



SURVEILLANCE **FOR *Aedes* VECTORS IN THE PACIFIC**

Workbook for Practical Workshop

Version 2: November 2025

Table of Contents

About this resource	1
Rationale	2
Workshop objectives	2
Workbook	3
Workshop sessions	4
Why? Objectives of <i>Aedes</i> surveillance	5
What? Targets for <i>Aedes</i> collection	7
How? Methods for <i>Aedes</i> collection	9
Where? Sites and locations for <i>Aedes</i> collection	11
When? Timing and frequency for <i>Aedes</i> collection	13
Which? Indices calculated from <i>Aedes</i> collections	15
Who? Engaging communities and other sectors for <i>Aedes</i> collections	17
And? Use of data from <i>Aedes</i> surveillance	19
Then what? <i>Aedes</i> mosquito control	21
Example forms	23
Container inspections (baseline surveillance)	24
Property mosquito habitat inspection (surveillance & control)	26

Abbreviations & acronyms

Ae.	<i>Aedes</i>
CDC	US Centers for Disease Control and Prevention
PacMOSSI	Pacific Mosquito Surveillance Strengthening for Impact
PICs	Pacific Island Countries and areas
RCCE	risk communication and community engagement
RS	residual spraying
SOPs	Standard Operating Procedures
SPC	The Pacific Community



About this resource

Rationale

The Pacific region faces a growing threat from *Aedes*-borne arboviral diseases such as dengue, Zika, and chikungunya. These diseases are transmitted in the region by at least 13 known species of the *Aedes* vectors that differ in their distributions, habitats and behaviours.

Establishing good knowledge of species distribution, seasonality and habitats is critical for informing appropriate vector control strategies to reduce risk or transmission of arboviral diseases.

This document is a supporting resource for the PacMOSSI practical workshop on *Aedes* surveillance for Pacific Island Countries and areas (PICs). It is intended to support Ministries of Health to define surveillance objectives, site selection, methods for collecting immature and adult vectors, calculation of indices, and data interpretation and use. Concise background information is included only, as further details will be provided throughout the workshop.

The ultimate goal of the workshop and this resource is to design context-specific surveillance systems that meets the needs of Ministries and Departments of Health by providing high-quality entomological data that can guide targeted, evidence-based, and effective vector control efforts.

Workshop objectives

The 5-day workshop on *Aedes* vector surveillance will take place in Honiara, Solomon Islands from 10 to 14 November 2025. The workshop is designed to be delivered in three modes: classroom learning or discussions, laboratory demonstrations or hands-on activities, and field practical participation.

The objectives of the training are to:

1. Equip trainees with essential skills in larval and adult mosquito surveillance for public health.
2. Develop trainees' understanding of linkage between mosquito surveillance and mosquito control.
3. Prepare trainees to conduct mosquito surveillance in their home countries following the training.

By the end of the training, participants are expected to have assembled the knowledge and skills necessary to develop and implement a basic *Aedes* vector surveillance plan.

Workbook

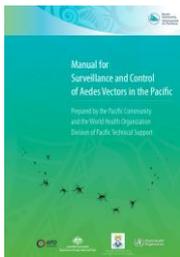
Purpose

This workbook is designed for use during the classroom sessions, but draws on experience from all three modes of learning. The workbook should be retained by each participant after the workshop to inform the design and implementation of *Aedes* vector surveillance in their respective countries.

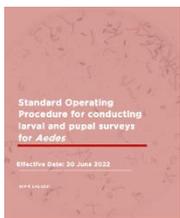
PacMOSSI plans to provide resources to selected countries to support baseline *Aedes* vector surveillance.

Technical content

Workshop content and this workbook have been developed based on the following key resources:



SPC/WHO [Manual on Surveillance and Control of Aedes Vectors in the Pacific](#) provides guidance for all PICs and should be contextualised for individual country and territory situations. The manual is aligned to requirements of vector surveillance under the International Health Regulations (IHR 2005), Asia Pacific strategy for emerging diseases and public health emergencies (APSED III) and the Global Vector Control Response 2017–2030.



PacMOSSI [Standard Operating Procedures](#) for *Aedes* provide comprehensive, standardised protocols for mosquito surveillance and control tailored to PICs. These encompass methodologies for mosquito surveillance, processing, storage, and insecticide resistance testing, ensuring consistent and effective practices across the region.



