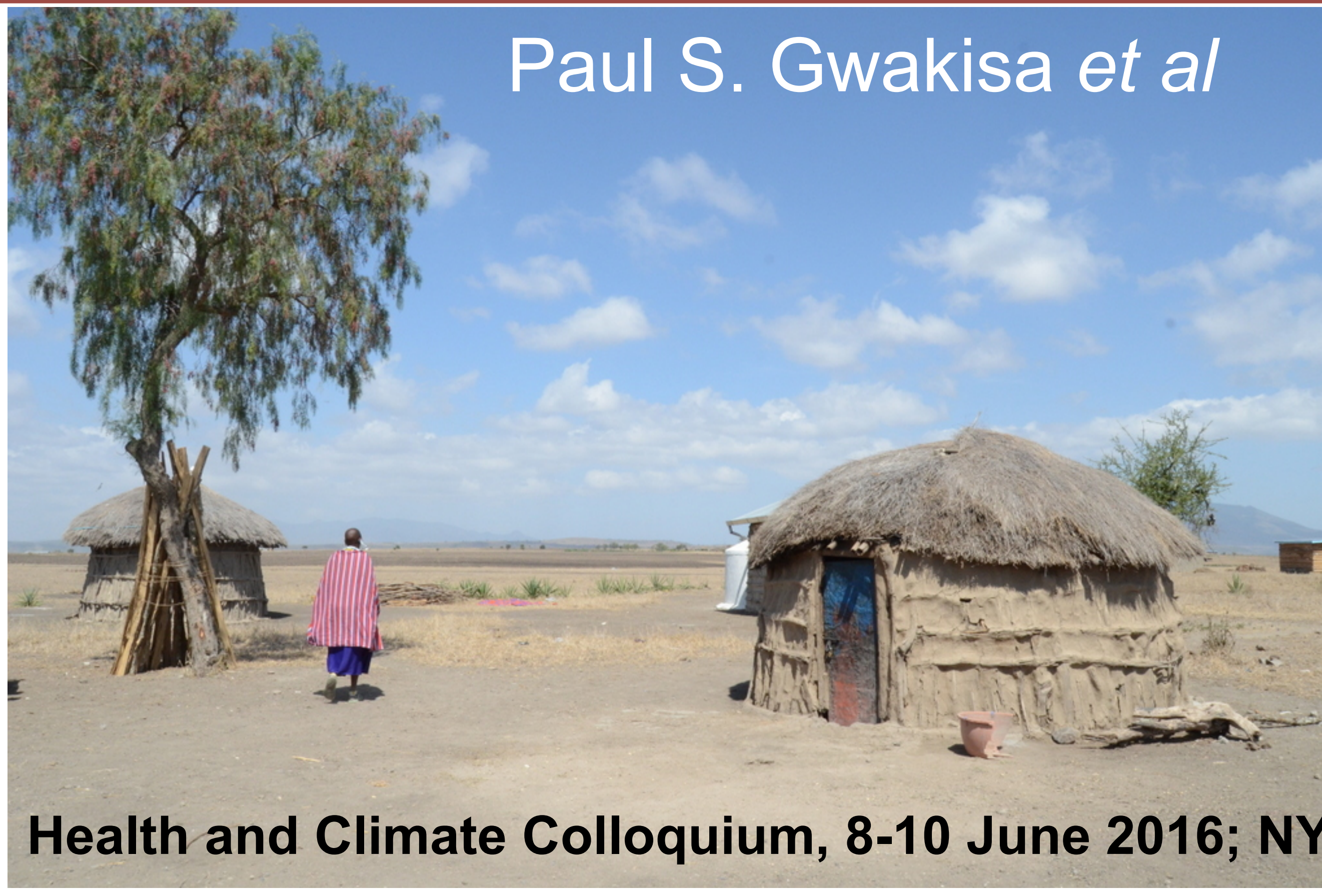
Predicting vulnerability and improving resilience of Maasai communities to vector-borne infections: A CASE STUDY



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Trypanosomiasis and Maasai people

- This case study reports on Maasai people in northern Tanzania and their environment-driven vulnerability to African trypanosomiasis, a disease transmitted by tsetse flies

