PacMOSSI: Operational Research

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PacMOSSI Seminar, 18 July 2025

The University Of Queensland
AUSTRALIA

ODeSI
Operational Research and Decision Support for Infectious Diseases

PacMOSSI OR program

Aim: To build PIC MOH capacity to conduct research that generates practical evidence in response to the operational challenges faced in the delivery of vector surveillance and control program activities.

Components:

- OR Short Course
- OR Seed Grants Scheme

Funded projects in PacMOSSI v1

Mosquito identification using AI

Insecticide susceptibility status study of *Aedes* subgenus Stegomyia in Koror, Palau

Optimising approaches to larval rearing in Solomon Islands

A comparison of community risk communication and awareness raising methods in Tarawa, Kiribati

A comparison of mosquito sampling methods in six Pacific Island countries

Using co-design with communities to reducing malaria in Wosera Gawi District, Papua New Guinea

Mapping *Aedes* vectors in Vanuatu

A comparison of mosquito sampling methods in six Pacific Island countries

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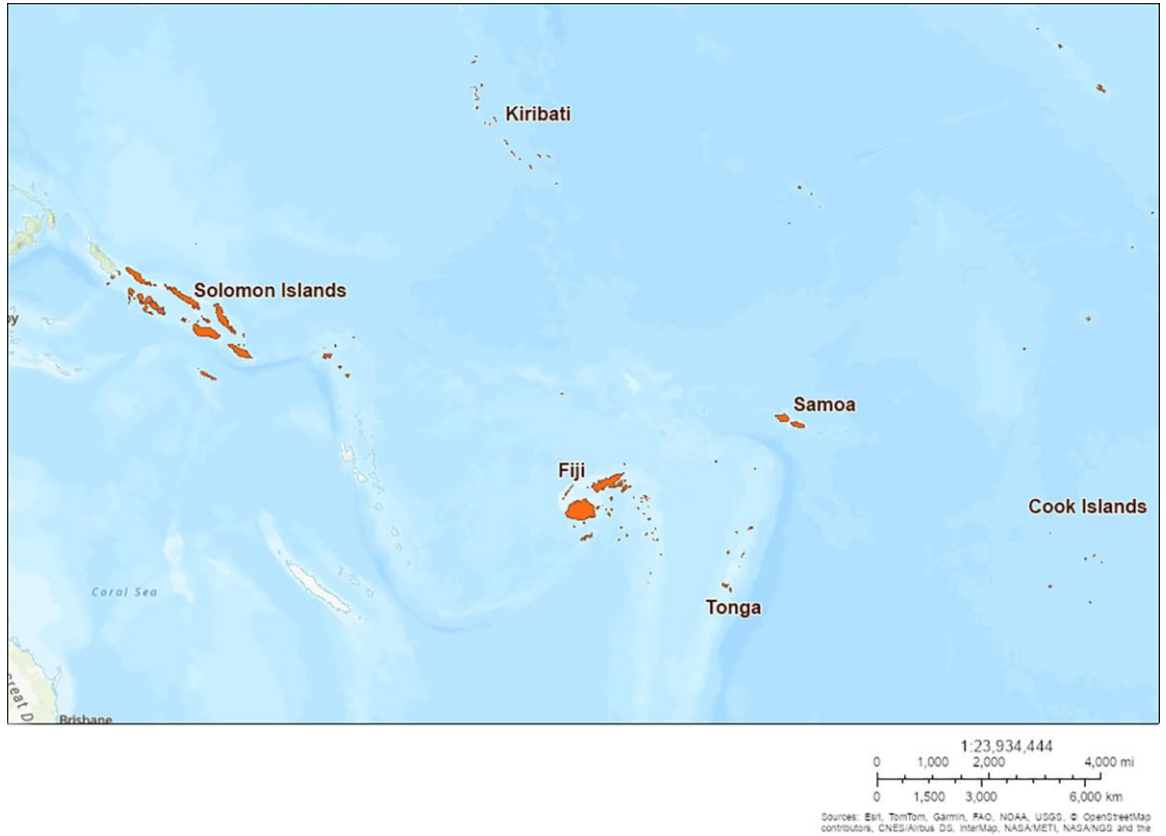
Collaborative multi-country operational research



PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

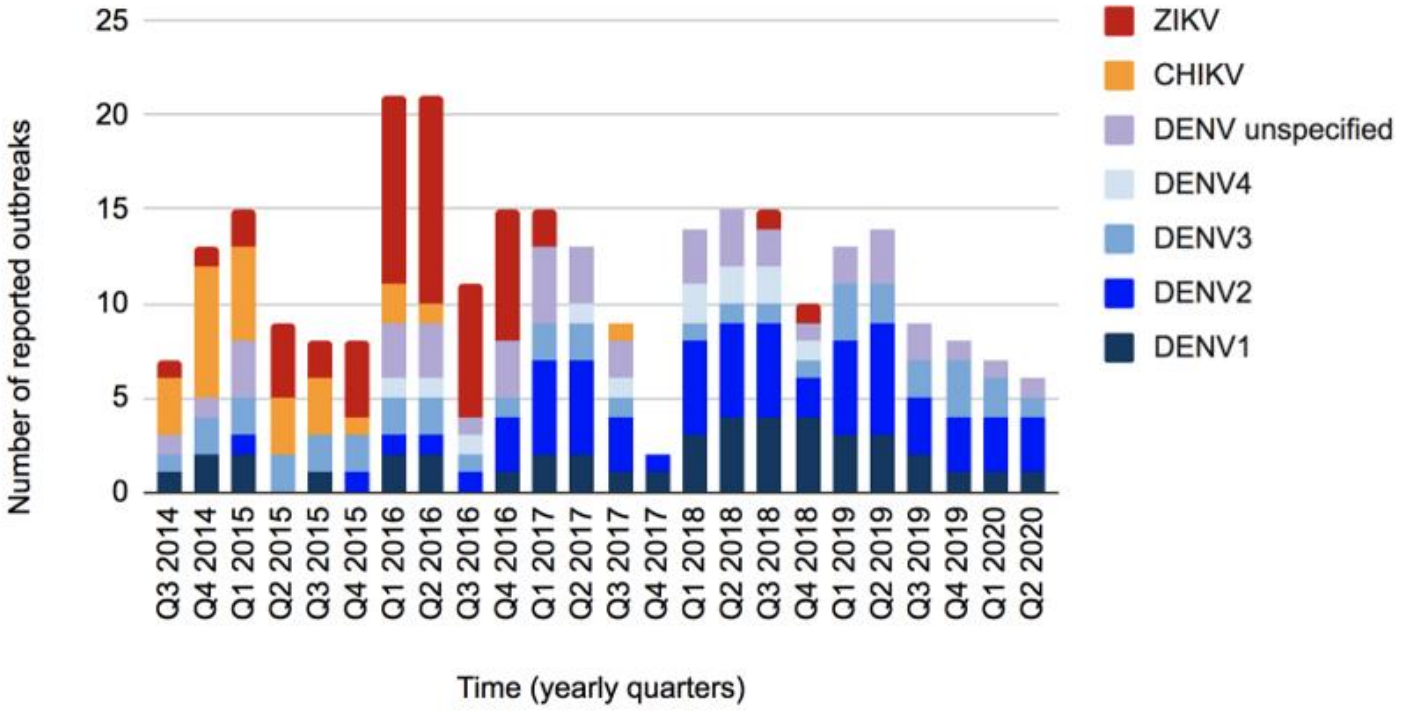
MINISTRY OF HEALTH

MINISTRY OF HEALTH & MEDICAL SERVICES

TE MARAE ORA
COOK ISLANDS Ministry of Health

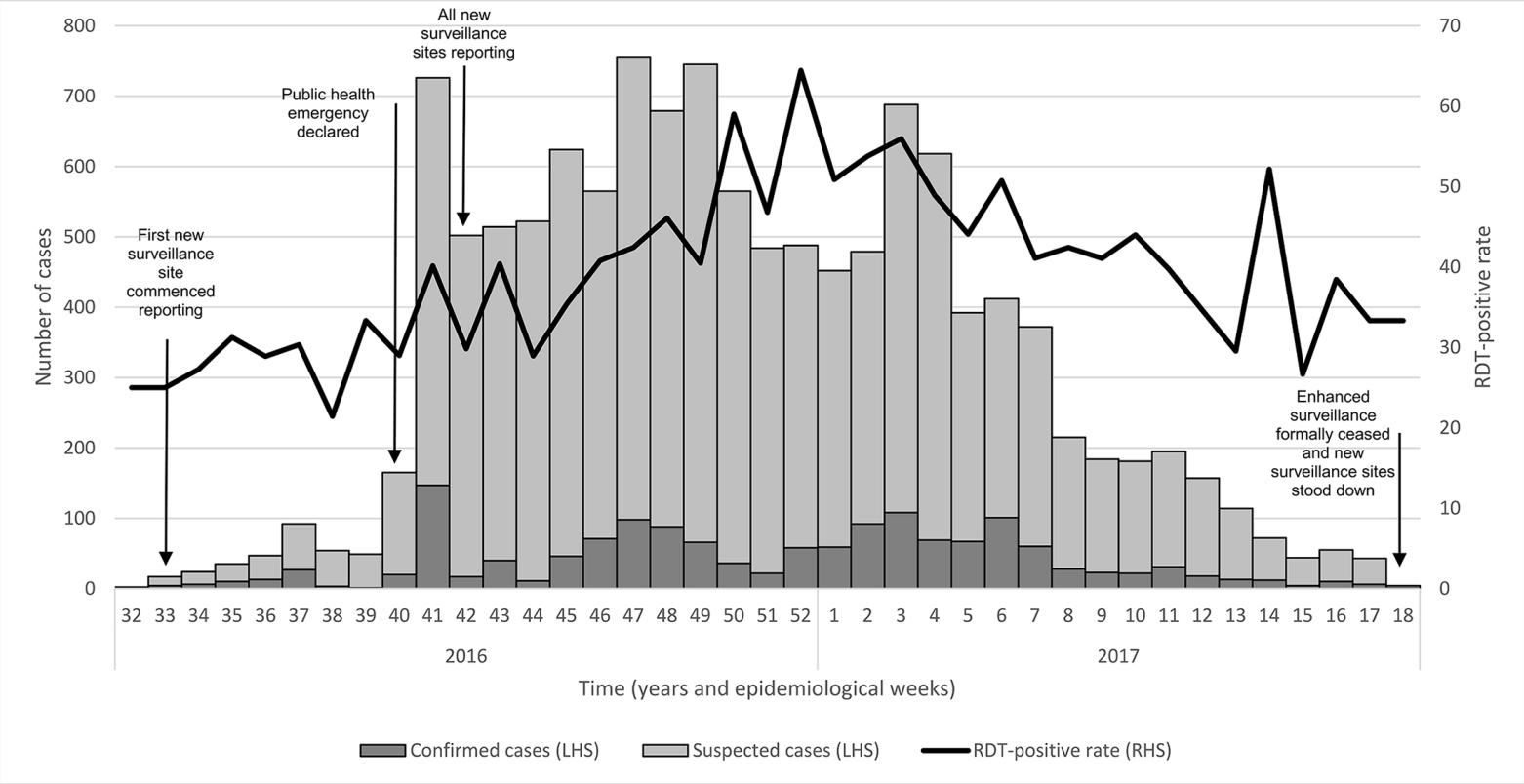
Ministry of Health
TONGA

Arboviral diseases outbreaks in the Pacific



Matthews et al, 2022

Example of impact



Craig et al, 2018

Aim

To generate Pacific-specific evidence about the **performance** and **operational feasibility** of commonly used mosquito sampling methods **to inform program improvement.**

Methods

Research aim
Compare the performance of three different mosquito sampling methods in the Pacific
Compare the operational feasibility of the sampling methods, given contextual challenges

Mosquito sampling tools compared

Gravid Aedes Trap (GAT)

BG-Sentinel II

Sweep netting