CDC [Surveillance and control of Aedes aegypti and Aedes albopictus in the United States](#) provides standardised guidance for detecting, monitoring, and managing these vectors to reduce the risk of arboviral disease transmission. It outlines best practices for integrated surveillance methods, data interpretation, and control strategies tailored to local ecological and epidemiological conditions.



PacMOSSI [online course](#) has been drawn on to develop course content, in particular Module 3 on mosquito surveillance.

This workbook and other workshop materials are available online at: <https://pacmossi.org/resource-category/training-materials/>



Workshop sessions

Why? Objectives of *Aedes* surveillance

Session aim The session will guide you in defining the overarching objective and the goals of your *Aedes* vector surveillance activity.

Rationale Clearly defining objectives and goals will ensure the surveillance plan is purpose-driven and aligned with programmatic goals such as prioritising mosquito control or evaluating disease risk.

Background

Objective: This should be a concise summary of the main purpose of your *Aedes* vector surveillance program.

Examples of Common Objectives:

- Generate quantitative data on *Aedes* populations to support targeted vector control and outbreak response planning.
- Assess the presence and distribution of *Aedes* species to establish a foundation for ongoing surveillance and risk monitoring.
- Assess the insecticide susceptibility of local *Aedes* species
- Guide targeted vector control interventions by providing data to inform when, where, and how to apply control measures most effectively.
- Evaluate the impact of interventions by measuring whether control activities are reducing *Aedes* populations as intended.
- Identify and manage key breeding sites to prioritise habitats for source reduction efforts.
- Support outbreak prediction and response by generating timely information to prevent or mitigate arboviral disease transmission.

It is important to note that your objective(s) may align with one or more of the general objectives listed above and may also include additional objectives tailored to your specific needs and available resources.

What? Targets for *Aedes* collection

Session aim The session will help to identify the optimal targets for your surveillance activity.

Rationale Specifying mosquito life stages and species to monitor ensures data relevance to the objectives and goals.

Background

Vector surveillance should be tailored to available resources and for the expected *Aedes* vector species that may be present in your country. [A guide to mosquitoes in the Pacific](#) provides a summary of published records of *Aedes* vector distributions in the Pacific. However, it is important to also consider the possible incursion of new species from neighbouring countries (especially those connected by travel and cargo routes).

- Important vectors that should be considered for monitoring in most PICs are: *Aedes aegypti* (priority if resources limited), *Aedes albopictus*, and *Aedes polynesiensis*
- Other vectors that may be considered for monitoring include: *Aedes cooki*, *Aedes hebrideus*, *Aedes hensilli*, *Aedes kesseli*, *Aedes marshallensis*, *Aedes pseudoscutellaris*, *Aedes rotumae*, *Ae. scutellaris*, *Aedes tabu* and *Aedes tongae*.s.s. (sensu stricto).

Vector surveillance can focus on different *Aedes* life stages depending on the required data outcome and use.

- **Egg surveys:** involve simple and low-cost traps to collect eggs; visual or automated counting; sensitive for detecting low-density populations; give an early warning of presence but no indication of adult density or biting risk; need to rear or molecular test for species.
- **Larval/pupal surveys:** widely used; require minimal training; can be carried out by community; useful to identify key larval habitats to target for larval source management; labour-intensive if large areas included and larvae require identification; do not correlate well with adult abundance; time-sensitive and may miss cryptic habitats.
- **Adult surveys:** most direct measure of transmission risk; more cost-effective than larval surveys in the long term due to reduced labour requirements; initial large investment in traps and batteries; may be technically demanding; high trap bias so some sub-populations can be missed.

Plan

Indicate the priority for surveillance targeting the different life stages.

Aedes species confirmed to be present in your country or area:

Potential *Aedes* species to remain vigilant for:

Best life stages to target with surveillance and why:

How? Methods for *Aedes* collection

Session aim The session will guide you in identifying the best methods for collecting *Aedes* to meet your objective and goals.

Rationale Using standard surveillance methods ensures data consistency, comparability across time and sites, and alignment with global best practices.

Background

Depending on the life stage(s) being targeted, there are a number of mosquito **collection methods** available that may also be used in combination. Each method is based on an understanding of how, where and when different life stages of the mosquito live and behave, and the particular species captured by each method can vary (such that no one method suits all mosquito species).

