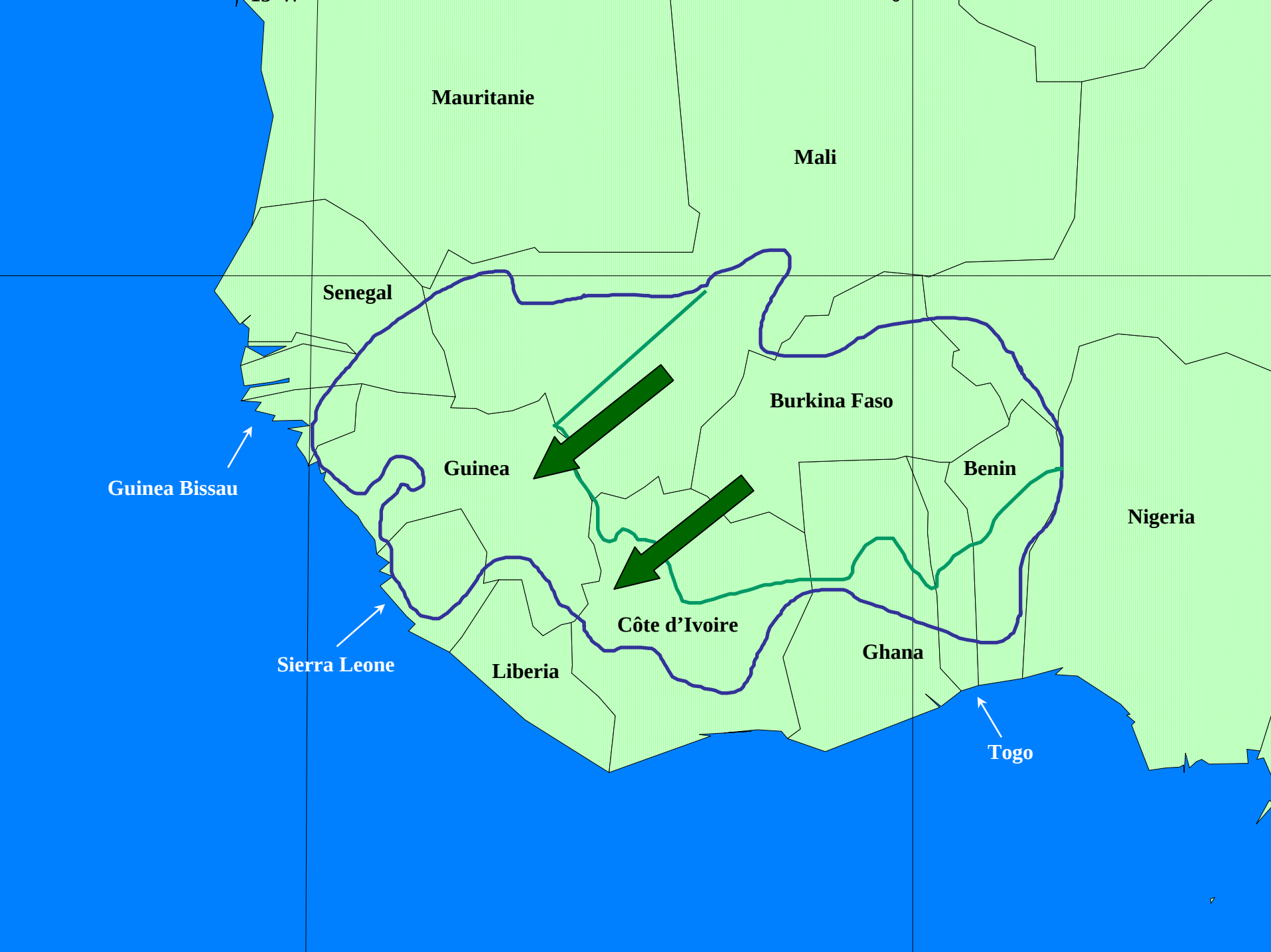
Resistance management in vector control: experience from Onchocerciasis Control in West Africa

