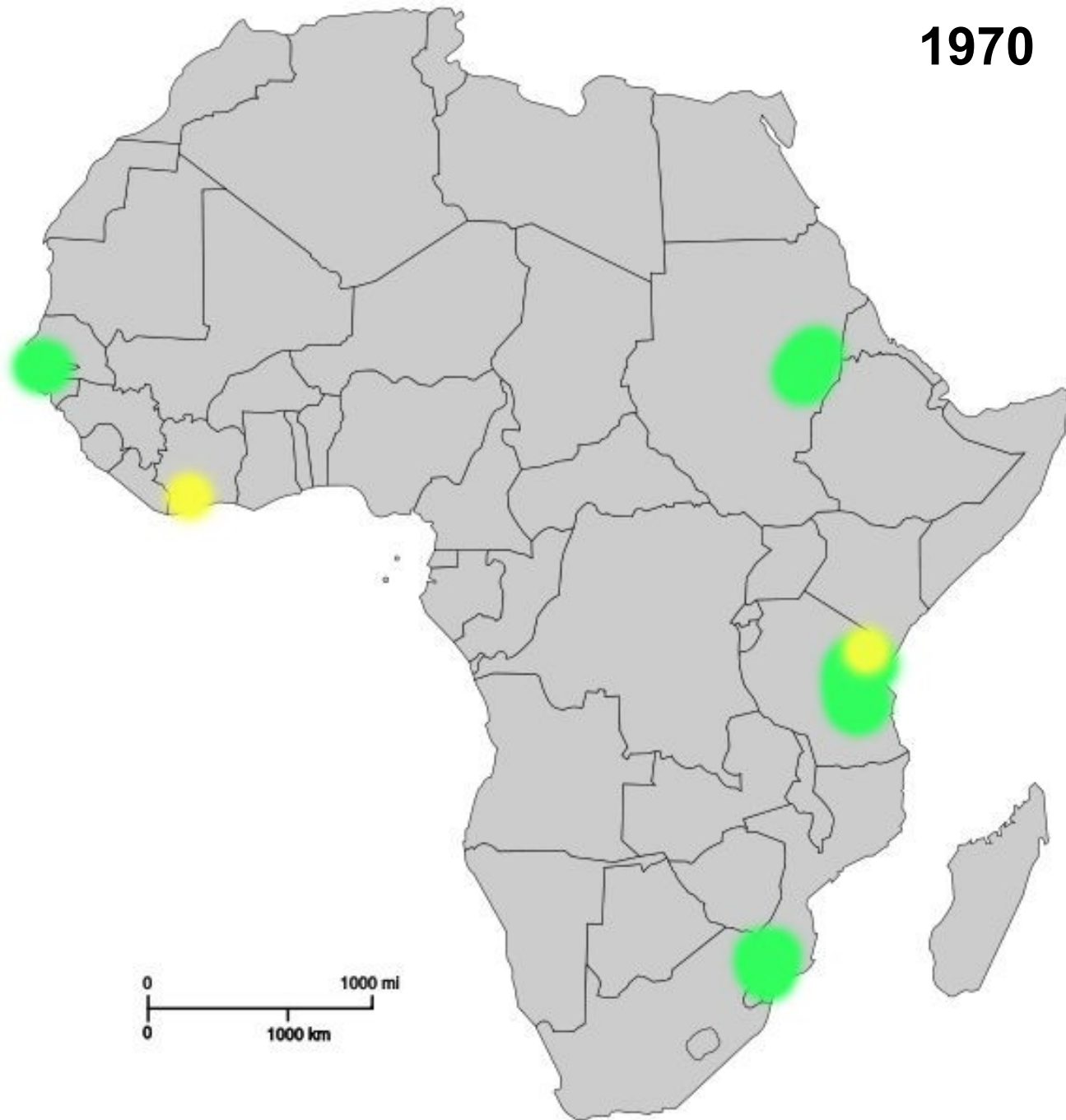
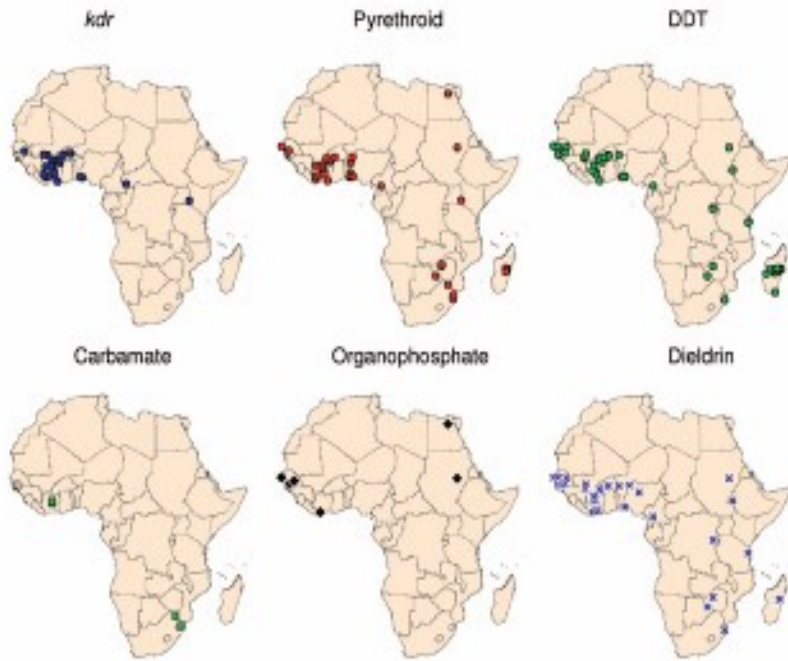