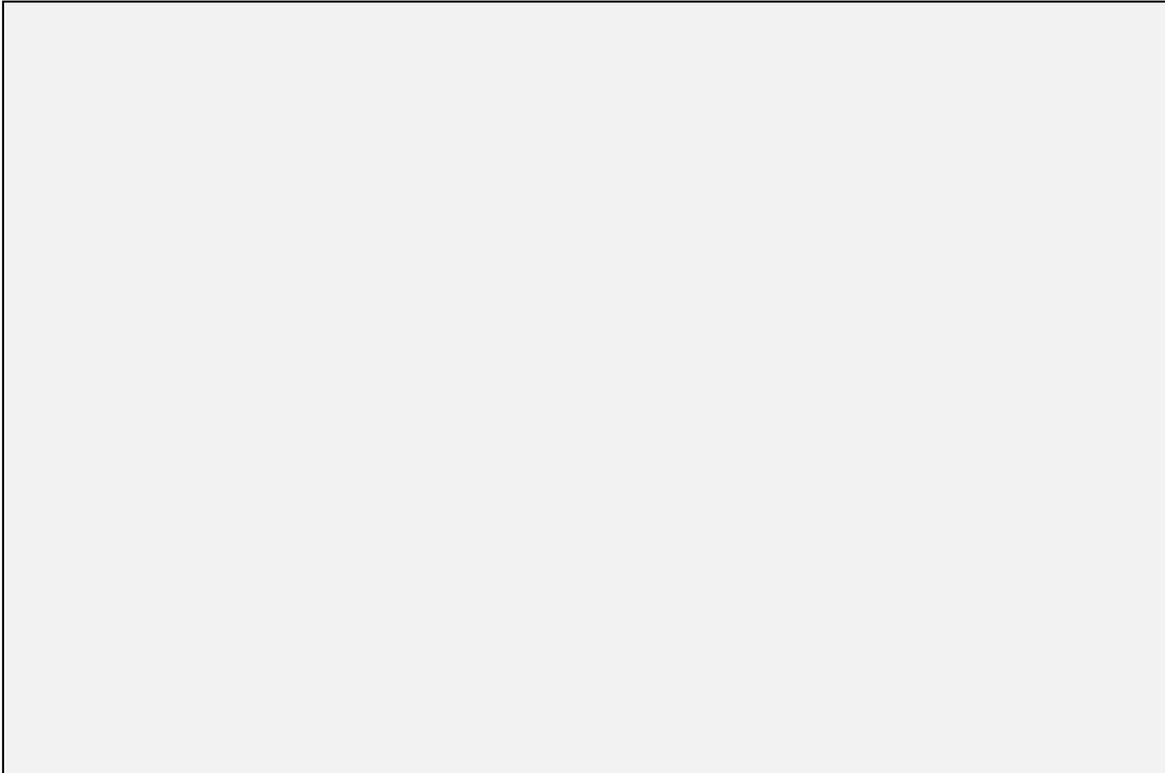
Life stages	Mosquito collection options
Eggs	<ul style="list-style-type: none">• Ovitrap (egg trap)
Larvae and pupae	<ul style="list-style-type: none">• Container inspection & immature removal or sub-sampling (sieving, pipetting, etc)• Larval dip counts or sweep netting (large containers)• Funnel traps (for wells, hard to access sites)
Adults	<ul style="list-style-type: none">• BG-Sentinel traps• Gravid <i>Aedes</i> traps• Resting collections (aspiration)• Sweep net collections• Carbon dioxide (CO₂) or light baited light traps (e.g., CDC miniature light trap)

Most of these methods will be demonstrated during the workshop.

Further details of these methods, including strengths and weaknesses, are outlined in the [Manual for surveillance and control of *Aedes* vectors in the Pacific](#).

Plan

Generate a list of the proposed *Aedes* collection methods for your surveillance activity.



Where? Sites and locations for *Aedes* collection

Session aim The session will help to identify where *Aedes* collections should be done.

Rationale Identifying surveillance sites allows for representative sampling and detection of spatial patterns in mosquito abundance and breeding activity.