Simulium damnosum: a complex of 6 sibling species

Entomological monitoring: 180 collection sites for weekly surveys


Mauritanie
Mali
Senegal
Savanah vector species
Burkina Faso
Guinea Bissau
Guinea
Benin
Nigeria
Côte d'Ivoire
Sierra Leone
Liberia
Forest vector species
Ghana
Togo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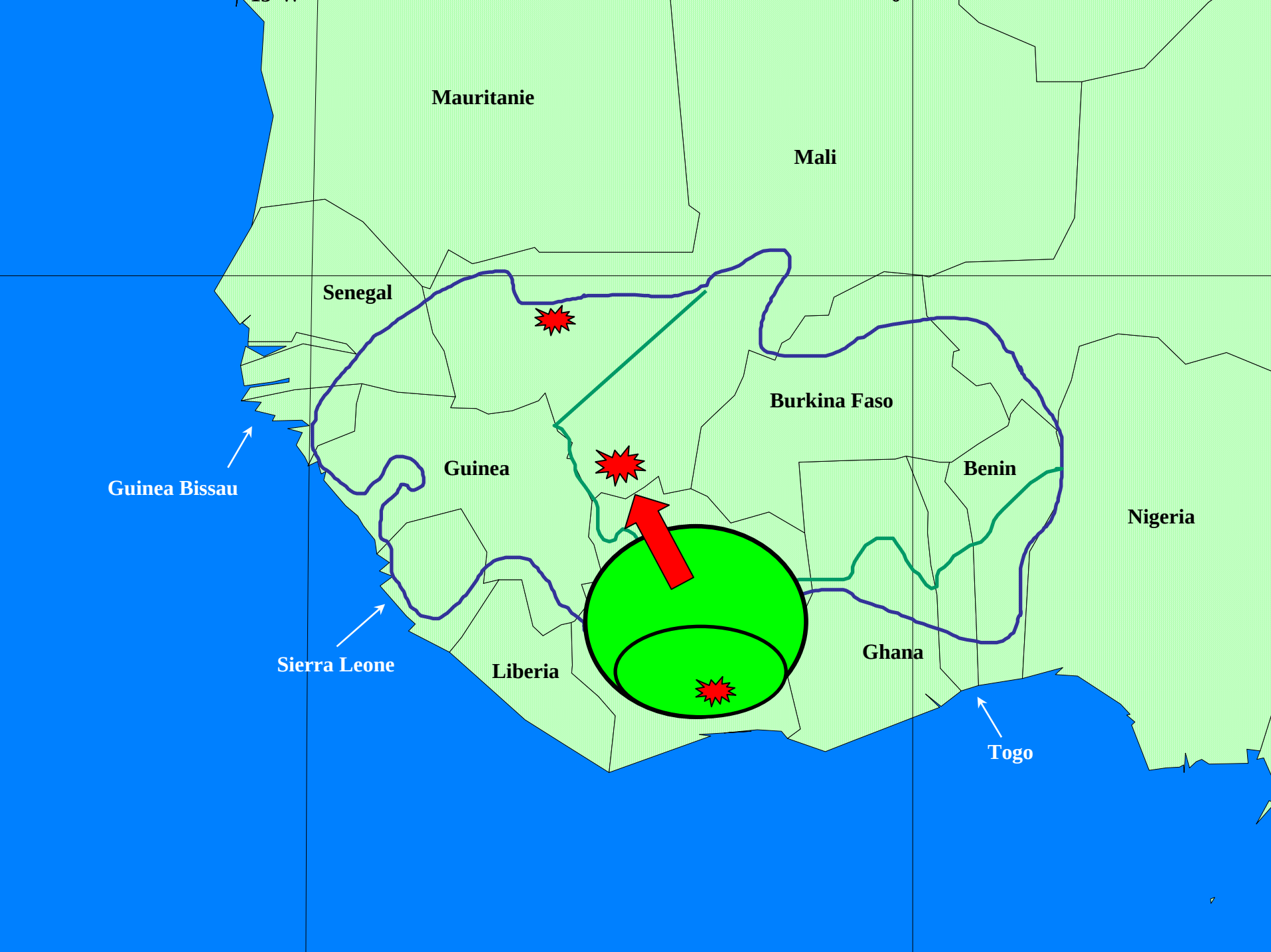
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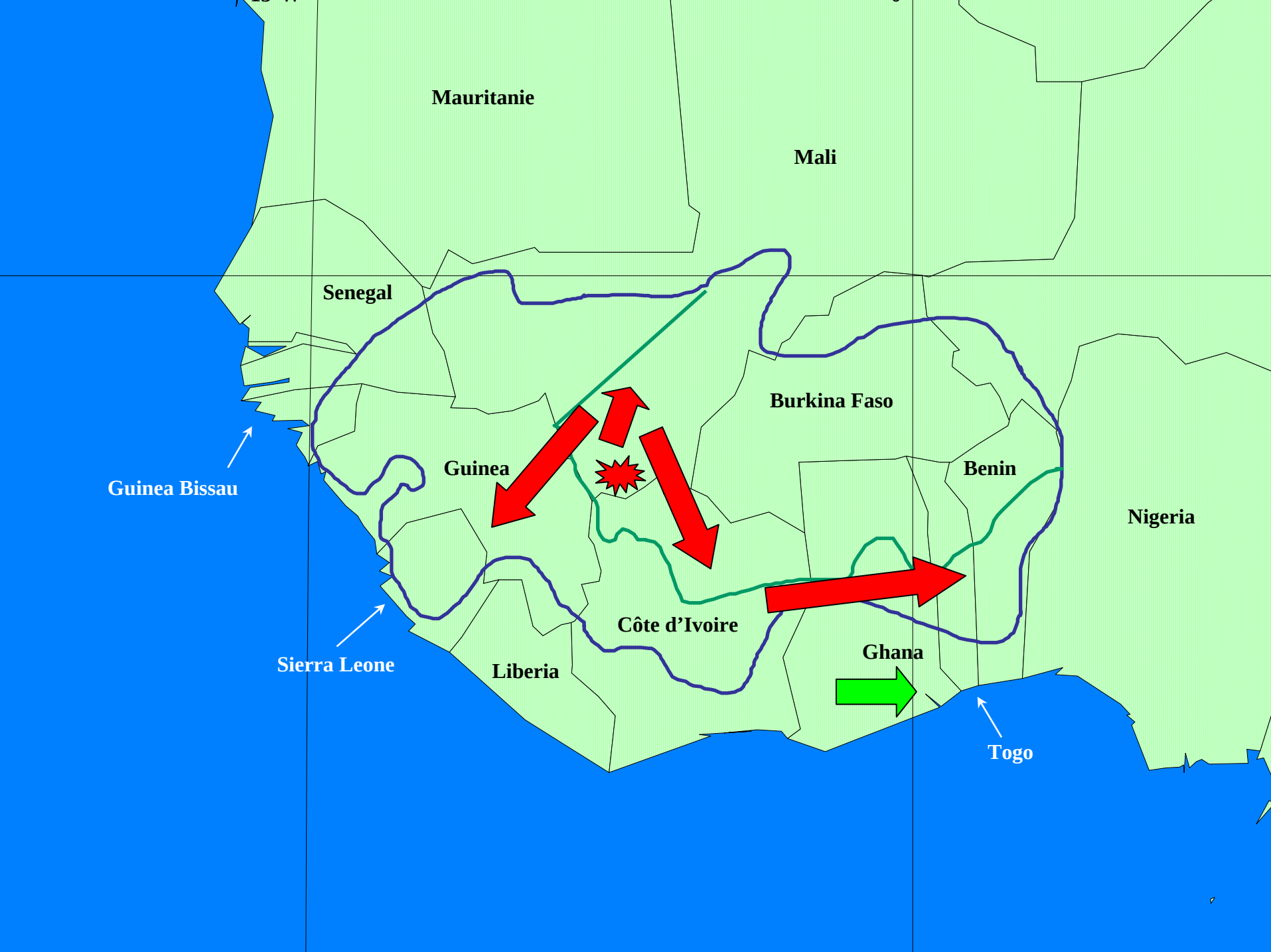
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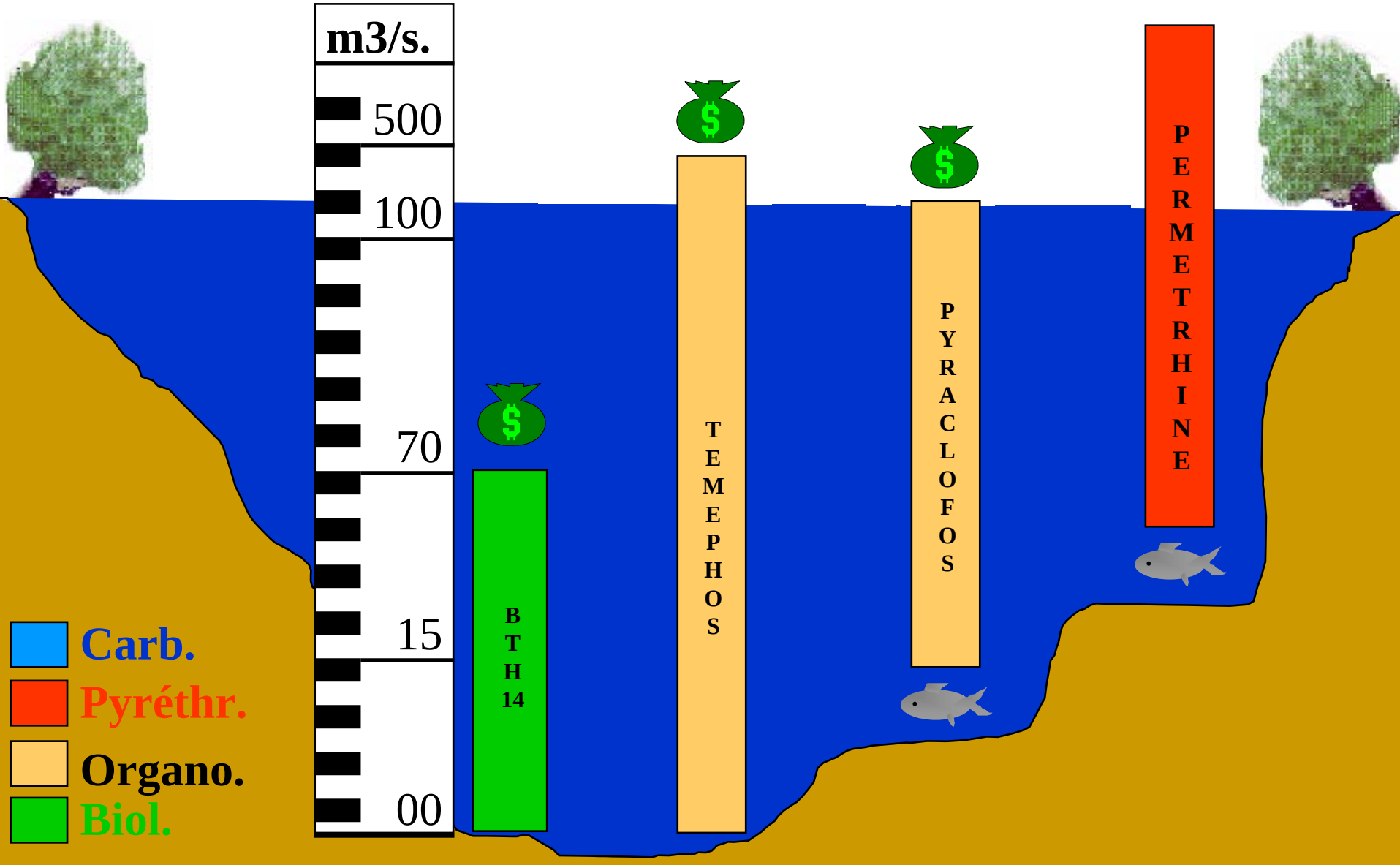
Larvicides utilisés par OCP



