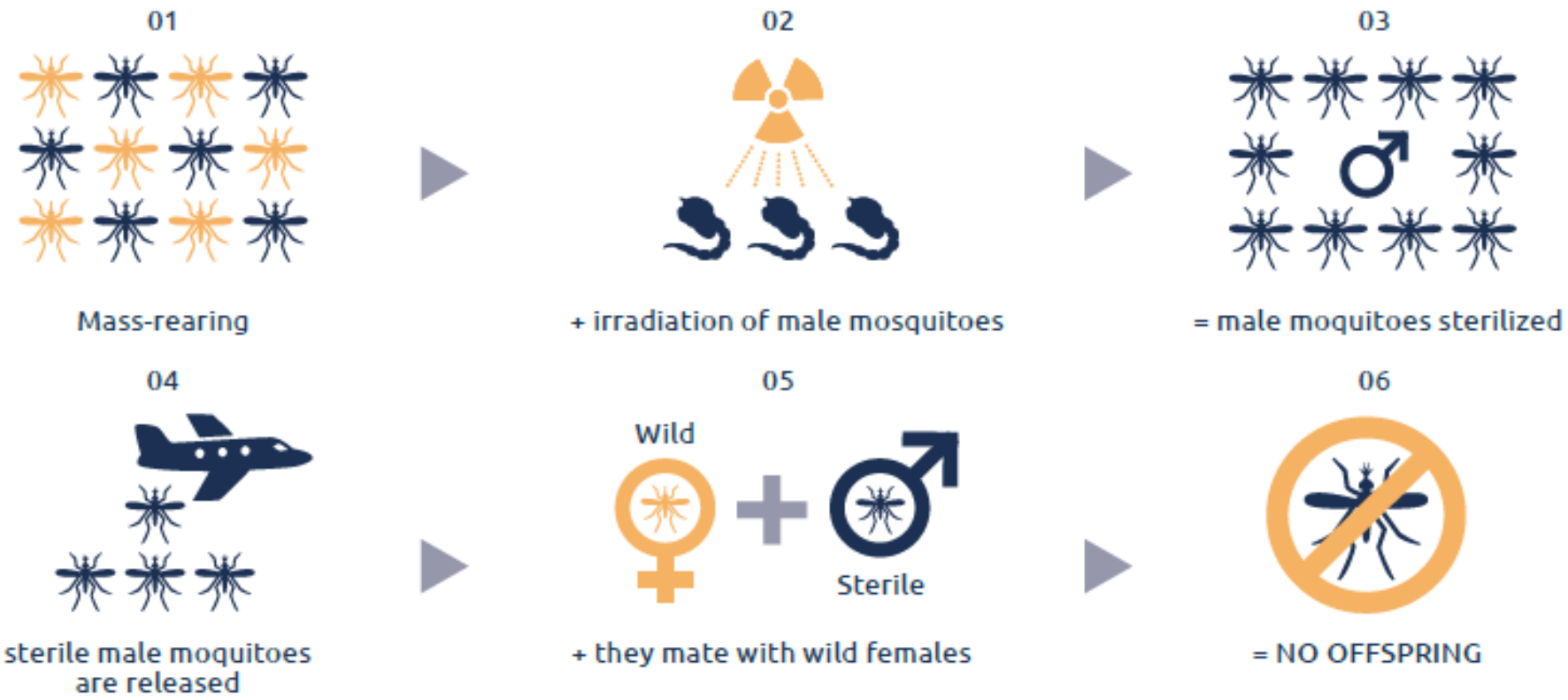
Review of Sterile Insect Technique (SIT) trials against *Aedes* mosquitoes

Jérémy Bouyer

Symposium "Research and Innovation for the control of vectors of emerging arbovirus" which will be held in Montpellier on February 14.