Background

The **geographic scope** for the *Aedes* vector surveillance activity should be defined. Depending on the objectives of your surveillance activity, this could be:

- national
- sub-national
- focused, such as in high-risk urban or peri-urban areas

Within the geographic scope, **sampling sites** may be selected either for convenience or to be representative. The following may be considered:

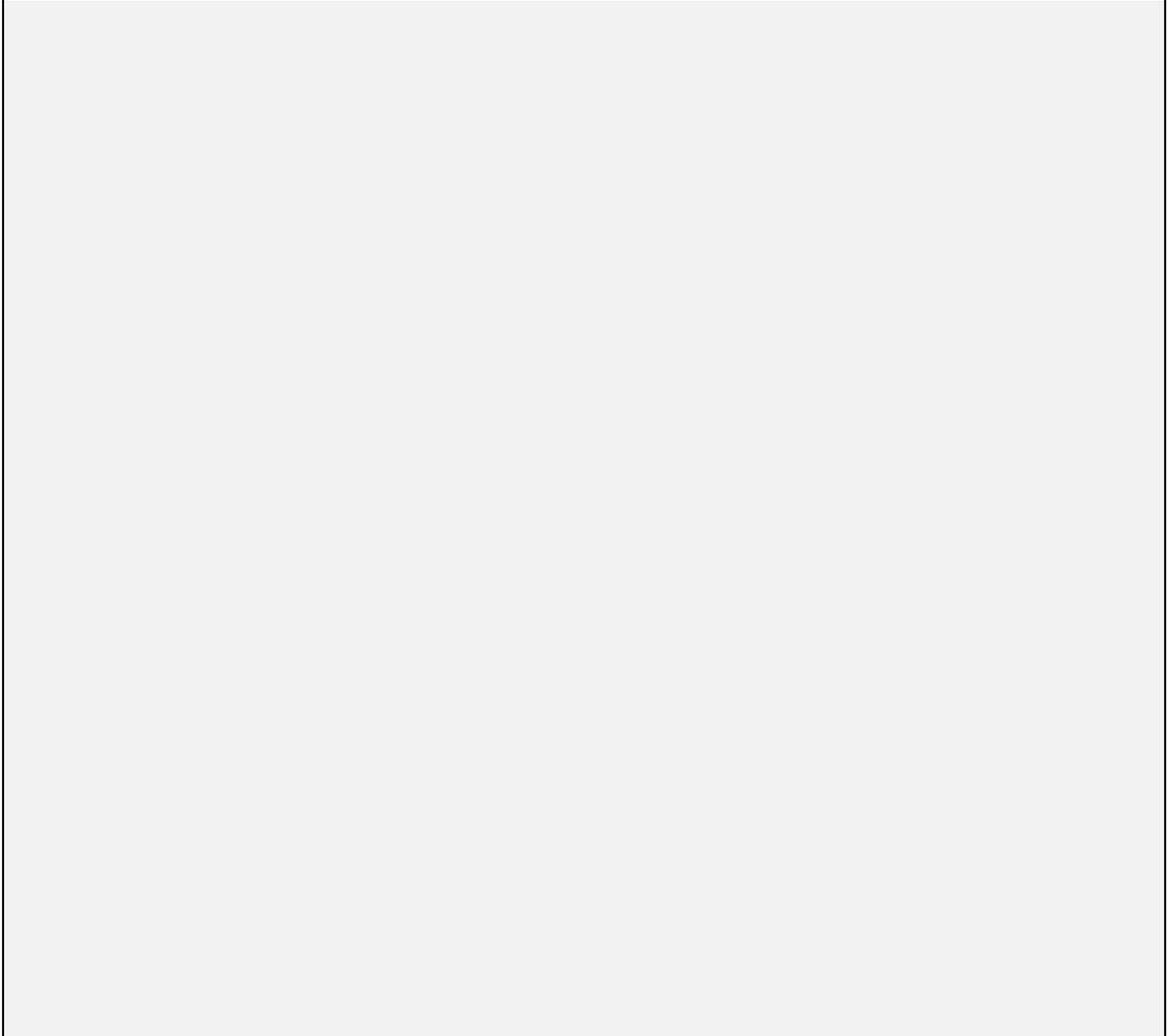
- Arbovirus case distribution, currently or historically
- *Aedes* vector indices, currently or historically
- High arbovirus or *Aedes* risk areas, such as points of entry, tourist zones
- Human population density
- Accessibility

Within sampling sites, the **sampling design** may include:

- Cluster sampling– In this approach, the study area is divided into natural groups, or **clusters**, such as neighborhoods, communities, or blocks of houses. A random selection of these clusters is then chosen for sampling.
- Systematic random sampling– Randomly sampling a given number of sites within a defined area, often with certain inclusion and exclusion criteria.
- Index, or household, sampling– inspecting a set number of houses or sites in a selected area to collect enough data to calculate common entomological indices, such as the House Index, Container Index, or Breteau Index (e.g., WHO recommends a minimum of 100 households per site for baseline index estimation).

Plan

Outline the location of proposed collection sites and sampling design for your *Aedes* vector surveillance activity.