Lessons learnt

(25 years of operations)

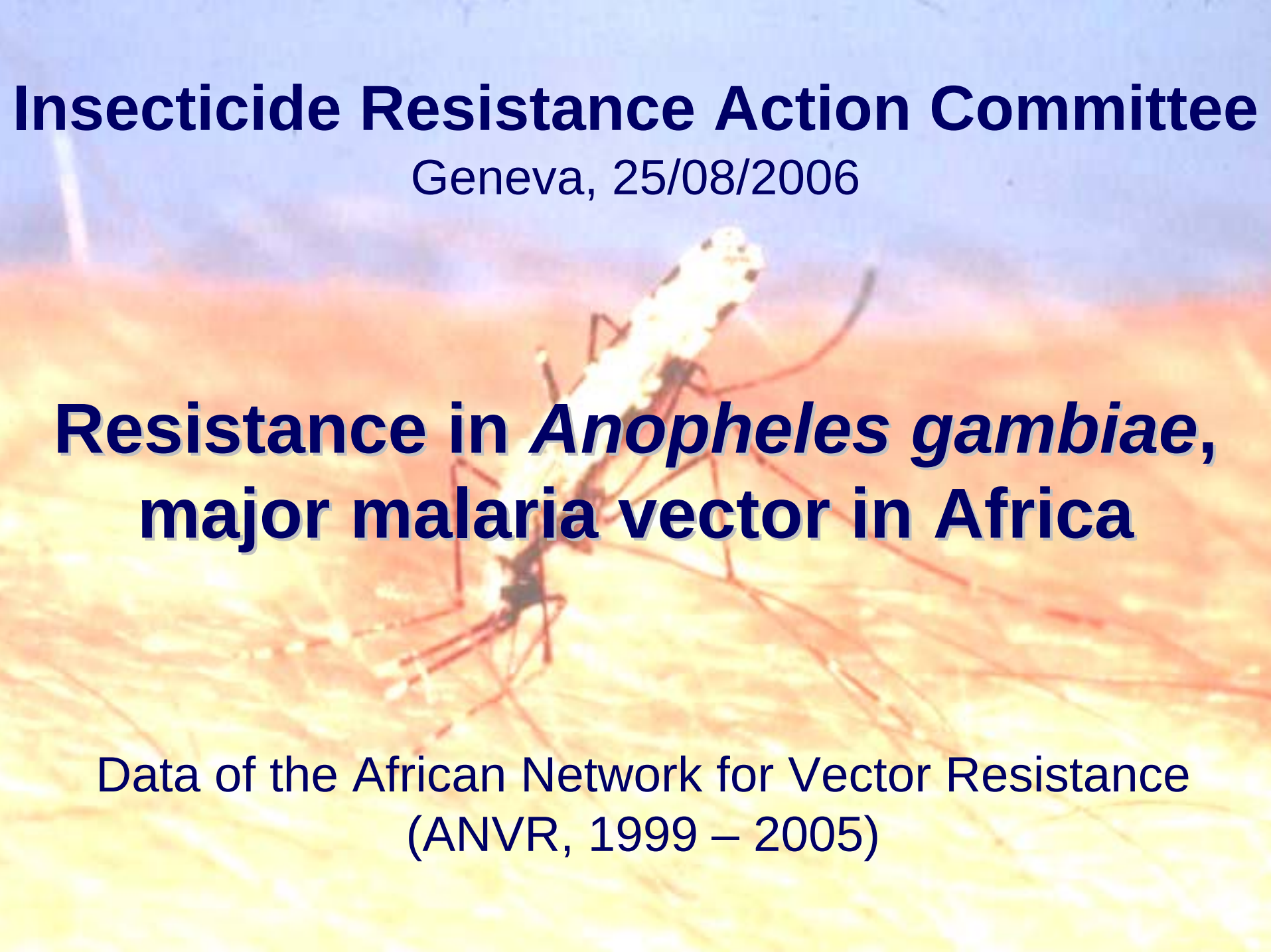
- Population dynamics and migrations are key in the spread of resistance
- Gene introgression between sibling species was a major factor for resistance dissemination. Also occurs with malaria vectors
- Full reversion of resistance is possible only if pressure is released as soon as resistance is detected
- Maintaining huge populations of resistant vectors is dangerous
- Development and spread of resistance is much slower when populations are under effective control