Joint FAO/IAEA Centre
Nuclear Techniques in Food and Agriculture

Sterile Insect Technique (SIT)



http://www-naweb.iaea.org/nafa/resources-nafa/SIT-Mosquitoes-LR.mp4

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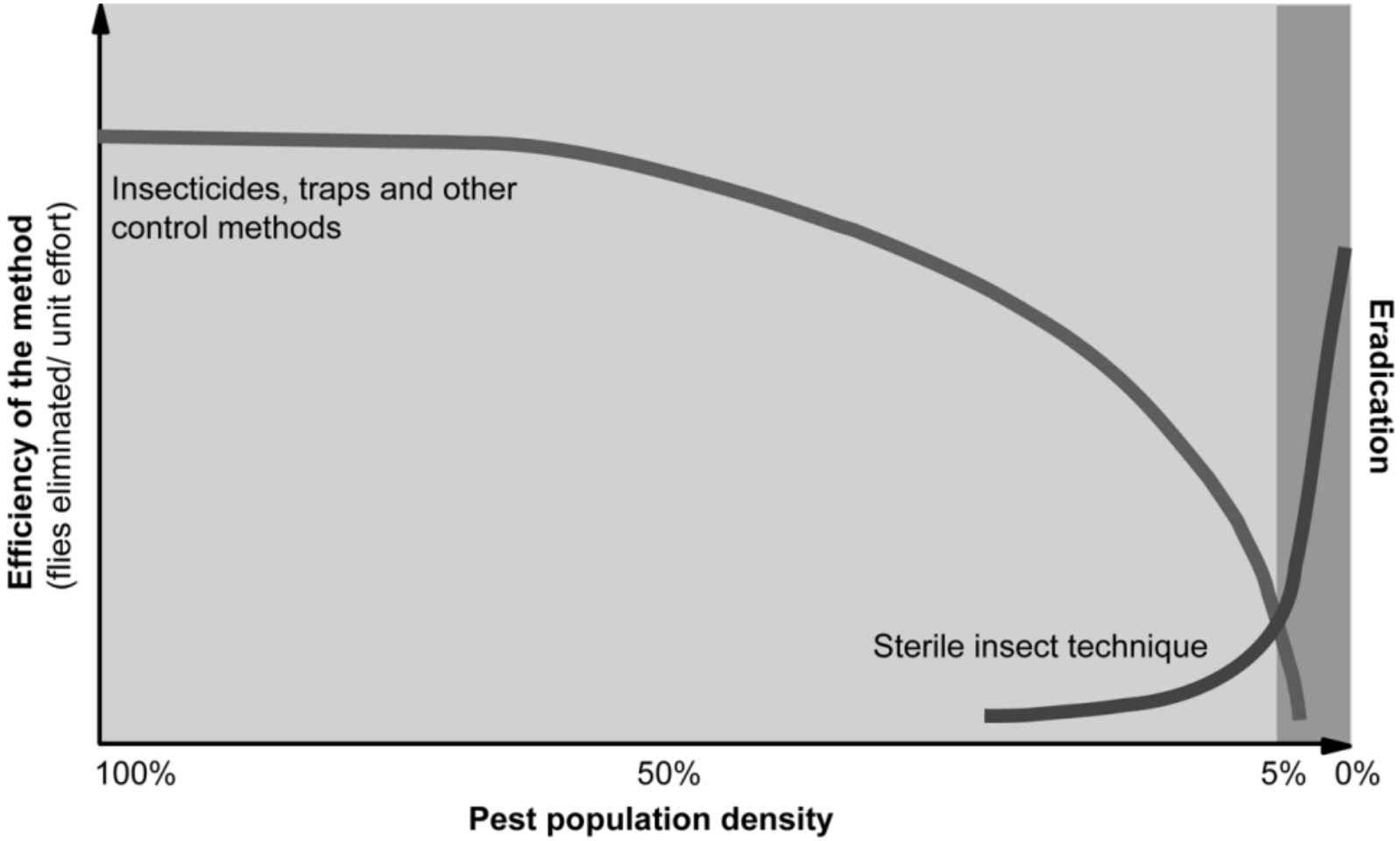
Value of SIT in AW-IPM strategies



