Potential MSc Topics

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At my homepage, I describe my research interests and if you think you have a thesis idea that could fit we can design one jointly.

Rainfed, burnt out, but not eaten? Mapping a problematic Tanzanian native rangeland species

Background

Invasive species are one of the five main drivers of environmental change globally. However, not all invasive species are aliens or non-natives. A number of problematic species are native and spreading following land-use change (e.g., human infrastructure), land management (e.g., grazing or fire) and climate change. Many countries have monitoring programmes for both invasive and spreading native species. However, in the global south such monitoring is often patchy due to a limited resources. Insufficient monitoring data makes it challenging to identify drivers accelerating the spread of problematic native species.

African daisy, *Gutenbergia cordifolia* (S.Moore) C.Jeffrey is a native annual herb widespread in tropical Africa that forms thick stands that reduces surrounding native species diversity and has a poor forage quality to wild and domestic herbivores (Ngondya *et al.* 2016; Ngondya *et al.* 2017; Mbundi *et al.* 2021) (Fig 1). Since 2001, *G. cordifolia* has been spreading throughout the Serengeti National Park, Tanzania, the second largest national park in the country. The spread of this species was assumed to follow an unusually heavy rains, preceded by intense drought and fires (Brett 2001).

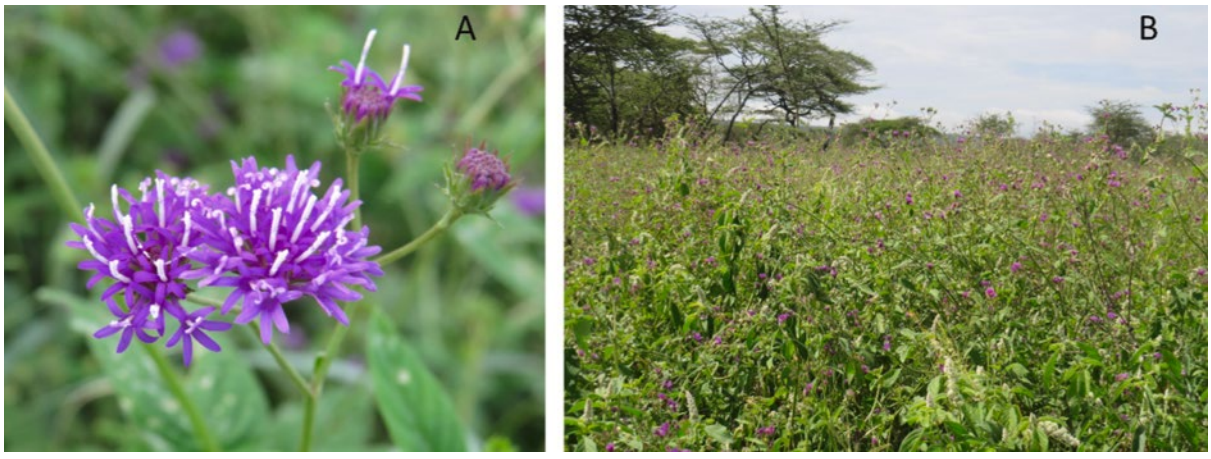

Figure 1. (A) Flowers of *Gutenbergia cordifolia* and (B) a grassland sward with >75% coverage of *Gutenbergia cordifolia.* From (Mbundi *et al.* 2021).

Aim

Using pre-collected survey data from 2015-2018, we would like to investigate how the occurrence and abundance of *G. cordifolia* relates to environmental and land-use management spatial variables, including: rainfall (or drought), fire behaviour (history, timing, frequency) and herbivory (e.g., wildebeest occupancy). To achieve this the project will focus of exploring species distribution modelling approaches in relation to remotely sensed or previously collected datasets.

Student interests and skills development

We are looking for a student with interest in ecology or natural resource management, spatial analysis and/or remote sensing. A student willing to learn or advance their skills in data management and data cleaning, spatial techniques and mapping. The project will be part of a collaborative team with supervisors in Stockholm University and interested collaborators and data contributors from Tanzanian and European institutes.

References

Brett, R. (2001) Investigation of black rhino mortalities at Ngorongoro crater, Tanzania: black rhino habitat and ecological requirements.