Lessons learnt
(25 years of operations)

- Rotations are effective especially if implemented at early stage of resistance development
- No resistance developed when rotations were implemented preventively
- *Bti* has been key in the rotation scheme to release pressure by chemical larvicides
- Strong operational and financial impact OP resistance

Insecticide Resistance Action Committee

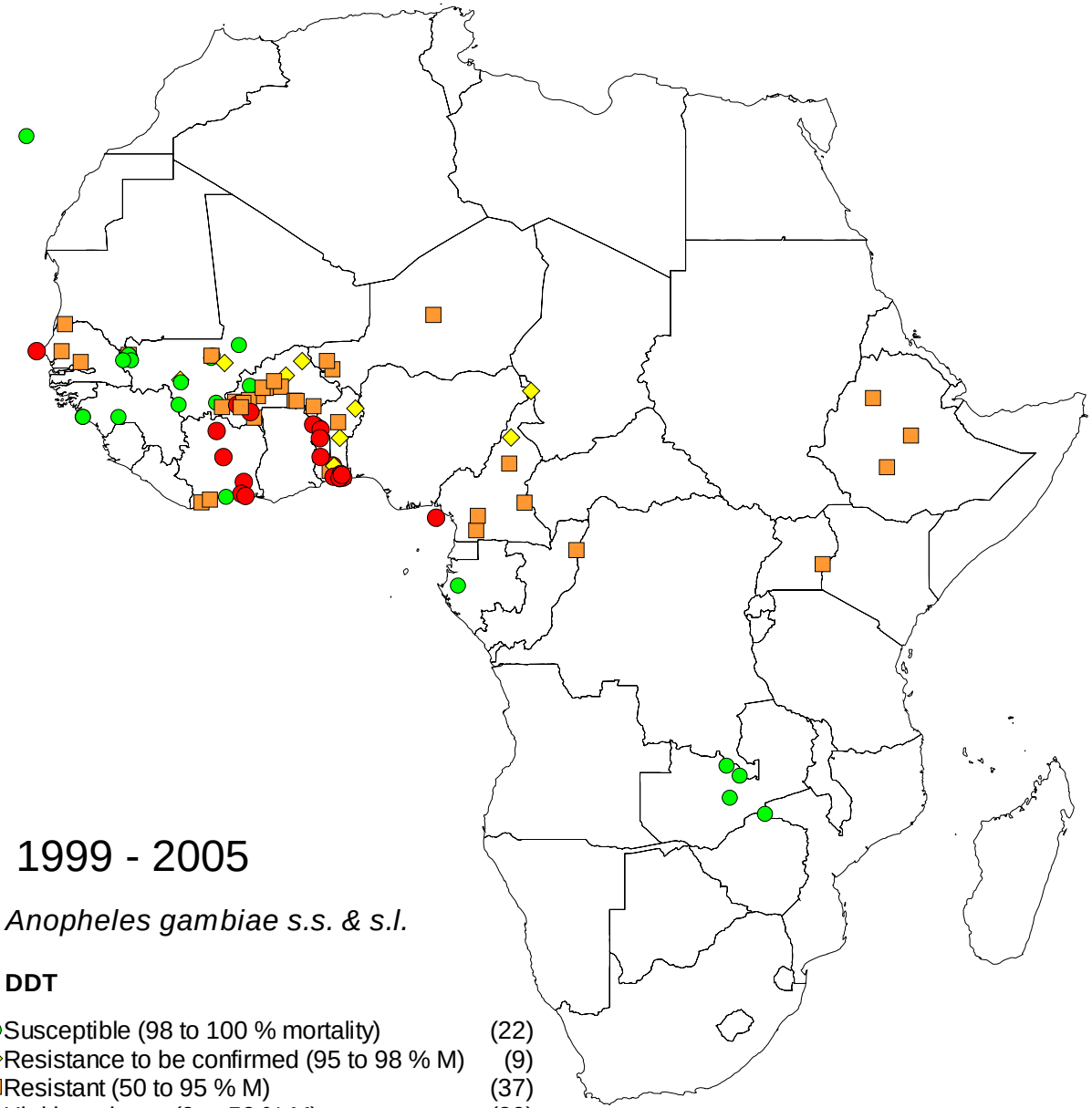
Geneva, 25/08/2006



Resistance in *Anopheles gambiae*, major malaria vector in Africa

Data of the African Network for Vector Resistance
(ANVR, 1999 – 2005)

Resistance to DDT (bioassay, WHO Tube test)