Strategic Options of SIT Integration

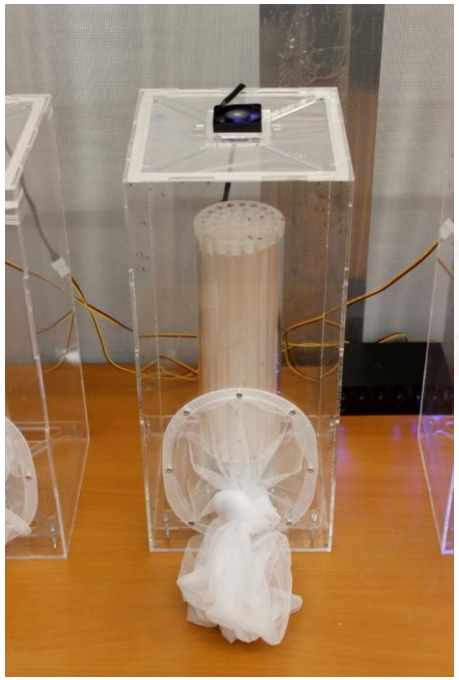
- ***Suppression:*** To reduce insecticide use & crop losses, and to develop low pests / vectors prevalence areas
- ***Containment:*** To avoid the spread of introduced non-native pests /vectors
- ***Prevention:*** To avoid establishment of non-native pests / vectors
- ***Eradication:*** To develop areas free of major disease vectors, reduce costs and facilitate international trade, or eliminate outbreaks of invasive pests

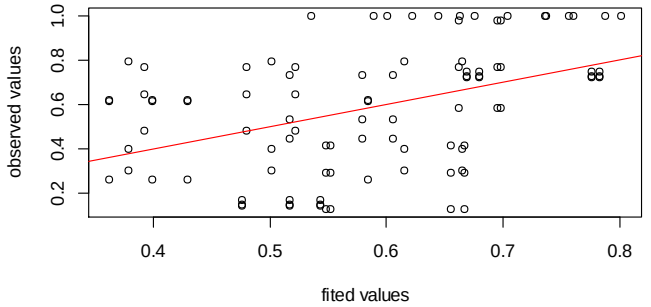



Technological innovations in mosquito SIT

Main bottlenecks solved

Correlation between flight ability and semi-field competitiveness in *Aedes* mosquitoes



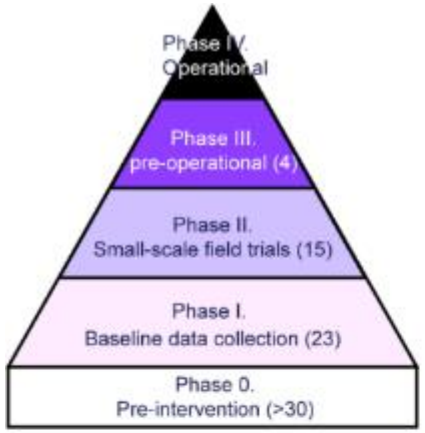


4hours,
standardized

2-21days (Rh or egg hatch)
very difficult to standardize

competitiveness ~ escape rate
(Cor = 0.43, p-value = 1.2e-05)

SIT & IIT-SIT: ONGOING AND PAST TRIALS (2022)



Phase	I	II	III	Total
2019	**21**	**11**	**2**	34
2022	**23**	**15**	**4**	42
Increase	10%	36%	50%	

