 February 2023 & 26 September 2023, Desaru 10–12 September 2024, and Semenyih 3 November 2025) were organised and conducted by MEME involving stakeholders within and outside the coalition from FELDA, FGV, SD Guthrie, Johor Plantation, Aramijaya, IOI Plantation, TH Plantations, Tradewind Plantations, MADOS, FIMA, Malaysian Palm Oil Board (MPOB), MPOGCF, Earthworm Foundation, WCS-Malaysia Programme, WWF-Malaysia, Seratu Aatai, Bring Back Our Rare Animals (BORA), Proforest, Satok Digital, PERHILITAN, Forestry Department and others. These workshops primarily discuss safety protocols, conflict mitigation measures, habitat connectivity, elephant behaviour and ecology, and emerging technologies such as AI for cameras, bioacoustics and drones to increase safety for people while monitoring elephant movement (Wong *et al.* 2026). Outreach materials such as safety posters for plantations and villages, human-elephant coexistence board games, a comic book and online modules were developed to support

harmonious human-elephant coexistence via having safe feeding grounds and movement passages for elephants (Tan *et al.* 2024, 2025). There is on-going effort to monitor elephant feeding behaviour and acoustics at one of the trial elephant foodbanks set up by FGV in Johor (Kasah *et al*. 2026) and a few other areas. Besides collaboration with MEME and ACE, PERHILITAN also supports the establishment of food banks and elephant corridors with other stakeholders such as MPOGCF, Earthworm Foundation, University Malaysia Kelantan and other universities and stakeholders in Johor, Terengganu and Pahang.

GOVERNANCE AND ACTION PLANS

The National Elephant Conservation Action Plan 2023-2030 (NECAP 2.0), developed by PERHILITAN with input from academia, NGOs, and the oil palm sector, sets out key strategies for elephant protection and conservation in Peninsular Malaysia. Its objectives include protecting habitats and connectivity, reducing HEC through coexistence, strengthening legislation and enforcement, expanding knowledge of elephant ecology and behaviour, and improving captive elephant management.

NECAP 2.0 interacts with other national policies such as the National Policy on Biological Diversity 2022-2030, National Forestry Policy, National Physical Plan (NPP4), Central Forest Spine Ecological Linkages Master Plan (PIRECFS 2022), Thirteenth Malaysia Plan (2026-2030), Rural Development Policy, National Agrofood Policy 2021-2030, National Agricommodity Policy 2021-2030, and National Construction Policy 2030. It also works in synergy with related initiatives, including the Malayan Tiger Crises Action Plan, Malayan Tapir Conservation Action Plan, and Integrated Khazanah Wildlife Enforcement Operations.



Figure 3. Continuous research and monitoring of elephants are needed to generate more findings that will help support harmonious human-elephant coexistence (Photo credit: MEME).

CONCLUSION

Protection and conservation efforts for elephants in Peninsular Malaysia requires working together with stakeholders and partners on the ground to secure coexistence and habitat connectivity, to allow elephants to move safely between feeding grounds while minimising risk of human-elephant conflicts. In effort to promote harmonious coexistence between people and elephants, we have to address the issue of safety for people and elephants on the roads, in agriculture areas and also in their natural habitat. There is a need to continuously conduct monitoring and increase scientific knowledge on behaviour and ecology of elephants in the Sundaic region, to support the on-going efforts on the ground.

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REFERENCES

Abdullah-Fauzi, N.A.F., Karuppannan, K.V., Mohd-Radzi, N.H.S., Gani, M., Mohd-Ridwan, A.R., Othman, N., Haris, H. *et al.* 2022. Determining the dietary preferences of wild Asian elephants (*Elephas maximus*) in Taman Negara National Park, Malaysia based on sex and age using trnL DNA metabarcoding analysis. *Zoological Studies* 61: e60. https://doi.org/10.6620/ZS.2022.61-60

Ament, R., Tiwari, S.K., Butynski, M., Chen, B.S., Dodd, N., Gangadharan, A., Jayasinghe, N. *et al.* 2021. *Protecting Asian elephants from linear transport infrastructure: The Asian Elephant Transport Working Group's introduction to the challenges and solutions*. Asian Elephant Transport Working Group.

