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Diversity and Insecticide Susceptibility of *Anopheles* Mosquitoes in Bushbuckridge, a Residual Malaria Transmission Setting in South Africa

Thabo Mashatola1,2, Zuziwe Mthiyane3, Shüné Oliver1,2, Jaishree Raman1,2, Basil Brooke1, 2, and Givemore Munhenga1,2

1Centre for Emerging Zoonotic & Parasitic Diseases, National Institute for Communicable Diseases, Johannesburg
2Wits Research Institute for Malaria, School of Pathology, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg
3Mpumalanga Department of Health, Malaria Control Programme, Mbombela, South Africa

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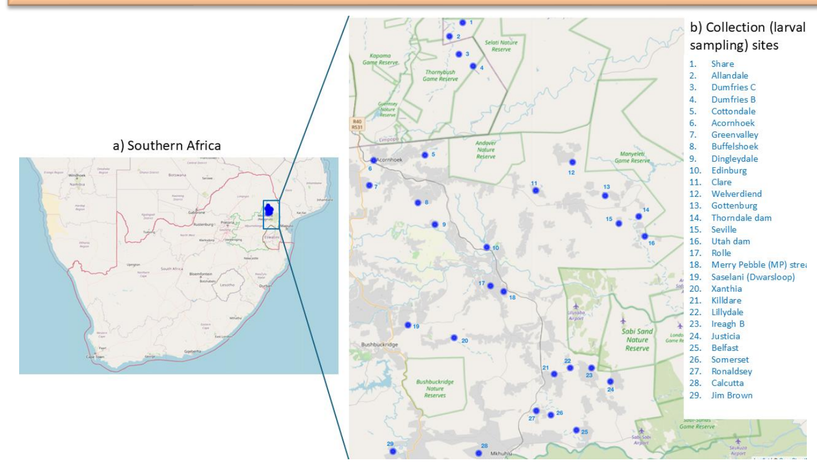
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

INTRODUCTION & AIM

- Bushbuckridge lies within South Africa's lowveld malaria belt and experiences persistent residual malaria transmission due to its proximity to Mozambique and Eswatini.
- Understanding local vector diversity and insecticide susceptibility is critical for:
  - Detecting changes in vector populations
  - Monitoring emerging resistance
  - Informing evidence-based malaria control strategies
- Study Objective
  - To assess *Anopheles* species diversity and insecticide susceptibility across Bushbuckridge between 2022 and 2024

