PAT – Projeto Aedes Transgênico
Aedes Transgenic Project

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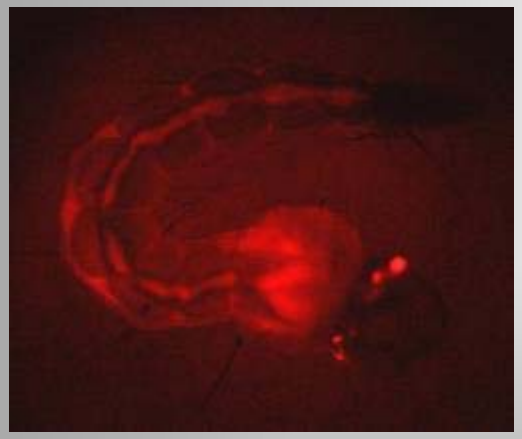
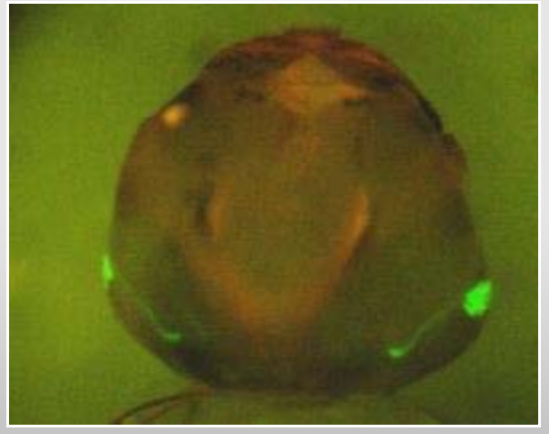




Dengue Prevention and 35 Years of Vector Control in Singapore

Eng-Eong Ooi,* Kee-Tai Goh,† and Duane J. Gubler‡

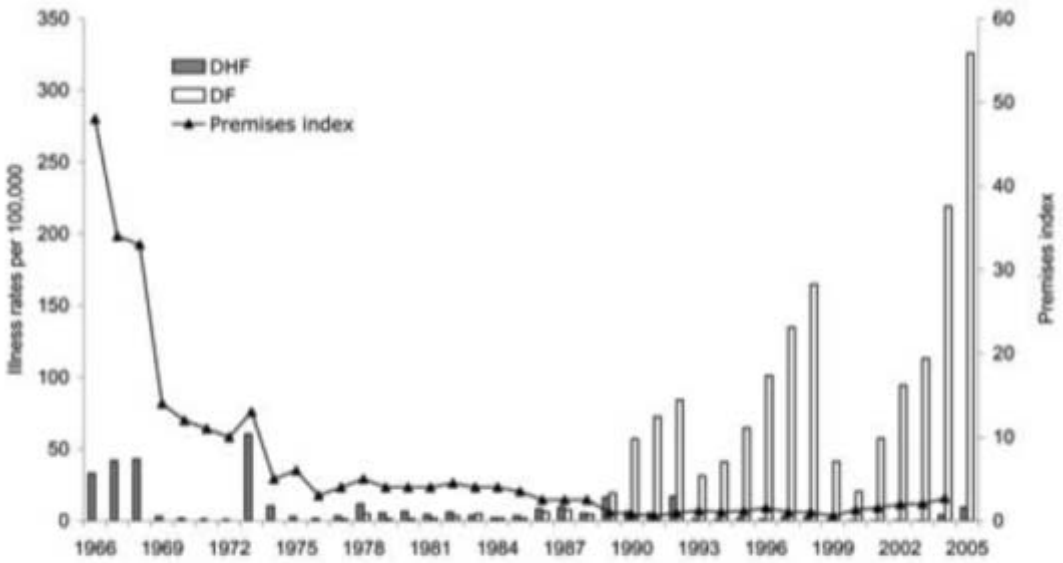
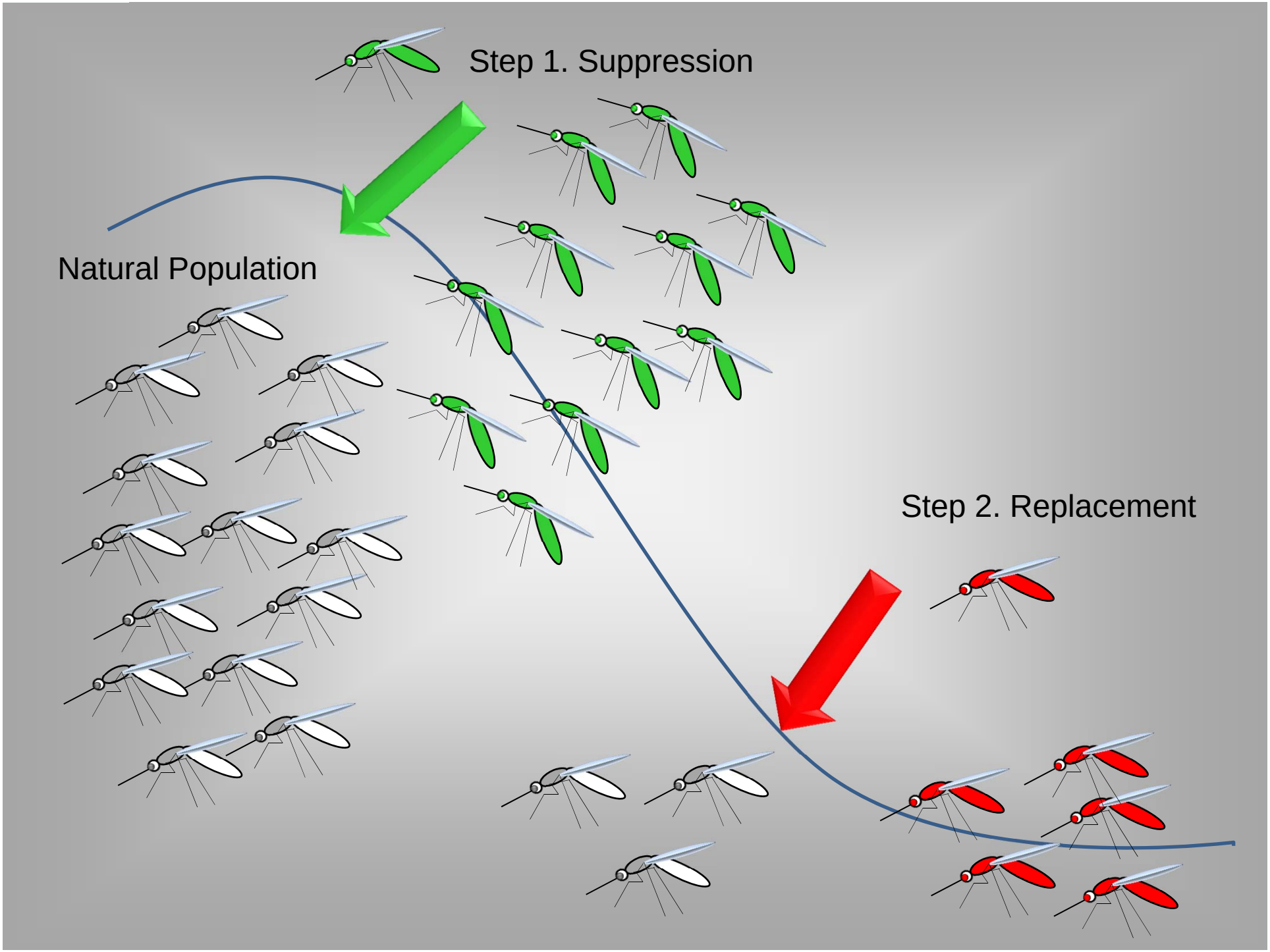


Figure 1. Annual incidence dengue fever (DF) and dengue hemorrhagic fever (DHF) and the premises index, Singapore, 1966–2005. DHF was made a notifiable disease in 1966, while DF became a notifiable disease in 1977. The annual incidences of DF and DHF reported in this figure were calculated from the number of reported cases each year from 1966 to 2004. The annual premises index is expressed as a percentage of the premises in which *Aedes aegypti* or *A. albopictus* larvae were found divided by the number of premises visited by environmental health officers.

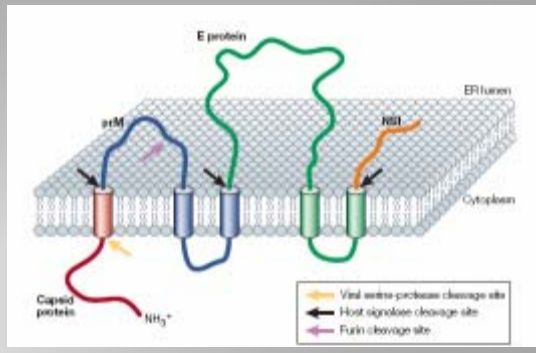
Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 12, No. 6, June 2006

After a 15-year period of low incidence, dengue has reemerged in Singapore in the past decade. We identify potential causes of this resurgence. A combination of lowered herd immunity, virus transmission outside the home, an increase in the age of infection, and the adoption of a case-reactive approach to vector control contribute to the increased dengue incidence. Singapore's experience with dengue indicates that prevention efforts may not be sustainable. For renewed success, Singapore needs to return to a vector control program that is based on carefully collected entomologic and epidemiologic data. Singapore's taking on a leadership role in strengthening disease surveillance and control in Southeast Asia may also be useful in reducing virus importation.


Step 1. Suppression
Natural Population
Step 2. Replacement

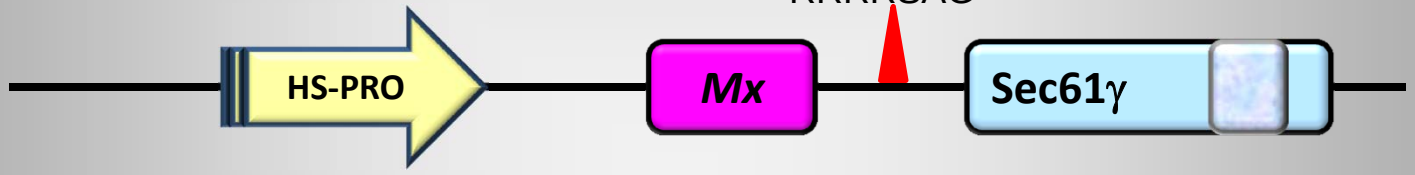
Gene Introduction
Virus-regulated mosquito gene Suicidal Model

