



Tsetse invasion in Karamoja, Uganda: An Emerging Threat to Socioecological Resilience

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Summary

Over 70% of Uganda is infested by tsetse with negative effects on human and livestock health. From colonial to post-independent Uganda, the Government of Uganda has strived to eradicate the tsetse menace through various interventions but it is still a threat following reemergence in some areas and the expansion of the tsetse belt. The tsetse challenge had been brought under control in Karamoja sub-region in the 1960s eradication effort. However, in the recent past, veterinary reports have indicated tsetse reinvasion estimated at 10 percent prevalence. Tsetse reinvasion of the sub-region represents an additional challenge to the already vulnerable pastoral communities interfacing with a range of constraints including extreme weather events such as drought. The reinvasion has considerable influence on the social-ecological resilience of communities. Participatory assessment reports indicate that tsetse has led to livestock

deaths and heightened human-wildlife conflicts owing to the perceived spread by elephants and buffalos that emerge from the Kidepo Valley National Park. Further, livestock abortions among donkeys, goats, sheep and cattle have been reported, decreased milk yield and interference on grazing in the prime grazing lands, and migrations across to Kenya. It is also alluded that women's labour input into crop production has decreased as the tsetse prevalence is high in some of the most fertile lands yet the women often move with young children to the gardens. These effects are a direct affront on the social-ecological resilience of the pastoral communities in the sub-region as they weaken communities' adaptive capacity. Cognizant of the potential transboundary character of the tsetse reinvasion sources in Karamoja, an urgent, strategic and system wide intervention should be undertaken in the sub-region.

Introduction

Tsetse flies are large flies exclusively endemic in tropical Africa and survive on vertebrate animals' blood; making them prominent vectors for sleeping sickness and Trypanosomiasis (nagana) in humans and livestock respectively. Uganda, tsetse fly invasions have also historically been reported in the Ugandan cattle corridor that stretches diagonally from south-western to north-eastern parts of the country.

Currently, one-third of the livestock in Uganda are vulnerable to tsetse invasions and mass trypanosomiasis outbreaks. The prevalence of tsetse flies threatens the socio-ecological resilience of communities in terms of absorbing, adapting and transforming their livelihoods. This is coupled to the fact that pastoralists inhabit drylands that are already fragile ecosystems that predisposed to intermittent shocks including drought and floods.

Tsetse distribution in Uganda

About 70% of Uganda is tsetse infested. Tsetse distribution in Uganda is part of the broader endemic mid-latitudes tsetse occurrence in Africa extending that covers the area from sub-Saharan and tropical Africa including the Kalahari desert. Uganda currently has 11 sub-species of tsetse. However, of these, only two, *Glossina f. fuscipes* and *Glossina pallidipes* have had significant verification and publicity before the latest invasion of *Glossina morsitans* in Karamoja. *Glossina f. fuscipes* is the most abundant and widespread tsetse type accounting for to 70% of the country's total tsetse infested

area. *Glossina Pallidipes* covers about 20% of the country while *Glossina morsitans* occurs across approximately 19% of the country. Reported areas of high tsetse fly infestation in Uganda are in south eastern belt of Lake Victoria basin, River Nile basin through Lake Kyoga lowlands in Teso and Lango sub regions and extend to West Nile and north eastern parts of the country. In Karamoja high tsetse prevalence has been observed in Kaabong and Kotido districts especially along Kidepo Valley National Game Park.

Figure 1(a-c): Predicted distribution of tsetse fly in Africa Maps prepared using data from PAAT-Information System-ERGO Ltd and TALA (2000).

