Surveillance of Climate-sensitive, tsetse-transmitted Trypanosomiasis in Kenya

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Introduction

- Trypanosomiasis is a neglected tropical disease transmitted by tsetse flies (DeVisser et al. 2010)
- Disease impacts on human & animal health, agriculture & tourism costing Africa >US$4.5B p.a
- Drug resistance a challenge to trypanocidal use
- Integrated vector management, IVM improves efficiency, cost-effectiveness, ecological soundness sustainability in disease control (WHO, 2019)
- The disease doesn't feature prominently in national budget for funding like TB, HIV or Malaria.

Objective: Determination of the tsetse apparent density, diversity of tsetse species, trypanosome infectivity in cattle & tsetse flies in Kwale county, prior to large-scale vector control program using lintegrated vector Management approach (IVM).

Fig 1: Tsetse presence in Kenya

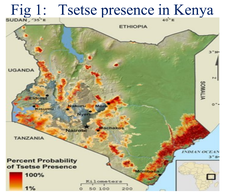
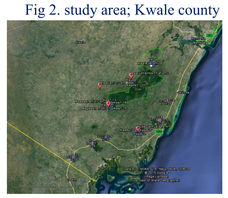


Fig 2. study area; Kwale county



Materials and methods

Parasitological surveillance in bovines and caprines

Parasitological method was used (Mbahin et al. 2013) Blood was collected from an ear vein in 110 bovines, into two heparinized micro-haematocrit centrifuge capillary tubes, sealed with cristaseal and centrifuged for 5 minutes at 9000 rpm (Murray et al. 1977; Jamal et al. 2005) PCV was determined and Buffy coat technique used to determine presence of mobile trypanosomes using phase-contrast microscope x40 objective lens.

Entomological surveillance

71 baited biconical traps were used to monitor tsetse population in the study area. Portion of flies were dissected to det ermine infection status.(Mamoudou et al. 2006)

fig 3. Parasitological survey

fig.4: Entomological survey

Results & Discussion

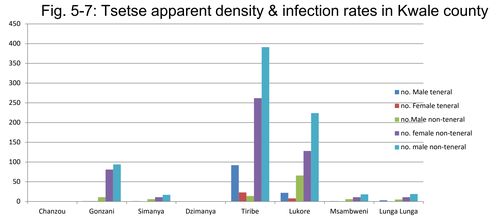
- Out of the 764 flies trapped (May 2018), 152 (19.89%) were teneral & 612 (81.11%) non-teneral (mature).
- 317 flies of the 764 flies were dissected. 22 positive for trypanosomes.
- Overall trypanosome infection rate > 6.94%.
- *Trypanosoma congolense* was the more infectious and prevalent than *T. vivax*.
- 110 bovines sampled, 3 positive cases > overall trypanosome prevalence 2.72%.
- No trypanosomes was detected in caprines
- Semi-arid areas such as Chanzou and Dzimanya in Kinango had neither flies nor trypanosome infections (0%).
- Mean apparent densities were strongly positively correlated with infection rates (Nthiwa et al. 2015).
- *Glossina pallidipes* was the most predominant species. Other species were *G. austeni* and *G. brevipalpis.*
- Vector borne disease risks are **sensitive** to **weather** and **climate**. **Temperature**, **rainfall** and **humidity** affect vector mortality, activity, rates of development, availability of breeding habitat, transmission cycles (Ogden, 2017).
- Multidrug resistance necessitates application of IVM approaches including combination therapy with trypanocides up to 80% of cattle population to reduce treatment failure rates (Wangwe et al. 2018)
- Bee health, other pollinators & biodiversity depletion are a key concern due to excessive use of pesticides (Siviter et al. 2018; Lord et al. 2018),
- Shift from chemical-based control methods to biological control such as waterbuck repellant collars, which are a tried & tested solution in Kwale (Saini et al. 2017)are key techniques highly preferred by farmers for tsetse control
- Enablers of IVM approach are the International agreements that Kenya has ratified, collaborations with research orga nizations, both local and international, support from African Union that led to establishment of KENTTEC, agency for tsetse and trypanosomiasis eradication in Kenya.
- Disablers to the approach remains the neglect of the disease, minimal funding, legal and institution drawbacks to full o perationalization of tsetse and trypanosomiasis eradication, lack of evaluation methodology and failure to document s uccesses in control activities (Meyer et al.2016)
- Environmental Management and Coordination Act, 1999 requires environment impact assessment to be done before any major tsetse eradication activities are done. This ensures ecosystem health is safeguarded and the community is involved for sustainability.

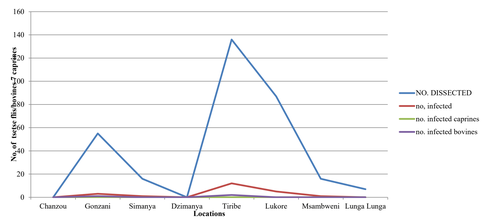
Frequent Droughts and flooding in coastal Kenya deprives smallholder farmers their **livelihoods**, a phenomenon exacerbated by upsurge in pests or shift of tsetse flies due to change in climate-change related parameters.

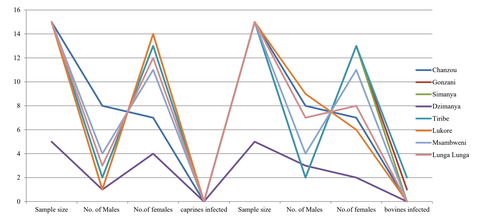
Table 1: Entomological survey data

LOCATIONS	TRAP TYPE	NO. OF TRAPS	SPECIES	TENERAL		NON-TENERAL		TOTAL	FTD
				Male	Female	Male	Female		FTD
Chanzou	Biconical	7		0	0	0	0	0	**0**
Gonzani	Biconical	12	*G. pd*	1	1	11	81	94	**3.9166**
Simanya	Biconical	8	*G. pd, G. brevi*	1	0	6	11	18	**1.0625**
Dzimanya	Biconical	8		0	0	0	0	0	**0**
Tiribe	Biconical	7	*G. pd , G. brevi, G. aust*	92	23	14	262	391	**27.9285**
Lukore	Biconical	8	*G. pd , G. brevi*	22	8	66	128	224	**14.000**
Ramisi	Biconical	7		1	0	6	11	18	**1.2857**
Lunga Lunga	Biconical	14	*G. aust, G. Brevi*	3	0	5	11	19	**0.5000**
TOTAL		71		120	32	108	504	764	**5.3732**

Fig. 5-7: Tsetse apparent density & infection rates in Kwale county







Integrated vector control methods

Conclusions

- Sustainable Integrated Vector Management for tsetse suppression can greatly reduce African animal (AAT) and human trypanosomiasis (HAT).
- Apparent density of the vectors is a good indicator for AAT transmission risk, as Nthiwa et al. 2015 found.
- Control strategies targeting the vector, trypanosome parasite and mechanical vectors
- Community sensitization and stakeholder involveme nt is key for sustainability of IVM & tsetse control
- One health approach for collaboration between stakeholders involved in livestock, wildlife, public health and conservation will play a key role in Tsetse eradication, if pursued.
- Parasitological and entomological surveillance to establish trypanosomiasis prevalence in varying seasons should be up-scaled in the county
- Integrated vector control by use of acaricides, trypanocidals, insecticide-treated traps & targets, farmer field schools & Zerofly netting be intensified.

>Global strategic framework for IVM recommends; advocacy, mobilization, collaboration, integration of vector control methods, evidence based decisions and capacity-building for full benefits of IVM to be realized (WHO 2019) in the midst of climate change.

Acknowledgement

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