Resistance to permethrin

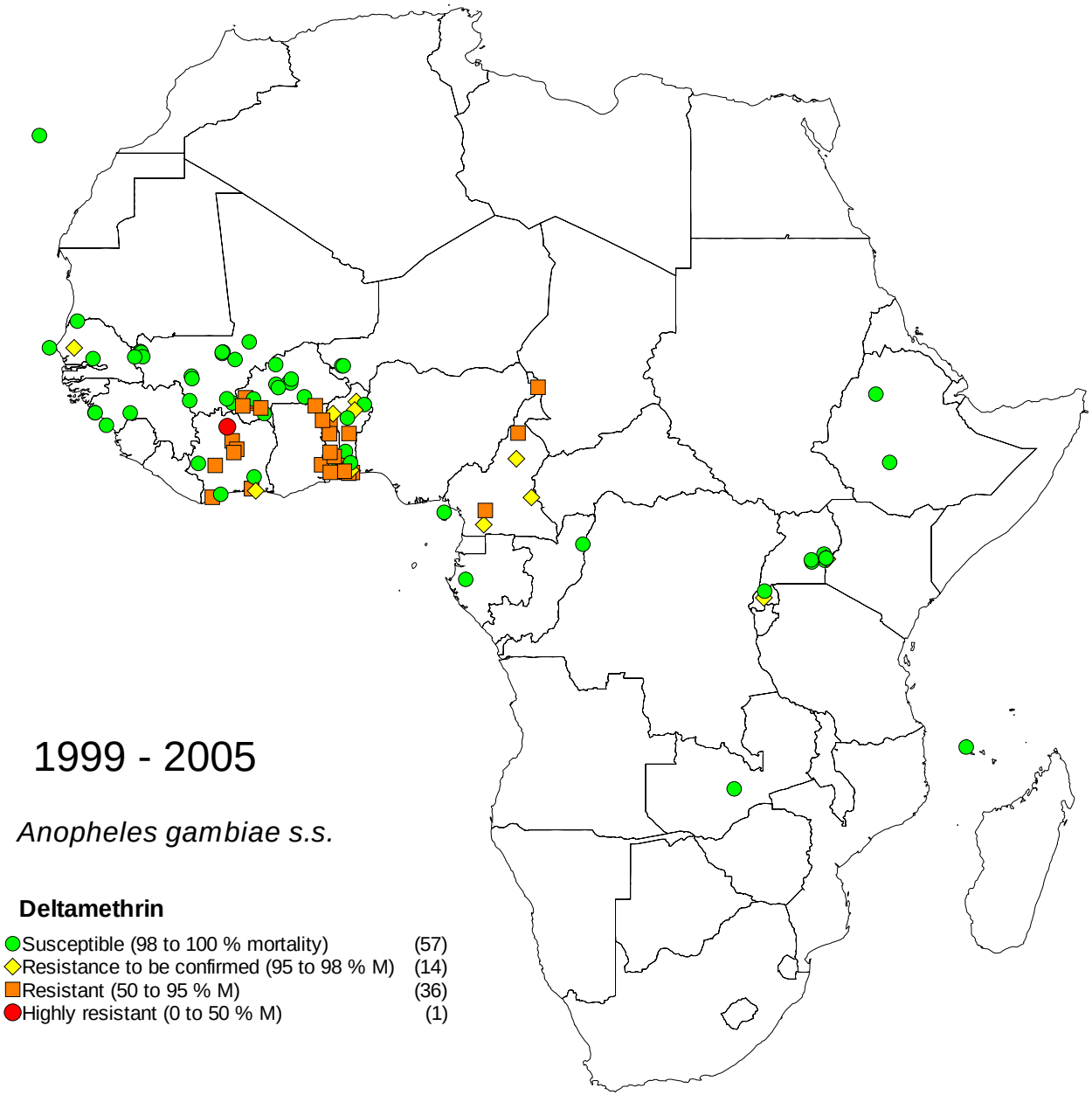
1999 - 2005

Anopheles gambiae s.s.