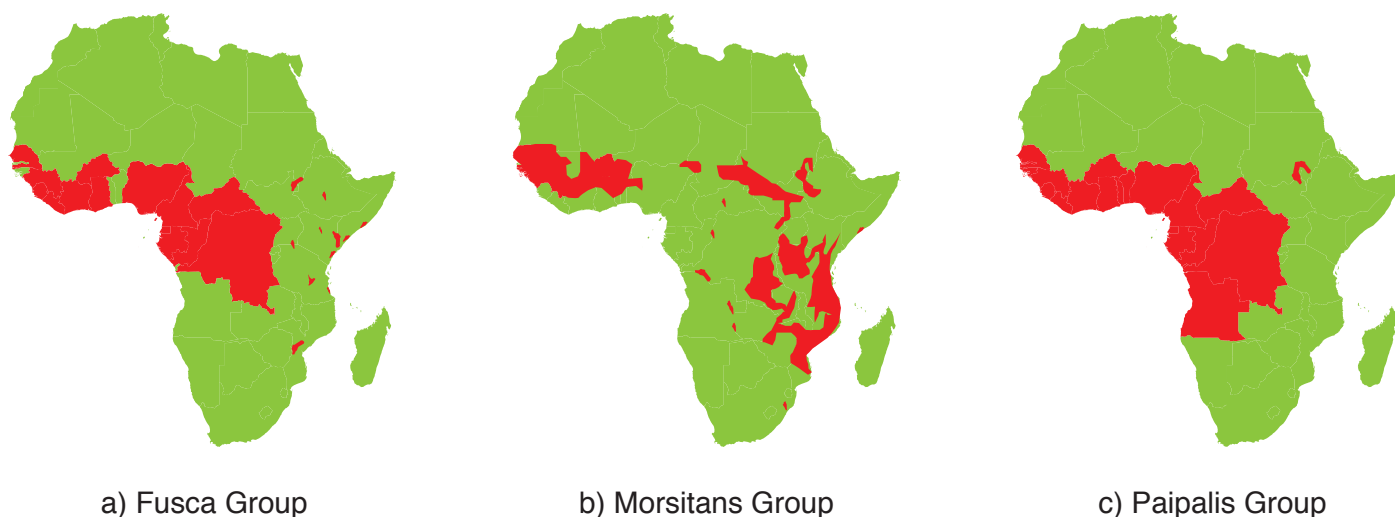
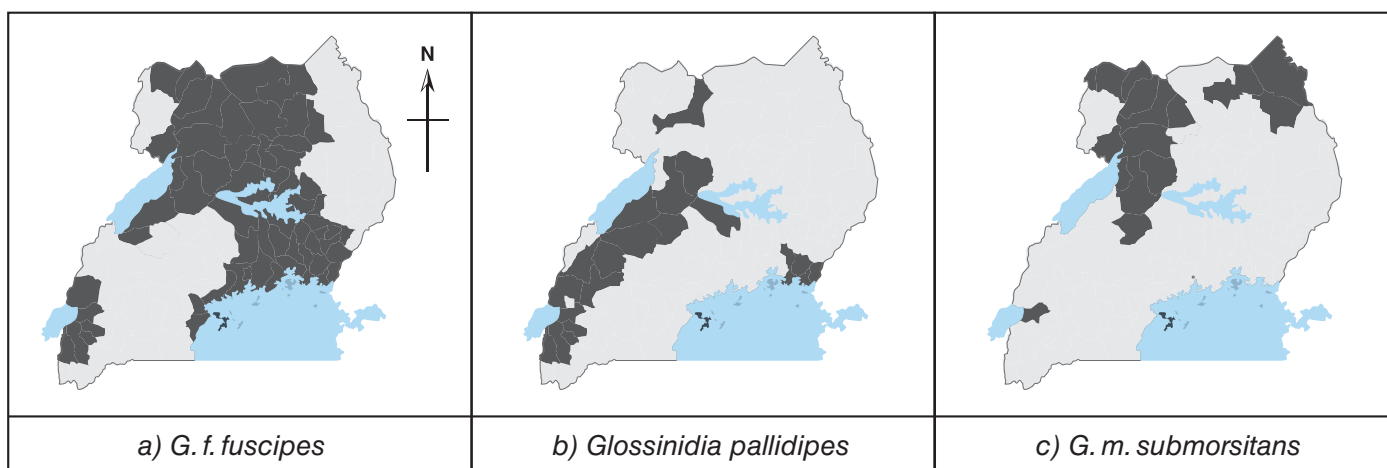


Figure 2: Historical distribution of the three major tsetse species



Tsetse distribution in Karamoja

Tsetse fly trap catches in the Karamoja sub-region indicated a high density of tsetse fly in northern Karamoja. Through participatory assessment undertaken in the districts of Kaabong, Kotido, Moroto, and Nakapiripirit in 2018, a historical account of tsetse in the sub-region was provided with the re-emergence traceable to between 2003 and 2007 period. This period is in tandem to the renewed forceful disarmament exercise in the sub-region.