Latin square experiment

1 complete Latin square

A single location		Day 1	Day 2	Day 3
	Sampling site A	BGS	GAT	SWN
	Sampling site B	GAT	SWN	BGS
	Sampling site B	SWN	BGS	GAT

2 complete Latin squares

A single location		Day 1	Day 2	Day 3
	Sampling site A	BGS	GAT	SWN
	Sampling site B	GAT	SWN	BGS
	Sampling site B	SWN	BGS	GAT

3 complete Latin squares

A single location		Day 1	Day 2	Day 3
	Sampling site A	BGS	GAT	SWN
	Sampling site B	GAT	SWN	BGS
	Sampling site B	SWN	BGS	GAT

Combined data

A single location				
	Sampling site A	BGS x 3	GAT x 3	SWN x 3
	Sampling site B	GAT x 3	SWN x 3	BGS x 3
	Sampling site B	SWN x 3	BGS x 3	GAT x 3

x 3 locations in each country

x 6 countries

= 54 sampling sites

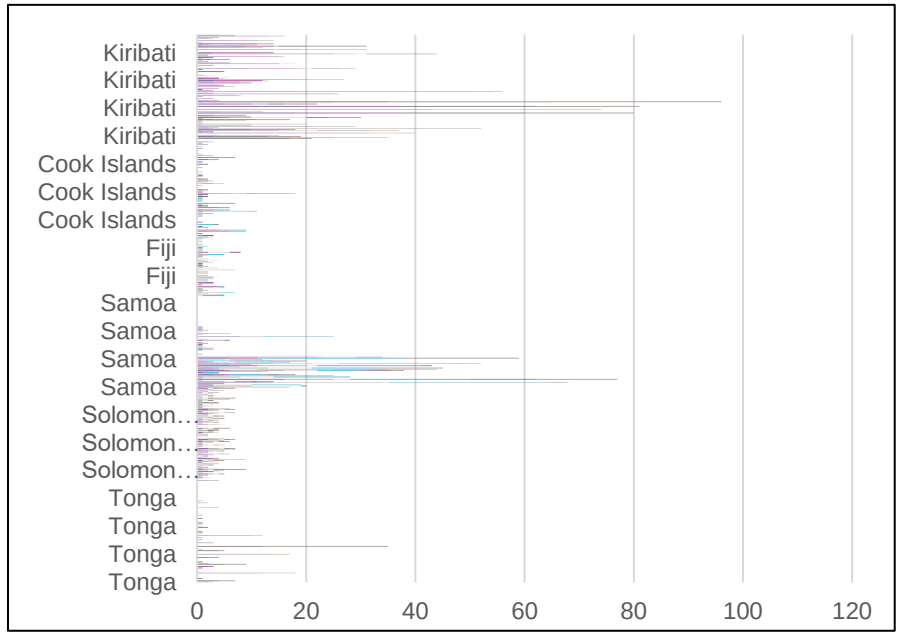

Buariki
Tearinibai
Nuatabu
Notoue
Abaokoro
Kainaba
Nabeina
Bonriki
Abarao
Betio
South Tarawa
Bairiki