When? Timing and frequency for *Aedes* collection

Session aim The session will help to define the best timing for *Aedes* collections.

Rationale Pre-defining timing and frequency of collections ensures appropriate resourcing and timely data capture to detect change over time due to seasonality and/or interventions.

Background

Collection timing and frequency will depend on the collection methods selected and the objective of the surveillance, such as whether it aims to identify temporal trends in mosquito vector abundance. It is important to note that the timing of collections may change due to climate variability.

Surveys may be conducted in:

- Peak rainy season (maximum mosquito prevalence)
- Dry season (to detect year-round presence in combination with peak season surveillance)

Duration or frequency will depend on the methods selected. For instance:

- Ovitrap may be set for a week at a time once per month
- Larval surveys may be done once per month or every 2 months
- BG sentinel traps may be set for 2 days, one time per week

The duration of trapping may be limited by the resources available, including available personnel.

Plan

Draft an overarching objective and primary and/or secondary goals for your surveillance activity.

Duration of collections:

Frequency of collections:

Which? Indices calculated from *Aedes* collections

Session aim The session will guide you on calculating *Aedes* indices based on collection methods.

Rationale Selecting appropriate indices enables quantifiable measures of vector density, arbovirus risk or vector control impact.

Background

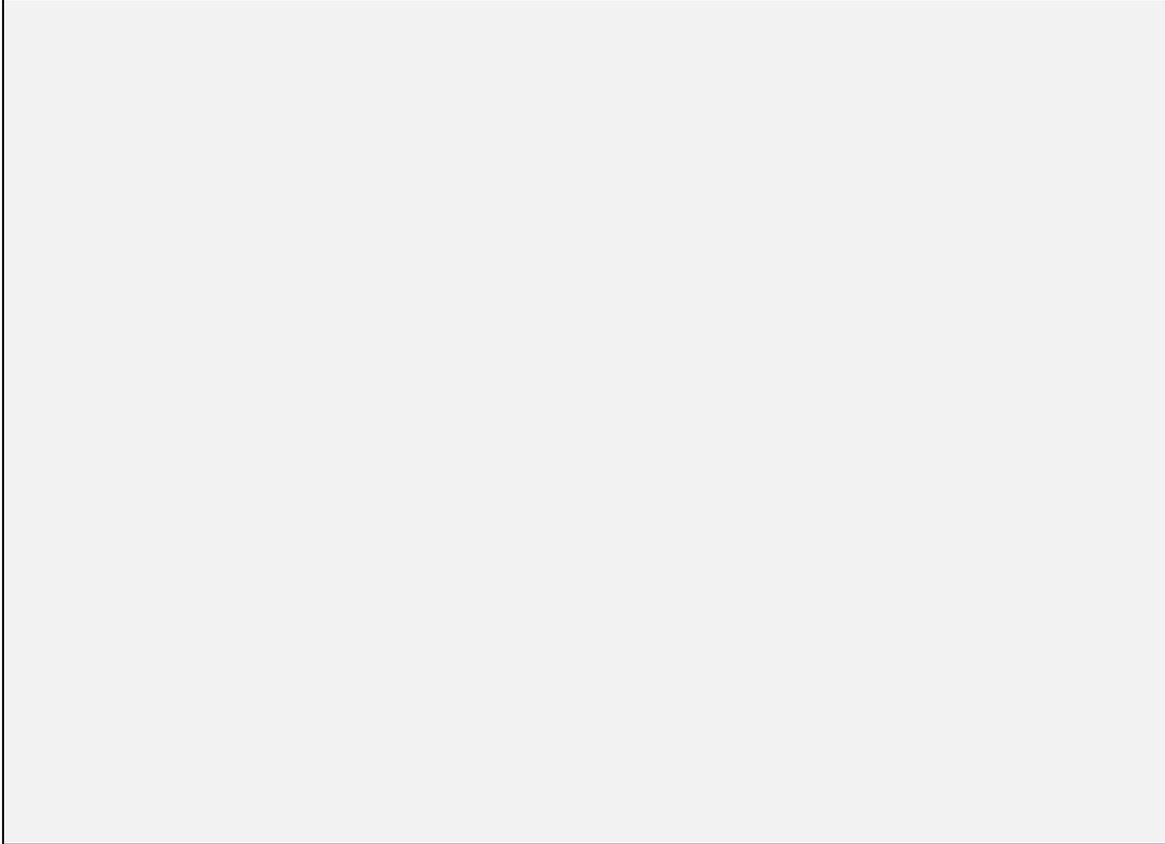
Standard entomological indicators should be calculated from *Aedes* collections to enable consistent, comparable, and actionable assessments of vector infestation levels.

