

Wildlife on the Edge: Effects of Oil Palm Agriculture on Health of Forest-Dependent Primates in Malaysia

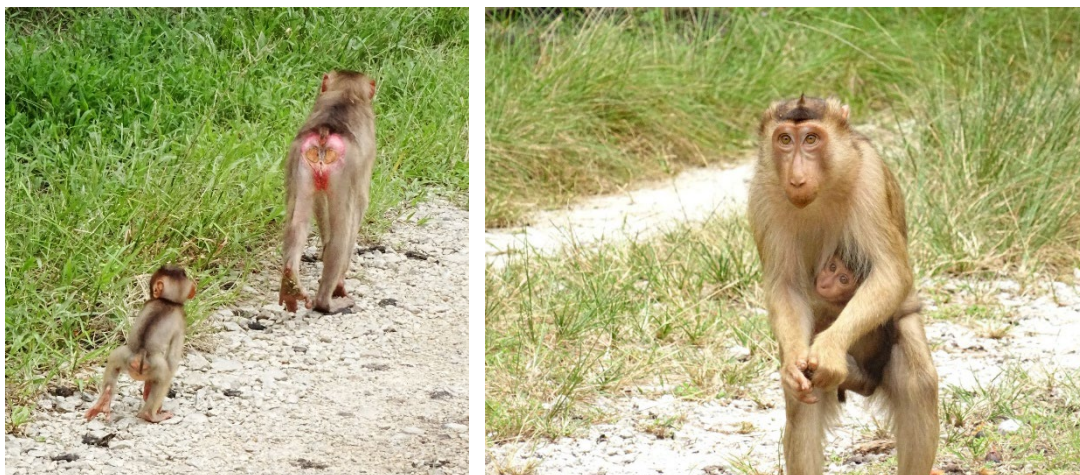
Project Updates

June 2024

Southern pig-tailed macaques (*Macaca nemestrina*) have recently been listed under the “Endangered” category on the IUCN Red List ([Ruppert et al. 2022](#)). Seemingly fairly well adapted to agricultural landscapes, they frequently enter oil palm plantations surrounding their remaining forest habitat. Here, they feed on a variety of food, most importantly, on plantation rats, the main pest species of oil palm crops ([Ruppert et al. 2018](#)). Our long-term data suggest that macaques may provide an important ecosystem service as a biological pest control, significantly reducing rat numbers and thereby increasing annual crop yield ([Holzner et al. 2019](#)).

Therefore, the aim of this long-term research project ([Macaca Nemestrina Project](#)) is to create a scientific basis for more sustainable management practices of Malaysian oil palm plantations and the protection of its biodiversity by assessing the impacts of agricultural landscapes on primates. This project is contributing to the sustainability discussions surrounding plantation management, specifically by reducing pesticides, creating wildlife-friendly plantation environments and enhancing the contribution of macaques to biological pest control by foraging on rats.

However, the use of plantations also poses risks to macaques concerning the health and fitness of individuals who frequently forage in plantations. Previously, we uncovered behavioural alterations, such as reduced rates of grooming and increased protectiveness by macaque mothers in plantations, likely weakening the social integration of individuals within groups and hampering infant development ([Holzner et al. 2021](#)).

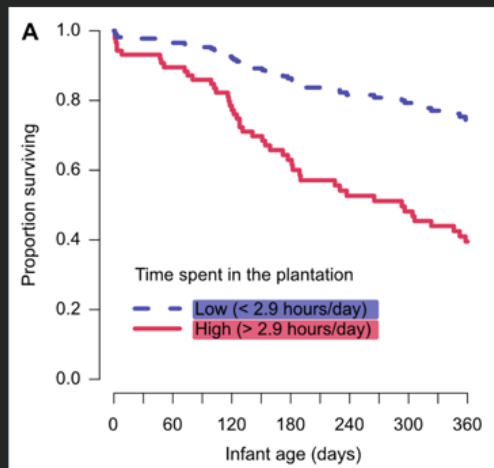


Mother and infant in plantation. (Photos by Anna Holzner for Macaca Nemestrina Project)