Step 2. Replacement



NS3 Cleavage site

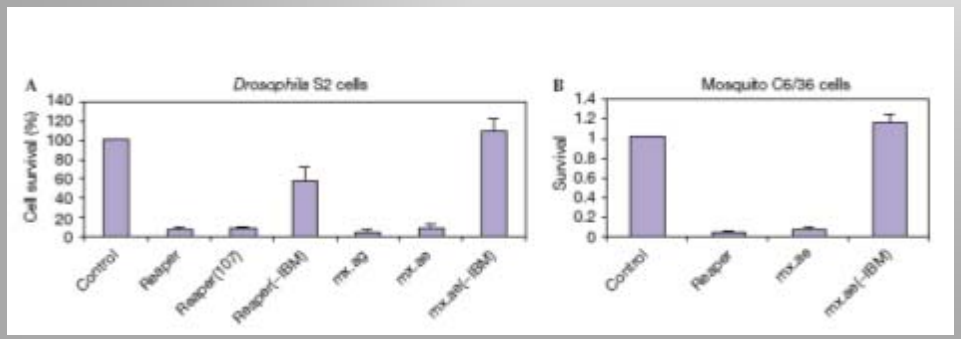
RRRRSAG

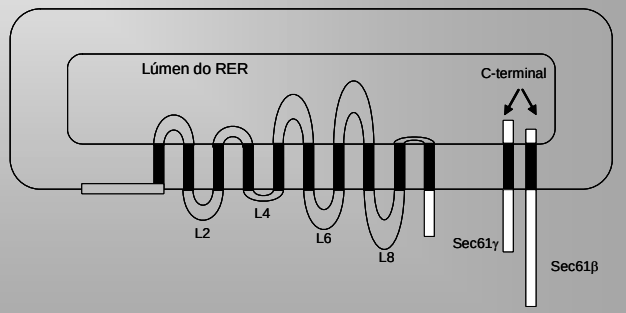


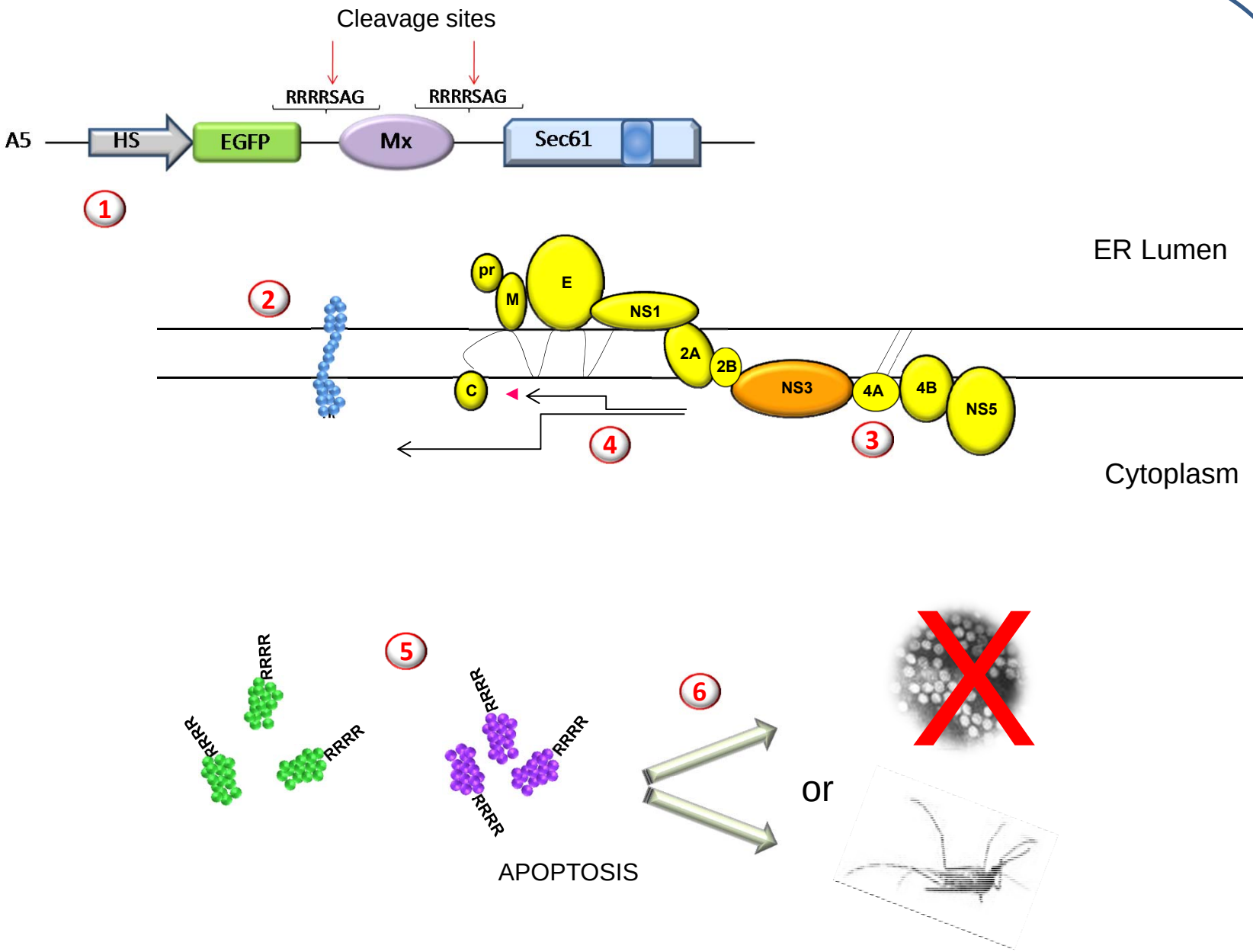
Constitutive Promoter

Lethal protein

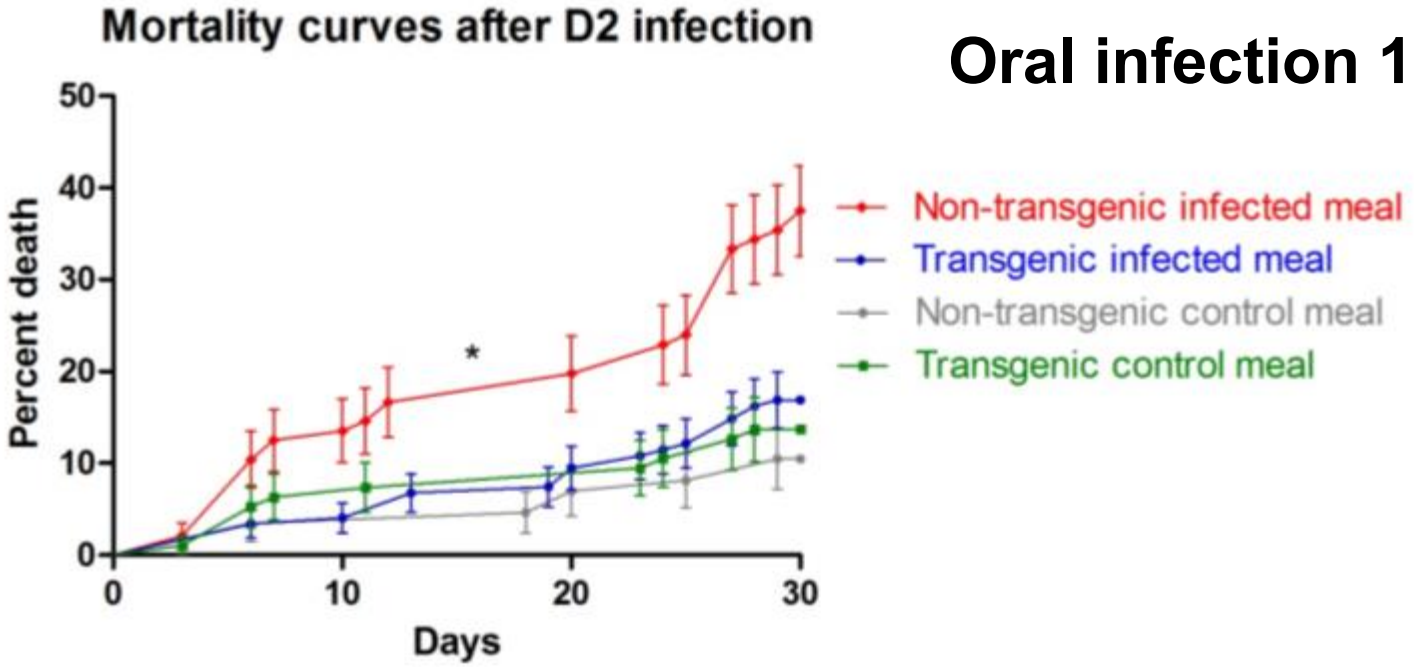
ER localization

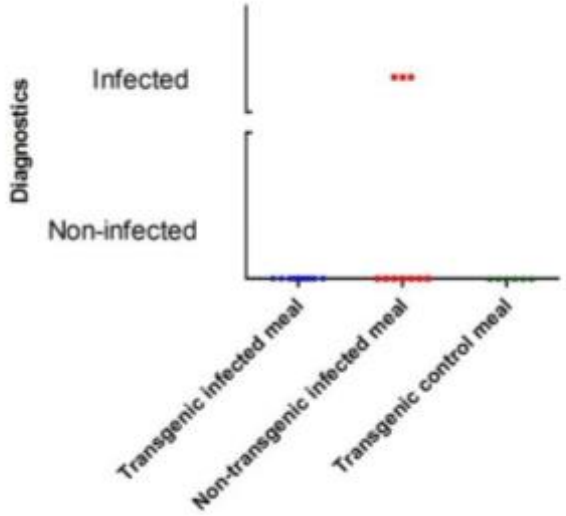





Cleavage sites
RRRRSAG
RRRRSAG
A5
HS
EGFP
Mx
Sec61
1
ER Lumen
2
pr
M
E
NS1
2A
2B
NS3
4A
4B
NS5
C
4
3
Cytoplasm
5
RRRR
RRRR
RRRR
RRRR
RRRR
6
or
APOPTOSIS

