

# ***Wolbachia, Sodalis* and trypanosome co-infections in *Glossina austeni* and *Glossina pallidipes* from the Kenyan coast**

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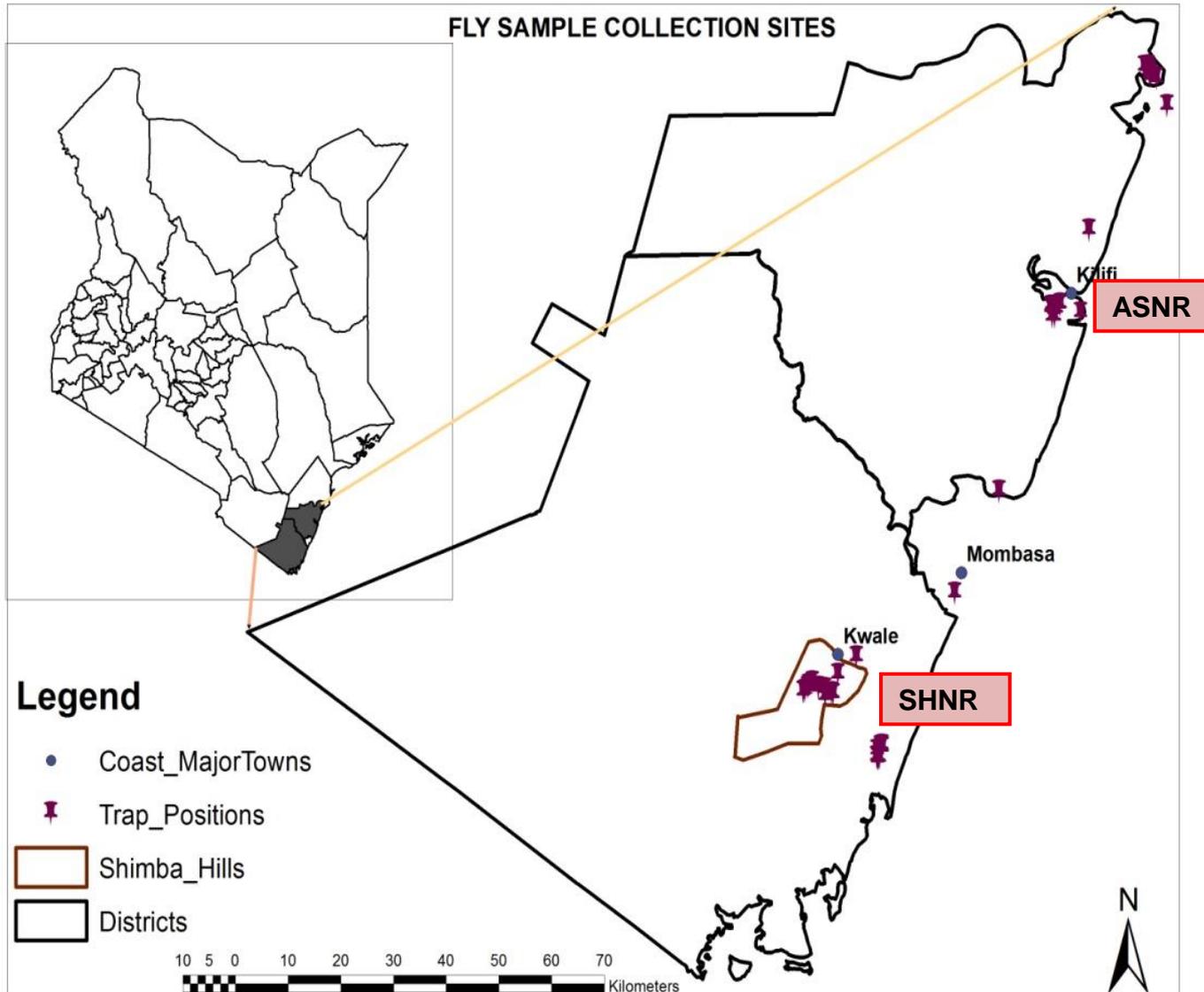
# Background

- Tsetse symbionts: *Wigglesworthia*, *Wolbachia* and *Sodalis*
- *Sodalis* is found in the gut » close association with trypanosomes
- May affect establishment and development of parasite infections in the midgut
- Transmitted from mother to developing larva, therefore are present at eclosion
- Trypanosomes acquired at ingestion of infective bloodmeal
- Opportunities for symbiont-based disease and vector control
  - paratransgenesis (Chagas', leishmania)
  - cytoplasmic incompatibility (mosquitoes, medfly)
    - (*Wolbachia* uninfected females x infected males = no offspring)
- Laboratory tsetse populations often homogenous; **what is the field situation?**