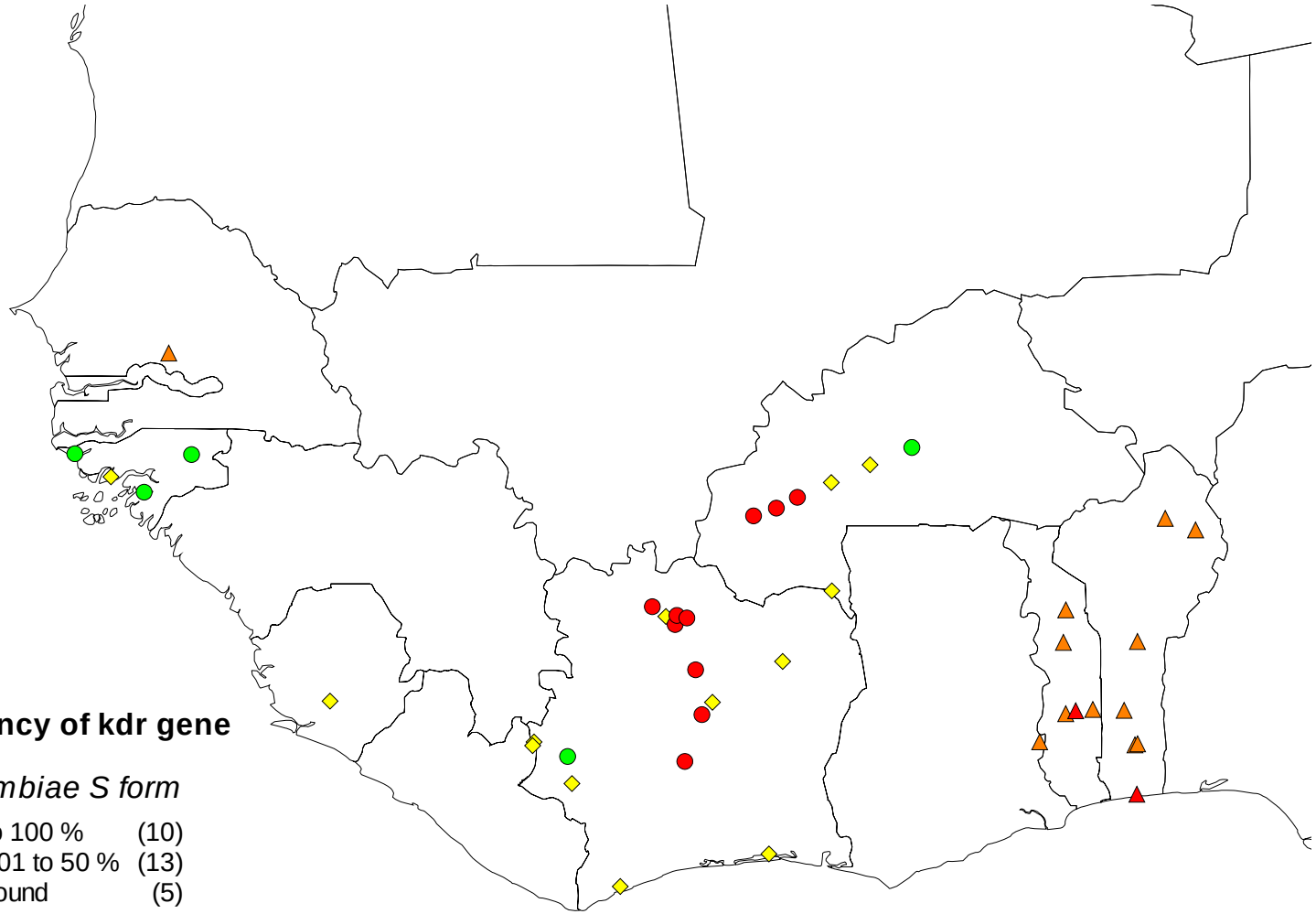
Permethrin

Susceptible (98 to 100 mortality)	(54)
Resistance to be confirmed (95 to 98 % M)	(16)
Resistant (50 to 95 % M)	(52)
Highly resistant (0 to 50 % M)	(16)

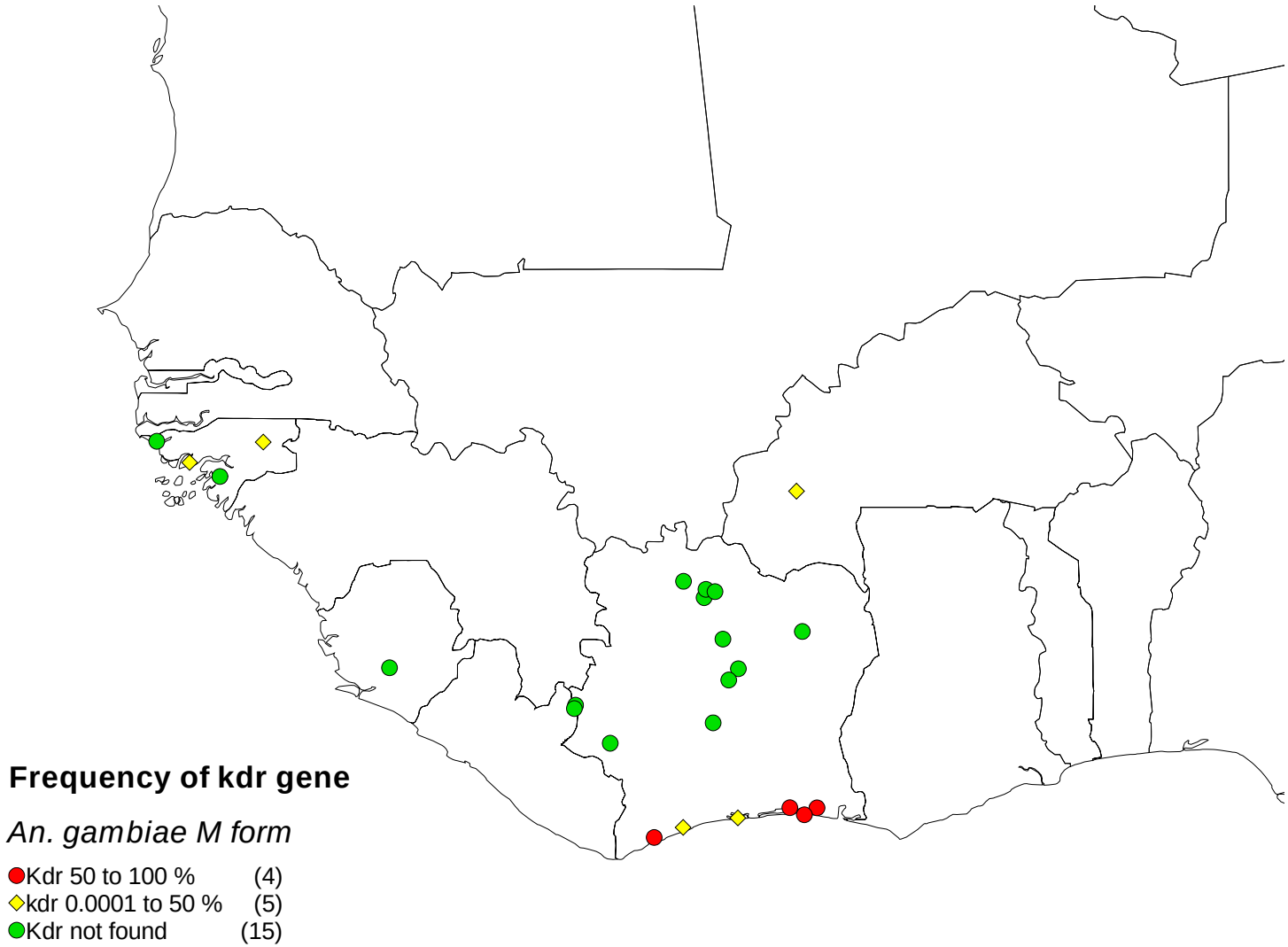
Resistance to deltamethrin



Frequency of *kdr* mutation (S molecular form)
(DDT & Pyrethroid resistance)