Airport
Main Road
Bikenibeu
Abarao
Eita
Tangintebu


Hospital (Hospital, Dentist, Ministry of Health)

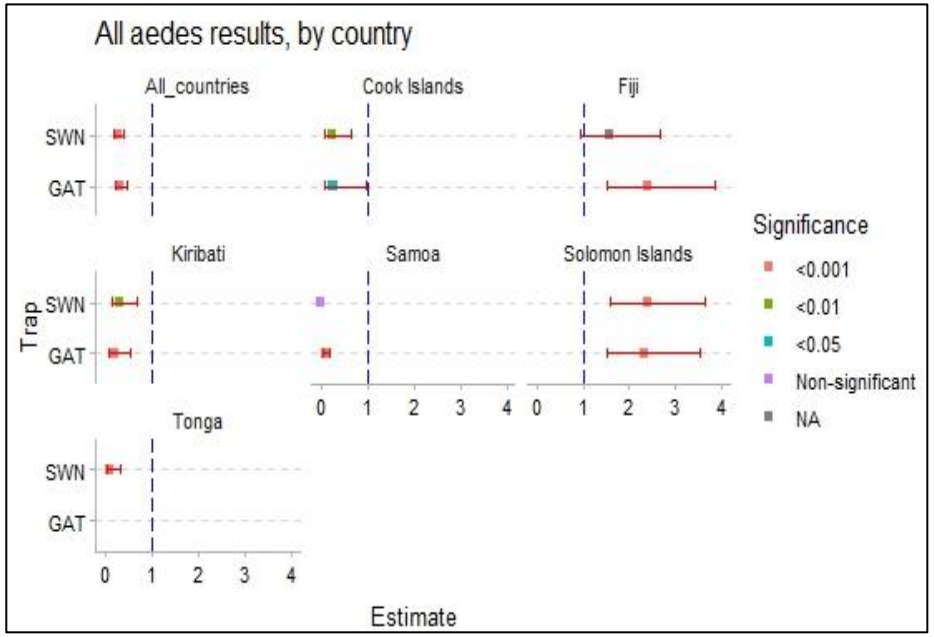
Analysis

Raw data