Resistance patterns in Sub-Saharan Africa

1970












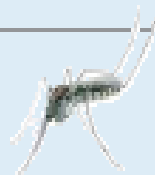





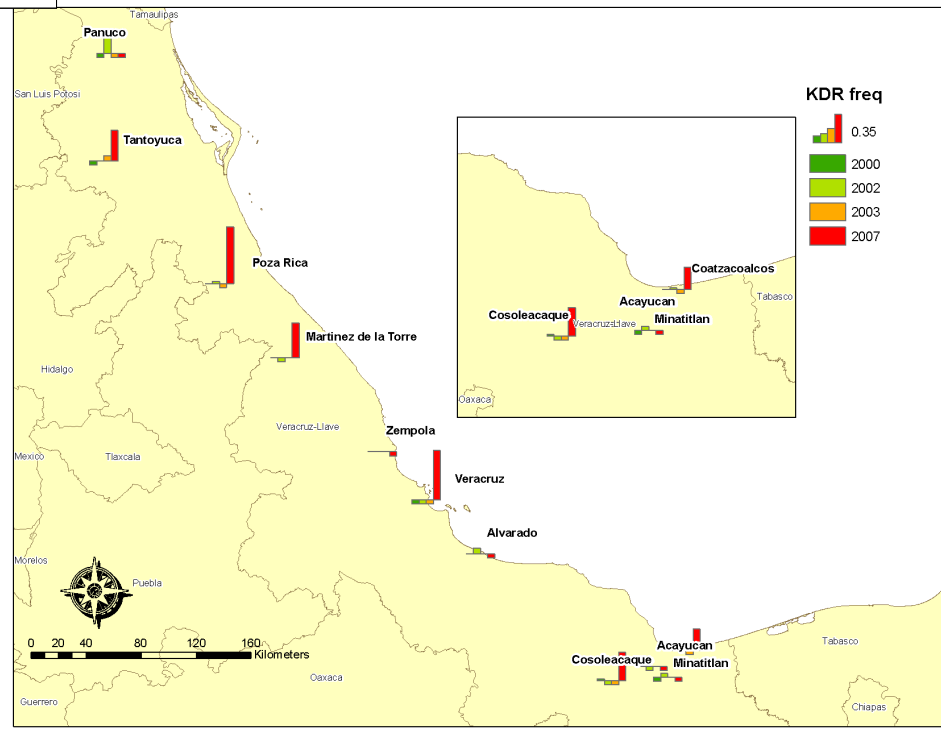
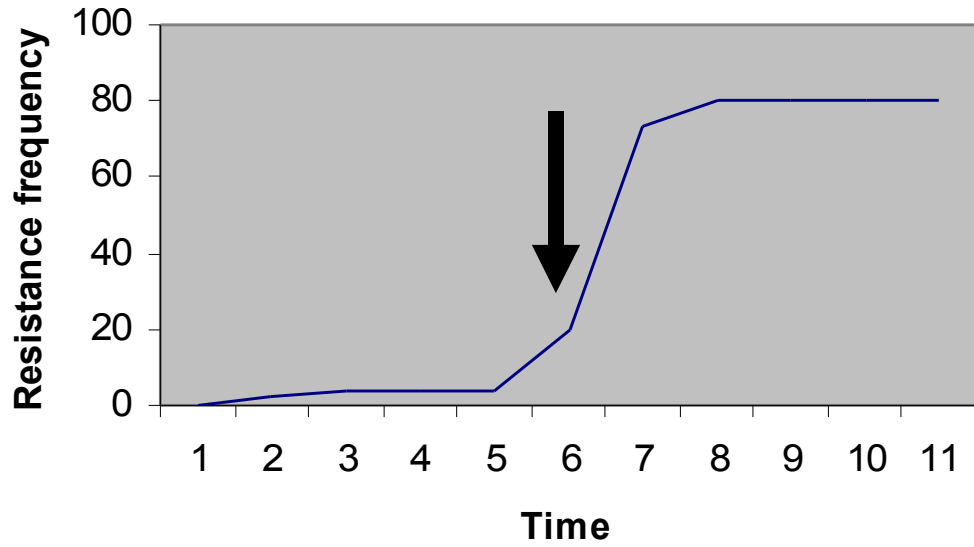
- **Growing observation of insecticide resistance in Vector Mosquitoes.**

- **Only 4 Classes of Insecticide approved for Malaria vector control, Only 1 for nets.**
- **Resistance is known for all these insecticides**

Major biochemical mechanisms of resistance





	Metabolic			Target-site	
	Esterases	Monooxygenases	GSH S-Transferases	kdr	MACE
Pyrethroids					