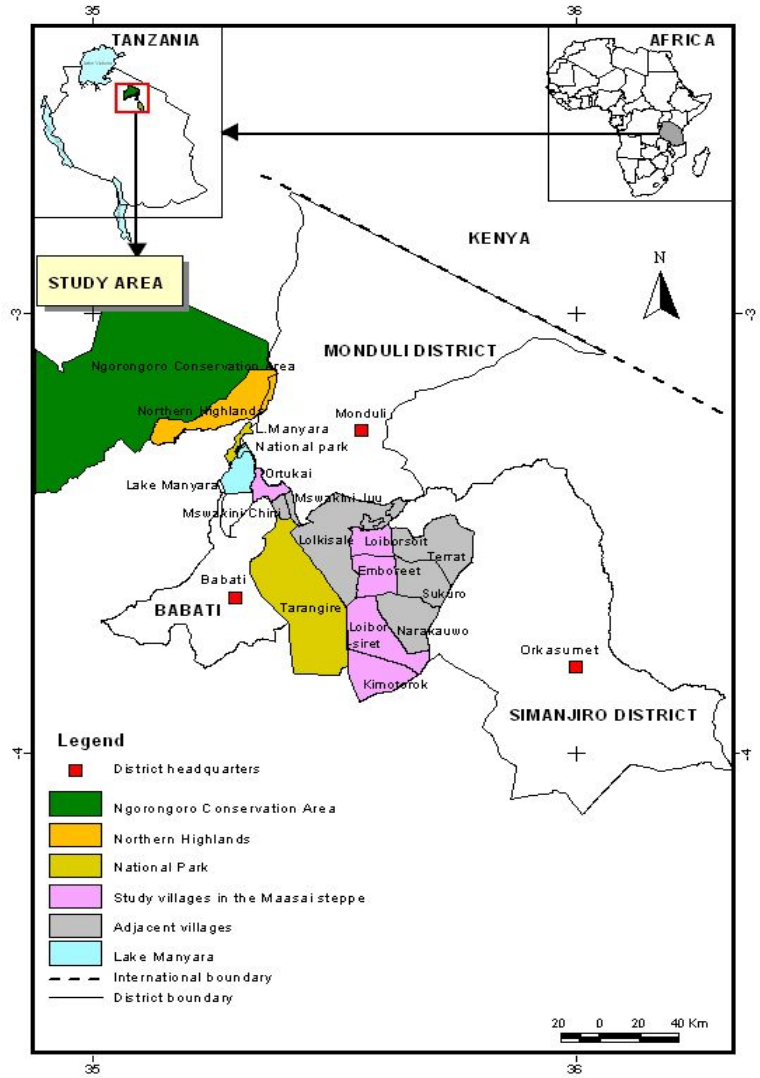
- Trypanosomiasis is among the neglected diseases,
  - it is zoonotic and
  - Endemic, hence affecting livelihoods of the Maasai people living in human-animal interface areas

Favourable Conditions for Trypanosomiasis in the Maasai steppe

- Changes in climate directly affect the conditions for tsetse fly development by altering vegetation cover and movement of animal hosts, and hence disease transmission dynamics

Where we work

- Due to effects of climate change the Maasai people are forced to alter their lifestyle from pastoralism to a more sedentary lifestyle.
- The Maasai are thus forced to move into wildlife areas in pursuit for water and pastures for their livestock and land for agriculture
- This increases their vulnerability to African trypanosomiasis.

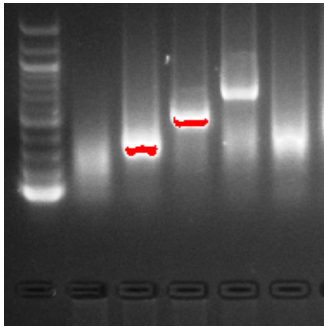


Our Research Aims and Objectives

Our main objective is to understand how changes in climate and land cover/land use influence current tsetse fly and trypanosomiasis distribution in the Maasai steppe.

We also want to make predictions for climate change and land cover so as to identify where future tsetse infestations and hotspots of infection are likely to occur.