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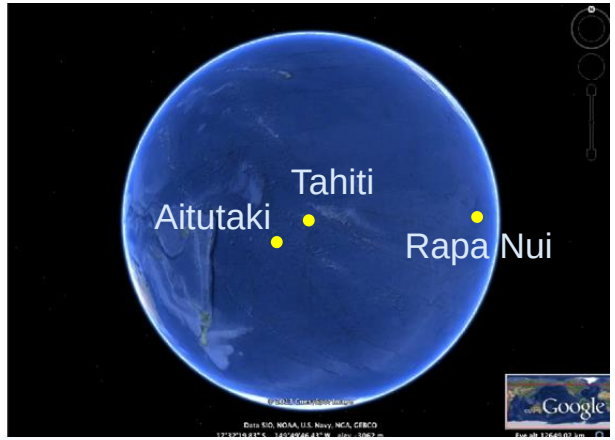
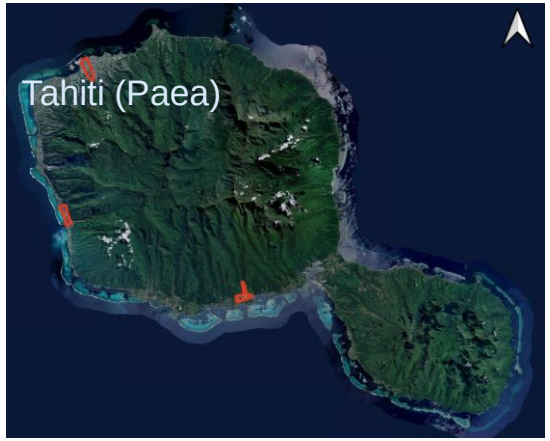
PAC-SIT consortium funded

Pacific consortium for testing the efficiency of the Sterile Insect Technique to control Vector Borne Diseases

