



Anopheles species identification: an old and continuing challenge

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Background

- Africa's anopheline malaria vectors are found mainly within the *Anopheles funestus* group and *An. gambiae* complex
- However, de Meillon (1947) proposed that the possibility exists for almost all anophelines to act as malaria vectors, when given suitable conditions
- The *Anopheles* genus contains about 500 species of which only a few are important for malaria transmission, making species identification during vector surveillance extremely important

Problem



- *A priori* morphological identification based on the use of dichotomous keys generally forms the basis for further molecular techniques
- However, there are some drawbacks to morphological species identification because it is time-consuming and identification might be incomplete if specimens have lost important external features
- There is a tendency toward developing molecular techniques designed to surpass morphological taxonomy as a form of species identification

Methods

- Anophelines were sampled from five African countries
- Morphologically identified using Gillies & Coetzee (1987)
- Non-vectors were subjected to PCR evaluation using the protocols for *An. funestus* group, *An. gambiae* complex, *An. funestus*-like and *An. rivulorum*-like

Results

Country	Province / Site	Morphological ID	Molecular ID using <i>An. gambiae</i> complex PCR	Molecular ID using <i>An. funestus</i> group PCR
Botswana	Xakanaka	<i>An. wellcomei</i> (n = 1)	-	-
Guinea Conakry	Siguiri	<i>An. rufipes</i> (n = 8)	-	<i>An. leesoni</i> (5)
Mali	Yanfolila	<i>An. rufipes</i> (n = 10)	-	<i>An. rivulorum</i> (1) <i>An. leesoni</i> (1)
Namibia	Katima Mulilo	<i>An. squamosus</i> (n = 2)	<i>An. gambiae</i> (2)	-
South Africa	Kwazulu-Natal	<i>An. rufipes</i> (n = 19)	-	-
	Gauteng	<i>An. crypticus</i> (n = 17)	-	-
		<i>An. marshallii</i> group (n = 1)	-	-
	Mpumalanga	<i>An. coustani</i> group (n = 6)	-	-
		<i>An. tenebrosus</i> (n = 1)	-	-
		<i>An. pretoriensis</i> (n = 20)	-	-
		<i>An. rufipes</i> (n = 9)	<i>An. gambiae</i> / <i>An. merus</i> (1)	-
		<i>An. maculipalpis</i> (n = 10)	-	-
	Limpopo	<i>An. maculipalpis</i> (n = 1)	-	-
		<i>An. rhodesiensis</i> (n = 1)	-	<i>An. leesoni</i> (1)
		<i>An. listeri</i> (n = 12)	<i>An. gambiae</i> (3) <i>An. merus</i> (2)	-

Conclusions

- Misidentifications are obtainable by analyzing non-vector anophelines based on vector-specific molecular assays
- Therefore vital to use molecular assays in conjunction with morphological identification
- If poor morphological identification cannot be corrected during the molecular part of the identification process, then misidentification of non-vector species as vector species will continue to be a growing problem in vector surveillance

Appeal

- Prof Maureen Coetzee is planning to revise the 1968 Anophelinae of Africa south of the Sahara by Gillies & de Meillon to bring it up-to-date with all the new species
- The keys (and those of Gillies & Coetzee 1987) also need to be revised and she would very much appreciate it if members of the VCWG could share with her their experiences of using these keys