Methodology



Data points: GPS, Temperature, Seasonality

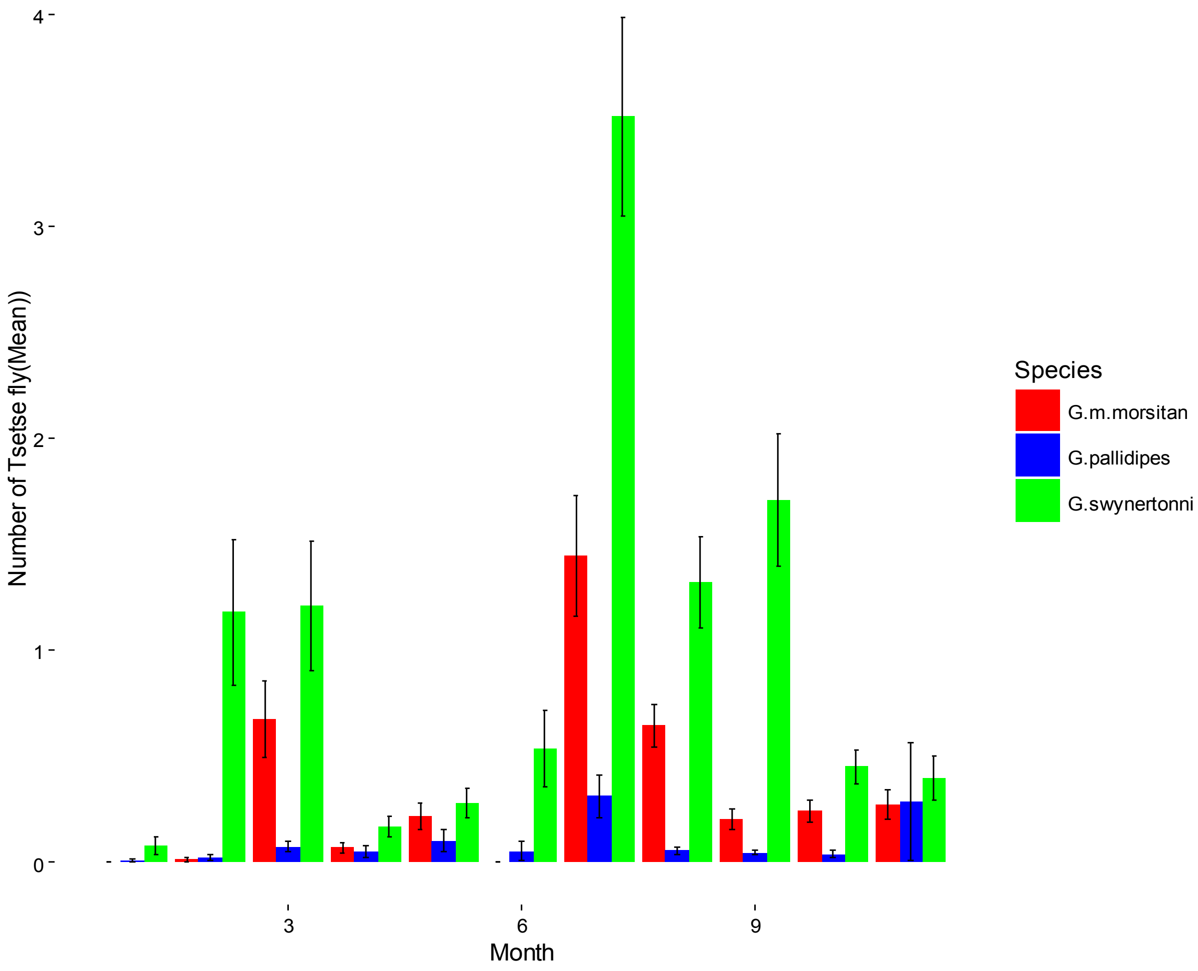
- **SEASONALITY**

- Fly abundance was associated with seasonality for all three species.