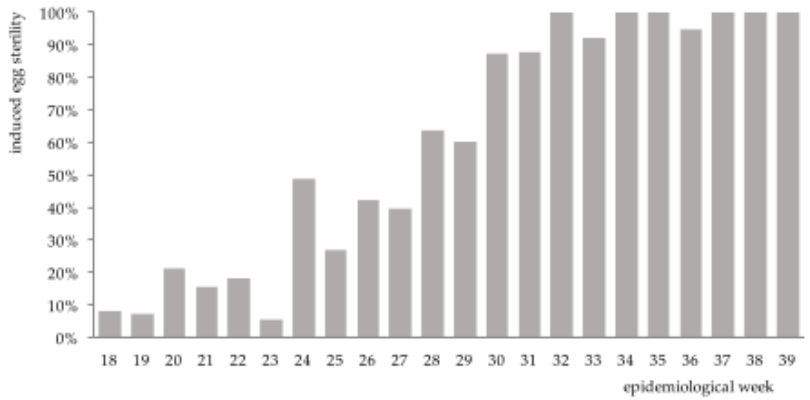
Cook Islands | French polynesia | Chile



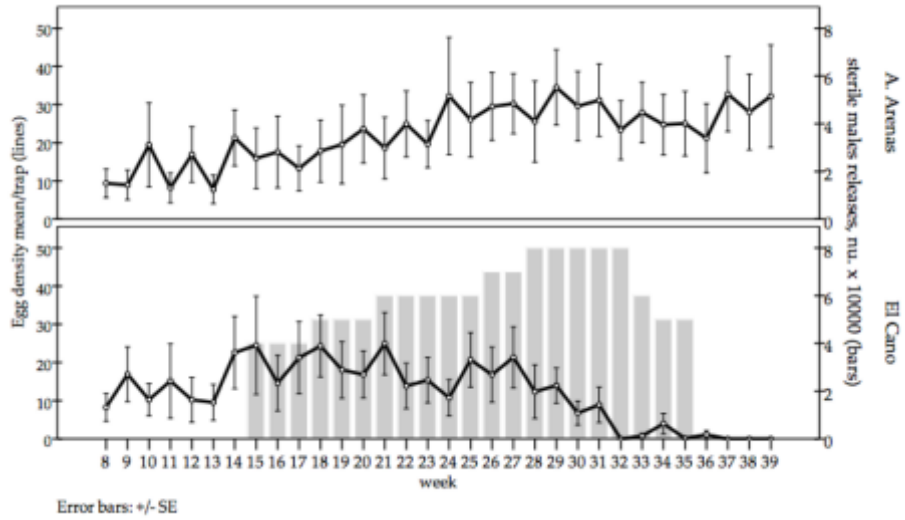


Example of SIT project

Project:	**Havana (Cuba)**
Approach:	SIT
Target Species:	*Ae. aegypti*
Size of release area:	~50ha
Current status:	Completed
Av. release density:	800 to 1.600 sterile males/week/ha
Integration with other tactics:	**No**
Results:	20 weeks in 2020: suppression efficiency 100%