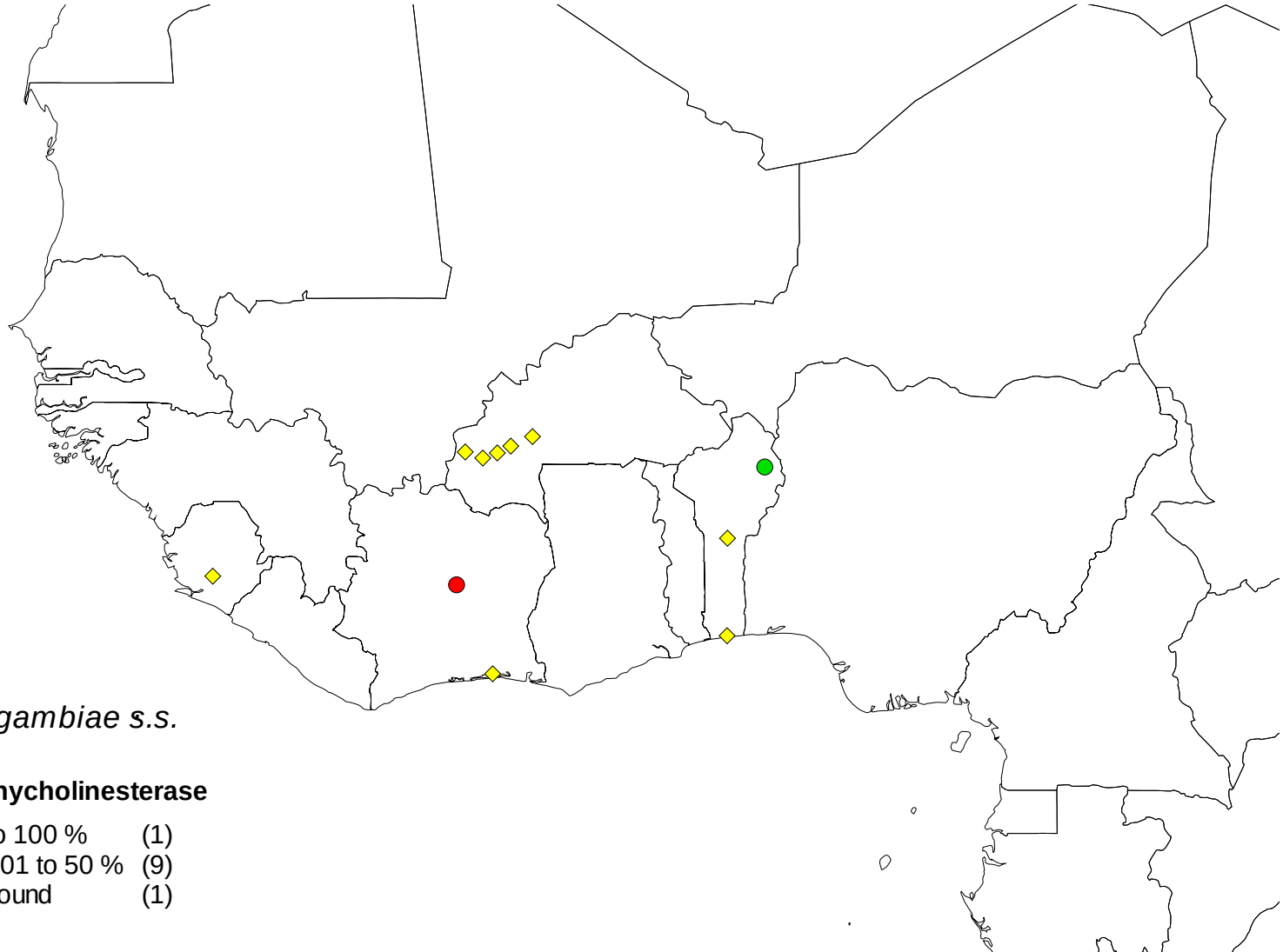


Frequency of *kdr* mutation (M molecular form) (2002 data)



Frequency of MACE mutation

(OP & Carbamate resistance)