Oral infection 10^5 pfu/ml





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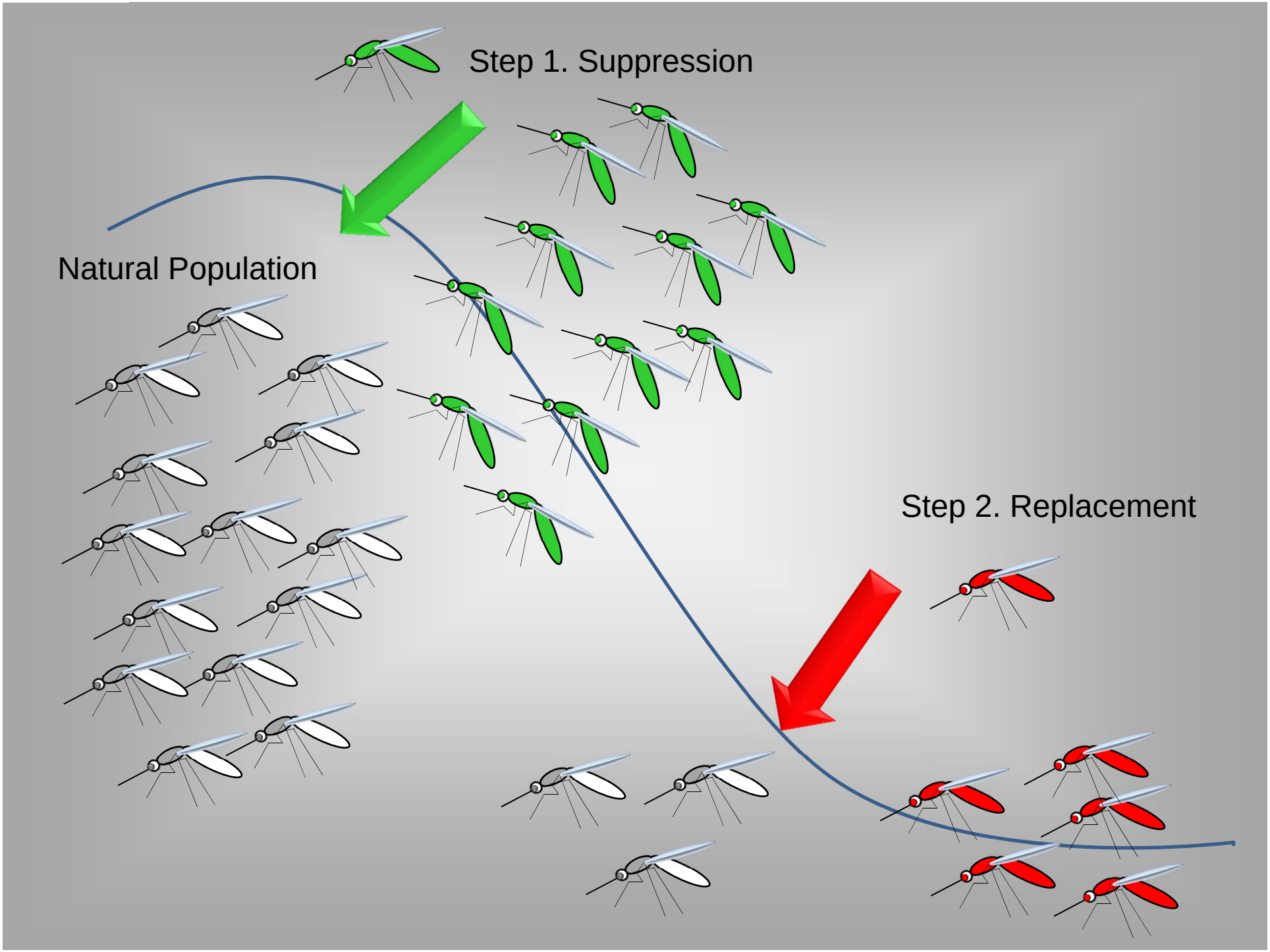
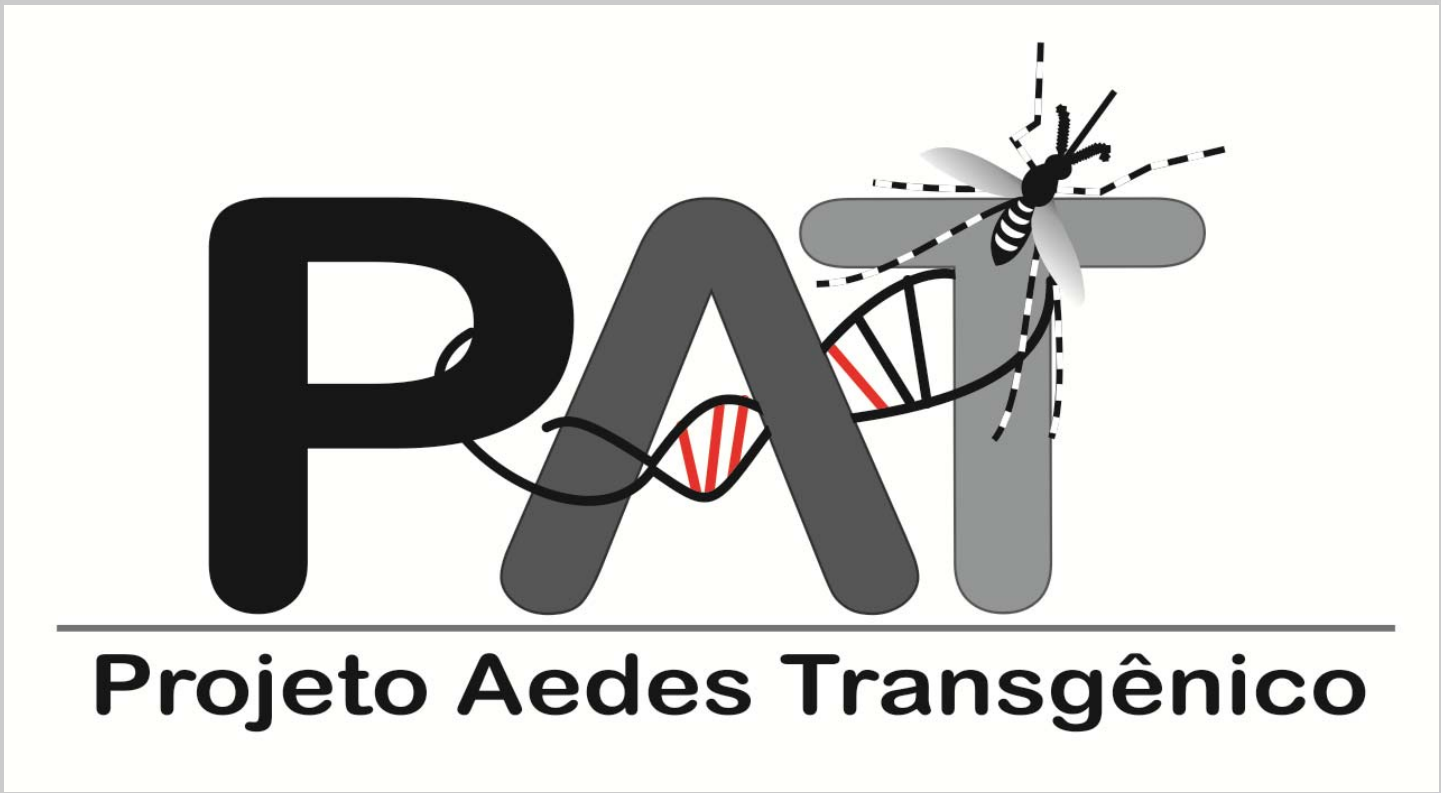
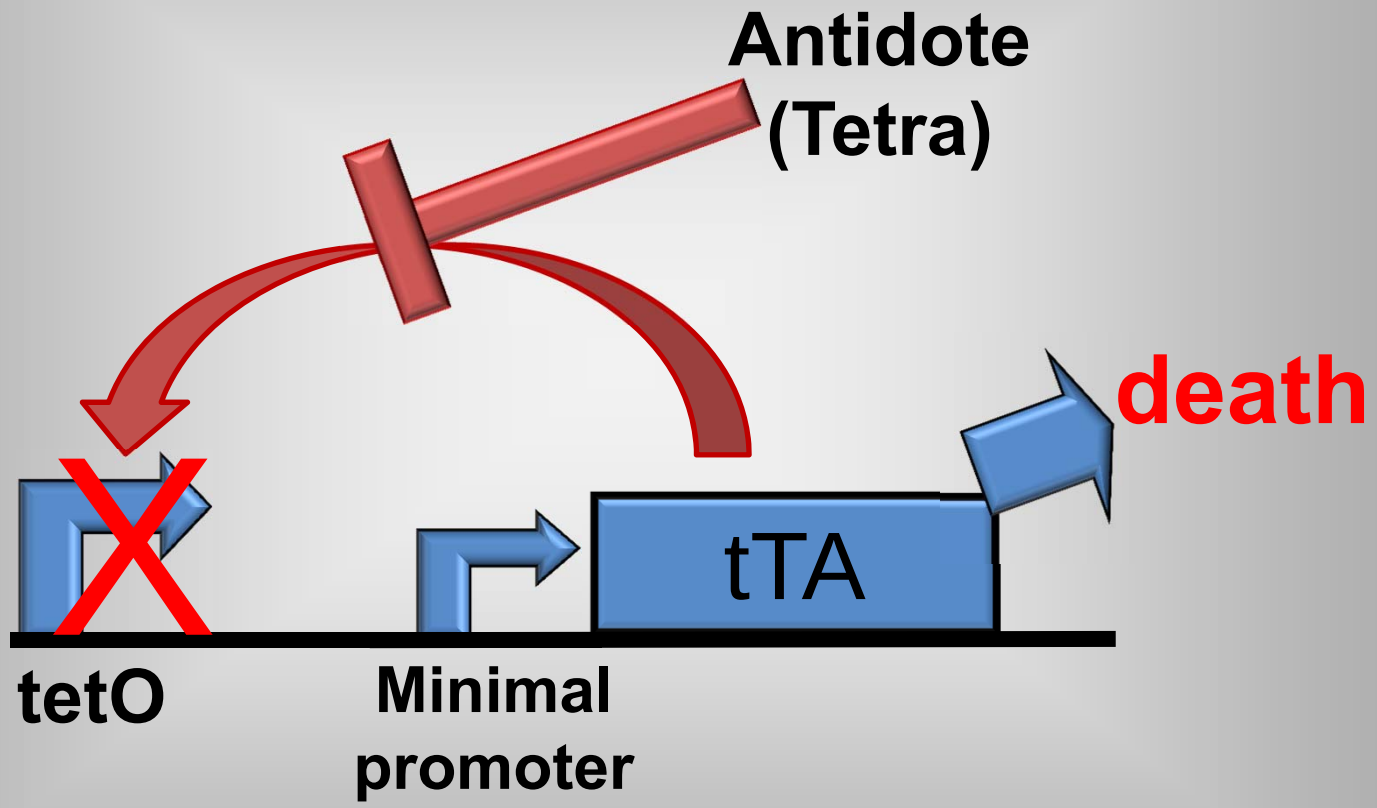

Step 1. Suppression
Natural Population
Step 2. Replacement

Step 1. Suppression

Open Field Release of OX513A *Aedes aegypti* Transgenic line evaluation



Repressive of **I**nsects carrying a **D**ominant **L**ethal gene (RIDL) – From OXITEC Biotech (UK)

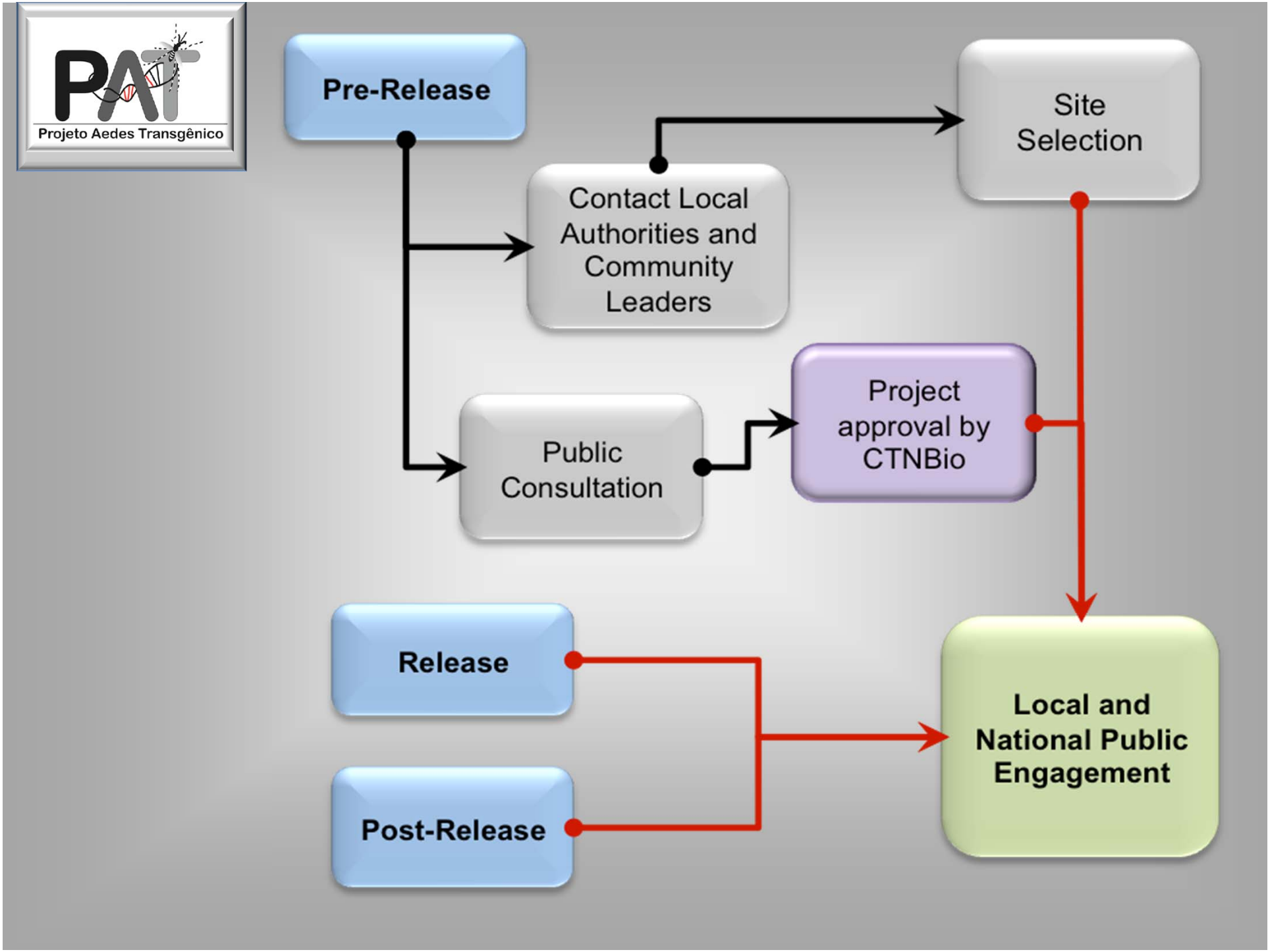


Thomas *et al.* 2000 Science 287: 2474-6

Projeto Aedes Transgênico

A field release validation for transgenic *Aedes aegypti* population suppression

- Goal – evaluate RIDL technology (OX513A) in open field release
- Collaboration between Universidade de São Paulo and Moscamed Brasil
- Oxitec agreement – No bias in the evaluation


Projeto Aedes Transgênico
Pre-Release
Site Selection
Contact Local Authorities and Community Leaders
Project approval by CTNBio
Public Consultation
Release
Post-Release
Local and National Public Engagement

Program Overview
Production -> Release -> Monitoring

Eggs produced (4-6 million/week)

Rear release generation

Eggs -> Pupae
1 million/week

Separate Male Pupae

Placed in release device

Release males
Adults x 3 week
(~0.5 million/week)