The tsetse prevalence is accelerating with two transmission routes (eastern and western route) from northern Karamoja to southern Karamoja aligned to the buffalo and elephants seasonal movements in search of water and pasture. As such the eastern route commences from Kidepo valley National Park through Pire-Nawuntos-Kalopeto-Kangaleta-Logum-Tukutan-Lokasirim to Remarim. Upon reaching Rememarim; this route sub-divides itself into two minor routes; one that enters Loyoro-Kotein to Sare and the other route crosses to Kenya.

The elephants and buffaloes on average take about three months at the water points at the Loyoro, Kotein and Sare; these have become convergence points. The second major transmission route commences from Kidepo Valley National Park through Nataba Lokure-Lofa-Omodoch-Lolelia-Lokapir. On reaching Lolelia, two minor routes emerge; one towards the areas of Leterua-Naperetom-Sidok and Lopoet.

The second minor route is that to Lolelia with entry points from Lomodoch-Kamoringaetyang-Sangar-Kotor-Kapeta-Lobanya-Kaicheri-Abim-Morulem. Both the eastern and western routes open towards central to southern Karamoja. However, presently the prevalence is largely concentrated in northern Karamoja in the districts of Kaabong and Kotido.

Within the two transmission routes in northern Karamoja, five tsetse fly concentration zones have been identified by the communities including: i) Loyoro zone (Losululut, Aterak, Sar, Tapajei, Natelo, Musorod, Longlech, Loyile, Lobuneit, Bwangakou, Loumo, Maechit, Timira and Nakutan), ii) Regen zone (Lobel, Kalokitido, Morunyang, Waliwal valley dam, Katukenyang valley dam, Makal, Kanakori, Kanachom,

Kaleta), iii) Kacheri zone (Lolelia, Kalingalem, Kayirang, Kapethinyang), iv) Usake-Kameon zone (Naminyit, Nawurat, Puta, Adumakuj, Lotila, Pire) and v) Lolelia zone (Kamoni, Narogole, Kumet, Kekuruk, Kamerisogol, Kamugemuge, Kalamaikol, Kotor, Lochokoi, Kaka, Lomodoch and Lochwai). Presently, tsetse fly concentration appears to be a preserve for northern Karamoja.

However, reported observations in central and southern Karamoja are being reported in parts of Napak and Narisai and Narentogo in Nakapiripirit district. These areas are on the western transmission route in which northern Karamoja and are connected through the Pian-Upe and Bokora wildlife reserves in southern Karamoja. In addition, some tsetse catches have been reported in Amudat district in southern Karamoja. These catches signal a re-emergence that could be linked to the tsetse belt in western Kenya.