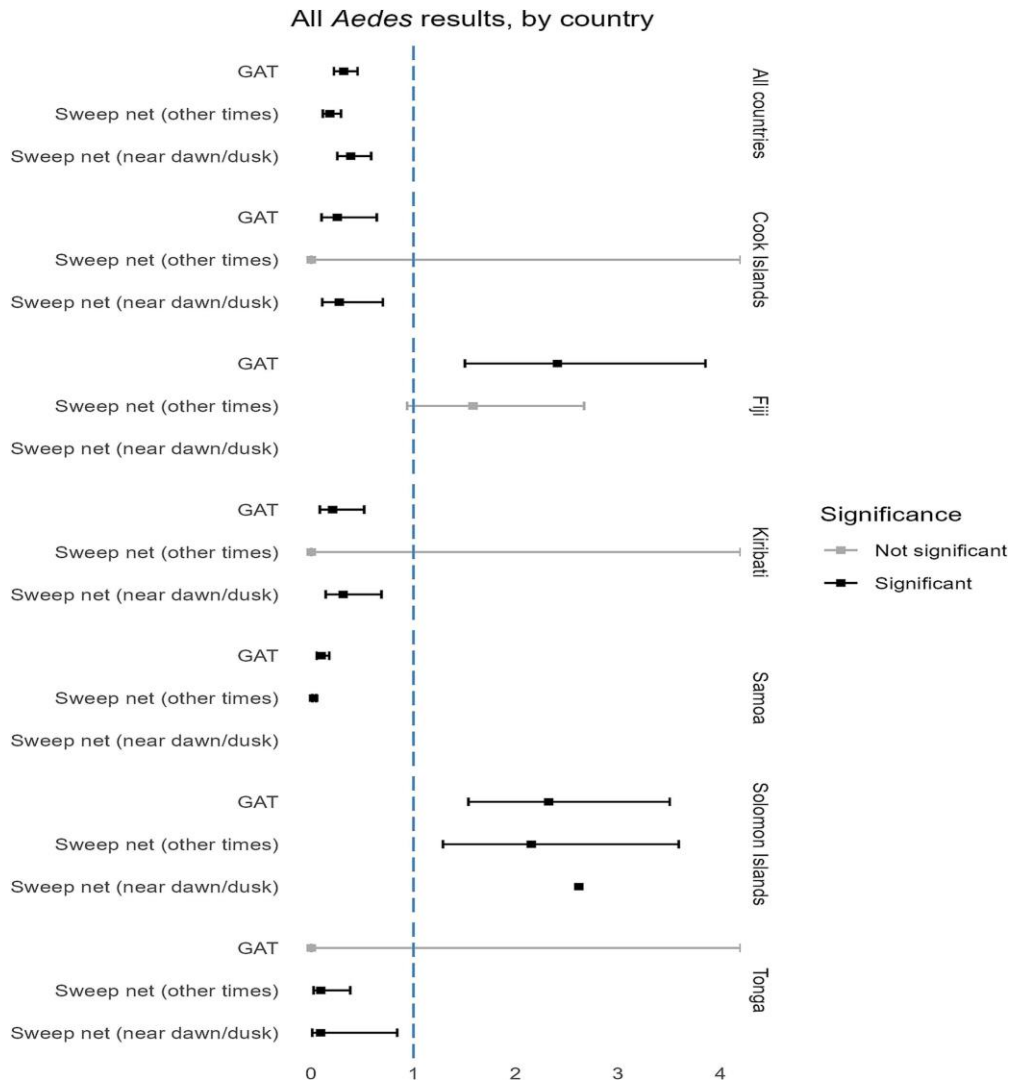


GLMM

Meaningful information



Comparative performance: All *Aedes* species



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