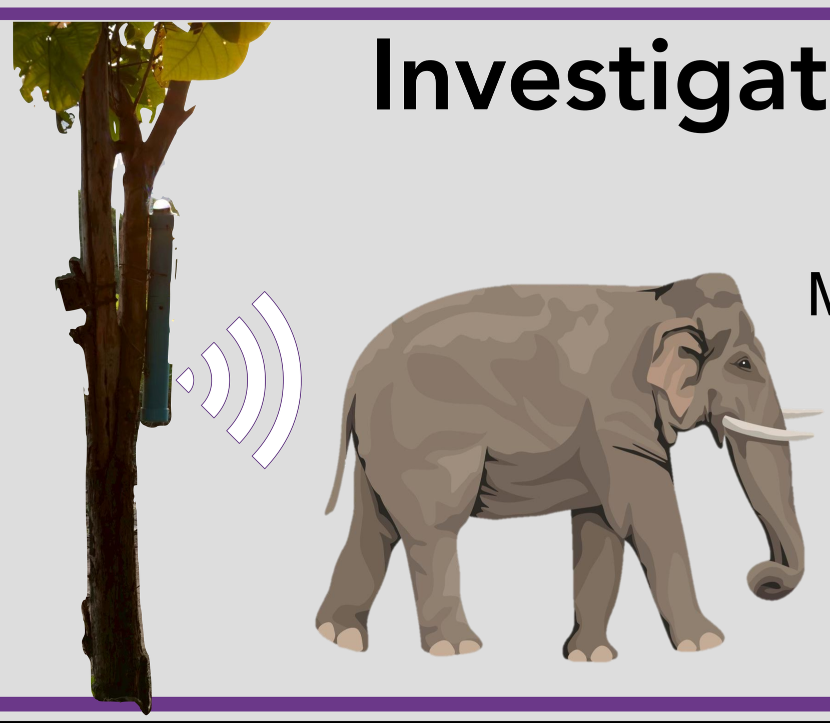
Investigating Individual Differences in Behavior: An Experimental Approach to Human-Elephant Conflict



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INTRODUCTION

- Asian elephants (*Elephas maximus*) face multiple challenges, including habitat loss, which pushes them to forage in crop fields and other human-dominated landscapes. This leads to human-elephant conflict (HEC).
- HEC mitigation strategies overlook the possibility that elephants' decisions to enter crop fields and their responses to deterrents **may be related to individual differences in behavior and cognition[1,2]**.
- Over six years, our team has found individual variation in wild elephants' responses to auditory, olfactory, and visual stimuli.
- The Targeted Personality Device (TPD) can emit stimuli **programmed for the specific behavioral profiles of local wild elephants**.

Hypothesis: TPDs will be an effective strategy for deterring elephants from crop fields.

Prediction: Elephant visitation will be lower when TPDs are turned on compared to when they are not.

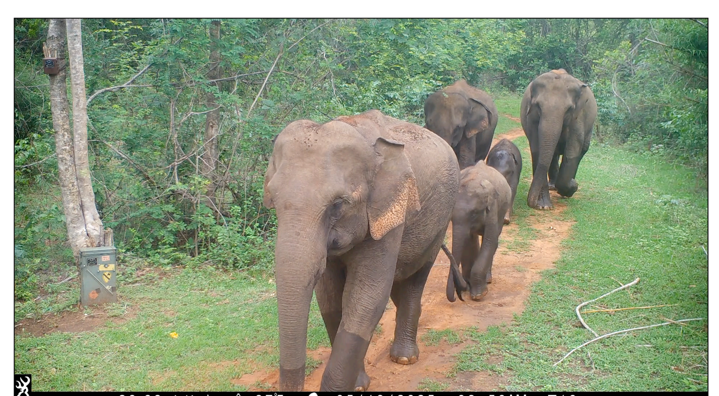
A wild Asian elephant foraging in a crop field, outside Kanchanaburi, Thailand.

BEHAVIORAL ASSESSMENTS

Several graduate students in the CCC lab have contributed to this project. Previous experiments assessed behaviors of wild elephants in the crop fields surrounding and within the Salakpra Wildlife Sanctuary in western Thailand.