- *e.g., G.swynertonni* had 3 peaks in March, July and September

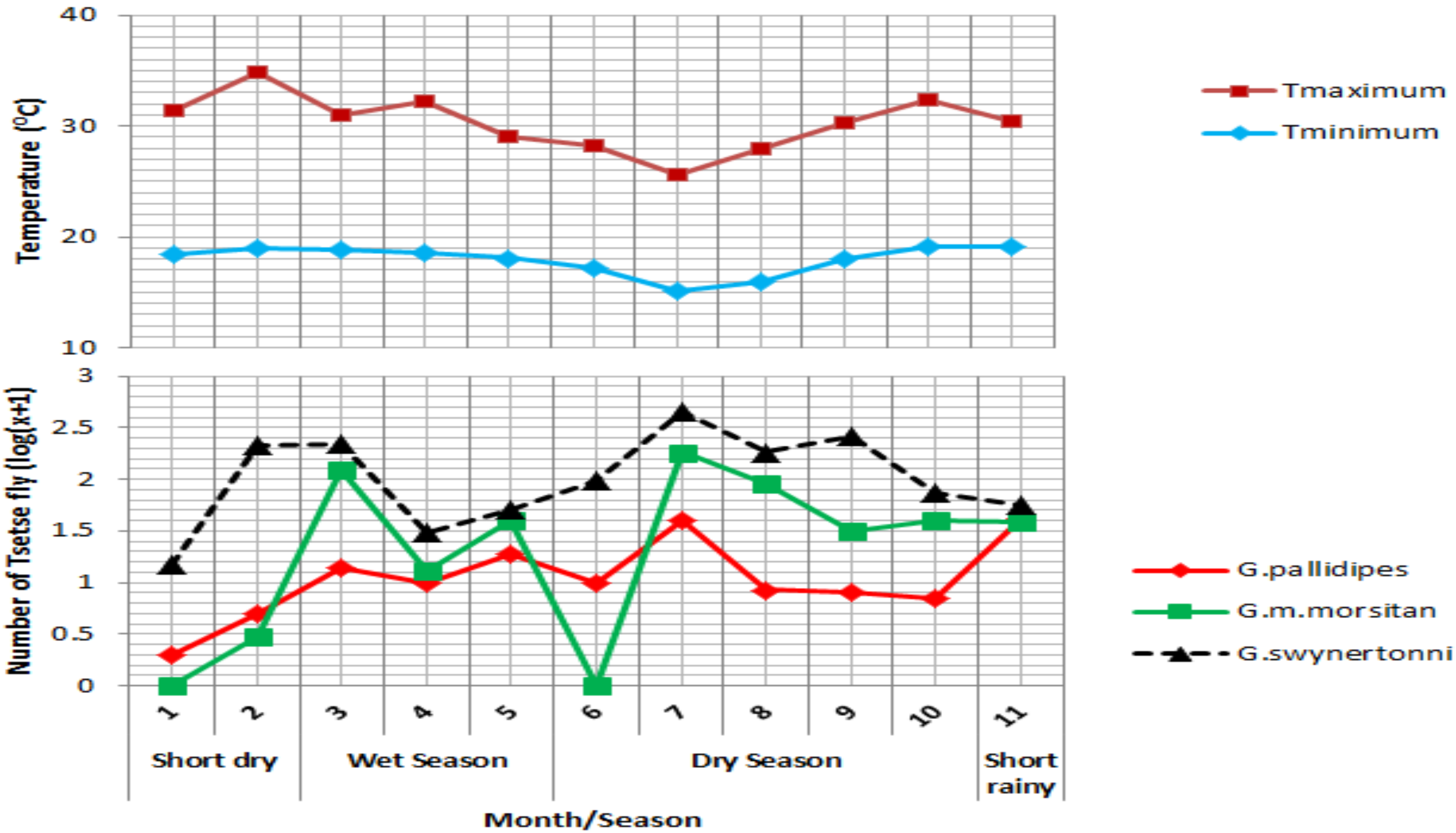
- *G. swynertonni* was most abundant (70.8%), followed by *G.m.morsitans* (23.4%) and *G.pallidipes* (5.8%)