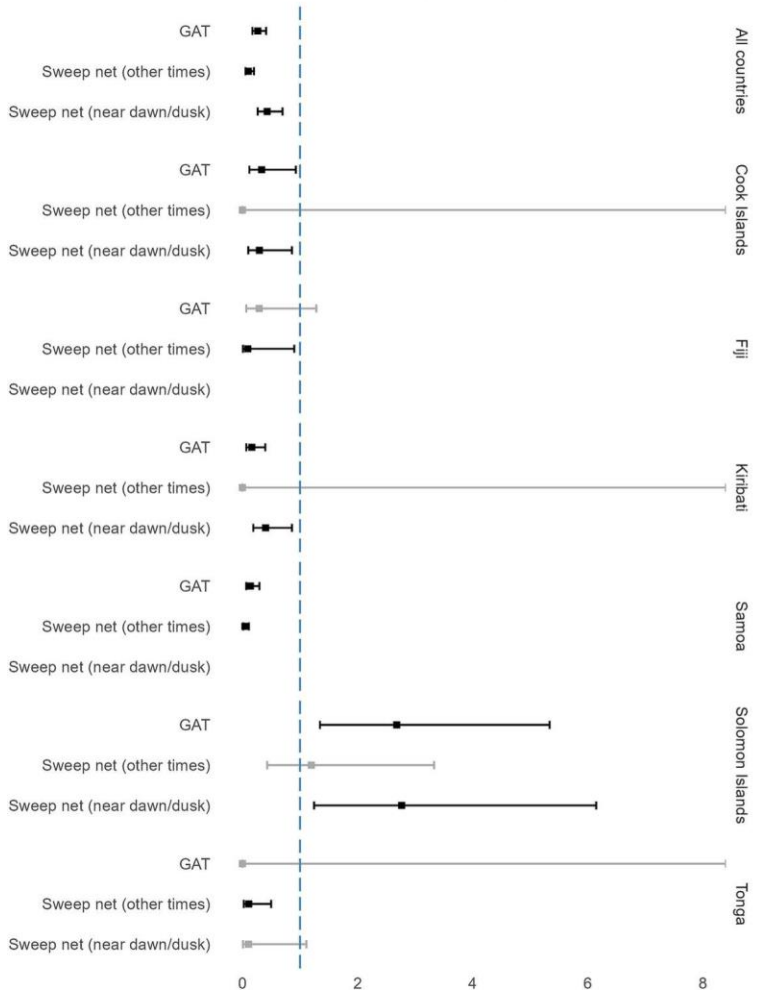
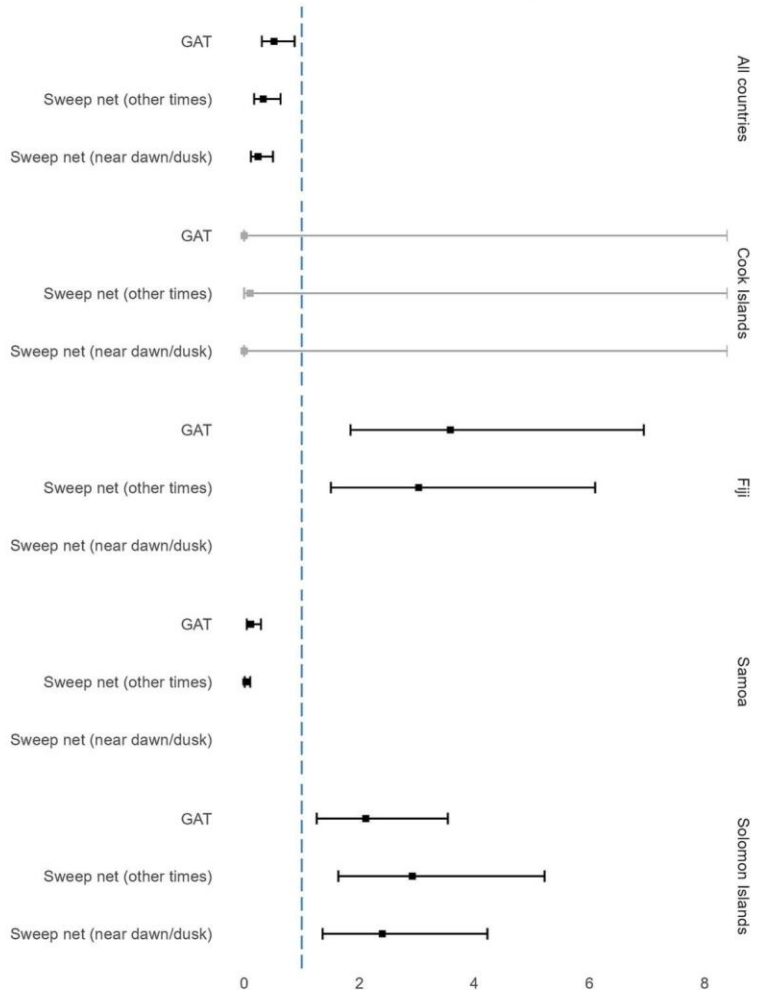
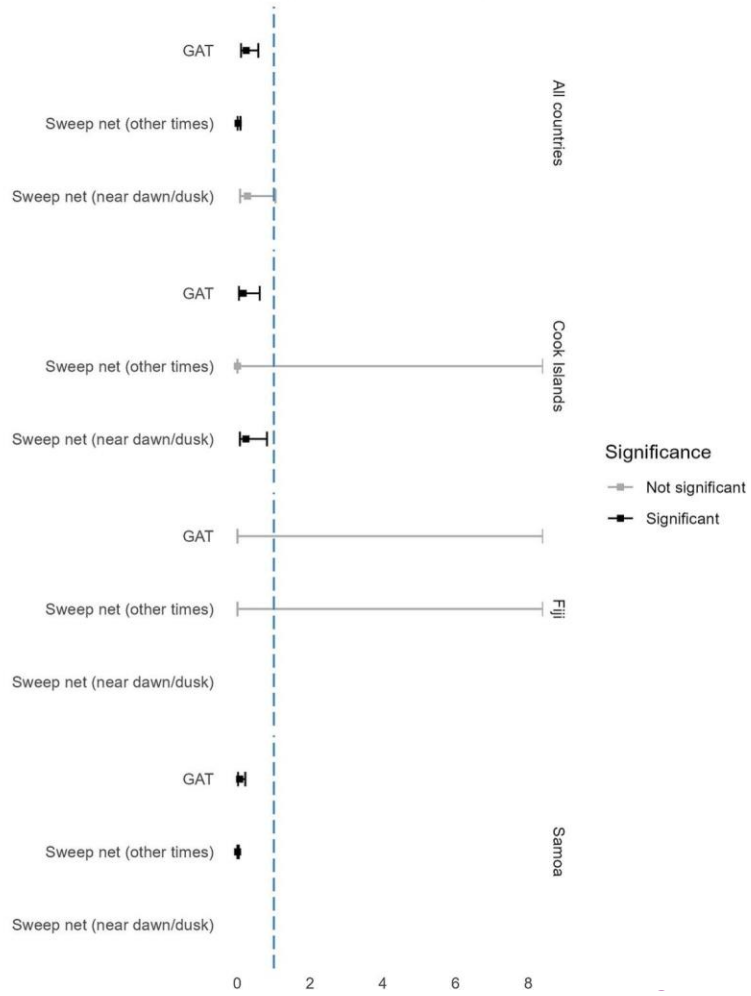
Ae. aegypti results, by country