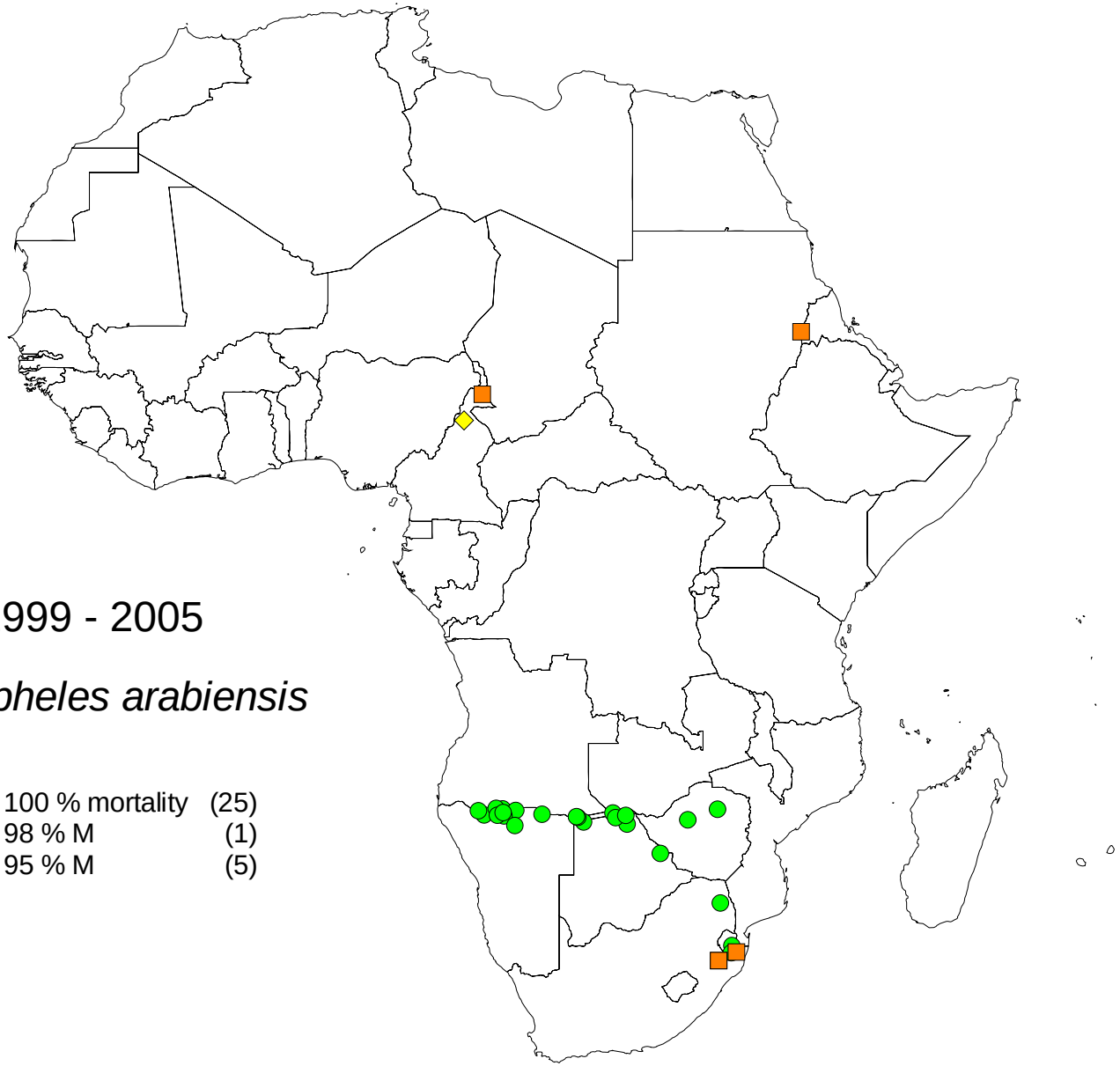


Anopheles gambiae s.s.

Modified acethycholinesterase

- AchE 50 to 100 % (1)
- AchE 0.0001 to 50 % (9)
- AchE not found (1)

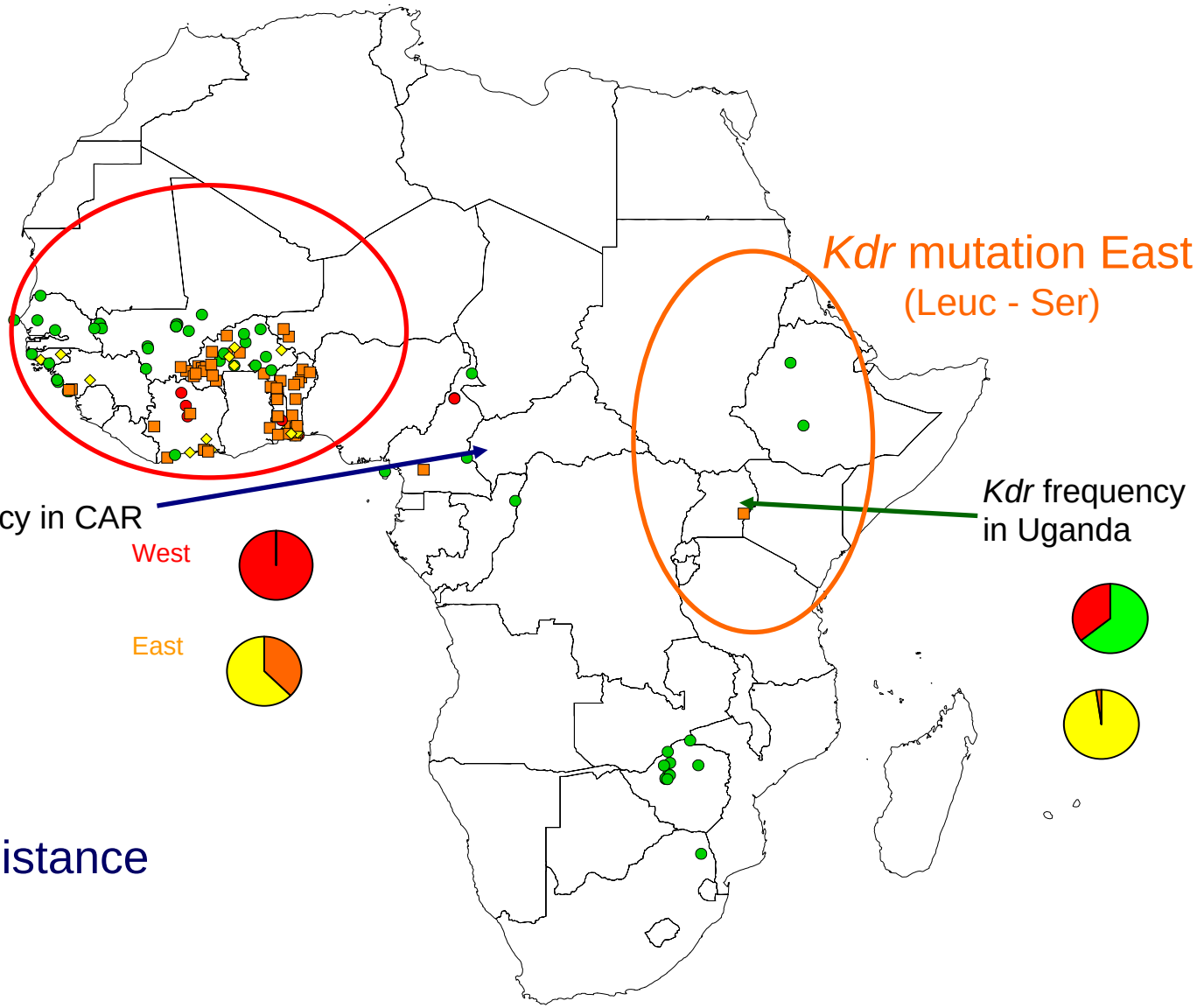
An. arabiensis, resistance to DDT



We are finding what we are looking for…

Kdr mutation West
(Leuc - Phen)

Kdr mutation East
(Leuc - Ser)



Permethrin resistance

Here we are…in Africa

- Almost none of the test results from West and Central Africa were obtained from areas with any past or current significant malaria vector control programme
- Most if not all selection pressure is coming from agriculture and eventually form household pesticides
- Is *An. gambiae* resistance manageable when it does not result from malaria control interventions?

Priorities

- Strengthening of resistance monitoring
- Origin of resistance and insecticide pressure
- Close monitoring of vector **populations**
- Operational implications of resistance (different vectors, interventions, R-mechanisms, insecticides…)
- Maintain or restore activity of current insecticides & interventions
- Adoption of preventive resistance management tactics where and when feasible

Priorities

- **Development of a new contact insecticide for public health alternative to DDT & pyrethroids**