Neophilia (attraction to novelty) in response to a novel object[3]. n = 52 individuals tested with two novel objects

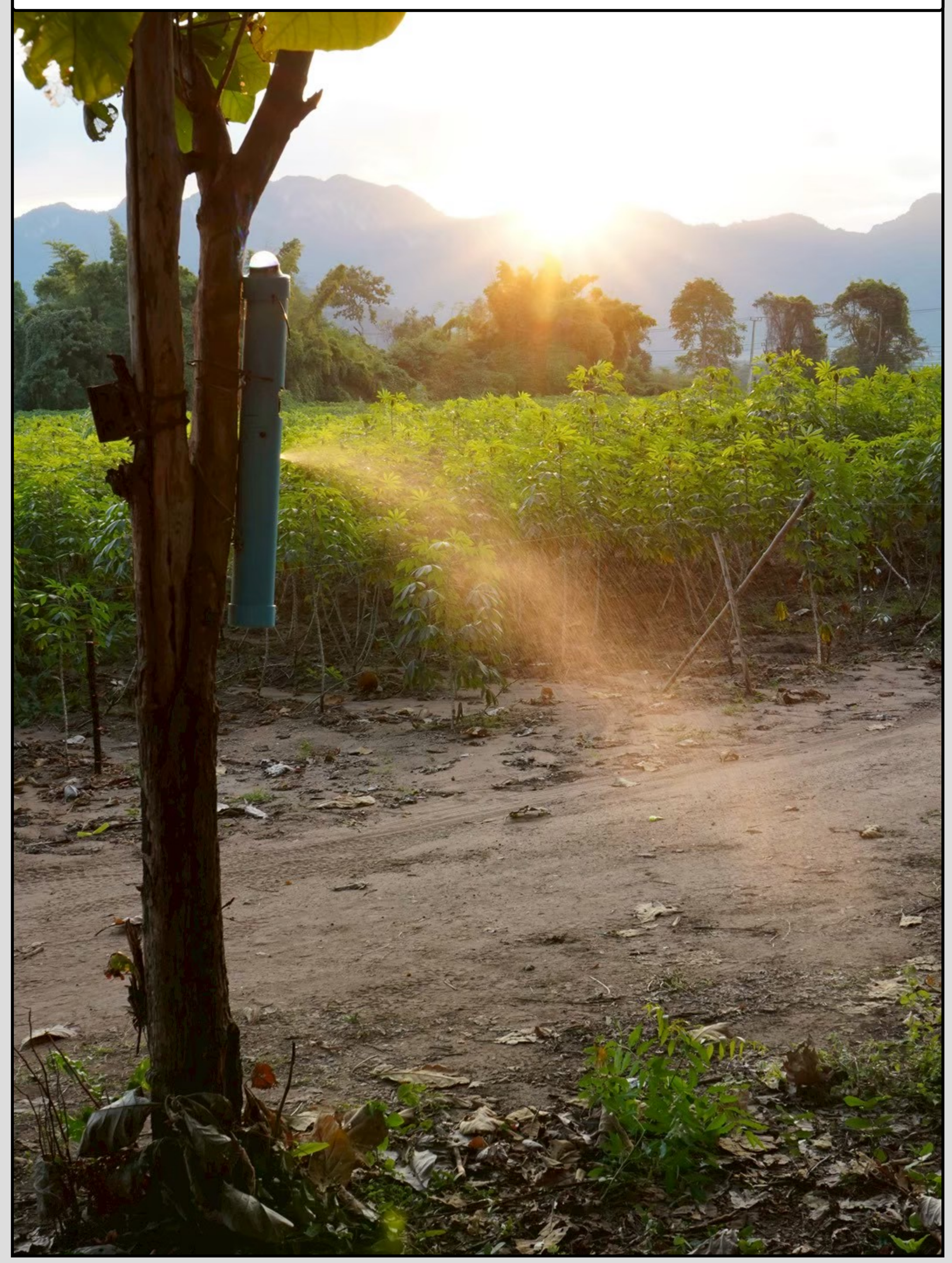
Boldness (response to predators) in response to predator auditory playback. n = 37 individuals tested with leopard, tiger, and human playback



Boldness in response to olfactory cues. Data collection in progress; individuals tested with three groups of human odors: diluted sweat from researchers, villagers, and park rangers.