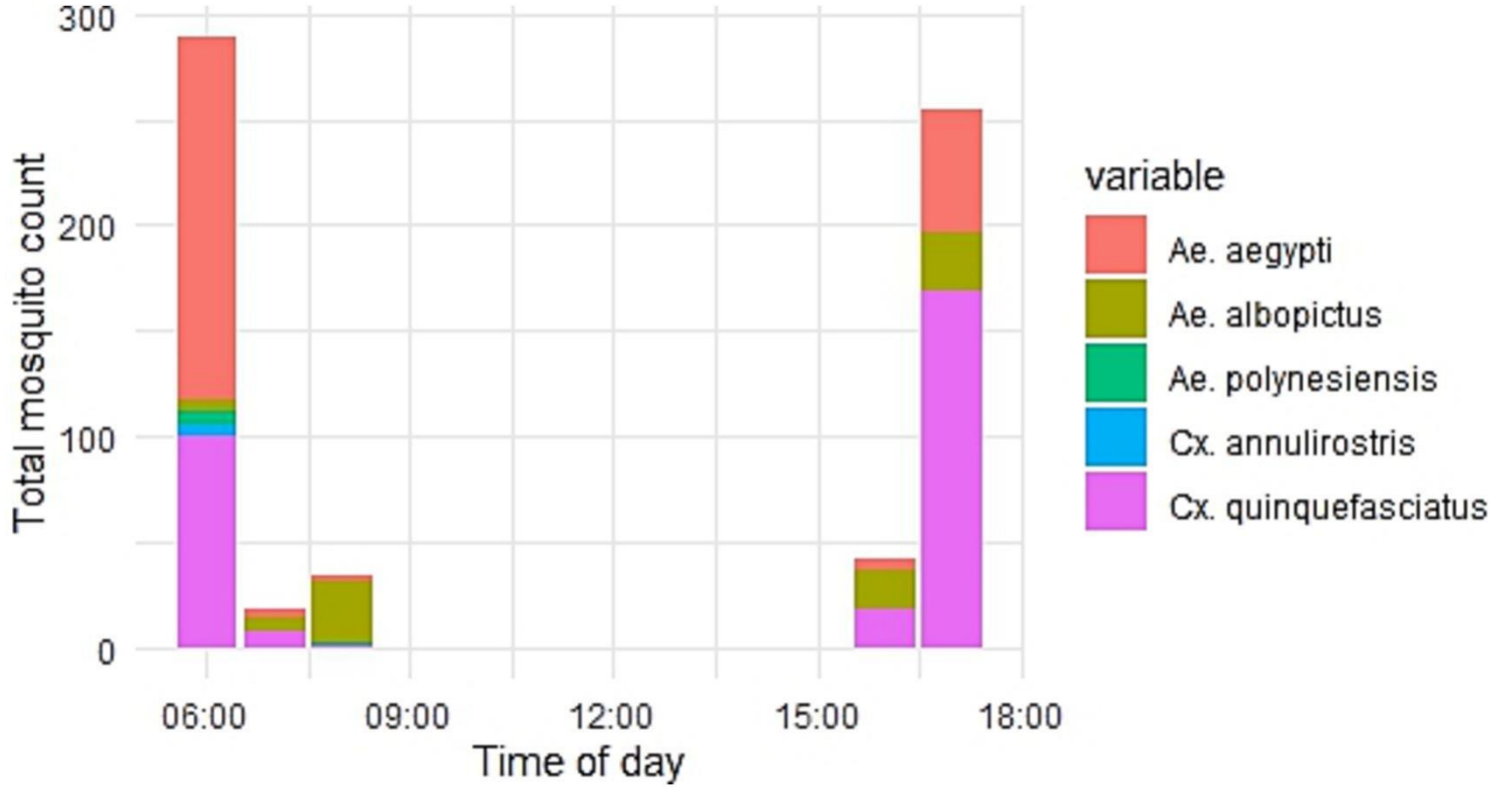
Ae. albopictus results, by country



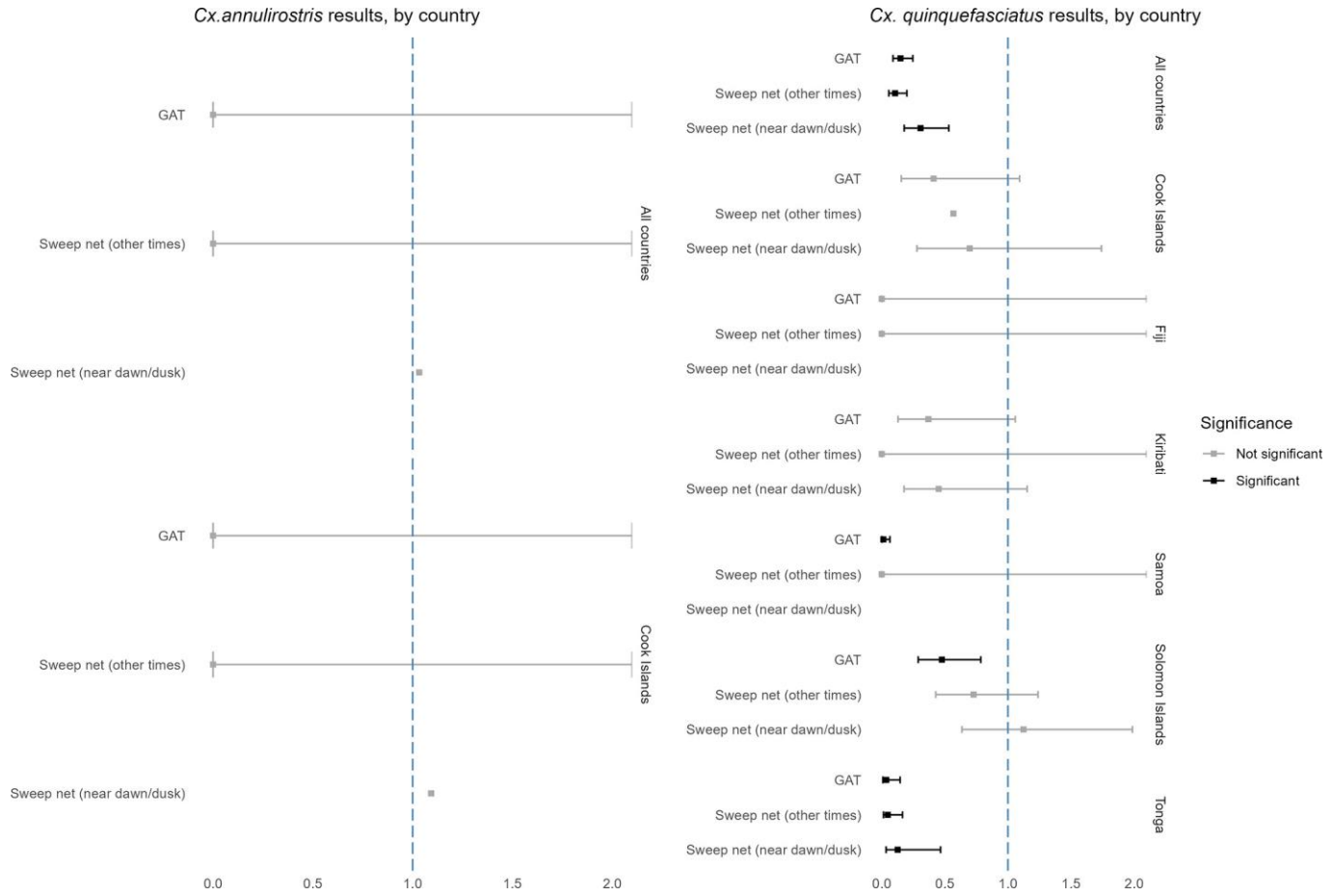
Ae. polynesiensis results, by country



Sweep net collections, by sampling hour



Comparative performance: *Culex*



Operational feasibility

	Pros	Cons

OR learning outcomes:

- “The experiment was a good learning experience for junior staff”
- “[we] realised the need to be organised and rigours in data collection”
- “I learned how to set up and conduct a research project”

Relevance of the findings

- BG-Sentinel traps outperform GAT and sweep netting methods, but the method poses challenges that limit its feasibility for routine surveillance.
  - Inform the choice of surveillance tools, strategies – leading to evidence
- The performance of GAT and sweep netting was comparable.
  - Sweep netting offer a alternative. May be a better option in some situations (e.g., during outbreaks or for collection in remote areas).
- Framing capacity building efforts around OR was valued for its practical nature, problem solving-based pedagogy, and relevance
  - This success will inform PacMOSSI (and other's) T&D approaches
- Developing OR skills among MoH staff promotes enquiry and encourages reflective practice.
  - Quality improvement processes leading to better health service delivery and health outcomes.

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A comparison of mosquito sampling methods in six Pacific Island countries

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ABSTRACT

