

## Physiological stress responses in wild Asian elephants *Elephas maximus* in a human-dominated landscape in the Western Ghats, southern India

This study is an attempt to understand physiological stress responses of elephants in the human-dominated landscape of Valparai, situated in the Anamalai hills of the Western Ghats mountains of southern India. Although studies on the physiology of elephants have previously been conducted in Africa and Asia, this study is the first to follow identified individuals over an extended period of time, to ascertain variations in faecal glucocorticoid metabolite (FGM or *stress hormone*) concentrations in elephants, in response to interactions with humans. The study was a part of the lead researcher, Sreedhar Vijaykrishnan's Masters degree, and conducted in collaboration between the National Centre for Biological Sciences, Bangalore, the Wildlife Conservation Society-India Program, the Nature Conservation Foundation, Mysore, and the Laboratory for Conservation of Endangered Species, CCMB, Hyderabad.

Sixty-nine individually identified elephants were followed over a period of six months, between November 2013 and April 2014; behavioural observations were made, and dung samples were collected to analyse potential differences in stress hormone concentrations in the absence of interactions and following drives/chases by humans. The dung samples were analysed at the Central Government research institute, the Laboratory for Conservation of Endangered Species.

We found that the stress hormone concentrations in elephants using the human-dominated landscape of Valparai were similar to those of elephants in the neighbouring relatively undisturbed landscape of Vazhachal, throwing light on possibilities of adaptation to changing surroundings. However, we also found that drives caused stress hormone concentrations to rise, showing that negative interactions with humans triggered physiological stress responses in elephants. When looking at stress hormone concentrations more closely across different age classes, the analyses showed that adults had the highest baseline values while calves had the lowest. This could possibly be because of the fact that adult individuals are aware of the inherent risks involved in living in a human-use landscape; however, following drives, the magnitude of increase was much higher in calves compared to adults, and this seems to tell us about the role of *experience* in coping with stressful situations.

While we found that stress hormone concentrations did not continue to remain elevated, it should be noted that continuous drives/disturbance events can trigger the concentrations to remain high consistently, leading to what could possibly be termed as 'chronic stress', a state which leads to the disruption of digestive and reproductive processes, and shuts down immune responses, which can be detrimental to the survival of the individual. Hence, the study emphasises the importance of considering physiological responses and its possible role in animal health before making management/conservation decisions such as large scale drives, especially in human-use landscapes. This study also highlights the importance of individual idiosyncrasies in a long-lived, social, highly adaptable mammal, such as the elephant, which is increasingly using human-modified landscapes and has extended ranges to semi-urban and urban peripheries.

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