Amiruddin, A.H., Tshen, L.T., van der Geer, A.A., Westaway, K., Hongwei, C., Smith D.A., Hasnan, H. *et al*. 2025. The first late middle Pleistocene *Stegodon* (Proboscidea, Stegodontidae) evidence found in Peninsular Malaysia. *Palaeontol Electron* 28: 1–30. https://doi.org/10.26879/1432

Avicena, N.R., Loo, Y.Y., Maul, T., Thong, N., Wong, C.C.T., de Silva, S., Saaban, S. and Wong, E.E. 2025. 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: 111272. https://doi.org/10.1016/j.biocon.2025.111272

Badam, G.L. 2013. An integrated approach to the Quaternary fauna of South and South East Asia - A summary. Journal of the Palaeontological Society of India 58: 93–114. https://doi.org/10.1177/0552936020130111

Bar-On, Y.M., Phillips, R. and Milo, R. 2018. The biomass distribution on Earth. *PNAS* 115: 6506–6511. https://doi.org/10.1073/pnas.1711842115

Bird, M.I., Taylor, D. and Hunt, C. 2005. Palaeoenvironments of insular Southeast Asia during the Last Glacial Period: a savanna corridor in Sundaland? Quarternary Science Reviews 24: 2228–2242. https://doi.org/10.1016/j.quascirev.2005.04.004

Cheng, Z., Wu, J., Luo, C., Liu, Z., Huang, E., Zhao, H., Dai, L. and Weng, C. 2023. Coexistence of savanna and rainforest on the ice-age Sunda Shelf revealed by pollen records from southern South China Sea. Quarternary Science Reviews 301: 107947. https://doi.org/10.1016/j.quascirev.2022.107947

Clements, G.R., Lynam, A.J., Gaveau, D. Yap, W.L., Lhota, S., Goosem, M. and Laurance, M.F. 2014. Where and how are roads endangering mammals in Southeast Asia's forests? *PLOS ONE* 9: e115376. https://doi.org/10.1371/journal.pone.0115376

Department of Wildlife and National Parks. 2023. National Elephant Conservation Action Plan (2023 – 2030). Cheras: Department of Wildlife and National Parks.

Fernando, P. and Pastorini, J. 2011. Range-wide status of Asian elephants. *Gajah* 35: 15–20.

Frank, B. 2016. Human–wildlife conflicts and the need to include tolerance and coexistence: An introductory comment. *Society & Natural Resources* 29:738–743. https://doi.org/10.1080/08941920.2015.1103388

Kasah, M.H.H., Syed, S.N.A., Yusoff, M.R.M., Ishak, N. *et al*. (in press) A case study of an elephant grazing ground (food bank) established by FGV Plantation (M) Sdn. Bhd. in Tenggaroh, Johor, Malaysia. *Prosiding Simposium Kebangsaan Konservasi dan Pengurusan Gajah Asia 2025. 16-18 November 2025, Tanjung Leman, Tenggaroh, Johor*. Cheras: Jabatan Perlindungan Hidupan Liar dan Taman Negara (PERHILITAN) Semenanjung Malaysia.

Hamilton, R., Amano, N., Bradshaw, C.J.A. and Roberts, P. 2024. Forest mosaics, not savanna corridors, dominated in Southeast Asia during the Last Glacial Maximum. *PNAS* 121: e2311280120. https://doi.org/10.1073/pnas.2311280120

IUCN. 2019. *Elephas maximus*: Williams, C., Tiwari, S.K., Goswami, V.R., de Silva, S., Kumar, A., Baskaran, N., Yoganand, K. & Menon, V.: The IUCN Red List of Threatened Species 2020: e.T7140A45818198

IUCN. 2023. *IUCN SSC Guidelines on Human-Wildlife Conflict and Coexistence*. https://www.hwctf.org/guidelines

Lister, A.M., Dirks, W., Assaf, A., Chazan, M., Goldberg, P., Applbaum, Y.H., Greenbaum, N. and Horwitz, L.K. 2013. New fossil remains of *Elephas* from the southern Levant: Implications for the evolutionary history of the Asian elephant. *Palaeogeography, Palaeoclimatology, Palaeoecology* 386: 119–130. https://doi.org/10.1016/j.palaeo.2013.05.013

Loo, Y.Y., Avicena, N.R., Thong, N., Haque, A., Nhlabatsi, Y.T., Abakar, S.Y.A., Ng, K.H. and Wong, E.E. 2024. WildTechAlert: Deep learning models for real-time detection of elephant presence using bioacoustics in an early warning system to support human -elephant coexistence. In *Advances in Brain Inspired Cognitive Systems*, J. Ren, A. Hussain, I.Y. Liao, R. Chen, K. Huang, H. Zhao, X. Liu, P. Ma and T. Maul (Eds.), pp. 385–399. Singapore: Springer Nature.