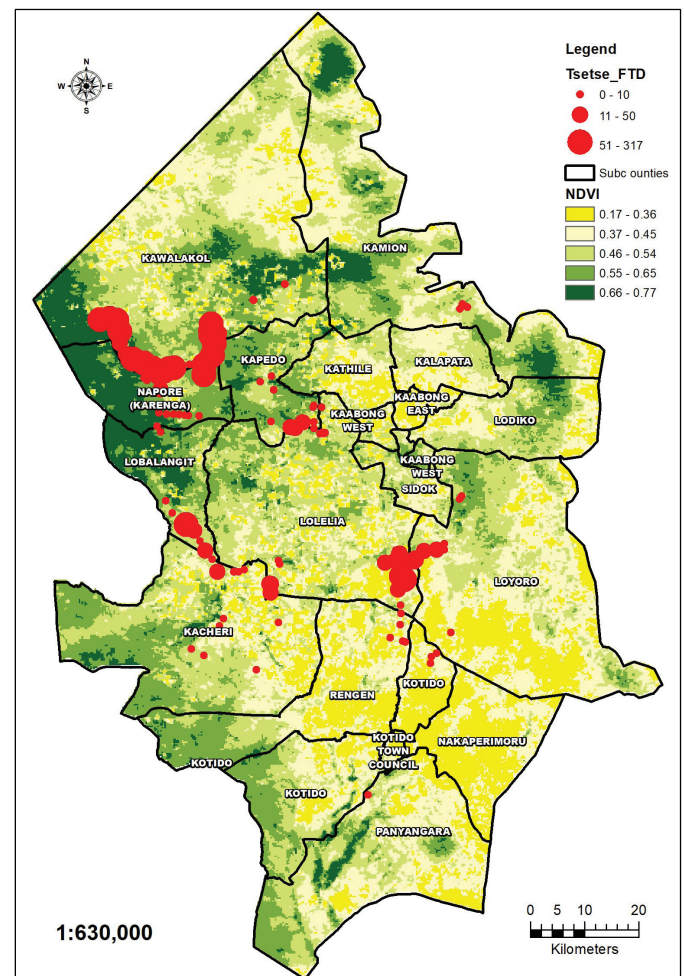


Figure 5: Spatial distribution of tsetse fly in northern Karamoja (Source: Authors)

Colonial period through 1950s	Post-colonial period 1962 - early 1970s	1970s - early 2000s	Mid - 2000s to post Disarmament period
			
<p>Colonial administration got established in Karamoja with several effects including well established subdivision of the cultural groupings in Karamoja. Tsetse was recognised as a problem in the region and a control camp established at Lolelia. Camp was also located on the fertile lands of Lokapir and Naperetom. This group used to kill wildlife including elephants for their trophies. This was perhaps the worst time in wildlife and livestock. Cattle were herded and confined to the east of Karamoja.</p>	<p>Post-colonial government recognised the menace of tsetse. A tsetse control officer called Ayela had been posted to Karamoja with an established camp in Kotido and parts of Kaabong closer to Kidepo valley. Control mechanisms including gazette of communities in one location/camps and mobilizing able bodied men to cut and burn all bushes and trees. A lot of vegetation was cut transforming woodlands into open grasslands.</p> <p>Evidence of these remnants of tree trunks can be observed at the Kidepo Valley. In addition, herbicides that killed everything including bees (non-selective) was used in the eradication efforts. At the fall of Obote I government in early 1970s, Karamojong acquired guns after overrunning the Moroto barracks. Light weapons thus made entry into the life of the pastoral community in this region. Ayela was killed by Amin's soldiers and this marked the end of the tsetse eradication efforts in the region.</p>	<p>Ayela, a re-known tsetse eradication officer had been killed in the early 1970s. The Karamojong were now armed and rapid proliferation of light weapons became more prominent in the sub-region. Governance systems collapsed with regards to public authority and administration. Intense livestock rustling and wildlife poaching became prominent. Wildlife got confined into the Kidepo National Park albeit as a refuge centre. This period also represented a rather a period of obscurity of Karamoja sub-region from government investment and Karamoja was viewed as a problem to the neighboring communities in Teso, Lango, Sebei, and Acholi.</p>	<p>In the mid-2000s about 2003, a disarmament exercise by the Government of Uganda was initiated. First, there was a peaceful disarmament involving voluntary declaration and return of guns to the Uganda People's Defense Forces (UPDF). Failure to achieve success and continued counter raids, forced Government of Uganda to launch a forceful disarmament exercise. Upon the disarmament, the UPDF then provided security to communities and herders.</p> <p>This marked the return of normalcy and 'peace' in the region. The wildlife that had hitherto been confined to Kidepo Valley National Park slowly started to return to graze in the outskirts of the National Park especially during the dry season. With the return of the wildlife, the reinvasion of tsetse first in Kaabong and Kotido were reported. As the wildlife continues to routinely return to the grazing and waterholes outside the park, the prevalence of tsetse is also intensifying.</p>

The re-emergence of the tsetse prevalence in the Karamoja sub-region has been attributed to several factors; firstly, the pastoral communities acknowledge the tsetse eradication efforts of the 1960s to 1970s especially those championed by a one Ayela; they observed that the Republic of Sudan (now South Sudan) did not undertake any action towards tsetse eradication in its areas of control.