Relative abundance of tsetse flies in different months

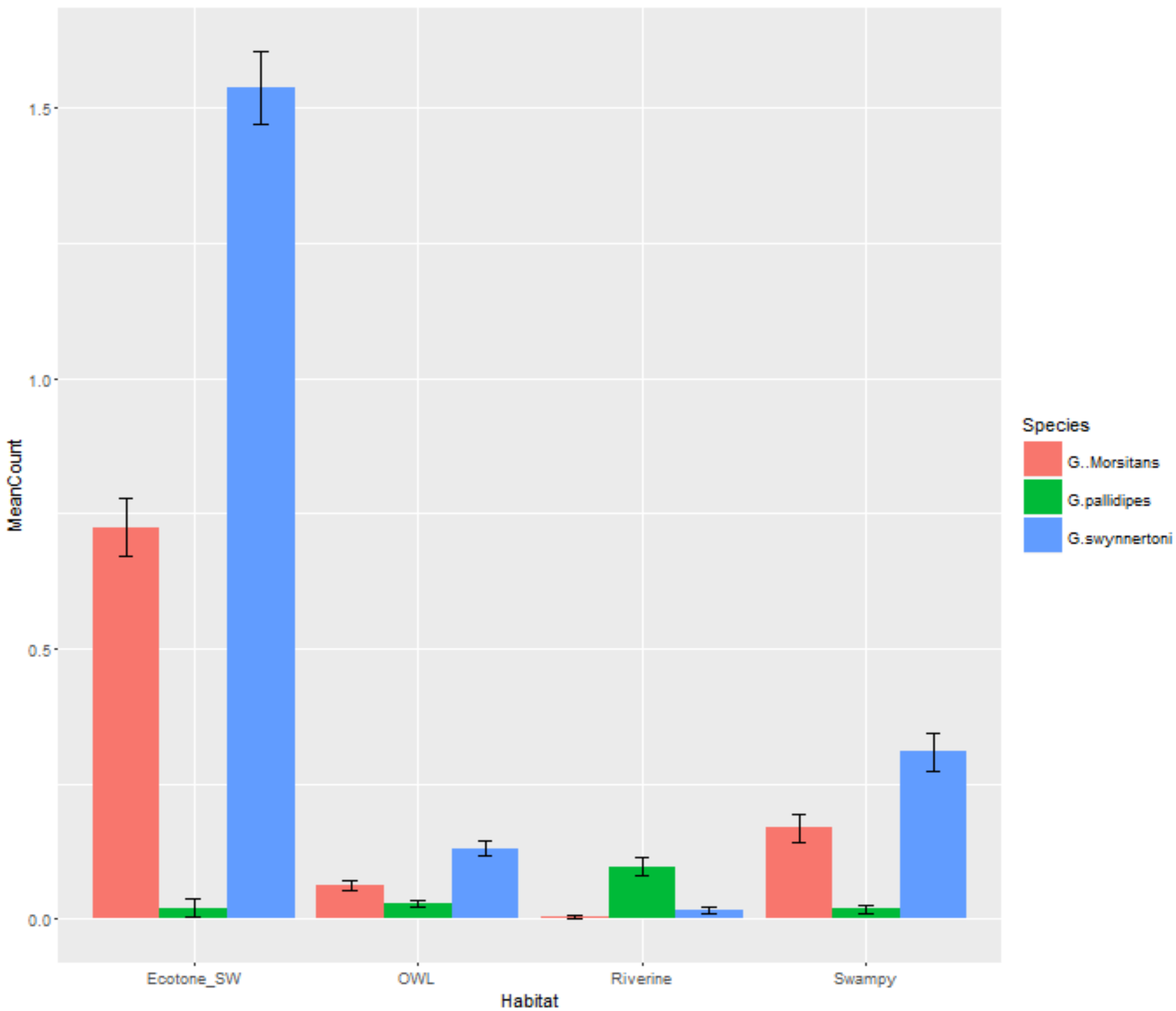


- Little variation in temperature pattern from one month to the next, with lowest temperatures in July.

- GLMM showed a significant negative relationship between tsetse fly abundance and maximum/minimum temperature



Relative abundance of tsetse fly species amongst habitats in relation to vegetation in the Maasai Steppe



- Highest tsetse catches in swampy-woodland ecotone habitat and the lowest in riverine habitat.
- Similar abundance patterns across habitats for *G. morsitans* and *G. swynnertoni*
- Host availability (livestock, wildlife, humans)

