

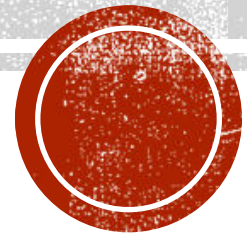
**THE GEOGRAPHICAL DISTRIBUTION OF THE MALARIA  
VECTOR *ANOPHELES ARABIENSIS* IN CABO VERDE,  
2016-2023: AN OPPORTUNITY FOR NEW TOOLS TO  
CONTROL AND SUSTAIN MALARIA ELIMINATION**

***Adilson DePINA***

19<sup>th</sup> Annual RBM Vector Control Working Group  
Meeting

15-17 April 2024

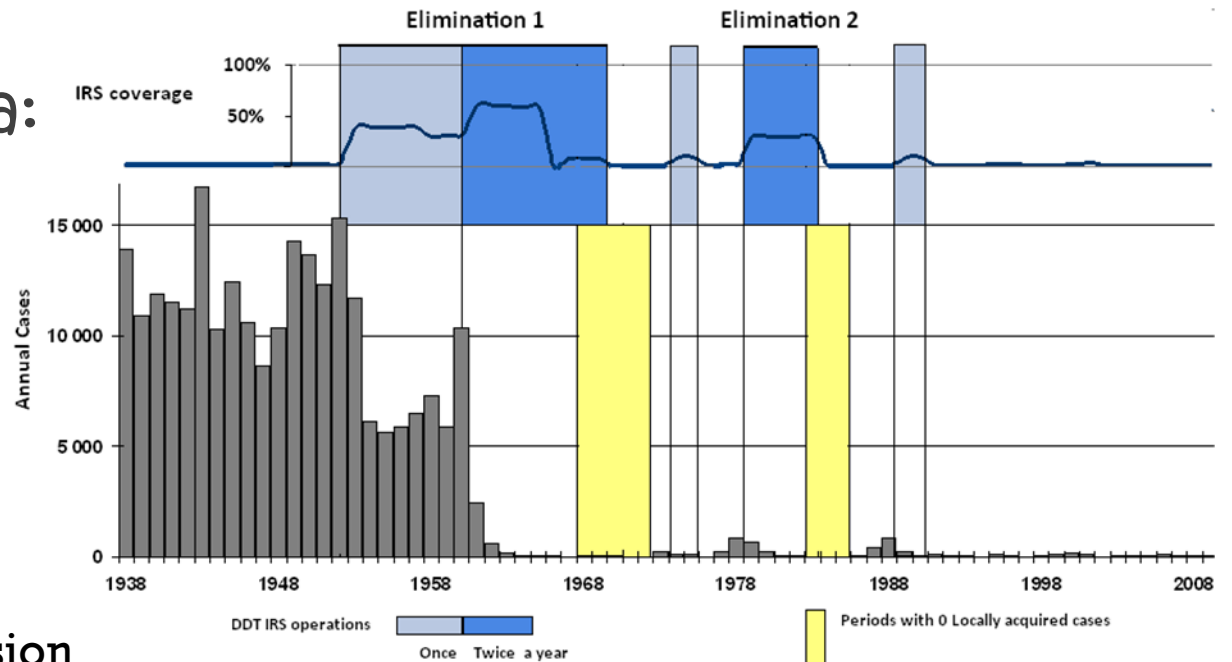