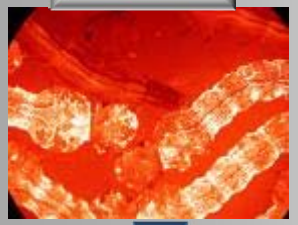
Monitoring

Adult traps

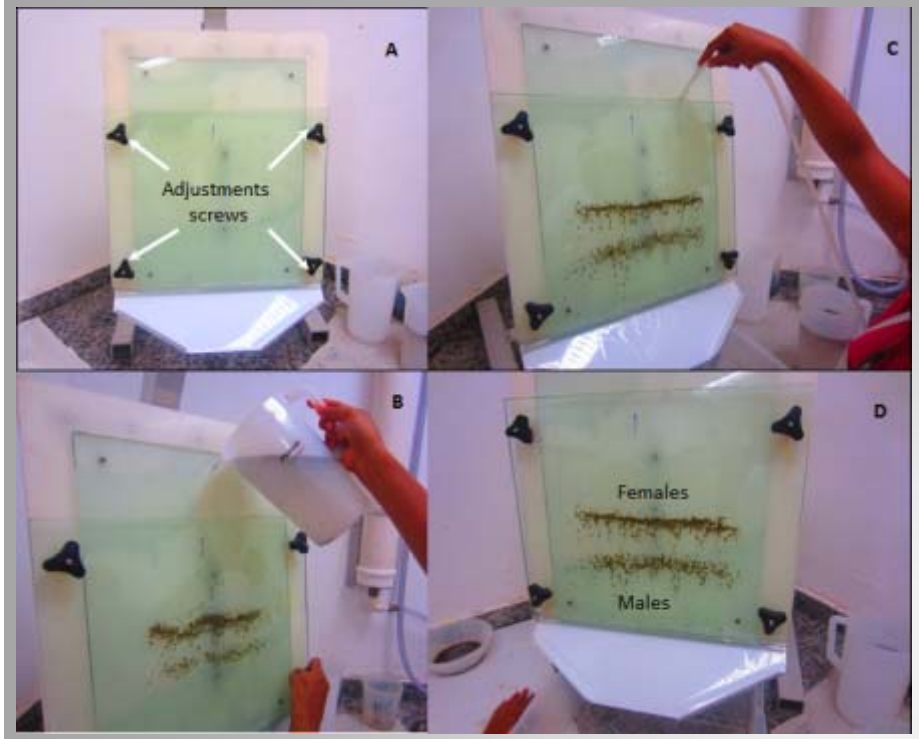
Eggs traps

Hatch eggs

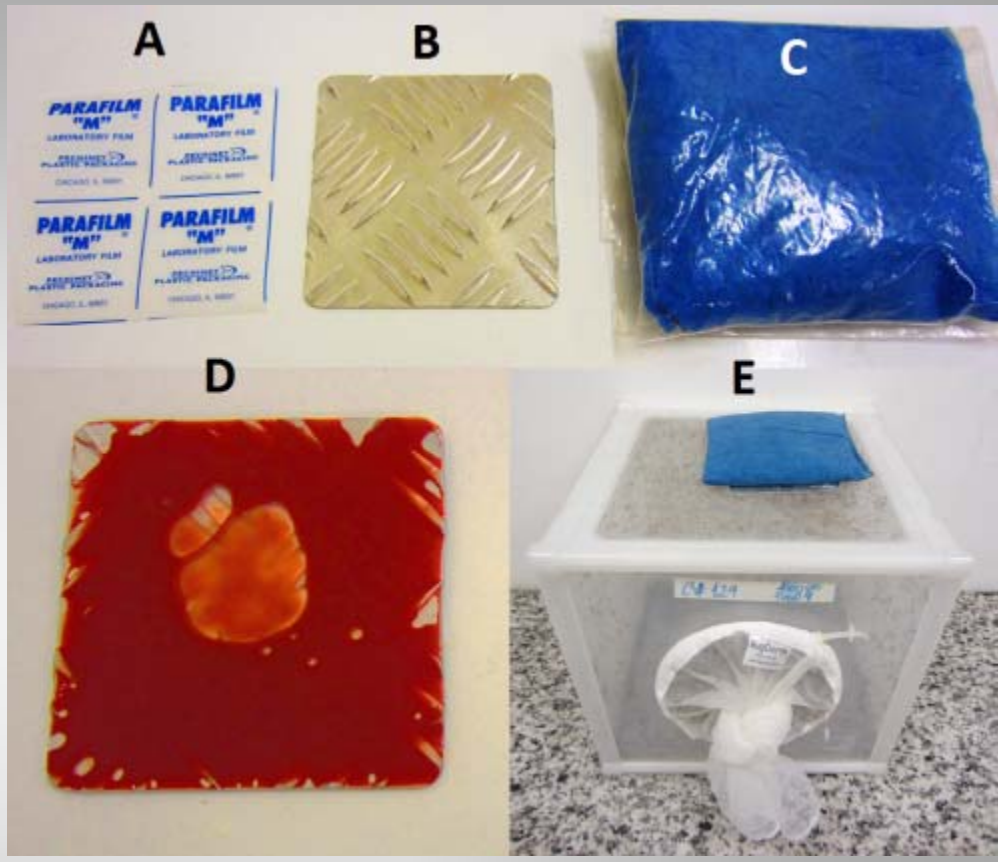
Mating



Larvae screened for presence of Fluorescent genetic marker



C: Wheat bag



Sex sorting efficiency – 0.014% (65/475,441)

~=1/7000 female/males released

jove Journal of Visualized Experiments www.jove.com

Video Article

Mass Production of Genetically Modified *Aedes aegypti* for Field Releases in Brazil

Danilo O. Carvalho[1,2], Derric Nimmo[1], Neil Naish[1], Andrew R. McKemey[1], Pam Gray[1], André B. B. Wilke[3], Mauro T. Marrelli[3], Jair F. Virginio[4], Luke Alphey[1,5], Margareth L. Capurro[2,6]

