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Releases of *Wolbachia* mosquito males to sterilize and suppress a population of *Aedes polynesiensis* on Tetiaroa Atoll, French Polynesia

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Introduction

Aedes mosquitoes represent a constant health burden for Pacific island communities by transmitting infectious diseases such as lymphatic filariasis, dengue, Zika and other arboviruses. They also impact tourism by their nuisance, thus weakening island economies.

The exophilic mosquito *Aedes polynesiensis* is present in semi urban areas, villages, rural and selvatic areas, breeding in natural habitats (rat-chewed coconuts, tree holes ...) which make interventions for source reduction difficult and calls for better suited control strategies.

The efficacy and sustainability of the *Wolbachia*-based Incompatible Insect Technique (IIT) is being trialed on an isolated islet (75 ha) of Tetiaroa, a populated atoll in the Society Islands, French Polynesia.

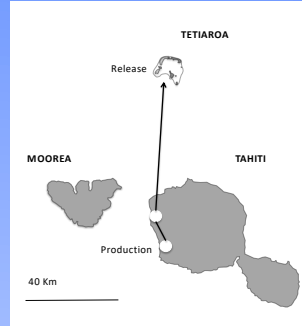
Wolbachia is a naturally occurring symbiotic bacteria that live only inside insect cells. While common in insects, *Wolbachia* is not infectious and cannot be transmitted to people, pets or any warm blooded animals.

Materials & Methods

The Incompatible Insect Technique is being assessed on Tetiaroa atoll by releasing ca. 53,000/week incompatible male mosquitoes over a prolonged period to sterilize wild females.

Population monitoring: 25 BG traps, and 18 ovitraps were used across the study area (treated and control islets) to survey the mosquito population dynamics.

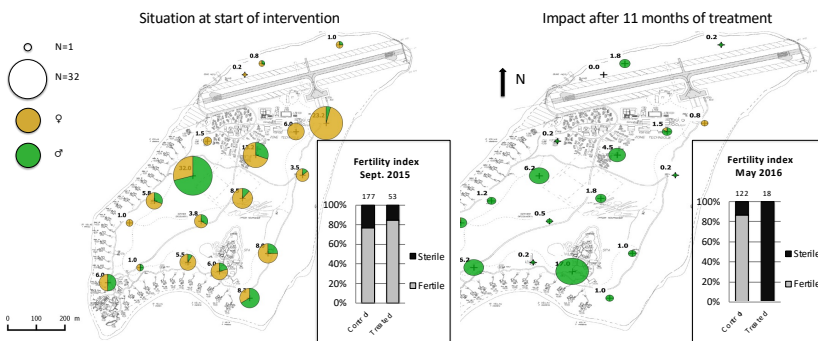
Release of incompatible males: mass reared *WolB* male pupae were transferred weekly by air to Tetiaroa atoll, allowed to emerge and released as adults across the treated islet.



Assessment of IIT impact : The mosquito adult population dynamics and egg hatch rate were monitored each week to determine the efficacy and sustainability of male releases on treated vs control islets.

Results

Wolbachia induced sterility and its impact on the target mosquito population



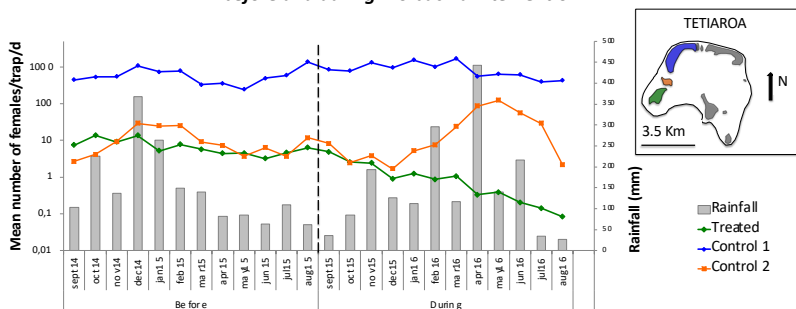
***Wolbachia* induced sterility:** complete sterility was achieved after 9 months of treatment (no egg hatch since May 2016).

Collapse of target mosquito population : sustained releases of incompatible males have lead to near complete elimination of the *Ae. polynesiensis* population

Rearing of incompatible males (top left), male/female pupae sorting (top right) transfer flight (center left), *Aedes polynesiensis* incompatible male (center right) , males ready for releases (bottom left) and monitoring with BG-Sentinel trap (bottom right).



Dynamics of *Aedes polynesiensis* female population on treated vs. control islets before and during *Wolbachia* intervention



***Aedes polynesiensis* female monitoring:** field data indicate a collapse of the population after only 4 months of treatment. As of August 2016, population elimination on the treated islet seems within reach.

Acknowledgments

We thank Tetiaroa Society and "The Brando" hotel for their logistical support which greatly facilitated the implementation of this study.

Conclusions

- The inundative and sustained release of *Wolbachia* incompatible males resulted in the significant reduction of the targeted *Aedes polynesiensis* mosquito vector population.
- The impact of the intervention was measurable after only 4 months of treatment
- The target population decreased regularly with the progressive depletion of fertile eggs at the treated site.
- Releases will continue until elimination is achieved. Specific bio-containment measures will be enforced to mitigate the risk of mosquito reintroduction.
- Permanent monitoring will be established to assess the long-term impact of the intervention, and to respond appropriately in case of accidental mosquito re-introduction events.
- Application of the *Wolbachia* IIT technology to the rest of the atoll and to other islands of French Polynesia is under consideration