# Objective

To determine the prevalence of endosymbiont infections in natural populations of *G. austeni* and *G. pallidipes* and to determine the degree of concurrent infections with trypanosomes

# Fly collection sites



# Materials and Methods

- Study area - coastal region of Kenya (*G. pallidipes*, *G. austeni* and *G. brevipalpis*) 2010-2012
- Fly trapping:
  - standard biconical trap, Ngu trap
  - baited with synthetic phenols and acetone
  - 6 - 24 hour trapping
  - Geo-referenced using Garmin GPSmap76
  - Catches preserved in ethanol

# Materials and Methods ...

- DNA extraction – from individual whole fly samples using Qiagen DNeasy® Blood and Tissue Kit
- Diagnostic screening
  - *Wolbachia*: *wsp* 81F/691R (Zhou et al, 1998)
  - *Sodalis*: GPO1F/GPO1R - (Dale & Maudlin, 1999)
  - Trypanosomes: ITS1 CF/BR (Njiru et al, 2005)
- Age structure
  - wing fray (100 males of each species)
  - Ovarian ageing (~ 30 females @)

## *Sodalis* prevalence in *G. austeni* and *G. pallidipes*

Sp.	N	n (%)		Prevalence %
		Females	Males	
<i>G. austeni</i>	ASF (100)	2/50 (4)	0/50 (0)	2%
	SHNR (196)	6/103 (5.8)	3/93 (3.2)	4.6%
	Total (296)	8/153 (5.3)	3/143 (2.1)	3.7%
<i>G. pd</i>	SHNR (302)	32/161 (19.9)	16/141 (11.3)	15.9%

- *Sodalis* infection higher in females cf to males (NS)
- *Wolbachia* infection 100% in *G. austeni* and 0% in *G. pallidipes*

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*Sodalis* infection was significantly higher in *G. pallidipes* ( $P < 0.001$ )

## Trypanosome prevalence in tsetse flies

Species	Source	N	<i>T.c.</i>	<i>T.v.</i>	<i>T.sm</i>	<i>Tbb/Tc</i>	Total
<i>G.austeni</i>	ASF	100	8	3	1	1	13 (13%)
	SHNR	196	12	11	2	0	25 (12.7%)
		296	20	14	3	1	38 (12.8%)
<i>G.pallidipes</i>	SHNR	302	11	11	7	1	29 (9.6%)

- *T. congolense* most common infecting parasite
- Low number of mixed infections observed

# *Sodalis* and trypanosome co-infection

	<i>G. pallidipes</i> (n=302)		<i>G. austeni</i> (n=296)	
	T+	T-	T+	T-
S+	10 (3.3%)	38 (12.6%)	3 (1.0%)	8 (2.7%)
S-	19 (6.3%)	235 (77.8%)	35 (11.8%)	250 (84.5%)
<i>p</i> – value	<i>p</i> = 0.0127		<i>p</i> = 0.1554 (NS)	

S<sup>+</sup>/S<sup>-</sup> *Sodalis* positive/negative, T<sup>+</sup>/T<sup>-</sup> trypanosome positive/negative

# Results...

## Age Structure

- (Some strains of *Wolbachia* have a life shortening effect)
- Male *G. austeni* population (18 d) relatively younger than sympatric *G. pallidipes* (30 d)
- Females of both species had comparable longevity and there was no significant difference between the frequency distribution of females among the ovarian categories 0-7 (up to 80 days old)

# Discussion and future work

- *Wolbachia* prevalence

- *G. austeni*

- ↑ since 1996 data (48%) » spread towards fixation
    - Real infection or genomic insertion?
    - Cytoplasmic incompatibility
      - ...and prospects for control applications?

- *G. pallidipes*

- Zero or low infection rates reported e.g. 1.2% of 1,800 samples
    - Sensitivity of analysis method? » further work

# Discussion and future work

- *Sodalis* prevalence
  - 2' symbiont, intermediate frequencies (0% in *Gff* to 55% in *Gpp*)
  - Temporal variation – related to temperature?
- Co-infection (*Sodalis*/trypanosomes)
  - Low rate (< 2%), widely variable results (e.g. 32% in *Gpp*)
  - *Sodalis*-negative flies also acquire (and transmit) trypanosomes
  - Increased susceptibility in some species
  - May depend on various factors (parasite-vector pairs, genotype...)
- Age structure
  - Does *Wolbachia* strain in *G. austeni* affect longevity?...more studies

# Acknowledgements

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