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Missing the burn? Examining savanna grassland species distribution in relation to changing burn history

Background

Unlike cold, wet or humid ecosystems, regular fires are integral to the structure and functioning of tropical grassland and savannas. Tropical grassland species are adapted to fire (e.g., triggering seed germination), fire prevents the dominance of trees and variation in fire history and intensity generates structural diversity that enhances biodiversity. Despite the importance of fires, in some savanna regions the frequency of fires is declining. In East Africa, pastoralist are becoming more sedentary, and in turn livestock graze the same areas continuously reducing fuel-loads required for fires. Outside protected areas, loss of fires may result in loss of key grassland species. Meanwhile, inside wildlife protected areas, vegetation continues to be managed using prescribed fires. The timing of fires within protected areas can also shape grassland communities, for example early (growing) season fires versus late season fires, the latter are more intense due to the larger build-up of grassland biomass, i.e., fuel loads.

Over the last two decades, the frequency of fires at the boundaries of the Serengeti National Park, Tanzania have declined due to livestock grazing around settlements and bomas (Probert *et al.* 2019; Veldhuis *et al.* 2019) (Figure 1). The consequence of these changing fire characteristics (history, timing and frequency) may already be altering the species composition of savannas and grasslands surrounding the park, and in turn, the quality of grazing areas for wildlife. Whilst we have anecdotal evidence of grassland species that either increase, decrease or do not change following fires, there is limited evidence from species distribution models.

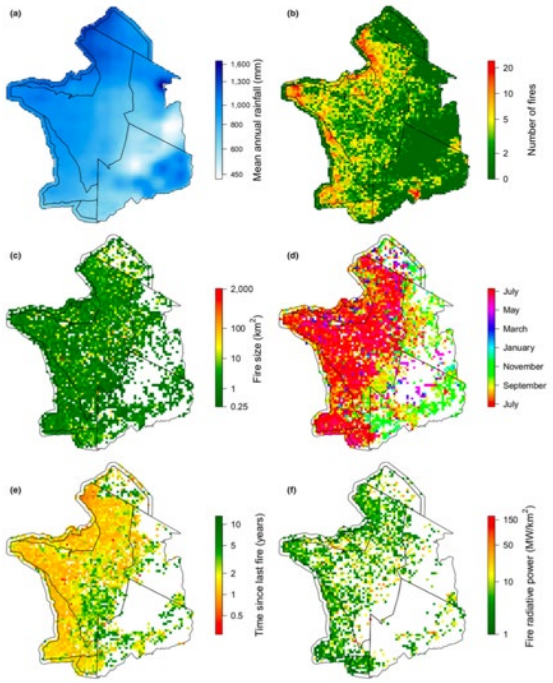

Figure 1. Changes in fire characteristics around the Serengeti National Park, Tanzania. From (Probert *et al.* 2019)

Aim

Using pre-collected grassland survey data from 2015-2018 from the interior and boundaries of the Serengeti National Park, this project will investigate how changes in prescribed fires (history, timing, frequency), whilst accounting for precipitation, has influenced the grassland species and community composition. To achieve as part of the project we will apply joint species distribution modelling (Ovaskainen *et al.* 2017; Tikhonov *et al.* 2020) to draw out individual responses of species to changes in remotely sensed fire regimes.

Student interests and skills development

We are looking for a student with interest in ecology or natural resource management, spatial analysis and/or remote sensing. A student willing to learn or advance their skills in data management and data cleaning, spatial techniques and mapping. The project will be part of a collaborative team with supervisors Anna Treydte and Stuart Smith at Stockholm University and interested collaborators and data contributors from Tanzanian and European institutes.

References

Ovaskainen, O., Tikhonov, G., Norberg, A., Guillaume Blanchet, F., Duan, L., Dunson, D., Roslin, T. & Abrego, N. (2017) How to make more out of community data? A conceptual framework and its implementation as models and software. *Ecology Letters,* **20,** 561-576.

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Veldhuis, M.P., Ritchie, M.E., Ogutu, J.O., Morrison, T.A., Beale, C.M., Estes, A.B., Mwakilema, W., Ojwang, G.O., Parr, C.L., Probert, J., Wargute, P.W., Hopcraft, J.G.C. & Olff, H. (2019) Cross-boundary human impacts compromise the Serengeti-Mara ecosystem. *Science,* **363,** 1424-1428.

Wildlife moving aids across the world

Background

Understanding wildlife movement within the landscape is important to predict species population declines and functional diversity. Particularly large mammals are facing an increasing number of barriers and obstacles through roads, agriculture, settlements and other infrastructure that hinder their movement patterns. Globally, this has become a challenge and reduces the fitness of the species involved but also increases conflicts with wildlife. This topic encompasses a thorough literature research globally on moving aids (e.g., bridges, underways, greenbelts…) that were put in place to support wildlife movement in our human-dominated landscapes.