Projeto Aedes Transgênico

Juazeiro & Petrolina City
Bahia State Pernambuco State

Site Selection

Projeto Aedes Transgênico

Site Selection

~ 15 Km distance

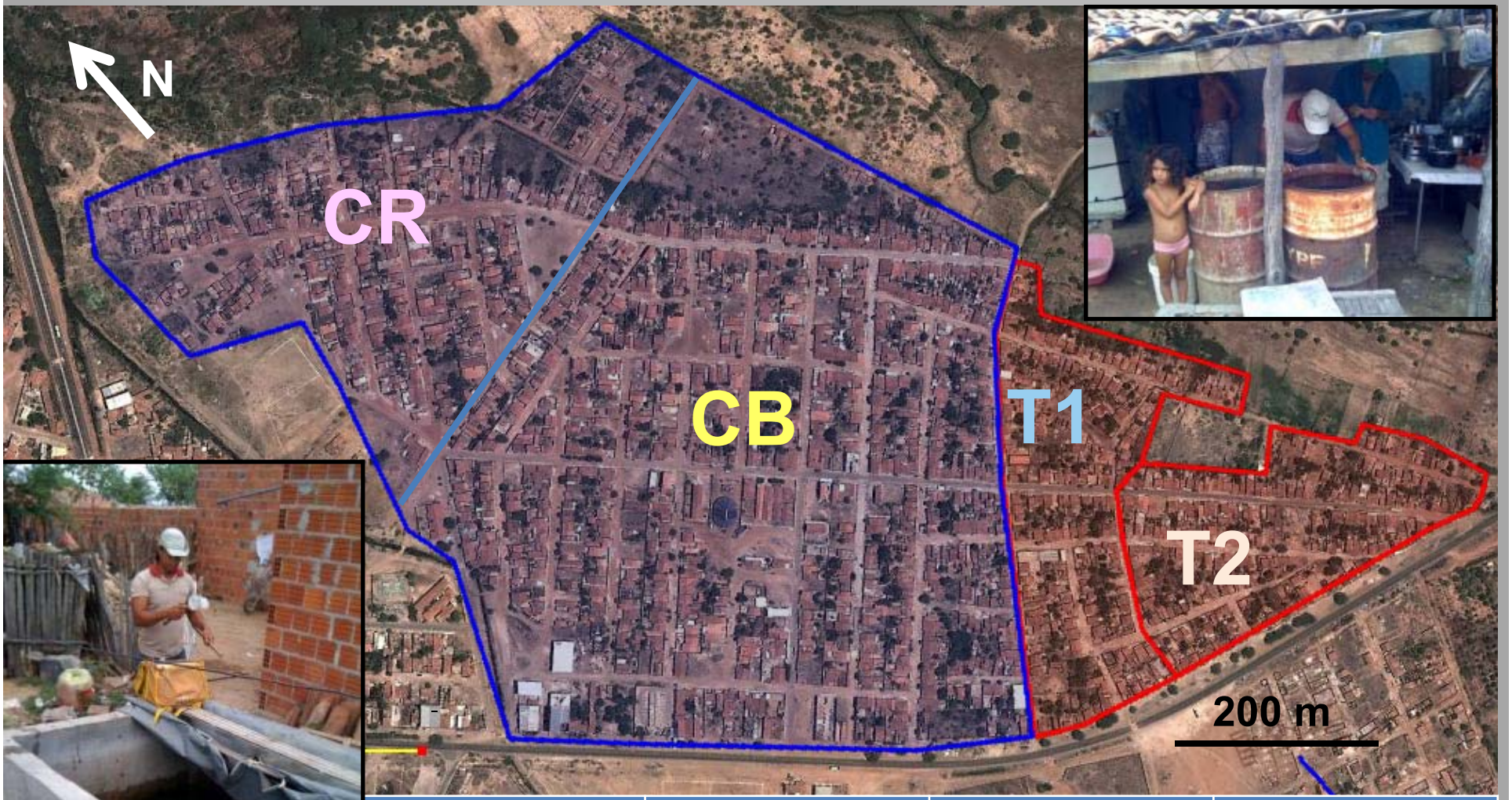
Itaberaba
1400 houses
550 km²

Mandacaru
600 houses
360 km²

PAT
Projeto Aedes Transgênico

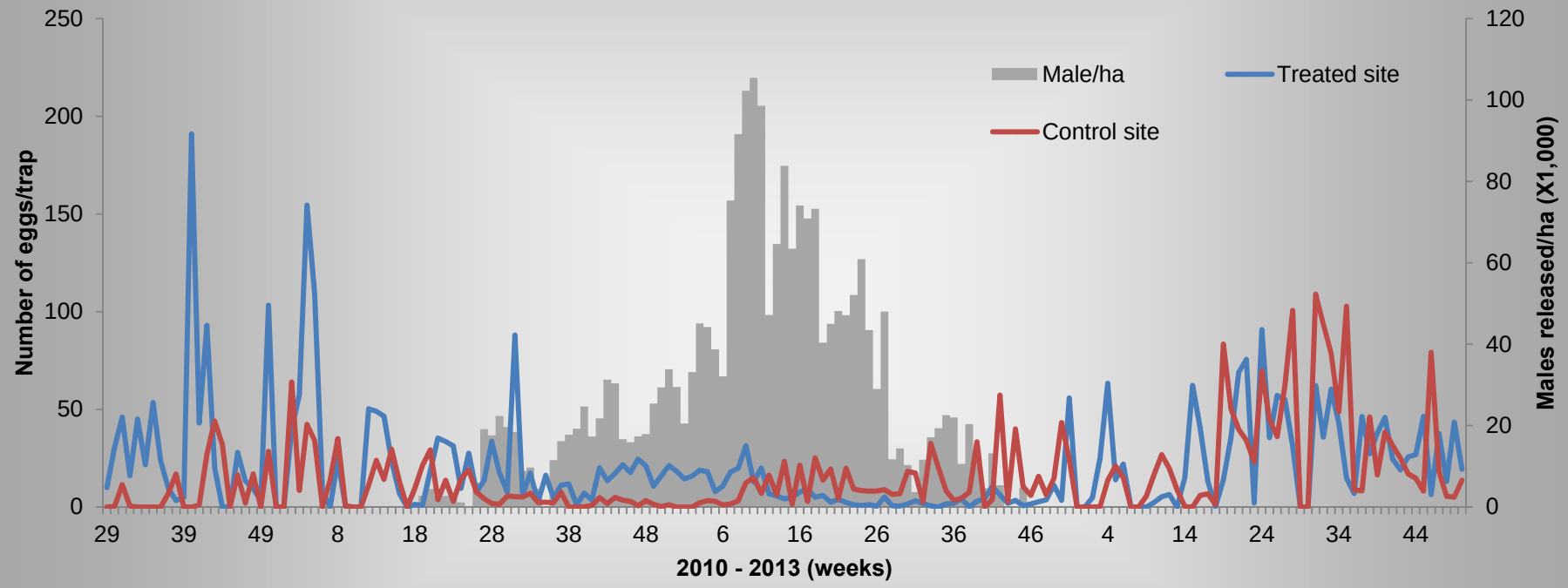
Sites - Itaberaba

Itaberaba – Field site

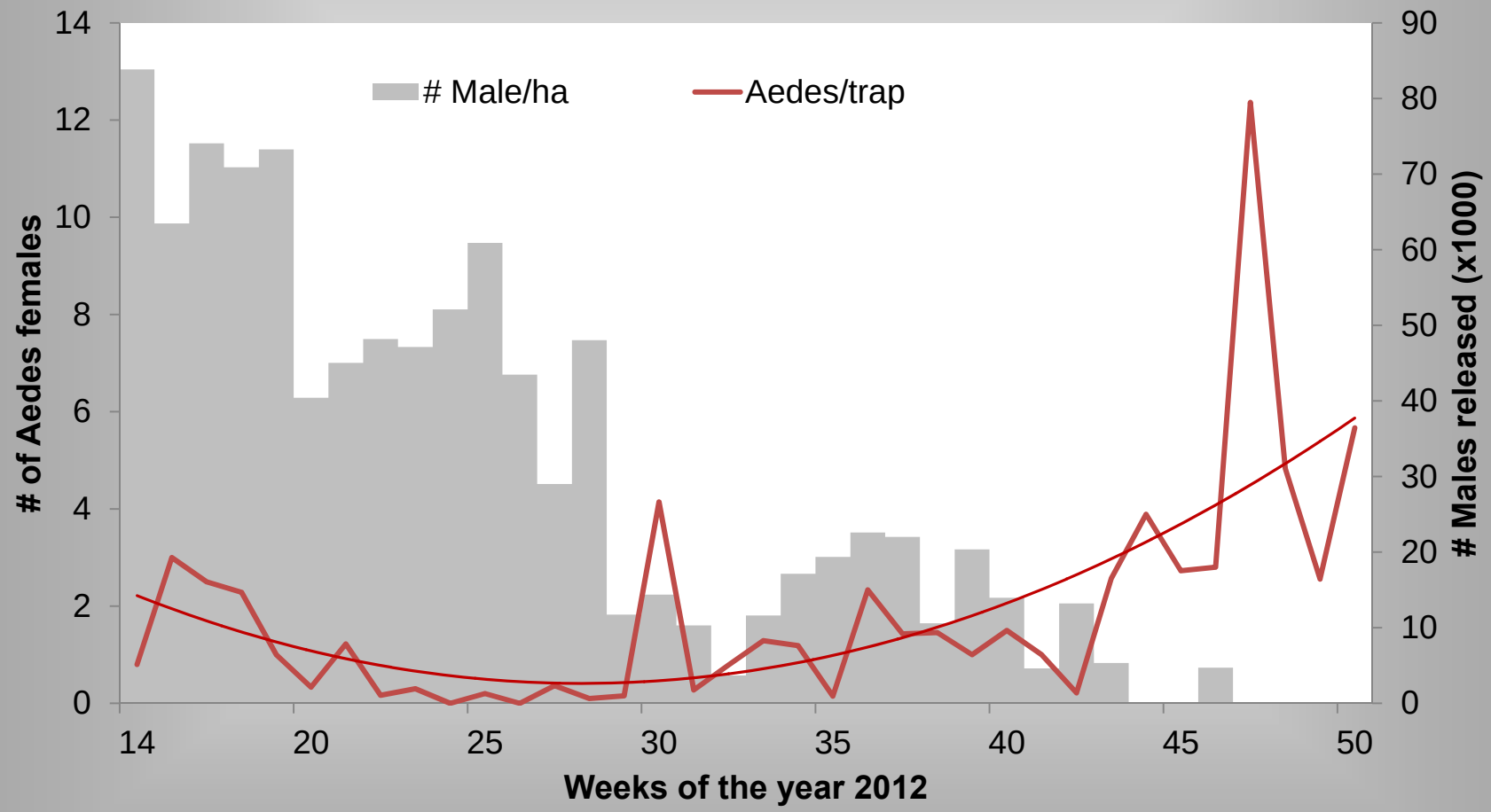


	Control (C)	Treated (T1)	Treated T(2)
Area (Ha)	40	5.5	5.5
Population (Est)	4300	900	900