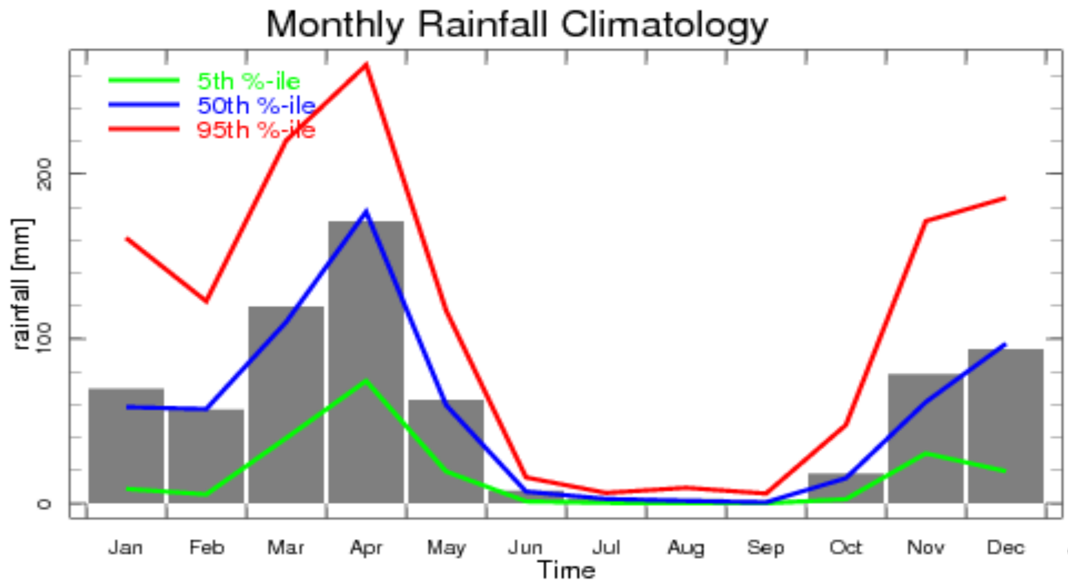
Trypanosome Infections in hosts

In tsetse flies

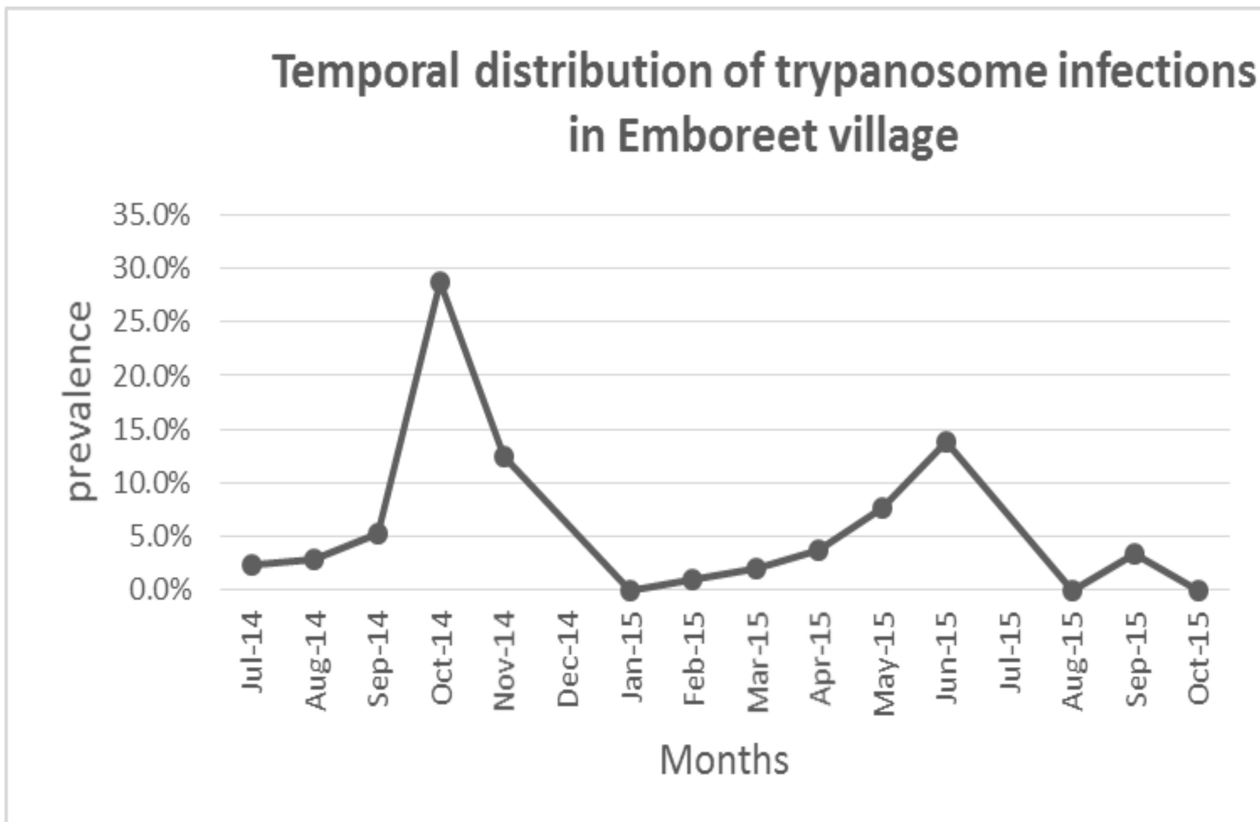
- **5.6%** as overall prevalence of infections
- Highest prevalence in October (30%, beginning of short rains) and June (15%, ending of long rains).
- Lowest prevalence in January and August (hot and dry months)