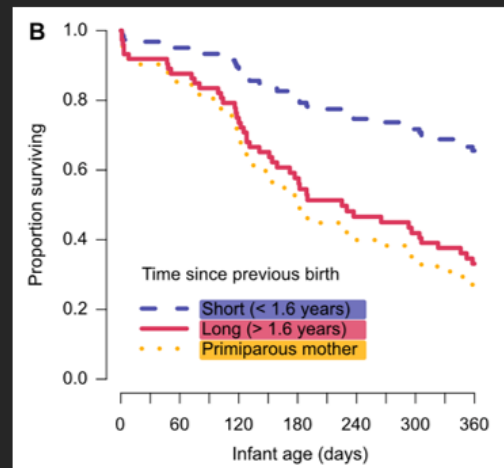
Our newest study, which is co-funded by The Rufford Foundation, reports an exceptionally high mean infant mortality rate of nearly 60% over 10 years ([Holzner et al. 2024](#)). The reasons for this high mortality are likely manifold, but survival analysis

revealed that prolonged visits to the plantation increased the risk of infant death. We hypothesize that the exposure to agricultural chemicals used in the plantations may play a significant role ([Holzner et al. 2024](#)).

RESULTS: Overall model result: $\chi^2 = 19.00$, $df = 4$, $P < 0.001$



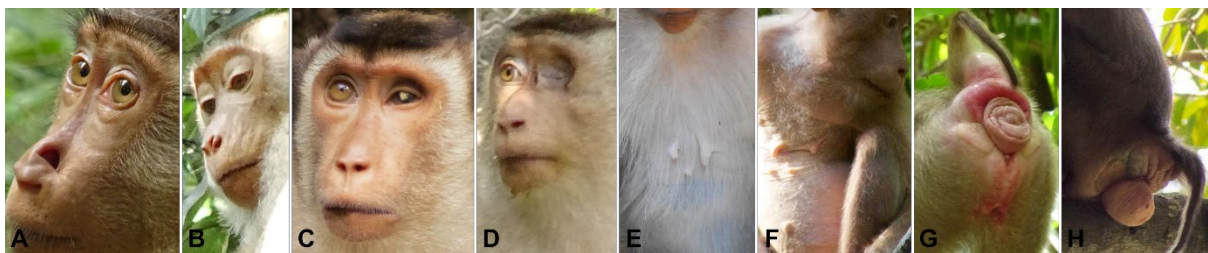
➤ Extended time spent in the plantation during infancy decreased the likelihood of infant survival



➤ Infants born to primiparous mothers and after long interbirth intervals had significant lower chances of survival

Increased infant mortality after extended time spent in plantation during pregnancy and of infants born to mothers after a longer interbirth interval. (Source: [Holzner et al. 2024](#))

Further, we have noticed distinct signs of impaired health in our study population. During the past decade, the number of adult females who form the core of social groups, has declined by nearly half. We observed the occurrence of congenital morphological deformities, vaginal tumours, and cases of infertility, which we suspect to be somehow linked to the exposure of agricultural pesticides.



Signs of impaired health observed in female southern pig-tailed macaques in Segari, Peninsular Malaysia. Shown are congenital morphological deformities in the face (A-D) and breast (E, F), as well as vaginal tumours (G, H). (Photos: Macaca Nemestrina Project).

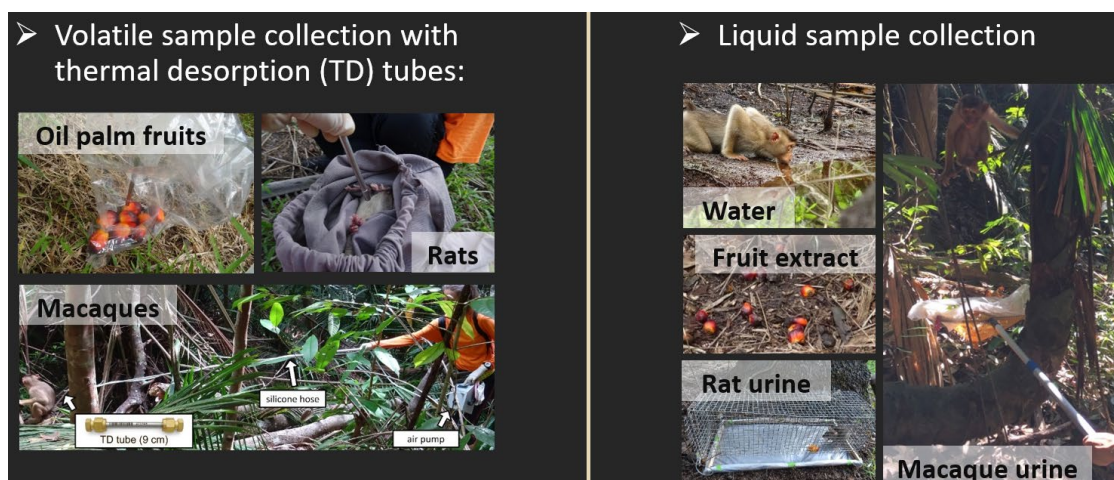
To understand the underlying causes, and arguably long-term consequences, of these observations, it is crucial to consider anthropogenic activities and their impacts within a broader context. Besides pesticides directly applied to plantations, toxic

effluents from nearby industries (e.g., industrial-scale livestock farming and sand mining) at the study site may enter the food chain of macaques through water ways.