Louys, J. and Roberts, P. 2020. Environmental drivers of megafauna and hominin extinction in Southeast Asia. *Nature* 586: 402–406. https://doi.org/10.1038/s41586-020-2810-y

Mahmood, T., Vu, T.T., Campos-Arceiz, A., Akrim, F., Andleeb, S., Farooq, M., Hamid, A. *et al.* 2021. Historical and current distribution ranges and loss of mega-herbivores and carnivores of Asia. *PeerJ* 9: e10738. https://doi.org/10.7717/peerj.10738

McConkey, K.R., Campos-Arceiz, A., Corlett, R.T., Sushma, H.S., Ong, L. and Brodie, J.F. 2022. Megafruit and megafauna diversity are positively associated, while megafruit traits are related to abiotic factors, in tropical Asia. Global Ecology and Biogeography 31: 740–752. https://doi.org/10.1111/geb.13464

Ong, L. 2021. The ecological functions of Asian elephants in the Sundaic rainforest: herbivory and seed dispersal. Semenyih: University of Nottingham Malaysia.

Ong, L., Campos-Arceiz, A., Loke, V.P.W., Pura, P., Tunil, C.M.T., Din, H.S., Angah, R. *et al.* 2021. Building ecological networks with local ecological knowledge in hyper-diverse and logistically challenging ecosystems. Methods in Ecology and Evolution 12: 2042–2053. https://doi.org/10.1111/2041-210X.13685

Ong, L., Tan, W.H., Davenport, L.C., McConkey, K.R., Mat Amin, M.K.A., Campos-Arceiz, A. and Terborgh, J.W. 2023. Asian elephants as ecological filters in Sundaic forests. Frontiers in Forests and Global Change 6: 1143633. https://doi.org/10.3389/ffgc.2023.1143633

Palkopoulou, E., Lipson, M., Mallick, S. and Reich, D. 2018. A comprehensive genomic history of extinct and living elephants. *PNAS* 115: E2566–E2574. https://doi.org/10.1073/pnas.1720554115

Rabett, R.J. 2017. The early human occupation of East and Southeast Asia. In *Handbook of East and Southeast Asian Archaeology*, J. Habu, P.V. Lape and J.W. Olsen (Eds), pp. 159–193. New York: Springer.

Ritchie, H. and Spooner, F. 2025. Almost all of the world's mammal biomass is humans and livestock. *Our World in Data*. https://ourworldindata.org/wild-mammals-birds-biomass

Saaban, S. 2026. Tinjauan & perspektif Pelan Tindakan Konservasi Gajah Kebangssan 2023-2030 (NECAP 2.0). In *Prosiding Simposium Kebangsaan Konservasi dan Pengurusan Gajah Asia 2025*. 16-18 November 2025, Tanjung Leman, Tenggaroh, Johor. Cheras: Jabatan Perlindungan Hidupan Liar dan Taman Negara (PERHILITAN) Semenanjung Malaysia.

Saaban, S., Othman, N., Yasak, M.N., Mohd Nor, B., Zafir, A. and Campos-Arceiz, A. 2011. Current status of Asian elephants in Peninsular Malaysia. *Gajah* 35: 67–75.

Saaban, S., Wong, E.P., Lim, J.C. *et al*. (in review). Revisiting the status of Asian elephants in Peninsular Malaysia. *Gajah*, IUCN SSC Asian Elephant Specialist Group.

Saaban, S, Khodri, N.F. and Abdullah, N.M. 2026. Elephant mortality cases in Peninsular Malaysia (2015-2024): Trends, causes and conservation challenges. *Journal of Sustainable Natural Resoures* 7(1): 54-65.