Collection method	Indicator(s)
Ovitrap	<ul style="list-style-type: none">• Ovitrap Positivity Rate/Index (OPR/OPI)• Mean Eggs per Trap (egg density index)
Container inspection Immature counts Larval sweep netting Funnel traps	<ul style="list-style-type: none">• Species presence/absence• Immature density• Container Index (CI), Breteau Index (BI), Pupal Index (PI), Pupae per Person Index (PPI)• Key containers
BG-Sentinel traps Gravid <i>Aedes</i> traps Resting collections Sweep net collections CO ₂ baited light traps	<ul style="list-style-type: none">• Species presence/absence• Species composition• Adult density• Resting density

See Table 10 on Page 20 of the [Manual for surveillance and control of *Aedes* vectors in the Pacific](#) for details on entomological surveillance indicators.

Plan

List the proposed *Aedes* indicators that you will calculate from your mosquito collections.



Who? Engaging communities and other sectors for *Aedes* collections

Session aim The session will help plan practical approaches for involving communities and collaborating with other sectors of the public for vector surveillance.

Rationale Community and cross-sector engagement are critical for gaining access, improving data quality, and ensuring the sustainability and impact of surveillance outcomes to guide vector surveillance and control efforts.

Background

Effective *Aedes* surveillance in PICs relies on building trust and cooperation with local communities, leaders, and organisations, as well as working with public sectors outside of health such as education, environment, and tourism.

Early communication about surveillance goals, involving stakeholders in planning and implementation, and sharing results back with communities and stakeholders all help increase participation, overcome logistical barriers, and foster local ownership—key factors for long-term success in resource-limited and culturally diverse Pacific environments.

An appropriate process to engage communities is to:

- Identify local leaders and community groups and discuss how to conduct awareness and engagement activities.
- Identify relevant organisations and suggest how best to coordinate logistical support and access.
- Propose feedback mechanisms to keep all stakeholders informed and engaged throughout the surveillance process.

Plan

Follow the steps above.

Local leaders and community groups, and proposed engagement:

Relevant organisations, and proposed coordination:

Proposed feedback mechanisms:

And? Use of data from *Aedes* surveillance

Session aim The session will help you to identify how *Aedes* surveillance data will be used to improve vector control.

Rationale Defining how data will be used ensures that surveillance findings inform decision-making, resource allocation, and intervention planning.

Background

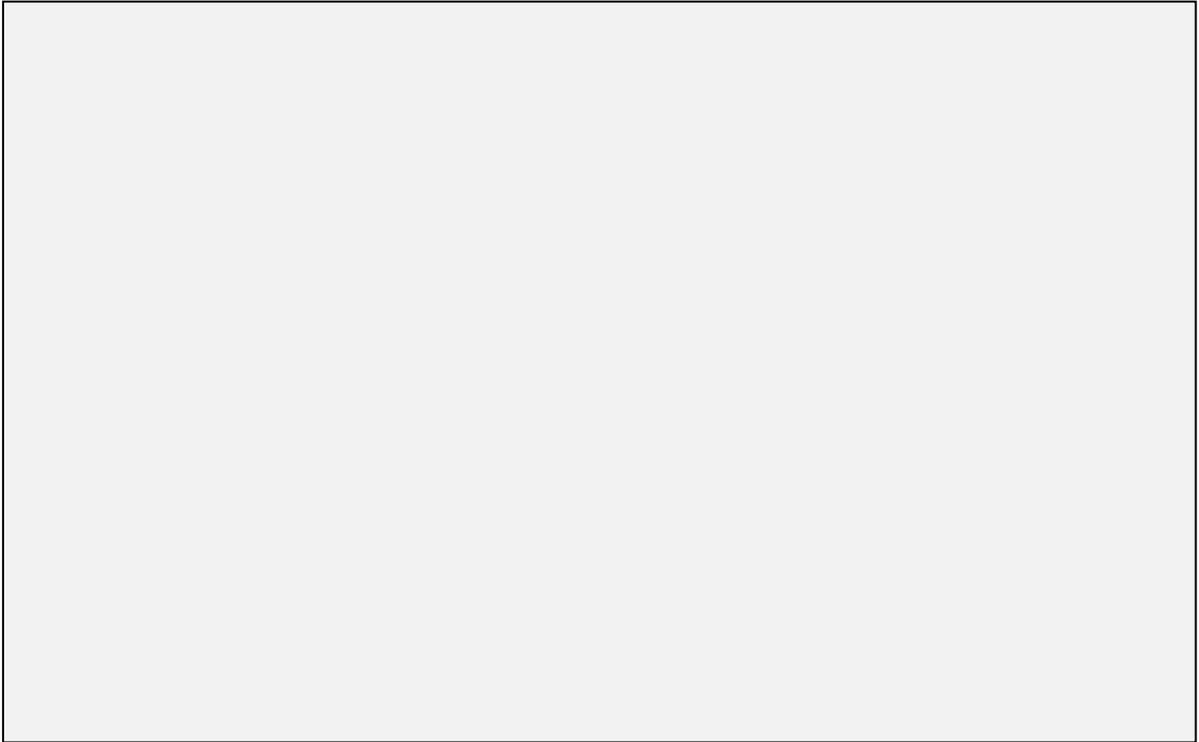
Clearly defining how *Aedes* surveillance data will be used is essential to ensure the information collected directly supports decision-making for vector control, resource allocation, and outbreak preparedness. Without a defined purpose, data may remain underutilised, reducing its value for guiding targeted interventions and evaluating programme effectiveness.