Radisson Blu Hotel, Kigali, Rwanda



# MALARIA IN CABO VERDE

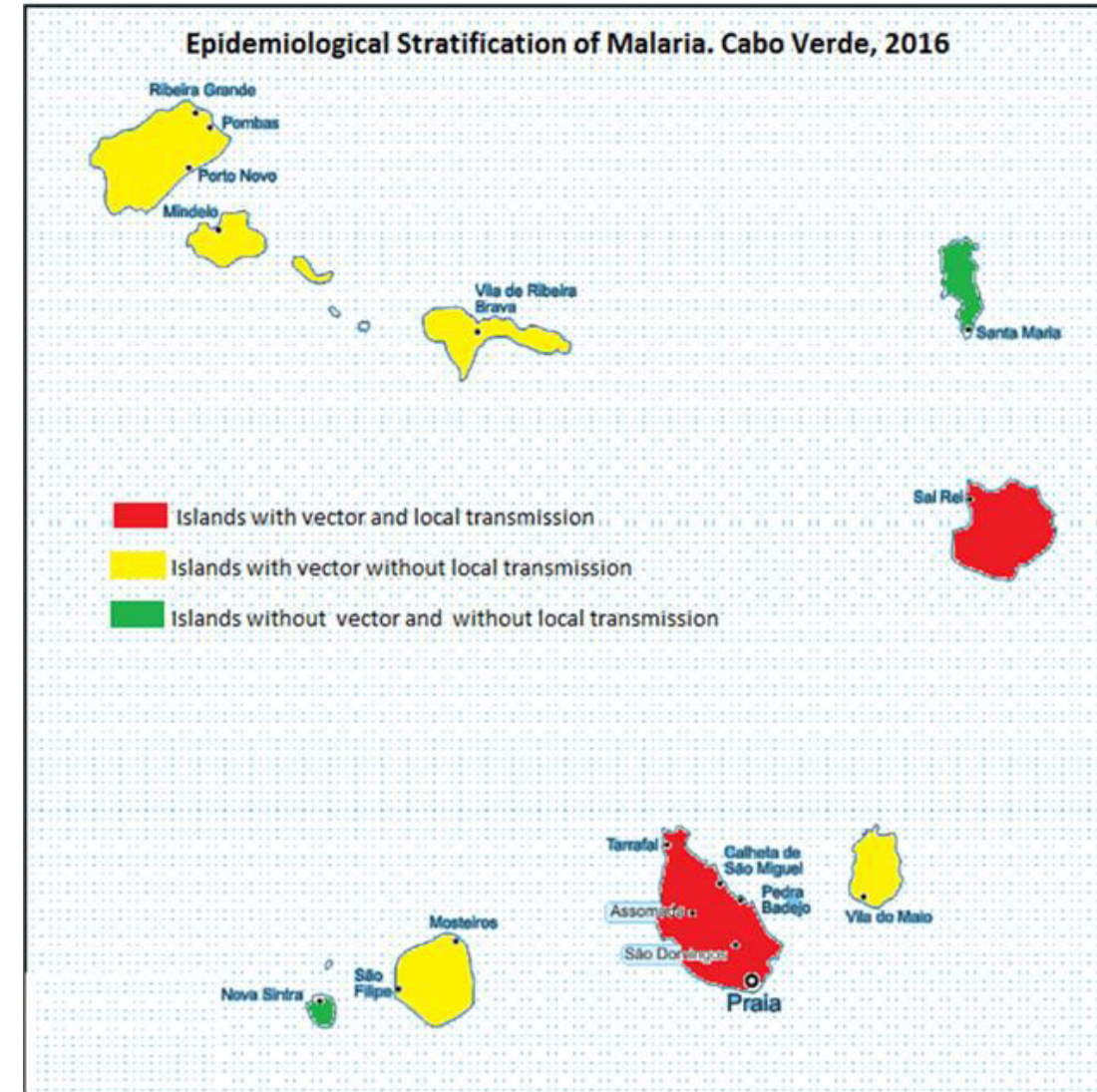
- Introduced in the 16th century;
- Endemic in the country in the 1940s (SV, Sal, Maio, Boavista, Santiago)
- Cases of hospitalization by malaria:
  - 1931 - 51.4%
  - 1938 - 36.3%
  - 1940 - 55.6%

WHO Global Malaria Eradication Program  
Cabo Verde Endemic Control and Combat Mission