METHOD

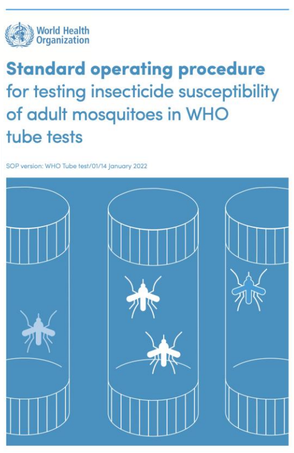
Study area



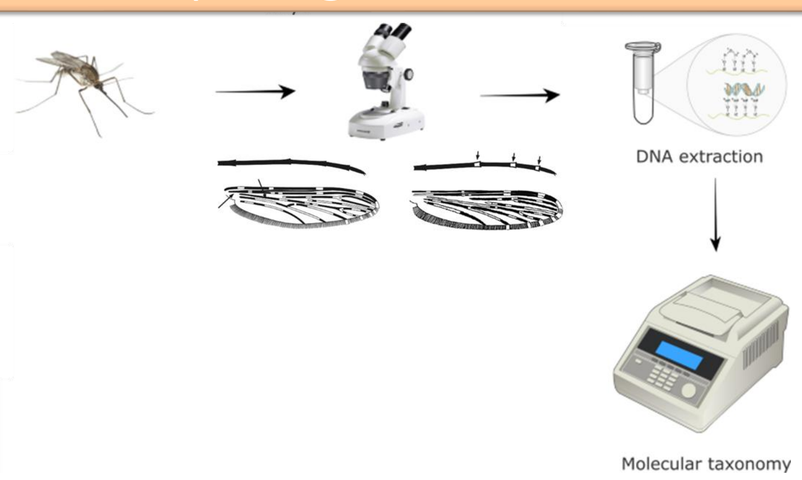
Larval collection

Adult exposure to insecticides

Insecticide	Concentration
Deltamethrin	0.05%
DDT	4%
Pirimiphos-methyl	0.25%



Adult morphological and molecular ID



RESULTS & DISCUSSION

Species relative abundance by locality

Species diversity

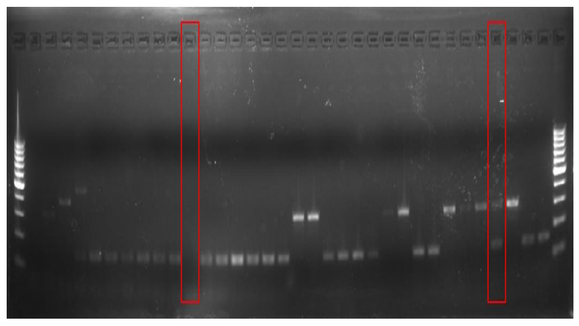
18 taxa identified, n=4,453.

Species	n	%
An. pretoriensis	1,487	33.4
An. quadriannulatus	921	20.7
An. rufipes	890	20.0
An. maculipalpis	320	7.2
An. arabiensis ★	316	7.1
An. coustani	185	4.2
An. squamosus	116	2.6
An. vaneedeni †	98	2.2
An. gambiae complex (PCR fail)	36	0.8
An. demeilloni	31	0.7
An. funestus group (PCR fail)	21	0.5
Others (*An. marshalli*, *An*. merus, etc.)	16	0.4
An. arabiensis/quadriannulatus hybrid ◆	2	0.04
TOTAL	**4,454**	**100**

★ *Primary vector* † *Secondary vector* ◆ *Putative hybrid (n=2; PCR-confirmed)*

Hybridisation finding: Two putative *An. arabiensis / An. quadriannulatus* hybrids detected by PCR — a rare occurrence (<0.1% frequency in natural populations). May produce altered host preference, vector competence or insecticide susceptibility. Genomic sequencing recommended for confirmation.

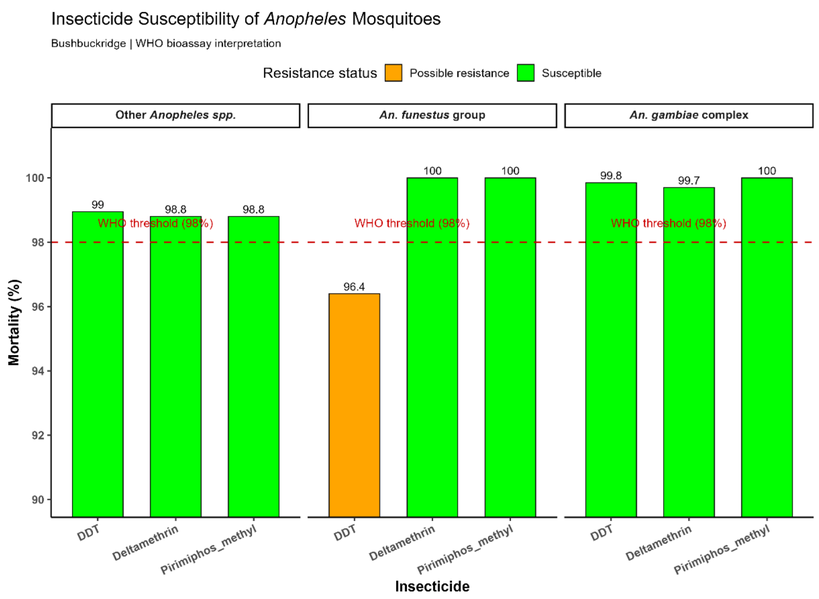
PCR failures: 3% of An. gambiae complex and 16% of *An. funestus* group specimens could not be resolved — attributed to DNA degradation, primer mismatches or possibly cryptic/novel taxa.



PCR multiplex gel: An. gambiae complex. Red boxes = PCR fail or putative hybrid banding patterns.

Insecticide susceptibility

- High susceptibility observed across most populations
- Mortality generally exceeded WHO susceptibility thresholds
- Reduced mortality (94.6%) observed in DDT-exposed *An. funestus* group
- Indicates possible emerging resistance requiring continued monitoring



CONCLUSION / FUTURE WORK

- Bushbuckridge supports a diverse *Anopheles* community in a residual malaria transmission setting.
- Most populations remain susceptible to key insecticides, although reduced DDT susceptibility was detected.
- Potential hybridisation and emerging resistance patterns highlight the need for continued surveillance to support adaptive malaria vector control.

CONTACT email: thabomas@nicd.ac.za