Surveillance outcomes should satisfy your specified objective(s) and drive improvements to your vector control program. To achieve this:

- Regularly review outcomes to determine whether data are meeting your objective(s) and goals.
- Update sampling locations, strategies, or frequency based on results to better achieve your objective(s).
- Conduct routine reviews of surveillance activities to ensure effectiveness and efficiency.
- Apply lessons learned to refine surveillance strategies, reporting methods, and the application of data for improved decision-making.
- Disseminate and communicate outcomes to relevant stakeholders, ensuring findings inform policy decisions.

Plan

Outline how your surveillance data will be used to inform decisions related to *Aedes* vector control.



Then what? *Aedes* mosquito control

Session aim The session will help you to understand the basic principles and methods of *Aedes* mosquito control.

Rationale Surveillance data and findings should inform intervention planning.

Background

When *Aedes* surveillance is well-planned and implemented, the arising data supports efficient and effective mosquito control and reduces resource wastage. There are numerous intervention options for control of *Aedes* vectors in the Pacific.

Intervention	Use scenario
Larval/immature control	
Container management	Covering, cleaning, moving or otherwise managing artificial containers in urban/peri-urban or drought-prone areas
Clean up campaigns (waste management)	Collection, destruction or other management of hard waste in residential areas and communities, including public areas
Larvicides (e.g. Bti, temephos, mono-molecular film)	Chemical or biological treatment of static water habitats; repeat application required
Biological control (e.g. copepods, fish)	Introduction of biological agents into large or permanent water bodies (ponds, cisterns); rural settings with natural habitats; periodic reintroduction may be required
Adult control	
Residual spraying (indoor) - IRS	Spraying of high-risk areas before or during outbreaks (or for invasive species) where <i>Aedes</i> are mainly indoor-resting
Residual spraying (outdoor and harbourages) - ORS	Spraying of high-risk areas before or during outbreaks (or for invasive species) where <i>Aedes</i> mainly rest outdoors incl. in foliage/vegetation
Space spraying (fogging)	Fogging in and around homes during mosquito flight times <i>ONLY for outbreak response in densely-populated urban areas with high transmission</i> (otherwise not recommended)
<i>Wolbachia</i> -infected mosquito releases	Urban centres with transmission sustained by <i>Ae. aegypti</i> ; islands with limited reinvasion risk
Spatial repellents	Households, schools, workplaces or residences, especially where other interventions are difficult to deploy or for added protection
Personal protection (bite prevention)	
Insecticide-treated nets	Provided to viraemic patients or vulnerable individuals when resting during the day in residences or health facilities (e.g. infants, infirm)
Other insecticide-treated materials (e.g. curtains, clothing)	Schools, workplaces or residences, especially where other interventions are difficult to deploy or for added protection where <i>Aedes</i> are mainly indoor-biting and resting
Topical repellents	Provided to (or purchased by) viraemic patients, vulnerable or high-risk individuals; applied during peak biting times; reapplication needed
Coils and vaporisers	Purchased by community members for use indoors during peak biting times; re-supply needed
All stages	
Health promotion and RCCE	All settings, including for preparedness in intra-epidemic periods (health promotion) and for response during outbreaks (RCCE)

Timing is also important for successful mosquito control. Routine or periodic control implemented in the absence of a significant increase in cases (i.e. considered an outbreak in a non-endemic area or an epidemic in an area that usually has cases) are considered to be **proactive**. In contrast, **reactive** vector control is triggered by an increase in cases at the start of or during an outbreak or epidemic.