It was a problem half solved. Thus, the source of the current reinvasion appears to have a trans-boundary element from South Sudan and perhaps parts of western Kenya (for the sited catches in Amudat district).

Secondly, it was observed that the disarmament exercise that was undertaken in the sub-region from around 2003 has

played a significant role in let lose the buffalos and elephants from the Kidepo Valley National Park to graze freely in others parts in the sub-region. Previously when the communities were fully armed, elephants and buffalos were contained into the park for safety as the communities killed them.

Thirdly, creation of valley dams and permanent water points in areas that originally did not have such waterholes has attracted elephants and buffalos into areas that were not previously their grazing grounds. As such, the dispersion of the two primary wildlife species attributed for tsetse spread in the region has widened and has their residence time in particular locations where permanent water sources exist.

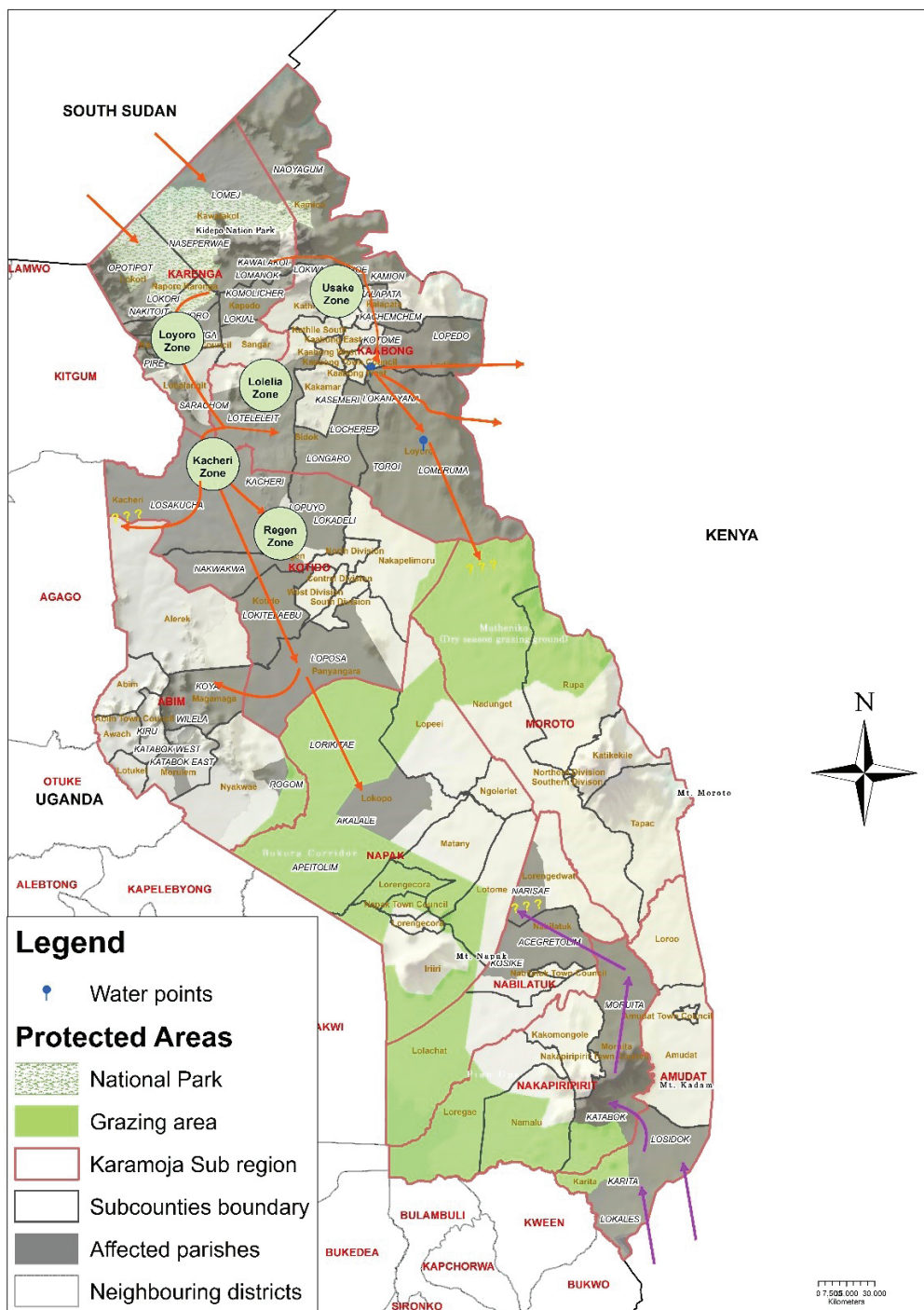
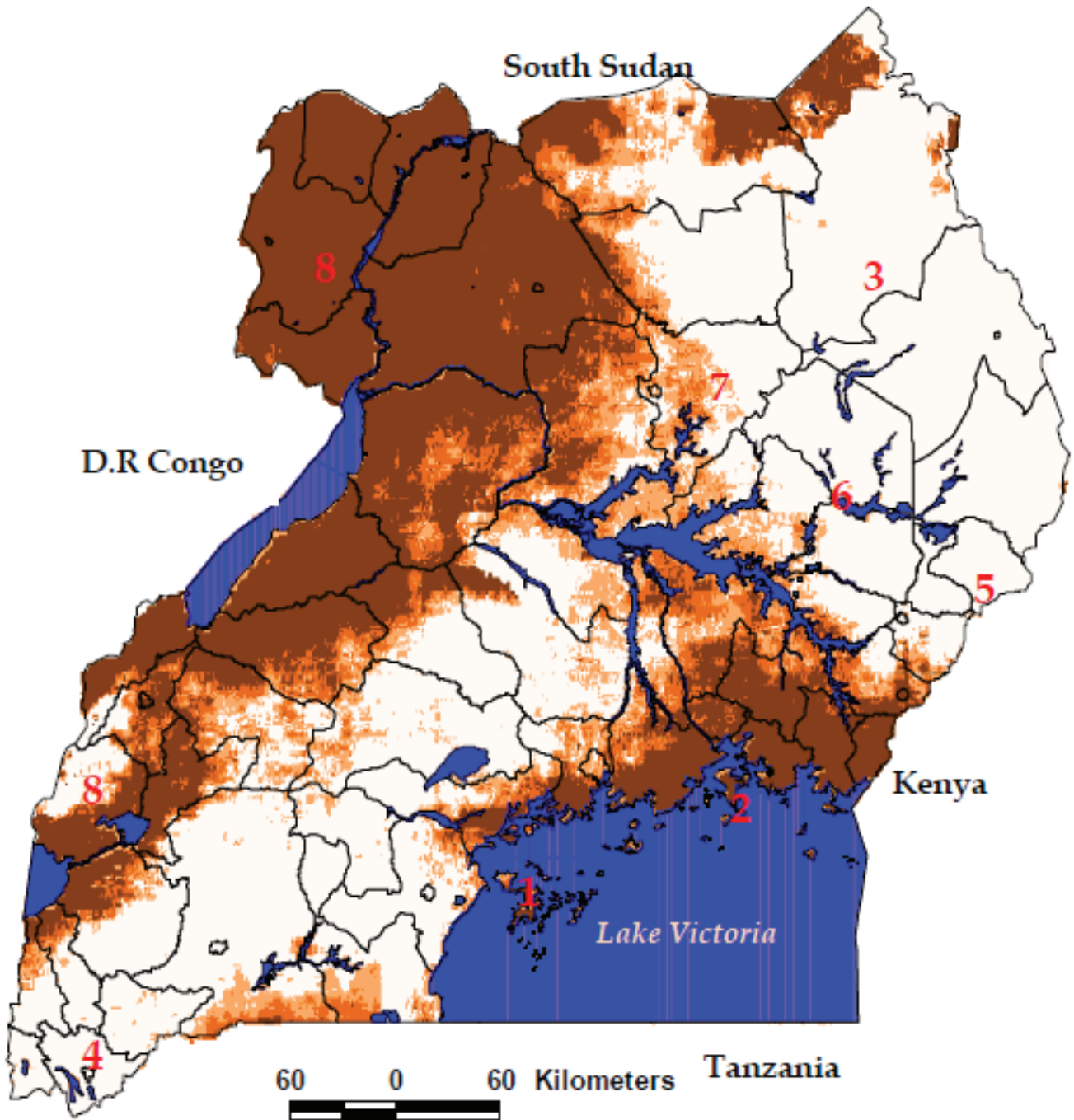


