

Research Proposal

Title

Towards sustainable human-wildlife coexistence in Northern Tanzania (WildCoTanzania)

Principal Investigators

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Rationale

In a rapidly changing landscape – responding to warmer climates, land-use changes, spread of invasive species and increased movements of human populations – the biodiversity of Northern Tanzania faces new challenges. The solutions to these challenges depend upon being able to foster sustainable coexistence of people and wildlife. Solutions that focus on sustainable implementation and ensuring an ecosystem that can support both people and wildlife will be key. An interdisciplinary approach bringing together diverse expertise from natural sciences, social sciences and co-creating solutions with local communities will ensure all perspectives are considered and help develop innovative solutions to these complex problems.

Aim

Our project aims to work towards this vision of human wildlife coexistence with two focus topics. 1) Firstly, relating to **invasive species** mitigation and control. Invasive alien plants [IAP's] are a key issue for both Tanzanian wildlife and people and is expected to get worse in the future. IAP's can quickly dominate their new environments, outcompeting native plants, altering key processes needed for water and fire regimes and can have devastating impacts on people's livelihoods. As part of our project we will explore sustainable solutions to IAP control as well as deepening our knowledge of post-control restoration in invaded landscapes. This will be explored both at the level of fundamental ecology but also to understand social dynamics of IAP control. We will explore how local communities can be most empowered to control and manage IAP infestations and which strategies can be best supported for community led conservation. To achieve this socio-ecological approach we will combine methods from both natural and social sciences. Spatial mapping of IAP spread combined with setting up experimental control plots, monitoring plant recovery, and exploring impacts of IAPs both above and below ground will offer important ecological insights. From the social perspective, participatory research methods will be used to establish effective collective governance institutions along with monitoring and evaluation of the programme's outreach, ensuring dissemination beyond partners. Methods such as social mapping, photovoice, diaries, interviewing, focus groups, and surveys will be used to achieve these goals.

2) Secondly, we aim to facilitate the coexistence between people and **megafauna** (large mammals). The megafauna of Tanzania plays a key role in ecosystem function, the identity of the landscape and – unfortunately – in the growing issue of human wildlife conflict. Our research group will work with an interdisciplinary approach to understand drivers of conflict with the

overall aim of helping develop solutions to mitigate it. We will investigate how to effectively design borders to facilitate sustainable coexistence between people and wildlife. We will investigate how to best position and manage corridors to facilitate sustainable coexistence between people and wildlife, focusing on solutions.

Scope

At the boundary of protected areas we see hotspots of both invasive species spread and human wildlife conflict. These areas, where people and wildlife must find a way to coexist, careful evidence-based management decisions are needed to increase the effectiveness of current biodiversity protection measures. The two key themes of this project will provide much needed scientific evidence to help inform decision makers on how best to design and manage wildlife corridors, protected area boundaries and land use possibilities. The project will be working with such decision makers – as well as local communities, NGOs and government workers - from the very start to ensure that from data collection to the implementation of evidence-based strategies all voices are heard.

As field ecologists with expertise on large mammal ecology and invasive plant science we [Prof. Michiel Veldhuis and Prof. Emily Strange, co-directors of the research group WildCoLab Leiden University] will develop a solid network of scientists, both Tanzanian and international and will facilitate the training of Tanzanian PhD and postdocs. We have both worked in this area for >5 years and currently supervise 4 PhD students (of which 2 Tanzanian) and a Postdoc that work on project related to the topics outlined above (they all submitted individual permit applications). Our team has a reputation to connect in-depth scientific understanding of ecological processes to societal impact by providing evidence-based solutions. projects on urgent research questions relating to the themes outlined above.

Postdocs:

Inger de Jonge. *Animal-mediated ecosystem homeostatis through mutualistic microbiomes*. (Greater Serengeti Ecosystem)

PhDs:

Exavery Kigosi. *Invasive species distribution and efficacy of control methods in Western Serengeti* (Grumeti and Ikorongo Game Reserves and Ikona WMA)

Yuhong Li. *Consequences of variation in basal resource quality for the structure of savannah food webs*. (Greater Serengeti Ecosystem)

Vera Thijssen. *Restoration of Speke Gulf* (Speke Gulf GCA and Serengeti NP)

Matana Levi. *Mitigating human-lion conflict in the Greater Serengeti Ecosystem* (Serengeti National Park, Grumeti GR, Ikorongo GR, Loliondo GCA, Ikona WMA, Ngorongoro CA)

Key recent papers:

1. Spatiotemporal habitat use of large African herbivores across a conservation border. **IK de Jonge**, H Olff, R Wormmeester, MP Veldhuis. 2022. Conservation Science and Practice 4 (8), e12754
2. A Learning Networks approach to resolve conservation challenges in the Ngorongoro Conservation Area. WE Harris, **EF Strange** et al. 2021. African Journal of Ecology 59 (1), 326-331
3. Training future generations to deliver evidence-based conservation and ecosystem management. H Downey, **EF Strange** et al. 2021 Ecological Solutions and Evidence 2 (1), e12032
4. Predation risk constrains herbivores' adaptive capacity to warming. **MP Veldhuis** et al. 2020. Nature Ecology & Evolution 4 (8), 1069-1074
5. Cross-boundary human impacts compromise the Serengeti-Mara ecosystem. **MP Veldhuis** et al. 2019. Science 363 (6434), 1424-1428
6. Large herbivore assemblages in a changing climate: incorporating water dependence and thermoregulation. **MP Veldhuis** et al. Ecology Letters 22 (10), 1536-1546
7. Modeling top-down and bottom-up drivers of a regime shift in invasive aquatic plant stable states. **EF Strange**, P Landi, JM Hill, JA Coetzee. 2019. Frontiers in Plant Science 10, 889
8. Evidence for a new regime shift between floating and submerged invasive plant dominance in South Africa. **EF Strange**, JM Hill, JA Coetzee. 2018. Hydrobiologia 817 (1), 349-362