In these studies, we compared elephants who entered crop fields with those who stayed within the borders of Sanctuary. We found considerable variation in behavior *both between and within groups*. This suggests that **elephants who enter crop fields do not all exhibit similar behaviors and, therefore, targeting mitigation strategies to specific elephant behavioral profiles may be more effective than traditional strategies.**

TARGETED PERSONALITY DEVICE (TPD)



STIMULI USED IN PILOT STUDY

Auditory

- Our previous research suggests elephants appear to consistently retreat from playbacks of human shouts.
- We used recordings of local villager shouts.

Olfactory

- Our previous research suggests elephants retreat more frequently from the odor of villagers compared to rangers or researchers.
- We used odor (sweat from t-shirts) from local villagers.

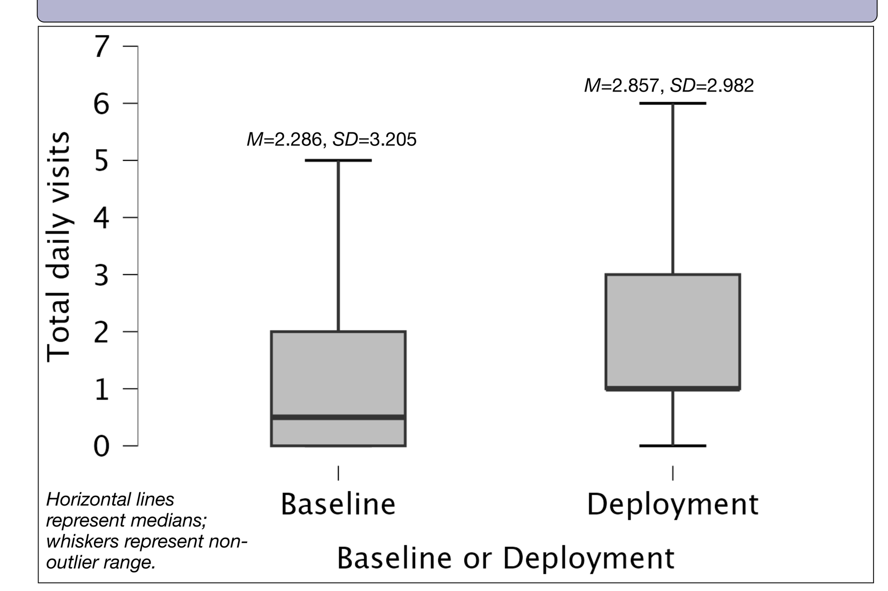
Visual

- We are investigating elephants' responses to lights (see poster P39).
- In the TPD, we used a generic party light that emitted moving red, green, and blue lights.

PRELIMINARY RESULTS

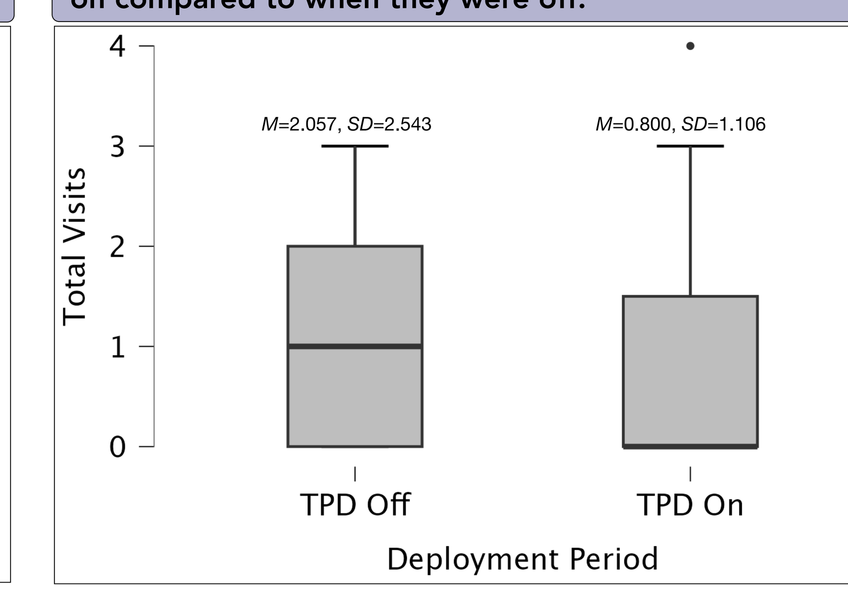
- Due to logistical constraints (battery charging, holiday leave, repairs, etc.) the TPDs could only be turned on for a portion of the deployment period.
- We included all elephants who entered the crop field at least once during either baseline or deployment.