In general, in the Pacific:

- Larval control with container management, clean-up campaigns and larviciding is the cornerstone of routine proactive *Aedes* control.
- Residual spraying indoors is undertaken for reactive control during outbreaks driven primarily by *Ae. aegypti*.
- Outdoor and harbourage spraying may also be done, especially if *Ae. albopictus*, *Ae. polynesiensis* or other outdoor-resting species are important vectors.
- Interventions can be combined for sustained control or rapid response, if resources permit.
- Community participation and intersectoral collaboration are essential.
- Regular monitoring and evaluation of interventions is important.

Plan

What methods do you know of that are currently used or planned for use in your country for *Aedes* control that target immature and adult mosquitoes?

	Proactive routine control	Reactive control
Larval/ immature control		
Adult control		
Personal protection		
Health promotion and RCCE		

Example forms

Container inspections (baseline surveillance)

Province/Island District/Zone Community/Suburb Property ID Household head/location manager

Date inspected Person(s) doing inspection

Property type residence health facility school other:

Container type (tick)																Container volume		Number of Aedes			Sample				
	Roof guttering or drain	Water tank	Well	Drum	Pool or spa	Water feature, pond, birdbath	Boat	Tyre	Esky or chill box	Plastic or tarpaulin	Pot, pan or kitchenware	Wheelbarrow or garden tools	Bucket	Plant, plant pot or base	Palm frond or bromeliad	Seashell	Coconut shell			Estimate or count (E/C)	I/II instars	III/IV instar	Pupae	Sample code	
1																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									

Property mosquito habitat inspection (surveillance & control)

Province/Island District/Zone. Community/Suburb

Property ID Household head/location manager

Date inspected Person(s) doing inspection

Property type	<input type="checkbox"/> residence	<input type="checkbox"/> health facility	<input type="checkbox"/> school	<input type="checkbox"/> other: ;;;;.....
Inspection result	<input type="checkbox"/> full access	<input type="checkbox"/> partial access	<input type="checkbox"/> no access	
Residual spray done	<input type="checkbox"/> no	<input type="checkbox"/> indoor	<input type="checkbox"/> outdoor	
Larviciding done	<input type="checkbox"/> no	<input type="checkbox"/> yes		

	Revisit required
	Report to council

Spray product used Conc. used Amount used

Larvicide used Conc. used Amount used

Actual and potential larval habitats			Larval sample		Treatment type (mark X)						
Type	Number found holding water (#)	Number positive for larvae (#)	Sample taken? (Y/N)	If yes, sample Code (#)	Destroy, dispose	Empty, move, invert	Fill in eg. with sand	Cover, screen	Larvicide applied	Residual sprayed	None
Roof guttering or drain											
Water tank											
Well											
Drum											
Pool or spa											
Water feature, pond or birdbath											
Boat											
Tyre											
Esky or chill box											
Plastic or tarpaulin											
Pot, pan or kitchenware											
Wheelbarrow or garden tools											
Bucket											
Plant, plant pot or base											
Palm frond or bromeliad											
Seashell											
Coconut shell											
Other small container, <2L											
Other medium container, 2-20L											
Other large container, >20 L											
Other											

Notes:.....

This workbook was produced by the PacMOSSI consortium with support from the Australian Government through Partnerships for a Healthy Region, the French Government, the New Zealand Government and the European Union through The Pacific Community (SPC). Information provided in this publication does not necessarily reflect the views of these development partners.

Content was adapted from that available from PacMOSSI, World Health Organization, SPC, US Centres for Disease Control and Prevention, Institut Pasteur of New Caledonia. Technical content was refined by Tessa Knox, Amanda Murphy, Brian Johnson, Elina Panahi, Nicolas Pocquet, Hugo Bogoro, Edgar Pollard and Maxine Whittaker.

Recommended Citation: PacMOSSI Consortium, Surveillance for *Aedes* Vectors in the Pacific: Workbook for Practical Workshop, Version 2: November 2025. Honiara, Solomon Islands.

Contact

Pacific Mosquito Surveillance Strengthening for Impact (PacMOSSI)

www.pacmossi.org

pacmossi@jcu.edu.au