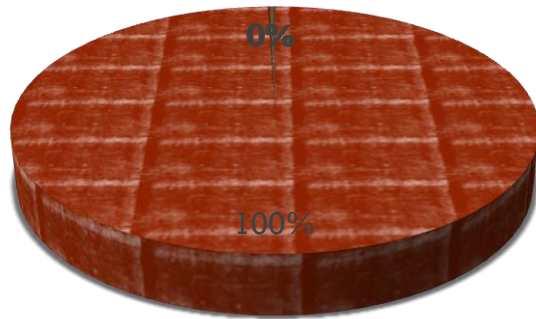
# MALARIA IN CABO VERDE

- Endemic in the 1950 years, with 5000 to 15000 cases per year and more than 200 malaria-related deaths;
- Unstable, October – December
- Affect mainly adult men (77%);
- Characterized by a low incidence
  - ✓ <1 cases / 1000 inhabitants – until 2017;
  - ✓ Zero local case – since 2018
- Last Indigenous cases are restricted to Santiago (Praia - 2017) and Boavista (2015) islands;
- Imported cases, from the African countries (Angola, Guiné Bissau, Senegal, and others);
- **Vector:** *Anopheles arabiensis*;
- **Parasite:** *Plasmodium falciparum*;



# Evolution of Malaria cases in Cabo Verde, 2010-2023

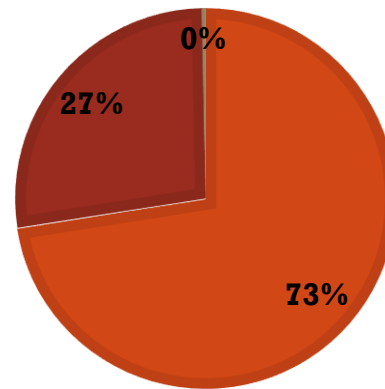
## Malaria cases by Plasmodium species



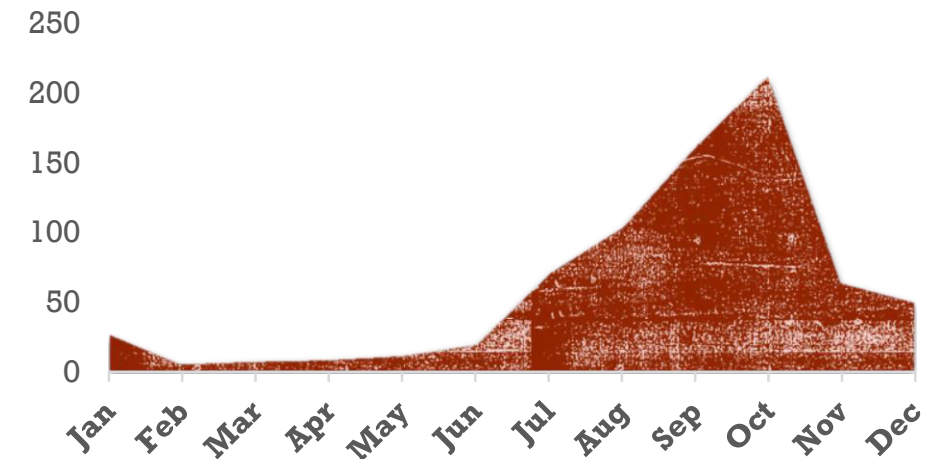
- Pl. falciparum
- Pl. vivax
- Pl. Ovale
- Mixte (Pf + Pm)