DDT					
Carbamates					
Organophosphates					

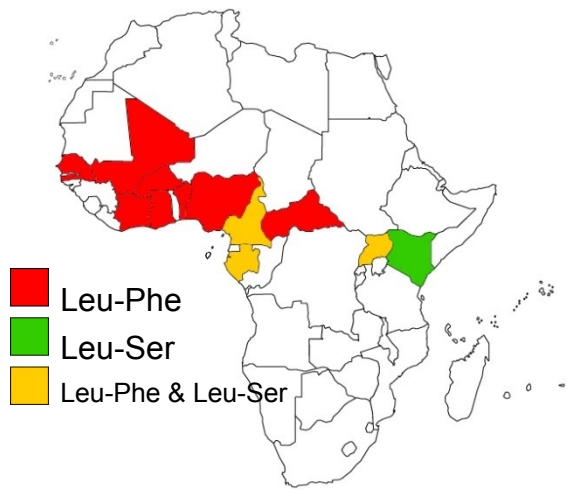
Resistance tipping point



Multiple origins and selective sweeps of the *kdr* mutations

At least four independent origins of *kdr* in *An. gambiae*

<i>kdr</i> allele	Intron-1 Haplotype		
	H1 (T-C)	H2 (T-T)	H3 (C-C)
L1014S			
L1014F			



Para Na channel has 33 exons (plus two duplicate exons over approx 80kb)

32 SNPs in total 5 in core region

Pre dominantly intronic

Anopheles gambiae genotyped N=330

Haplotype reconstruction from genotypes