Aim

The study will highlight the most commonly used aids, the times and conditions under which they were installed, and understand their long-term success. The student will select certain case studies and highlight successes and failures of these pathways. The student will visit some example sites and interview stakeholders involved to gain in-depth views on the success of these aids for a sustainable human-wildlife coexistence.

Student interests and skills development

We are looking for a student with interest in animal population and movement ecology, spatial analysis and/or remote sensing. A student willing to learn or advance their skills in data management and data cleaning, spatial techniques and mapping.

References

CORLATTI, L., HACKLÄNDER, K. and FREY-ROOS, F. (2009), Ability of Wildlife Overpasses to Provide Connectivity and Prevent Genetic Isolation. Conservation Biology, 23: 548-556. https://doi.org/10.1111/j.1523-1739.2008.01162.x

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Human-wildlife coexistence in Europe – how can carnivores be integrated into modern and traditional lifestyles?

Large carnivore species such as wolves, bears, lynx etc have triggered extreme responses by humans who have been directly or indirectly affected by these species. Particularly livestock holders are often strongly against rewilding or reintroduction ideas, leaving wildlife conservationists in the dark on how to achieve acceptance and a sustainable human-wildlife coexistence. Few studies have quantified the successes of compensation, mitigation and prevention schemes of various projects aiming at carnivore conservation in Europe. Based on case studies, temporal and spatial conflicts can be predicted and management of these conflicts improved if the right media and communication strategies are applied.

Aim

The project will highlight several case studies of human-carnivore conflicts through mapping and use Max-Ent models for predicting possible future conflict hotspots. The project will further investigate what media and communication strategies were used in these cases and which stakeholders were involved in mitigation / prevention plans. The student will undertake comparative studies on areas with versus areas without conflicts, despite carnivore presence, to understand underlying factors of conflict.

Student interests and skills development

We are looking for a student with interest in animal population and movement ecology, spatial analysis and/or remote sensing. A student willing to learn or advance their skills in data management and data cleaning, spatial techniques and mapping.

References

Dalerum, F., Selby, L. O., & Pirk, C. W. (2020). Relationships between livestock damages and large carnivore densities in Sweden. *Frontiers in Ecology and Evolution*, *7*, 507.

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Livestock foraging on woody vegetation (=browsers) in a changing world

Across the world, rangelands and savanna systems undergo a rapid woody vegetation encroachment. The herbaceous vegetation is being outcompeted, which make it increasingly difficult for pastoralists with grazing livestock to feed their herds. Many pastoralists are adapting to the deteriorating rangelands and climate change with higher numbers of browsing livestock in their systems. This study will conduct a thorough literature research and collect grey data / reports from livestock institutions and offices around the world. We expect that over the last 20 years, the number of goats and camels (browsers), for example, has strongly increased, while cattle and sheep (grazers) numbers are declining. We compare the livestock data with maps on woody vegetation cover change to spatially determine hotspots of change based on various case studies and model current and future trends. We might also include some expert interviews with livestock institution officers in eastern Africa to get a deeper insight into the developments on site.

Other potential topics:

Invasive plants and ungulate foraging in Sweden:
Feeding behaviour observations, dung analyses (high-resolution microscope), n-alkanes? Other technology? Camera traps

Wild boar population development – scenario modelling (Max-Ent):
potential spread under different land use models, impact of wild boar on soils and woody vegetation as well as conflicts with farmers in surrounding farmland

Lupine invasion in Dalarna
Potential spread, distance to roads, water, management technologies (cutting, fire, uprooting, plant extract spraying); Response to different temperature, irrigation treatments, soils (nutrients) as experiment

Grazing impact on soil microbiota / mycorrhizae
How does grazing of livestock on the Swedish grasslands affect soil microbiota, in particular mycorrhizae? We will investigate sites of different grazing pressure and assess soil and plant properties.

Comparing livestock systems between Tanzania and Mongolia
Understanding a GPS collar data set, comparing this across different seasons and different livestock management systems will provide insights into movement patterns, extent of grazing and activities of different livestock herds in different landscape settings. We will also investigate and spatially model the livestock's impact on vegetation and soils

Urban wildlife coexistence
What wildlife species do we have in Stockholm? Where? How many? Habitat overlap? Citizen science, camera traps, spoor plots, trapping / baiting….