

# Standard Operating Procedure for artificial resting site collections with pit shelters

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**Effective Date: 19 November 2021**

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SOP #: PIT-2021

Image: WHO 2016.



**PacMOSSI**

Pacific Mosquito Surveillance  
Strengthening for Impact

# Scope

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The purpose of this SOP is to outline the materials and processes required to create and service pit shelters to catch resting adult mosquitoes.

## Overview

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Description: Pit shelters are a type of artificial resting structures used to provide an attractive micro-habitat where mosquitoes can rest. Muirhead-Thomson (1958) initially developed and trialled pit shelters in Tanzania. The key feature of a pit shelter is the inclusion of horizontal channels that are dug into the walls that provide an attractive location for mosquitoes to rest.

Target species and physiological states: Captures resting adults of both sexes and many species.

Entomological surveillance indicators: Adult vector occurrence, density and resting location.

Advantage: This method uses cheap, locally acquired materials which can be easily constructed.

Disadvantage: This method is labour-intensive to establish as pits, especially in rocky or sandy soil and pit shelters can flood by seepage, even if a roof is provided, in areas that receive high rainfall.

Sampling period: The pit shelters are often deployed overnight for 12 h periods. Collections should take during period of minimum flight activity. For *Anopheles* mosquitoes, preferably in the early morning.

Data: Total number of resting mosquitoes per sampling effort (by species and sex). When necessary, field data is merged with the results of subsequent laboratory analyses.

## Materials

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- Oral aspirator (1 per collector + spares)
- Collection cups
- Rubber bands
- Cotton wool
- Mesh for cups
- Scissors
- Torches
- Batteries for torches
- Pencil/pen/markers
- Data collection form/digital device
- Shovel
- Ladder
- Materials for roof construction

# Trap location selection

1. Construct the pit shelter in a location unlikely to flood.
2. Additionally, rocky or sandy ground may impede digging.
3. Talk with the local residents about the location to place the trap. Ensure that the householders are happy with the location of the trap.
4. Ensure that trap is in a safe location where it is unlikely that children or animals will not fall into it.

# Sampling procedure

- 1. Select the site for the pit shelter and dig the hole.**
  - a. The pit should be 180 cm deep, with an opening 150 cm x 120 cm wide.
  - b. At 50 cm deep, one or two small cavities are dug out horizontally (30 cm) deep on each side.



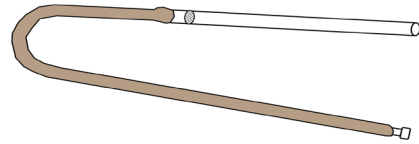
Image: WHO.

- 2. Where the pit shelter isn't built under vegetation, to provide shade, then a roof must also be constructed.**
  - a. Thatch or plastic can be used for the roof material.
  - b. Ensure the structure is fenced to prevent children and animals from falling inside.



Image: WHO.

- 3. Ensure collections have equipment required to service the pit traps.**
- a. For further details about collection cups and using an oral aspirator see [SOP# MOS-2021](#).



- 4. Deploy the pit trap overnight and collect any resting mosquitoes early in the following morning.**
- a. Carefully and slowly enter the pit using a ladder.
  - b. Resting mosquitoes are generally passive and can be collected with careful visual inspections and an oral aspirator. A battery aspirator, such as the prokopack can be used to quickly sample the structure.



Image: WHO.

- 5. Temporarily store the mosquitoes in labelled collection cups until processing and long-term storage. For further details see [SOP# MOS-2021](#).**

*Additional notes:*

- Clean the pit trap of any spiders, cobwebs or other material when servicing it.
- One Indian study found that watering the trap the night before servicing it improved catch rates (Silver 2008).
- Head torches are very useful as they provide a hands-free solution. People have used red lens (~680 nm) which is considered invisible to mosquitoes and therefore does not impact behavior.

# Safety/Risk assessment

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Your workplace may require you to complete a risk assessment prior to conducting field work. There are a range of risks to which field workers could be exposed, and when sampling with pit traps may include:

- Mosquito transmitted infections
- Chloroform
- Dog bites
- Trip hazards. Position the pit trap away from busy foot paths and construct a fence around the trap to prevent children or animals from falling in.

For further details on safety and risk assessments see [SOP# MOS-2021](#).

## References

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Muirhead-Thomson, R.C. (1958) 'A pit shelter for sampling outdoor mosquito populations.' *Bulletin of the World Health Organization*.

<https://apps.who.int/iris/handle/10665/265386>

Silver, J.B. (2008) 'Mosquito ecology: field sampling methods.' 3rd edition; Springer: New York.

### Acknowledgements

Content drafted by Kyran Staunton, Tanya Russell and Thomas Burkot (James Cook University).

### Suggested citation

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