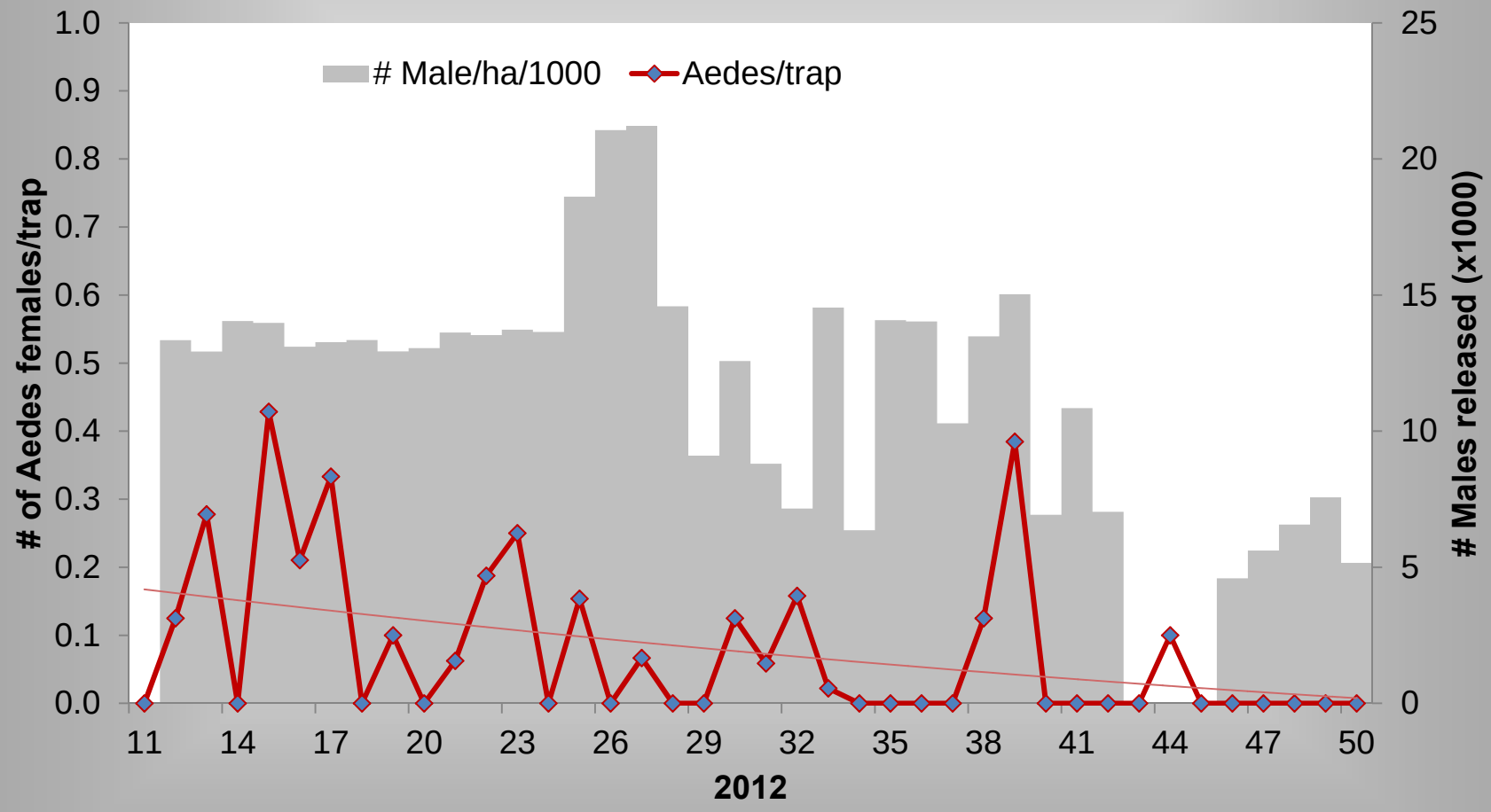
Itaberaba Eggs/Ovitrap



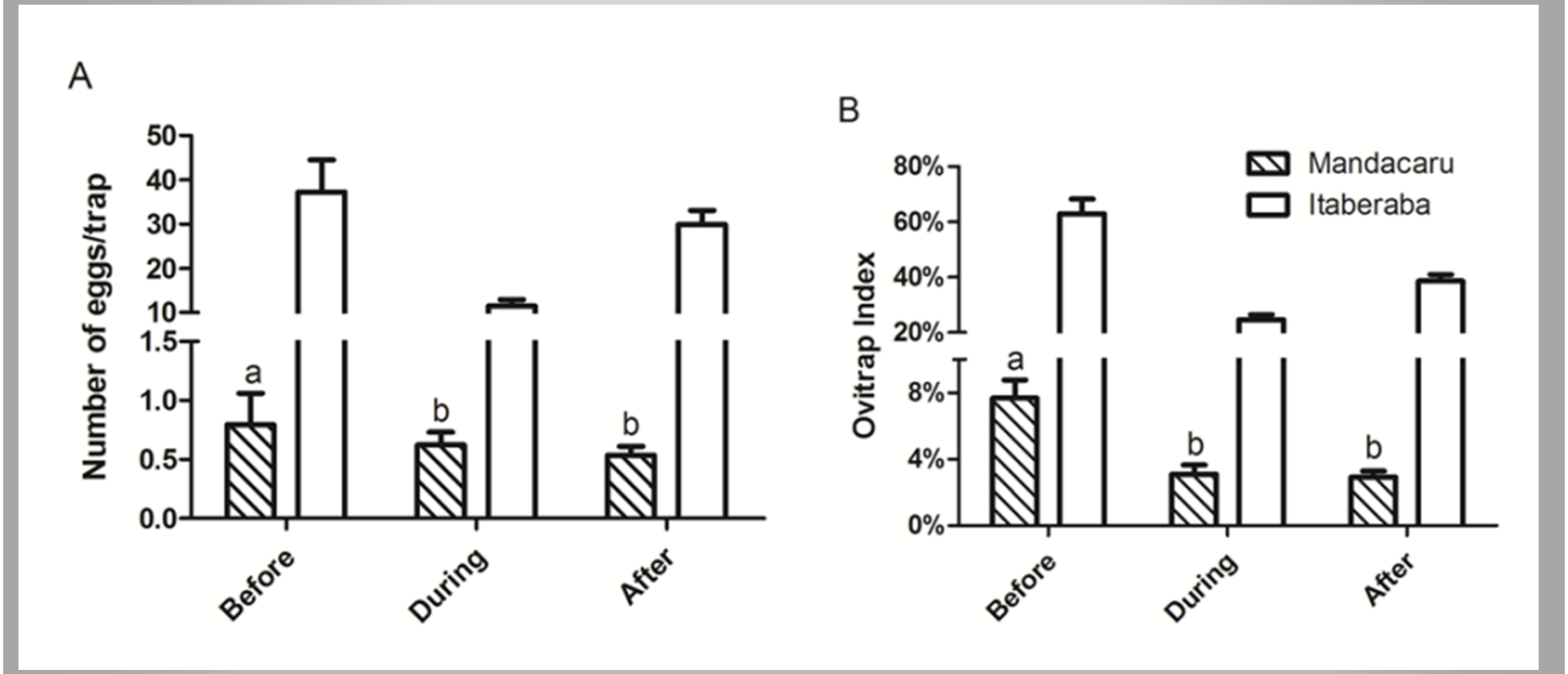
Itaberaba Female/BG trap



Mandacaru Female/BG trap



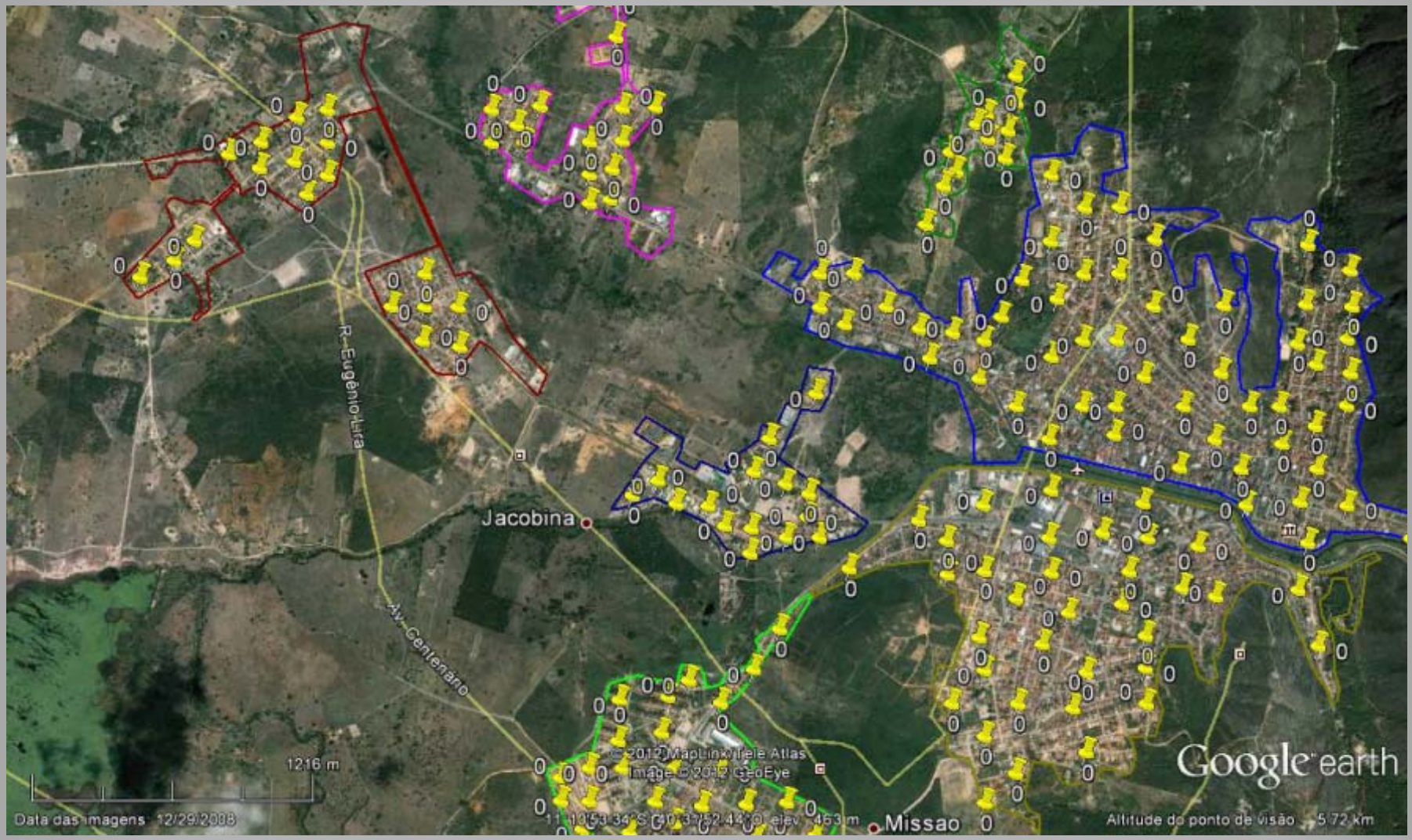
Itaberaba X Mandacaru

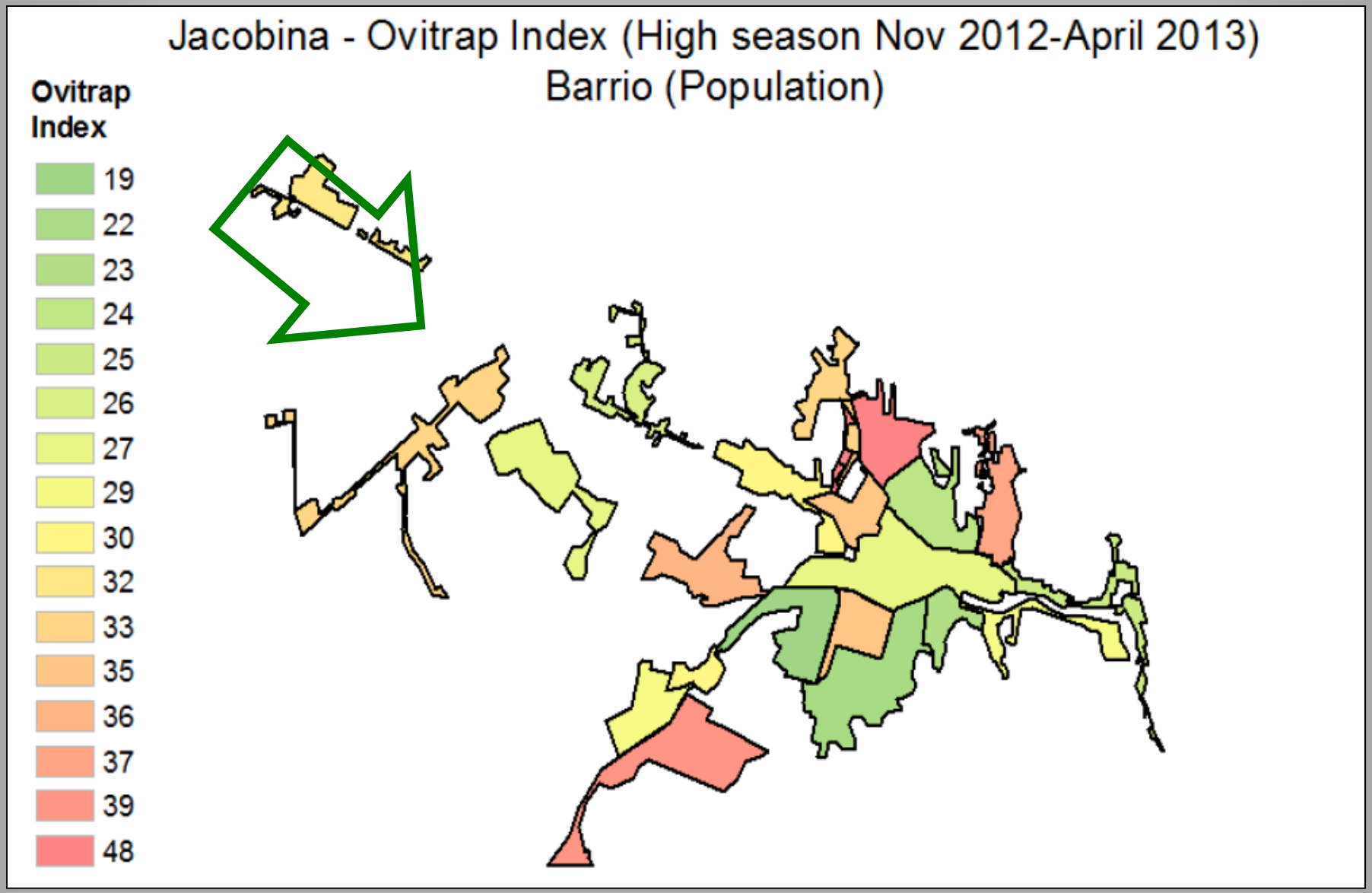


Projeto Aedes Transgênico

New Project – Jacobina - Bahia

New Project – Jacobina - Bahia





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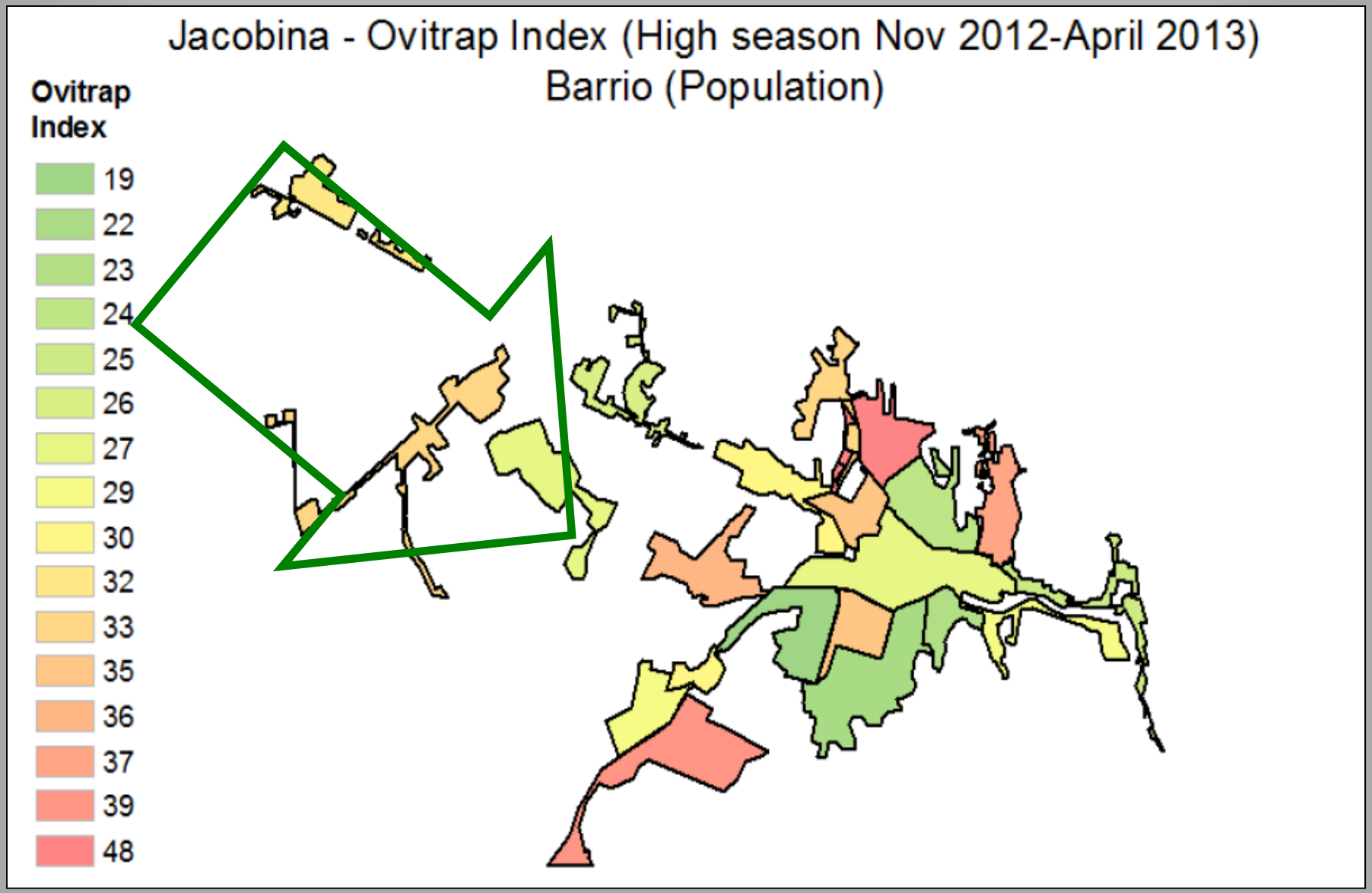