In cattle

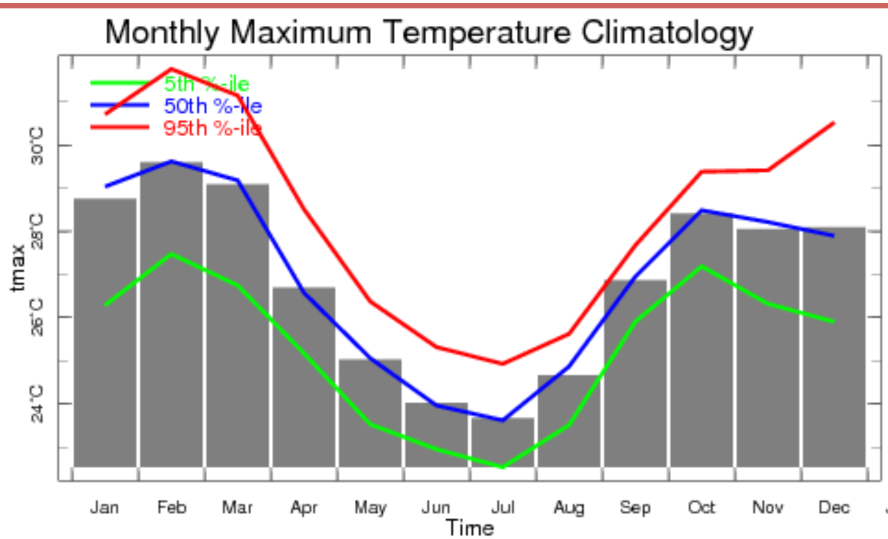
- 17.2% as overall prevalence of infections
- Highest prevalence (18.7%) at the end of long rains (June)
- Lowest prevalence (16.0%) in August (dry season