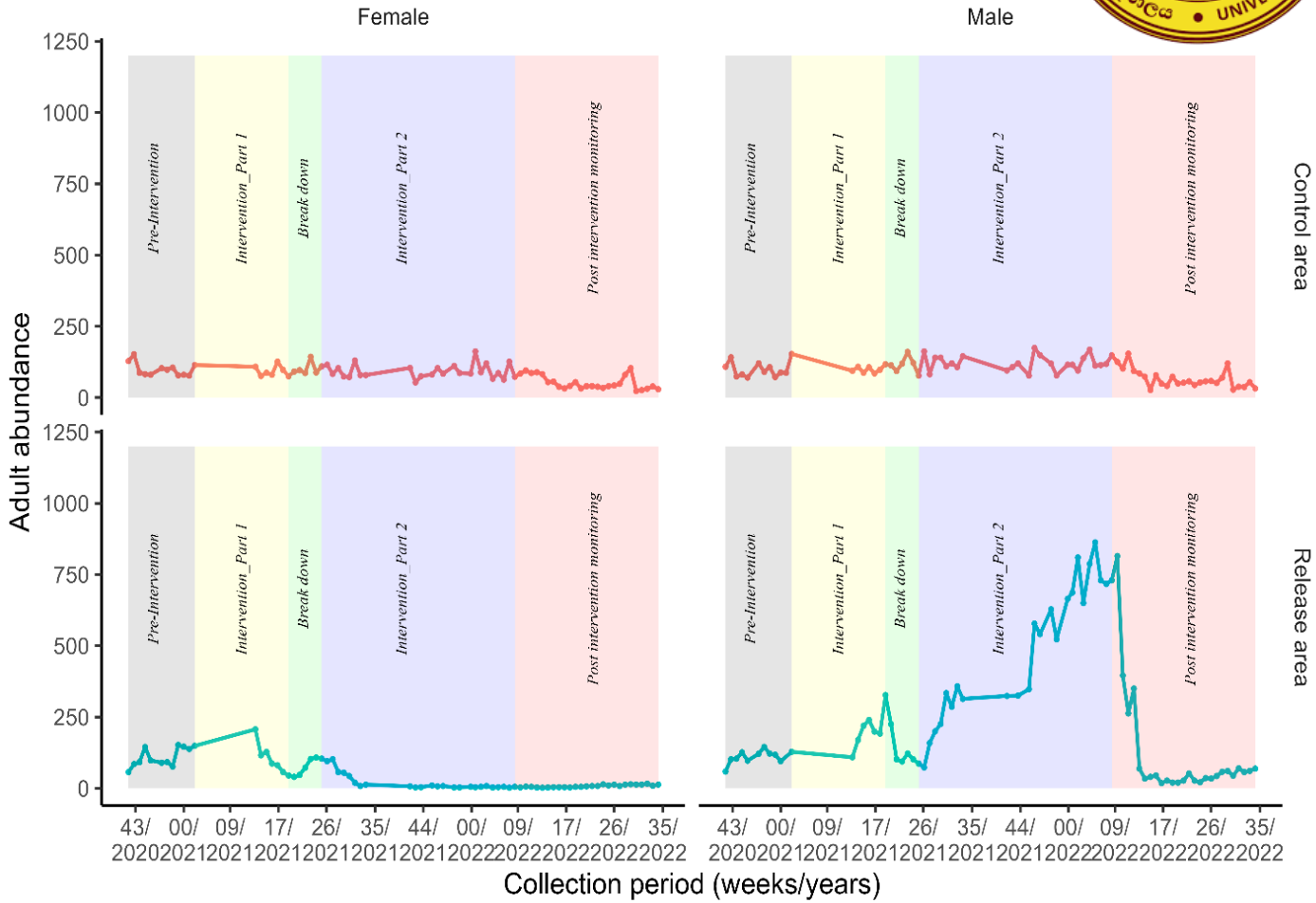


Gato et al. 2021 Insects

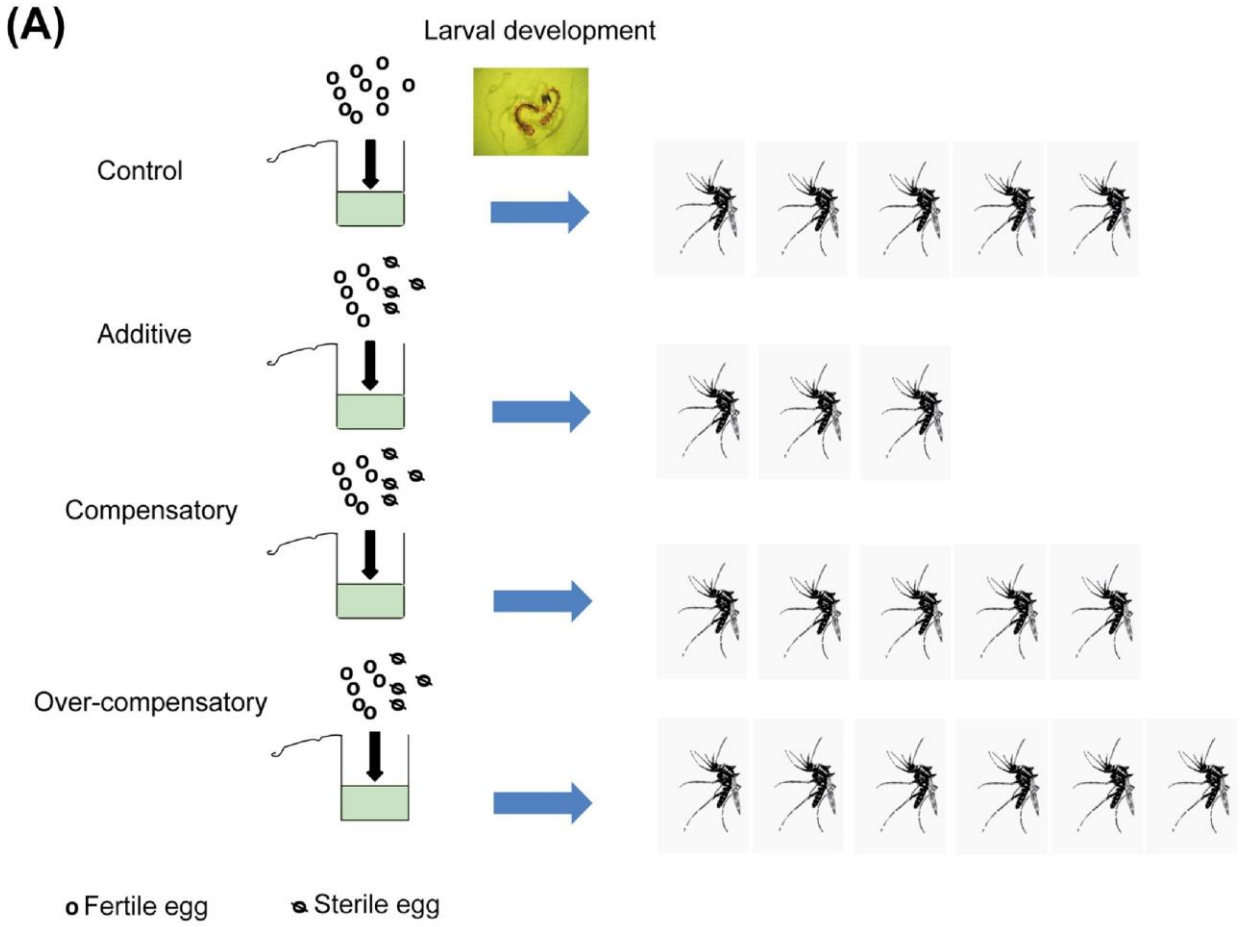


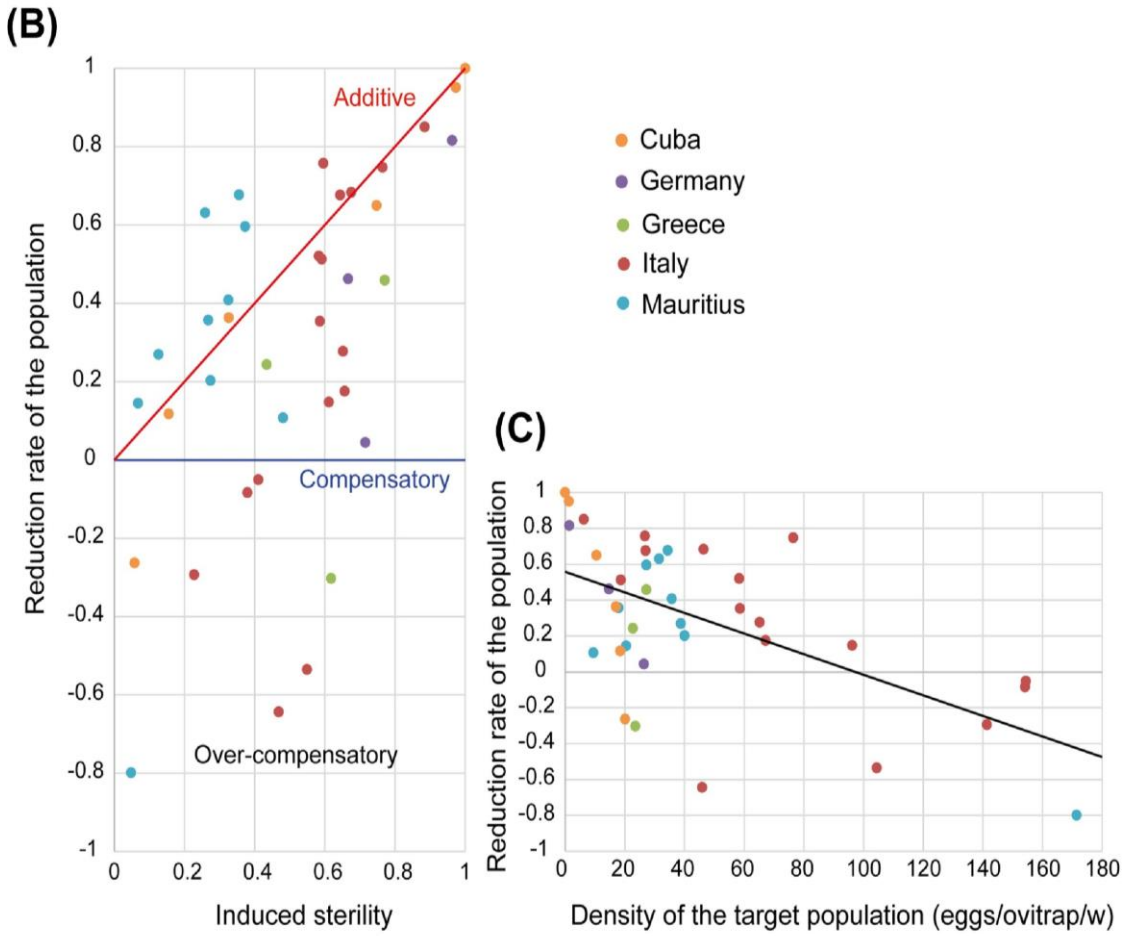
SIT trial in Sri Lanka

Project:	**District of Gampaha**
Approach:	SIT
Target Species:	*Ae. albopictus*
Size of release area:	~30ha
Current status:	Completed
Av. release density:	3300 sterile males/week/ha
Integration with other tactics:	**Yes, source reduction**