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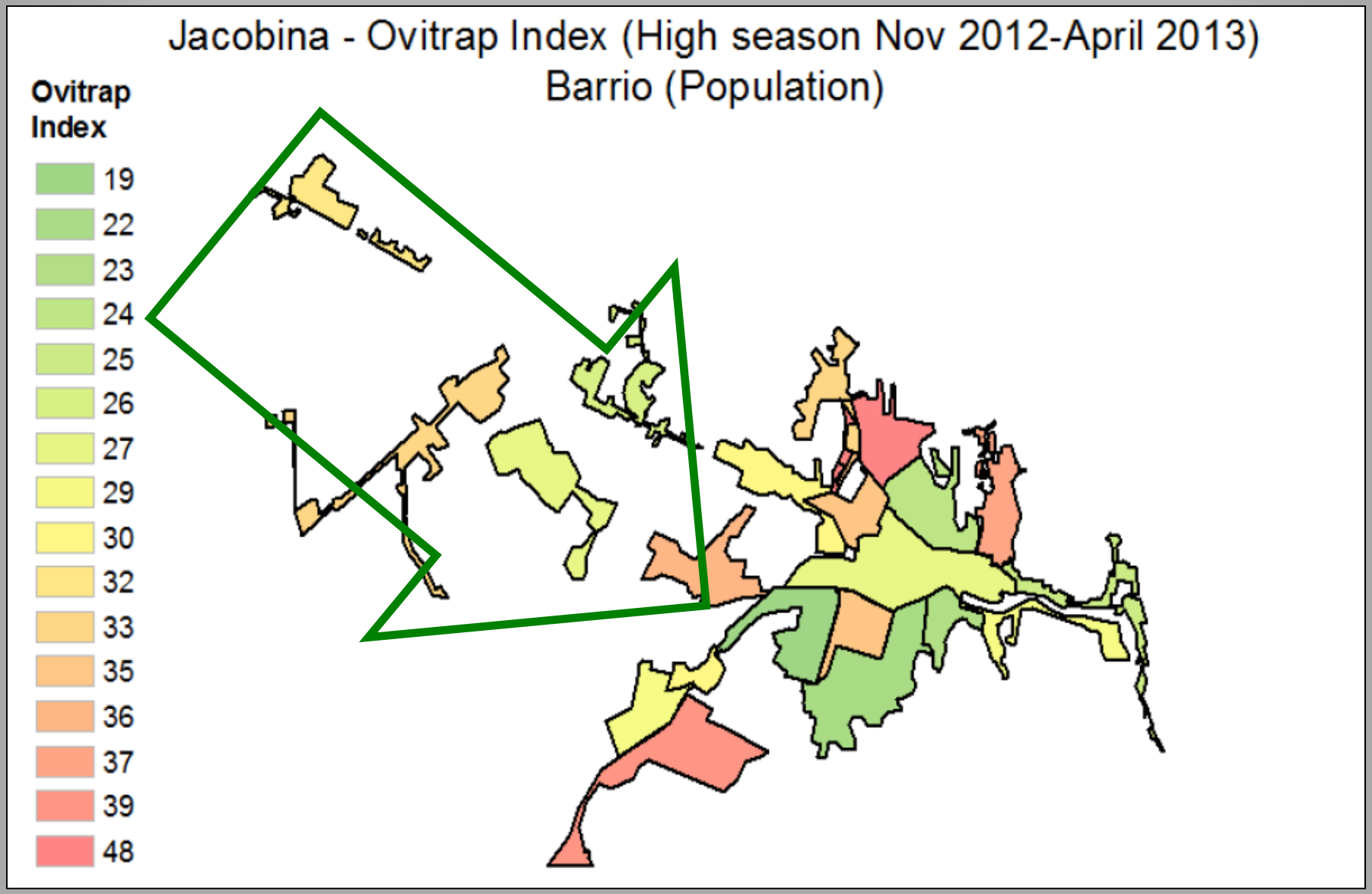

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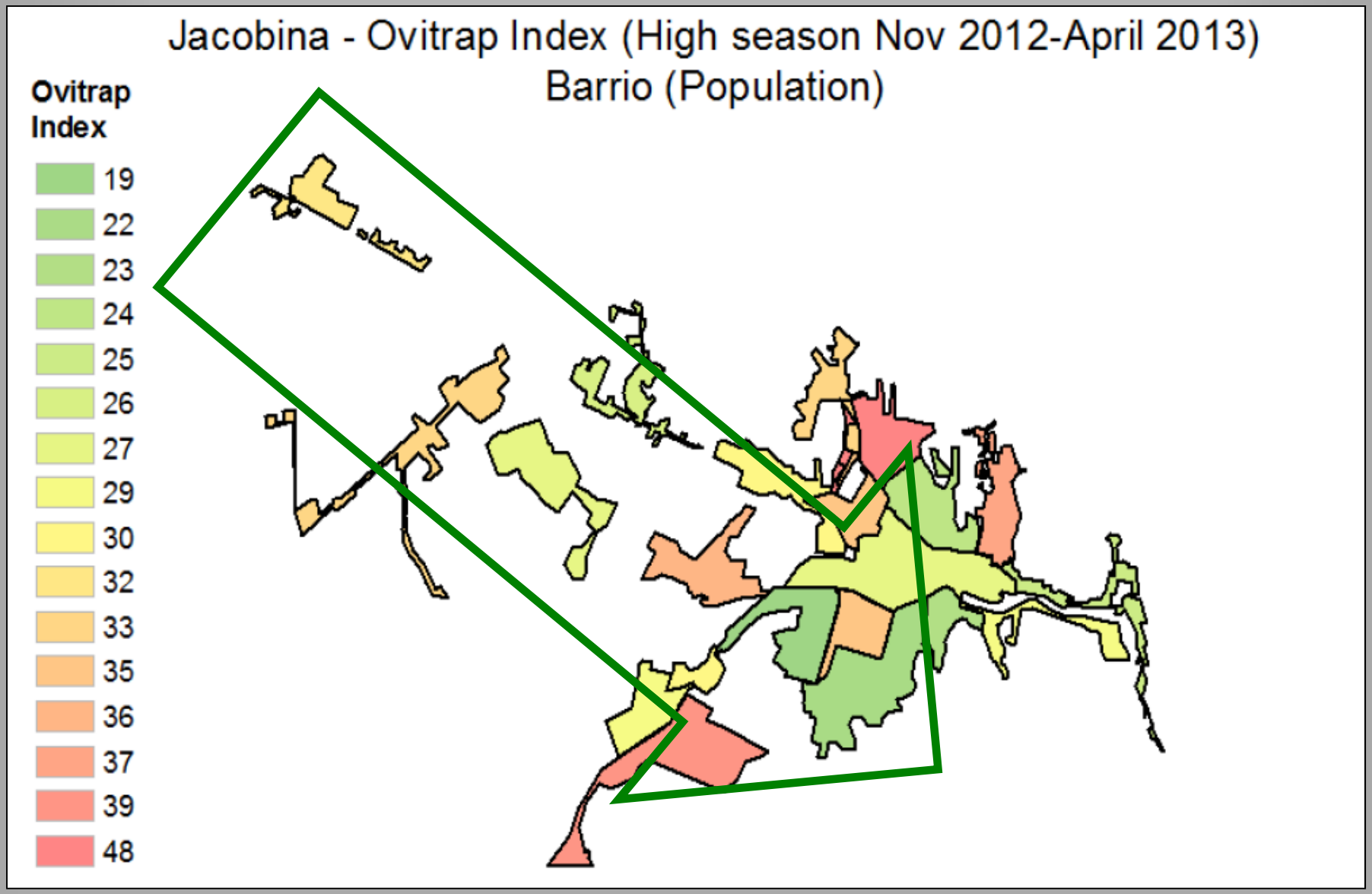

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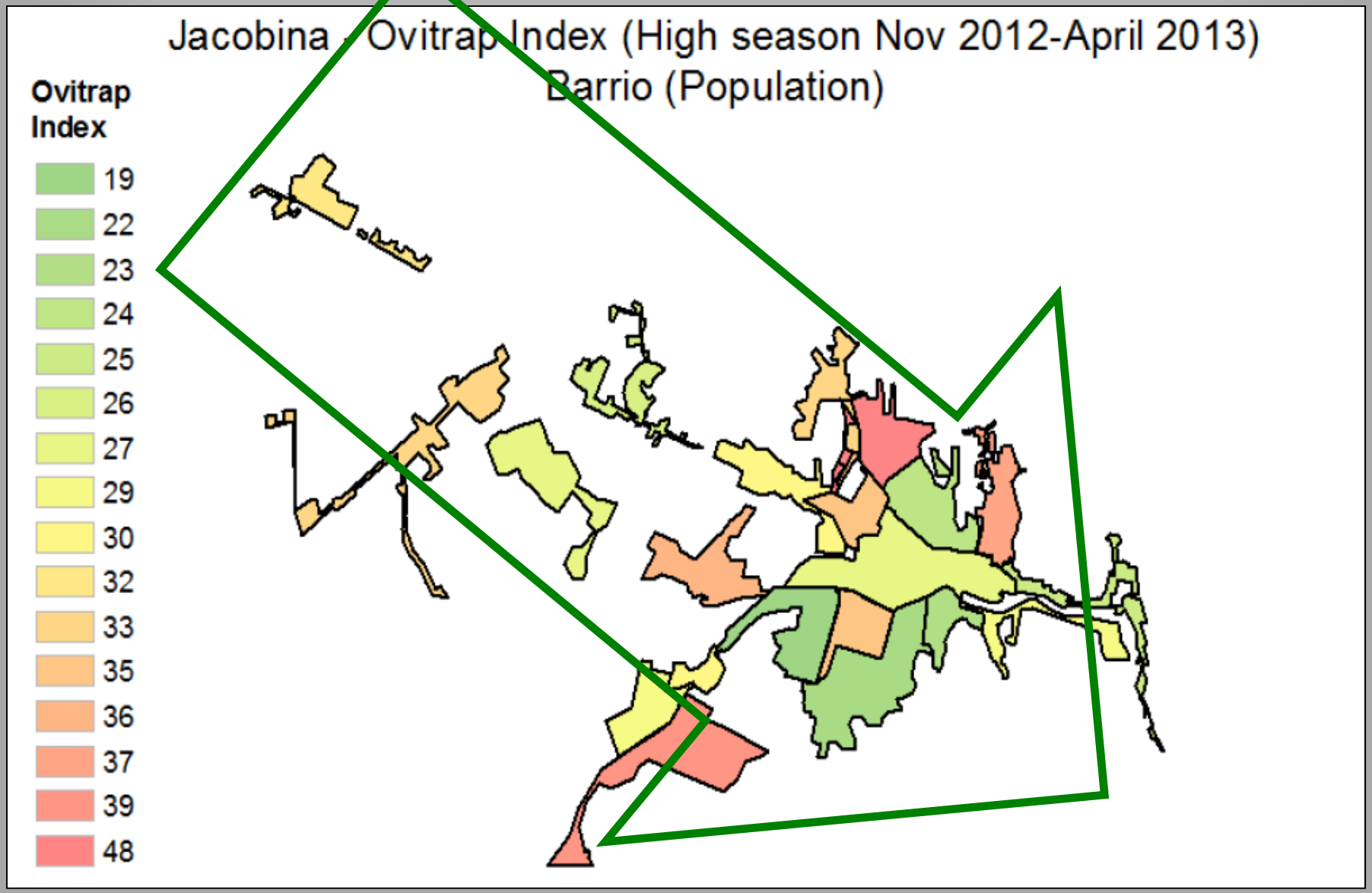


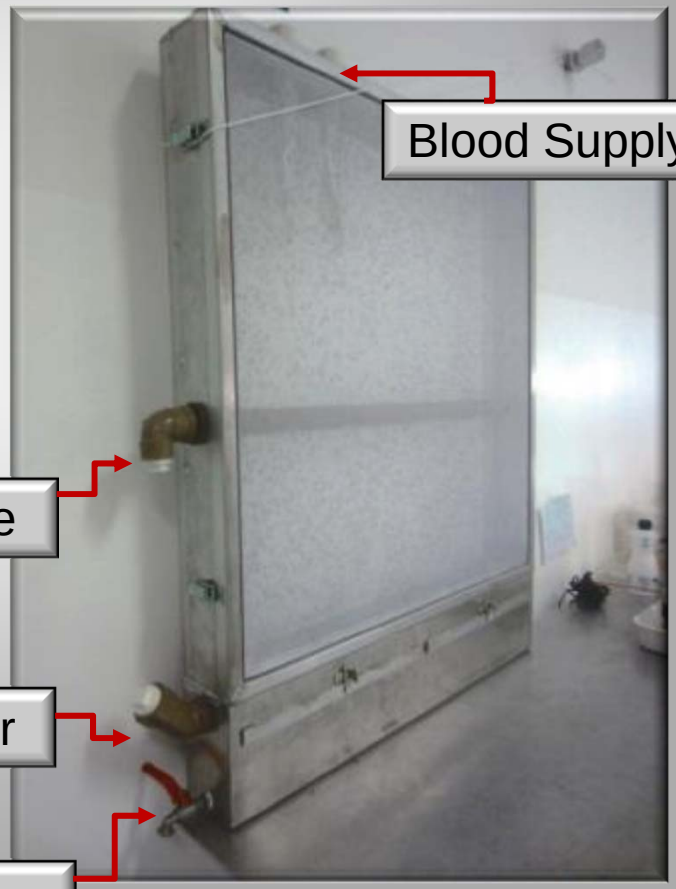
unpublished

Aedes aegypti Production (UPAT)

COLONY
4 to 6 million eggs/week

Males for releases
1 million/week

Adult cage
12,000 females/cage
= 8 small cages (30x30)



Pupa transportation
1,000 pupae/well

C25

BOD 16ºC ON

Community Engagement

Action		Period			
		Pre-release	Release		Post-release
		2010*	2011	2012	2013*
Domiciliary visit					
Internet	Social Network				
	Web site				
Interviews / appearances	TV				
	Radio				
	Newspaper				
	Magazines				
Jingle broadcast					
Leaflets distribution					
Meeting local leaders					
Questionnaires					
School presentations / lectures					
Monitoring system					
Truck loudspeakers					

* - In both years, the columns are representing the last two semesters and the first two respectively.