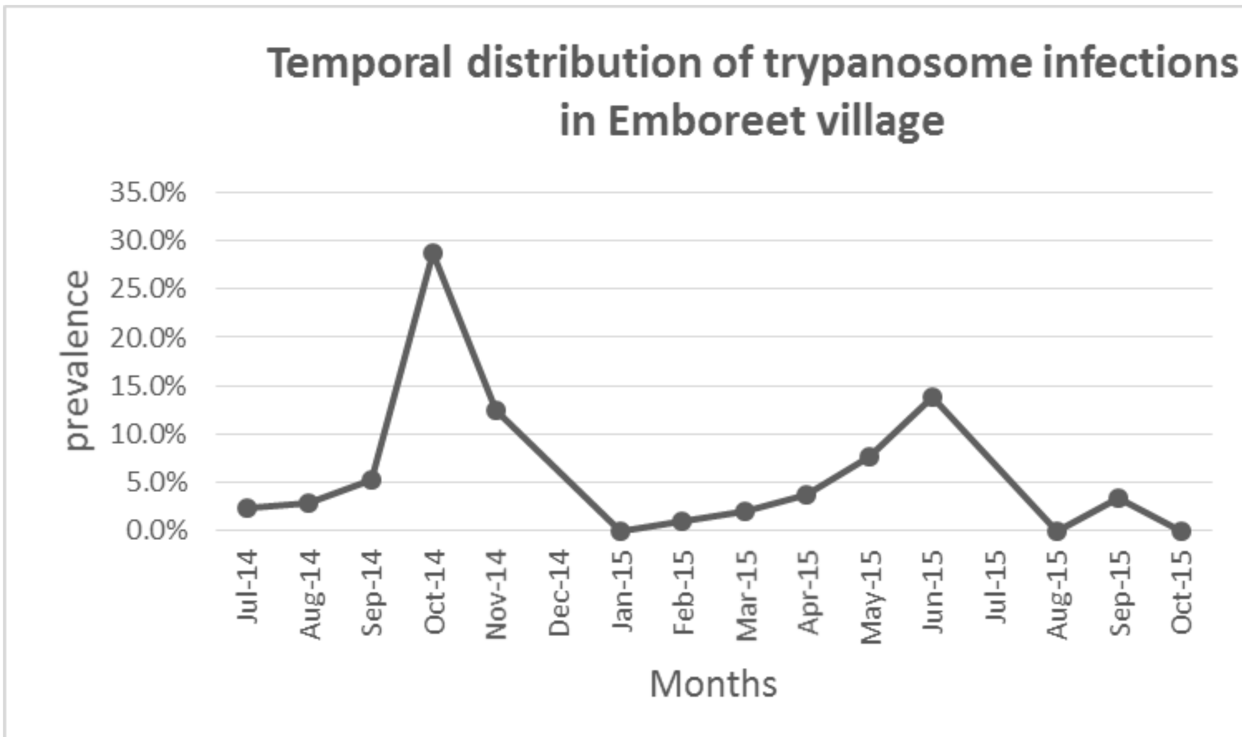


Monthly Rainfall Climatology
5th %-ile
50th %-ile
95th %-ile
rainfall [mm]
0
100
200
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Time



Temporal distribution of trypanosome infections in Emboreet village
prevalence
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15
Apr-15
May-15
Jun-15
Jul-15
Aug-15
Sep-15
Oct-15
Months


Monthly Maximum Temperature Climatology
5th %-ile
50th %-ile
95th %-ile
30°C
28°C
26°C
24°C
tmax
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Time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Jun-15
Jul-15
Aug-15
Sep-15
Oct-15
Months

CONCLUSIONS

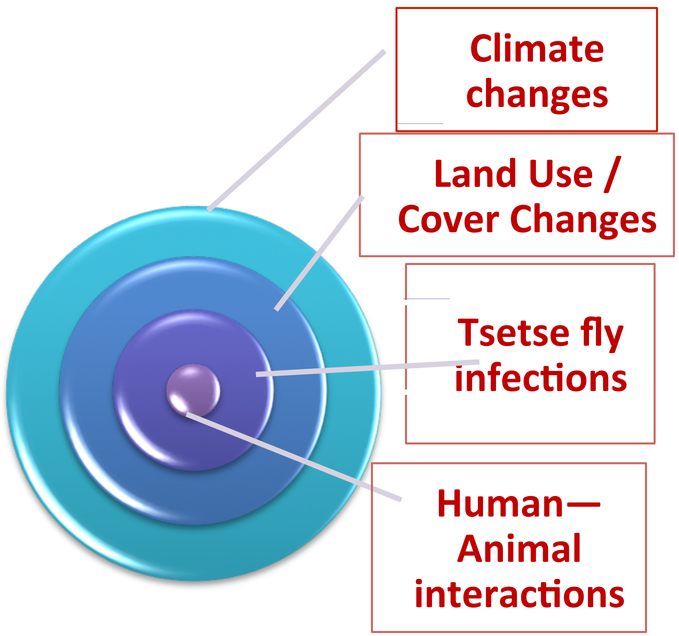
• We show seasonality of tsetse abundance and trypanosome infections both in tsetse flies and cattle: *T. vivax, T. congolense, T. brucei*.

•We show no human-infective parasites (*T.b. rhodensience*) so far in the study area as confirmed by SRA-PCR and SRA-LAMP.

• Due to presence of reservoirs and anthropo-zoonotic feeding behaviour of tsetse flies we can not negate vulnerability of Maasai communities to Trypanosomiasis.

• Based on our and medical sources, Human cases of the disease (HAT) have declined (10-20 years). This suggests that with a changing environment, Trypanosomiasis can potentially re-emerge, and hence it is important to institute surveillance especially in human-animal interface areas.

Thank you



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