## Malaria cases by sex

- Homens
- Mulheres
- ND



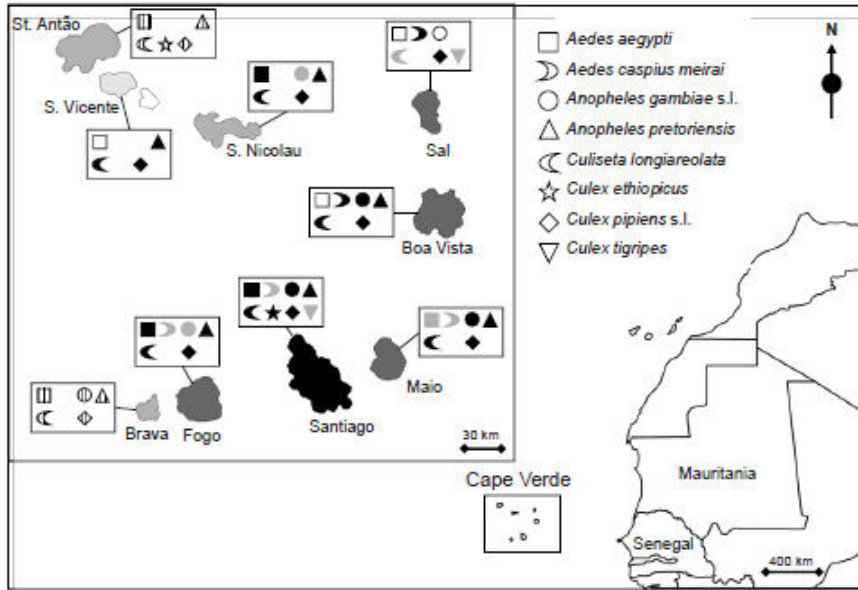
## Evolution of malaria cases per month



# FIRST ENTOMOLOGICAL STUDIES IN CABO VERDE

- **Alfredo Oliveira : 1909 - *Anopheles gambiae* (Santiago);**
- **FS Ferreira, IHMT: 1945 - *Aedes aegypti* (São Vicente);**
- **Meira et al.: 1947 – *Anopheles pretoriensis*, *Culex pipiens*, *Culex longiareolata*, (São Nicolau);**
- **Nogueira and Coito: 1950 - *Aedes aegypti* e *Culex p. quinquefasciatus* (Brava);**
- **Meira: 1952 – *Aedes capius* (Sal);**
- **Cambournac and Meira, 1952 – Contribuição para o Estudo de Sezonismo em Cabo Verde;**
- **Meira, 1954; 1957; 1958; 1958; 1959; 1963; 1964;**

# More recent studies (i):



**Mosquito fauna on the Cape Verde Islands (West Africa): an update on species distribution and a new finding; Alves et al., Vol. 35, no. 2 Journal of Vector**



**bioRxiv**  
THE PREPRINT SERVER FOR BIOLOGY

bioRxiv posts many COVID19-related papers. A reminder: they have not been formally peer-reviewed and should not guide health-related behavior or be reported in the press as conclusive.

New Results

Follow this preprint

**Update on the mosquito fauna (Diptera: Culicidae) distribution in Cabo Verde: occurrence of the species complexes *Anopheles gambiae* and *Culex pipiens* (*pipiens*, *quinquefasciatus* and their hybrids)**

Silvânia Da Veiga Leal, Isaias Baptista Fernandes Varela, Davidson Daniel Sousa Monteiro, Celivianne Marisia Ramos de Sousa, Maria da Luz Lima Mendonça, Adilson José De Pina, Aderitow Augusto Lopes Gonçalves, Hugo Costa Osório

doi: <https://doi.org/10.1101/2021.09.01.458512>

This article is a preprint and has not been certified by peer review [what does this mean?].