Figure 9: Tsetse dispersal routes in Karamoja (Source: Participatory assessment data). The reddish-brown arrows denote tsetse emerging from the Kidepo Valley National Park in north Karamoja. Purple arrows denote the tsetse perceived to be coming from West Pokot in Kenya.



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|-----------------------------------|------------------------|
| 1. Kalangala Island | 6. Teso region |
| 2. Buvuma Island | 7. Lango region |
| 3. Karamoja region | 8. West Nile region |
| 4. Kabale region-Kigezi highlands | 9. Mt. Rwenzori region |
| 5. Sebei region/Mt. Elgon region | |

Figure 10: Prediction of tsetse prevalence for the three major species combined in Uganda, 2011

Socioecological resilience under tsetse invasion: implications on tsetse control

An examination of socioecological resilience of tsetse infested communities in northern Karamoja indicated absorptive capacity of 15.0%, adaptive capacity of 22.1% and transformative capacity of 24.5% with an overall computed socioecological resilience index of 20.5 percent. Complex and multiple dimensions of socioecological interactions in Karamoja exist. These interactions included

1. livestock-wildlife interaction;
2. wildlife-human-livestock interaction;
3. agricultural land expansion into wildlife grazing locations;
4. cross-country human-livestock-wildlife movements;
5. intensified water resource development for livestock production development without due consideration for wildlife grazing and water needs; and
6. seasonally oriented wildlife-livestock movements taking advantage of heterogeneously distributed water and pasture resources in space and time.

These observations highlight the need for the application of transdisciplinary, interdisciplinary and system dimensions in planning, implementing and managing tsetse control interventions in the area. Multi-disciplinary approaches for addressing socioecological challenges are severally considered.

By adopting transdisciplinary, interdisciplinary and system dimensions, it is my belief that the actors in the intervention sphere will be better poised to co-create integrative solutions. Collaborative co-creation of solutions brings stakeholders together to share knowledge and form networks that are vital in guiding intervention strategies and practices that increase socioecological resilience. Furthermore, through these approaches, practitioners are in a better position to engage

policymakers, decision leaders and local communities to adopt scale- and transboundary-level interventions. This process is particularly important because resilience and sustainable development are possible only within a context where the processes affecting and the processes affected by the health of ecosystems and human societies are holistically considered. Thus, integrative and cross-sector approaches to tsetse control are critical. The tsetse distribution in Karamoja bears a spatiotemporal distribution characteristic. Both entomological surveys and participatory assessments revealed a higher prevalence in northern Karamoja than in central and southern Karamoja. Of particular concern is the spatial distribution and spread southwards and the emerging south-to-west Karamoja pattern. These patterns call for the establishment of a permanent, robust and routine tsetse monitoring system in Karamoja. This robust system must be inclusive, taking into consideration local knowledge and information systems.

It is also critical to develop approaches that can enable the timely transfer of tsetse-based information for prevalence and risk quantification. This speed is important in facilitating timely response.

Actors in tsetse control must pay close attention to seasonal dimensions because dispersal is associated with seasonal migrations of hosts, especially wildlife. Considering the flux in wildlife and livestock-cattle mobility into Uganda during the dry season, it is vital that monitoring be conducted to ascertain tsetse dynamics associated with this mobility. Temporal migratory route monitoring could perhaps aid in providing critical information regarding the progression of tsetse abundance and therefore help with the identification of risk hotspots, particularly because these routes are transformation foci.

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