Sheldon, F.H., Lim, H.C. and Moyle, R.G. 2015. Return to the Malay Archipelago: the biogeography of Sundaic rainforest birds. Journal of Ornithology 156: 91–113. https://doi.org/10.1007/s10336-015-1188-3

Sukumar, R. 2003. *The living elephants: evolutionary ecology, behavior, and conservation*. New York: Oxford University Press.

Tan, A.S.L. 2016. Mapping the current and past distribution of Asian elephants (*Elephas maximus*) and human-elephant- conflict (HEC) in human-occupied-landscapes of Peninsular Malaysia. MRes thesis. Serdang: University of Nottingham Malaysia.

Tan, C.K.W. and Wong, E.P. (in review). Conservation of charismatic megafauna. In *Greening of Malaysia*, A.K.S. Wee and C. Gibbins (Eds.). London: Springer Nature

Tan, C.K.W., Loo, Y.Y., Ahmad Husam, A.A., Hii, A. and Wong, E.E. 2024. What's the story of the elephant? Evaluation of choose-your-own-adventure activities on public perception of human–elephant conflict. *Integrative Conservation* 3: 212–229. https://doi.org/10.1002/inc3.64

Tan, C.K.W., Ahmad Husam, A.A., Thomas, D.P., Nurul-Asna, H. and Wong, E.E. 2025. The effects of a role-playing board game on perception of human–elephant conflict and coexistence. *Conservation Science and Practice* 7: e70140. https://doi.org/10.1111/csp2.70140

Tan, W.H., Hii, A., Solana-Mena, A., Wong, E.E., Loke, V.P.W., Tan, A.S.L., Kromann-Clausen, A. *et al*. 2021. Long-term monitoring of seed dispersal by Asian elephants in a Sundaland rainforest. *Biotropica* 53(2): 453–465. https://doi.org/10.1111/btp.12889

Terborgh, J., Davenport, L.C., Ong, L. and Campos-Arceiz, A. 2018. Foraging impacts of Asian megafauna on tropical rain forest structure and biodiversity. *Biotropica* 50: 84–89. https://doi.org/10.1111/btp.12488

Tshen, L.T. 2013. Quaternary *Elephas* fossils from Peninsular Malaysia: Historical overview and new material. *Raffles Bulletin of Zoology* 29: 139–153.

Wadey, J., Beyer, H.L., Saaban, S., Othman, N., Leimgruber, P. and Campos-Arceiz, A. 2018. Why did the elephant cross the road? The complex response of wild elephants to a major road in Peninsular Malaysia. Biological Conservation 218: 91–98. https://doi.org/10.1016/j.biocon.2017.11.036

Wong, E.P., Loke, V.P.W., Wader, J., Solana-Mena, A., Thuppil, V., Abdul Patah, P., Othman, N., Saaban, S. and Campos-Arceiz, A. 2018a. Elephants, roads and drivers: Case study of Gerik-Jeli highway. *The Institution of Engineers, Malaysia* 9: 26–29

Wong, E.P., Campos-Arceiz, A., Saaban, S., Wadey, J. and Walker, S.L. 2018b. The elephant who finally crossed the road – Significant life events reflected in faecal hormone metabolites of a wild Asian elephant. *Gajah* 48:4–11.

Wong, E.P., Yahya, S.N., Amirrudin, A.A. *et al*. 2026. Achieving Coexistence with Elephants (ACE) – a coalition to promote a harmonious human-elephant coexistence via collaboration with plantations, non-profits and academia using science and evidence-based management. *Prosiding Simposium Kebangsaan Konservasi dan Pengurusan Gajah Asia 2025. 16-18 November 2025, Tanjung Leman, Tenggaroh, Johor*. Cheras: Jabatan Perlindungan Hidupan Liar dan Taman Negara (PERHILITAN) Semenanjung Malaysia.

Woodruff, D.S. 2010. Biogeography and conservation in Southeast Asia: how 2.7 million years of repeated environmental fluctuations affect today's patterns and the future of the remaining refugial-phase biodiversity. Biodiversity Conservation 19: 919–941. https://doi.org/10.1007/s10531-010-9783-3

Yamamoto-Ebina, S., Saaban, S., Campos-Arceiz, A. and Takatsuki, S. 2016. Food habits of Asian elephants *Elephas maximus* in a rainforest of Northern Peninsular Malaysia. *Mammal Study* 41: 155–161. https://doi.org/10.3106/041.041.0306