Macaque drinking from polluted water source in oil palm plantation (Photos: Macaca Nemestrina Project)

The objective of this study is thus to detect pesticides in the plantation environment, in the macaques' food (i.e., water, oil palm fruits, and rats), and the macaques themselves (i.e., their body odour and urine) to assess the level of exposure of the macaques to harmful substances in their habitat, which we have done through a comprehensive collection of chemical samples in the plantation and from the animals.



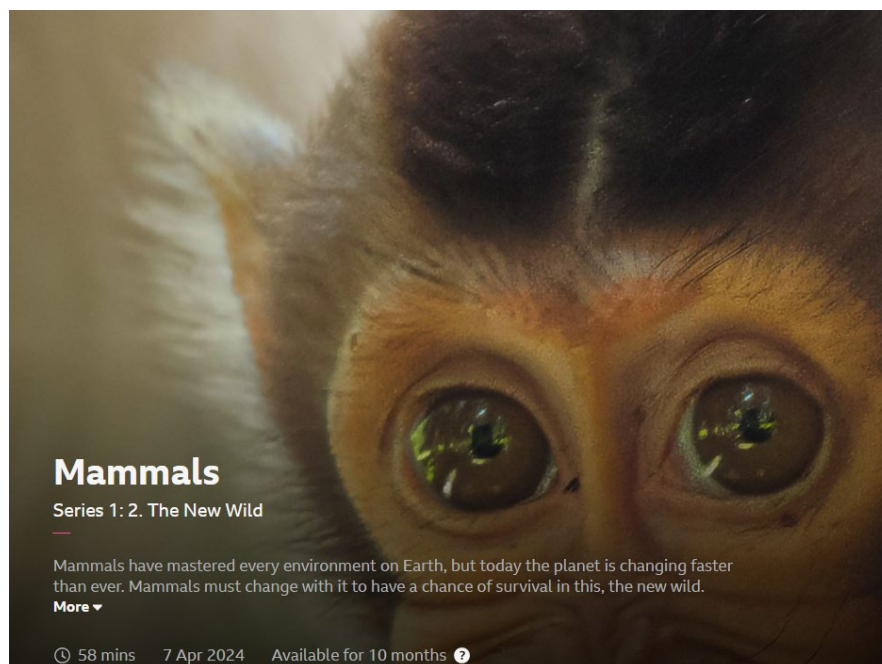
Methods of collecting chemical samples for pesticide analysis from oil palm plantations for GCMS and LCMS analysis (in progress) (Photos by Anna Holzner for Macaca Nemestrina Project).

Our preliminary pilot data analysis indeed indicates chemical effects on the macaques after exposure to herbicides following the wide scale spraying of weed killers (a standard practice in many oil palm plantations), as evidenced by changes in the chemical profiles of the macaques' body odour following the exposure of paraquat. A more comprehensive chemical analysis is currently being conducted to investigate further details, which we expect to conclude by Q1 2025.

As part of this study, we have also been intensively engaging with stakeholders of the local oil palm industry, at the study site and beyond, through a detailed Key Informant

Interview survey, interviewing 150 knowledgeable stakeholders of the industry about current pest control practices, their perception of macaques and their knowledge on the biological pest control services of these primates. We are currently analysing the answers of these detailed interviews to assess an appropriate way of future engagement with the industry. We hope to drive forward the idea of wildlife conservation in palm oil plantations through pesticide-free management practices, which protects primates and people alike. The outcomes of our study will be published in academic journals and made widely available on local channels, including social media in multiple languages.

Indeed, one of the most important public outreach highlights of our project is the broadcasting of our work in [Episode 2 “The New Wild”](#) of BBC’s latest natural history documentary “Mammals” in April 2024, which can be accessed in BBC iPlayer in the UK.



References

BBC Mammals Episode 2 “The New Wild”, 07 April 2024:

<https://www.bbc.co.uk/iplayer/episode/m001y4f2/mammals-series-1-2-the-new-wild>

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