Community Engagement

Total people 17,101,269 in Brazil – Based on the Brazilian Institute of Public Opinion and Statistics (IBOPE) data

Leaflet distribution

Projeto Aedes Transgênico

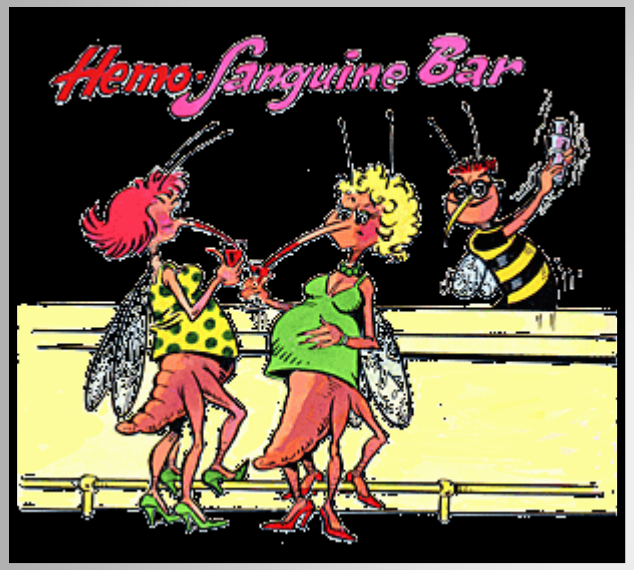
Mosquito Aedes \Dengue

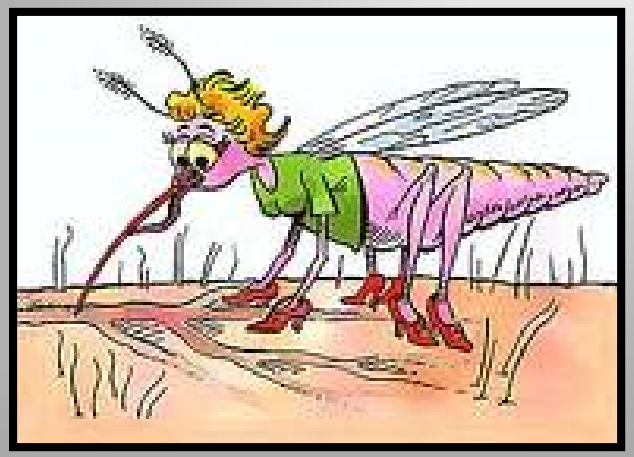
Pica durante o dia (bite during the day)

Muriçoca (*Culex)*

Pica durante a noite (bite during the night)

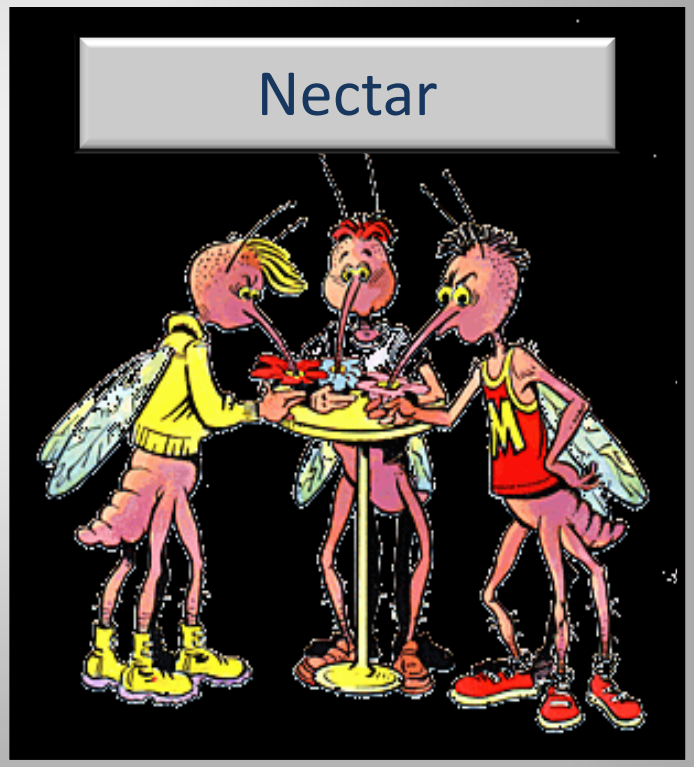
Bar – Blood for Sale!





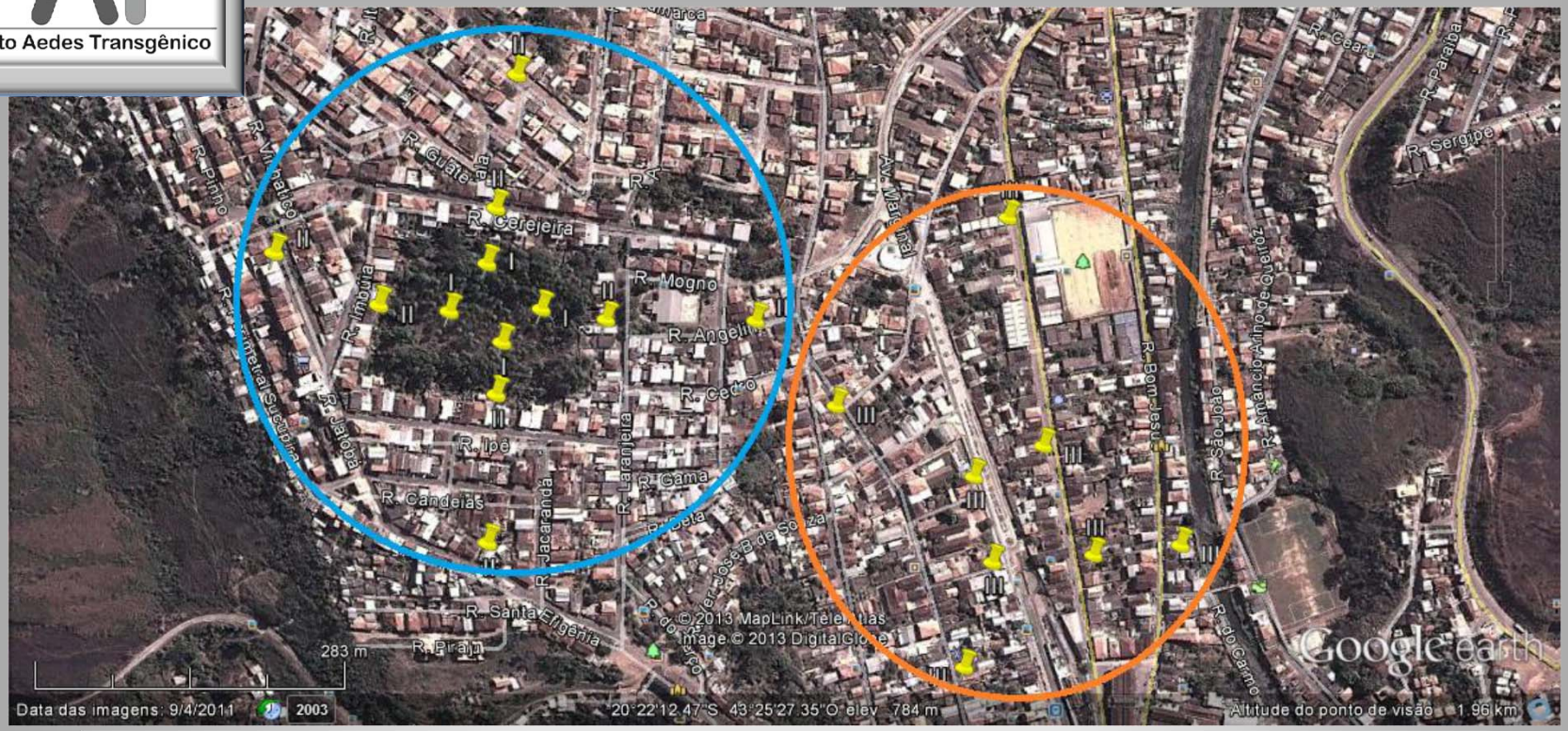
Fonte: Google

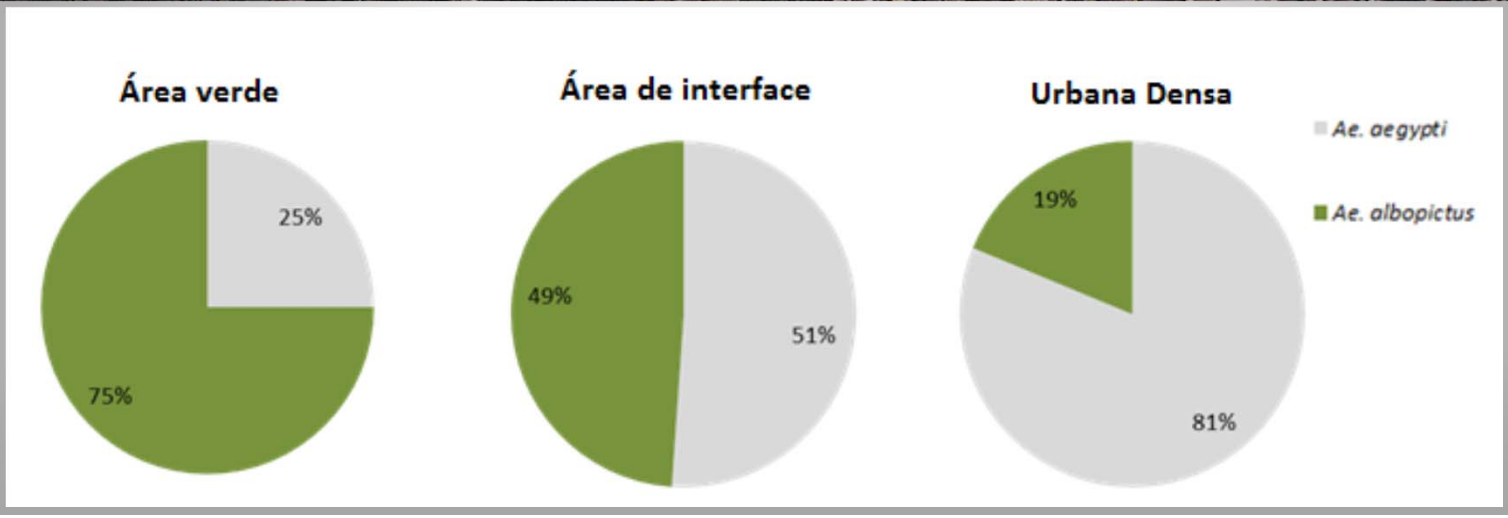
Only females (girls) bite



Projeto Aedes Transgênico

Aedes agypti X Aedes albopictus





Projeto Aedes Transgênico

Moscamed Brasil

Universidade de São Paulo

MOSCAMED BRASIL

USP Universidade de São Paulo

GOVERNO DA Bahia TERRA DE TODOS NÓS Secretaria de Ciência, Tecnologia e Inovação

FAPESP

CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico

INCT - EM
PRONEX/DECIT

SPOT

To control dengue Moscamed is releasing in this community

A large amount of TRANSGENIC MOSQUITOES .

We would like to recall that this mosquitoes are not the well known

CULEX

They are transgenic MALES and they DON'T BITE.

They are good fellows that will give you protection against dengue.

For more information call a health agent or get in touch with

MOSCAMED

By the phone

(74) 3612-5399

PAT –AEDES TRANSGENIC PROJECT

This one makes the difference.

Jingle Transgenic *Aedes*