Surprisingly, elephants visited **more frequently during deployment compared to baseline.**



Generalized Linear Mixed Model with a Poisson distribution and log link; elephant ID was a random effect: ChiSq = 6.332, df = 1, ***p* = 0.012**

However, if we only look at the deployment period, we find that elephants visited **less frequently when the TPDs were on compared to when they were off.**



Generalized Linear Mixed Model with a Poisson distribution and log link; elephant ID was a random effect: ChiSq = 4.844, df = 1, ***p* = 0.028**

Scan here to view related research from our lab:

Scan here to view press coverage of the TPD deployment:

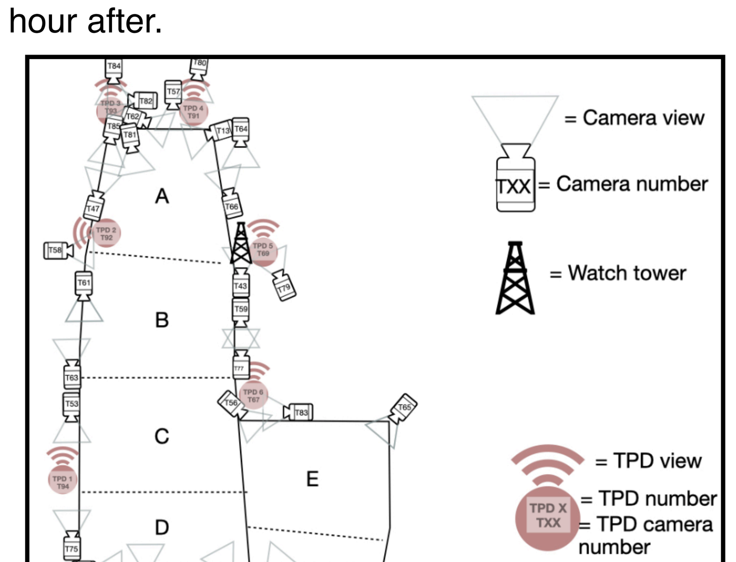
EXPERIMENTAL DESIGN

PROFILES

- We monitored elephant activity in the crop field for 106 days prior to deployment.
- After identifying elephants (n=39), we chose stimuli based on their responses to the previous behavioral assessments.
- These assessments suggest that most elephants entering the crop field were shy to human stimuli.
- We programmed the TPD using human stimuli.
  - Predator vocalizations would likely not be effective against bolder elephants.
  - Novel stimuli may attract neophilic elephants.
- We deployed the TPD for 80 nights.

RESEARCH SITE

- We installed six TPDs around the exterior of the crop field.
- 32 camera traps formed a grid to capture video of elephants that approach the crop fields.
- A "visit" began when an elephant entered the crop field and ended when the elephant was not observed for one hour after.



TPD COMPONENTS

DISCUSSION

- Elephant visits increased between the baseline and deployment phases, which may be due to external factors such as crops nearing harvest, or an increase in overall elephant visitation in the region.
- When the TPDs were powered on, elephant visitation significantly decreased, suggesting the TPDs worked as an effective deterrent in this initial test.
- A deeper behavioral analysis (e.g., how individual elephants responded to the activation of the TPD) could better reveal how effective the TPDs and the selected TPD profile were.
- This research contributes to our understanding of how personality and cognition interact to impact elephant decision making, particularly under anthropogenic pressure. Individual variation in behavior and cognition should be considered when developing strategies to mitigate human-wildlife conflict across species.

FUTURE DIRECTIONS

- Deploying TPDs at two sites, one site that has TPDs programmed based on the profiles of local elephants and one site that does not, could help us determine the efficacy of targeting mitigation at specific behavioral traits.
- Longer term, collecting data over several seasons or several years could help determine how the presence of the TPD itself – or other factors such as environment (seasonality), elephant migration patterns, or crop harvesting cycles – explain the variation in elephant presence over time.

REFERENCES: 1. Jacobson and Plotnik (2020) Comparative Cognition & Behavior Reviews 15:131-148; **2.** Greggor et al. (2020) Annual Review of Ecology, Evolution, and Systematics 51:483-503; **3.** Jacobson et al. (2025) Royal Society Open Science 12:250896.

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