Results:	March 2021 – April 2022: 98.2% induced sterility / suppression efficiency 95.5% post-intervention monitoring: very slow recovery of the target population (isolation)



When less is more: accounting for overcompensation in mosquito SIT projects



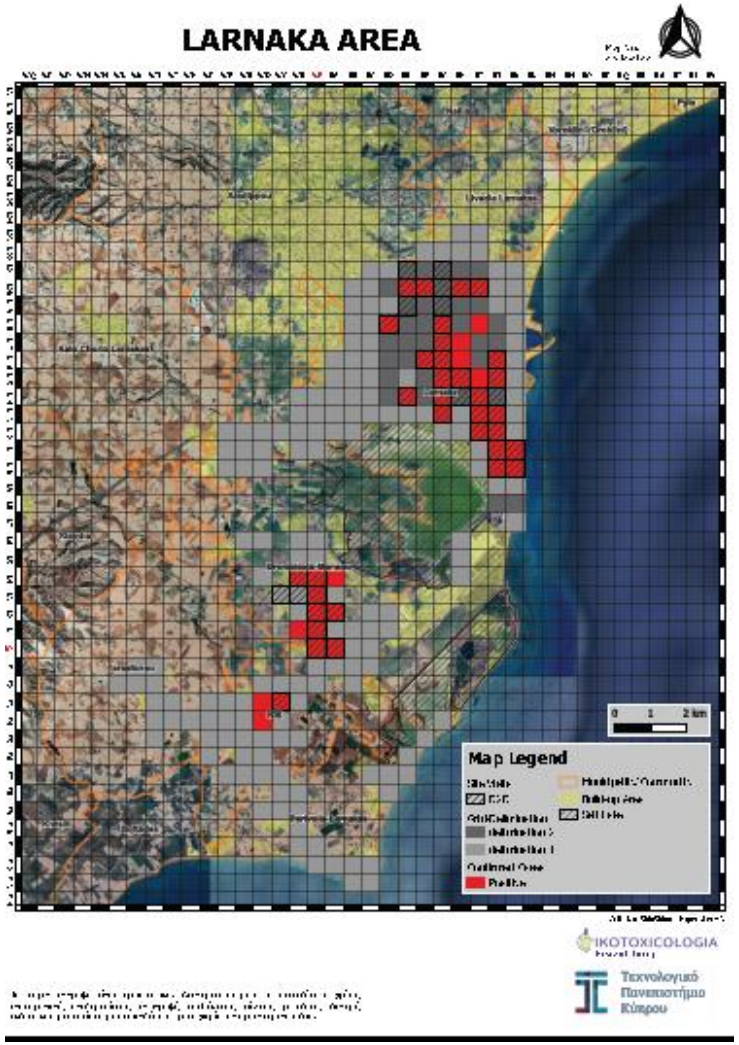


Trends in Parasitology DOI: (10.1016/j.pt.2023.02.001)

Main lessons from field trials

- Complementary method of suppression needed (reduction of larval habitats / public education)
- Isolated area of buffer with release of sterile males of at least 200m (min 50ha)
- Field competitiveness must be > 0.2
- Induced sterility must be > 0.7 (density-dependant compensation)

First elimination project in Cyprus



Aedes aegypti 10.25km2

Aedes albopictus 16.75km2

Cyprus University of Technology


IAEA Seibersdorf Laboratory
THANKS!
Joint FAO/IAEA Programme
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