Outbreaks of arboviral diseases pose a significant threat to health security in Pacific Island countries and territories. In the absence of vaccines or treatments, effective vector control is critical to reduce risk and respond to outbreaks. This relies on sustainable mosquito surveillance strategies to identify vectors and guide control efforts. This study evaluated the performance and feasibility of three adult mosquito sampling methods—BG-Sentinel II (BGS) traps, BG Gravid *Aedes* Traps (GAT), and sweep netting (SWN)—in six Pacific countries: Cook Islands, Fiji, Kiribati, Samoa, Solomon Islands, and Tonga. Sampling followed a Latin square design across 54 sites in 18 locations. Data were analysed using a generalised linear mixed model and Simpson's Index for diversity. Qualitative interviews with public health staff captured operational experiences. 2815 mosquitoes were collected, with *Aedes* species comprising 61 %. Species composition varied significantly between countries ($p < 0.05$). BGS traps yielded considerably more mosquitoes than GAT and SWN ($p < 0.05$). No major species bias was observed across sampling methods. The public health staff interviewed emphasised the value of mentoring, co-design, and resourcing for operational research. Pacific context-specific challenges underscored the need for simple, durable tools for routine use, particularly if to be used in remote settings. This is the first multi-country study conducted in the Pacific to compare *Aedes* sampling methods.

1. Background

Arboviral diseases, particularly dengue, Zika and chikungunya, exhibits distinct bionomic characteristics, including susceptibility to insecticides, oviposition preferences, as well as biting and resting behaviours [7]. The effectiveness of public health vector interventions

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PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

Australian Government

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