## ELIMINATING MALARIA

Case-study 2

Moving towards sustainable elimination in Cape Verde



*Zoologia Caboverdiana* 5 (1): 14-19

Available at [www.scvz.org](http://www.scvz.org)

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**First report of *Culex* (*Culex*) *tritaeniorhynchus* Giles, 1901 (Diptera: Culicidae) in the Cape Verde Islands**

Joana Alves<sup>1,2</sup>, Adilson de Pina<sup>1</sup>, Mawlouth Diallo<sup>3</sup> & Ibrahima Dia<sup>3</sup>

<https://www.biorxiv.org/content/10.1101/2021.09.01.458512v1>

# BACKGROUND:

- ❑ An integrated approach to malaria vector control has become increasingly relevant, especially for countries aiming to eliminate or significantly reduce the risk of infection;
- ❑ Evidence-based strategies require detailed knowledge of the identity, distribution, and bionomics of these vectors within the target area;
- ❑ Cabo Verde is part of Initiative E-2025, a group of countries identified by WHO as having the potential to eliminate malaria by 2025;
- ❑ Despite the target of zero local malaria, a robust surveillance system in the country, which includes entomological surveillance, becomes essential to maintain the country free of the disease and prevent reintroduction;
  - Entomological study using data from 2016 and 2023 to update geographical distribution of the main malaria vector in Cabo Verde;

# METHODOLOGY

- ❖ **Collection of larvae and pupae:** Under the entomological surveillance activities led by the INSP/PNL/DS, mosquitoes were collected from 2016 to 2023. The collection of immature mosquitoes (larvae and pupae) was performed by inspection of immatures both indoors and in the surroundings of urban, peri-urban, and rural areas
- ❖ **Collection of adult mosquitoes:** Several techniques were employed for adult collection: Biogents Sentinel traps, mechanical aspiration using improved prokopack and backpack aspirators and CDC UV light trap.



- ❖ **Medical Entomology Laboratory of the INSP to identification**
  - dichotomous keys;
  - PCR amplification of ribosomal DNA (rDNA) (Scott et al., 1993);
- ❖ **Statistical analysis:**
  - Excel spreadsheet (2016)
  - The map was prepared using QGIS (3.30)



# RESULTS

## Geographical distribution of *Anopheles Arabiensis* in Cabo Verde, 2016 - 2023



### Legend

- World map
- Cabo Verde
- Anopheles arabiensis*



Source: Medical Entomology Laboratory  
National Institute of Public Health  
Map base: National Institute of Land  
Management  
Elaborated by Jonas Gomes  
National Observatory of Health  
July 10, 2023

# Some Findings:

- An update on the distribution of *An. arabiensis* in Cabo Verde with the compilation of fieldwork carried out over the last 7 years;
- The presence of this mosquito was observed in 6 of the 9 inhabited islands, (Santo Antão, São Vicente, São Nicolau, Maio, Boavista and Santiago)
- For the first time the presence of *An. arabiensis* was identified both morphologically and molecularly in Santo Antão.
- Despite the presence of *An. arabiensis* in 6/9 (66.7%) of the inhabited islands, the species density seems to be low
- The identification of *An. arabiensis* in Santo Antão island and in São Nicolau, may be related to the increased mobility of goods and people to and from these islands, or simply to the increase/improvement of entomological surveillance activities in recent years.
- The development and exchange of tourism between the Cabo Verde and the countries where malaria is endemic, may regularly favor the risk introduction of imported cases of malaria in the country.
- **In conclusion:** *An. arabiensis* remains the only species of the *Anopheles gambiae* complex present in the Cabo Verde (in 6/9 islands).

# Challenges / Opportunities :

- ❖ Persistence of imported malaria cases → robust surveillance system;
- ❖ *An. arabiensis* present in 6/9 islands → Entomological surveillance system
- ❖ Barlavento islands without local cases → understand the vector capacity / contact with the parasites;
- ❖ Vector control activities focused in LM/IRS → The implementation of IVM and new interventions/technologies;
- ❖ Low mosquitoes density → Behavior and bioecology studies and news approaches;
- ❖ Entomological surveillance → Capacity building, research and international collaboration;
- ❖ Malaria elimination → share the experience and invest in preventing reintroduction.

# Obrigado



Ministério  
da Saúde



**The Global Fund**  
To Fight AIDS, Tuberculosis and Malaria

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IPPHL 2022, IVLP 2017

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