

An adult approach to *Aedes aegypti* surveillance

We need rapid, relevant sampling methods for *Aedes aegypti*

Scott A. Ritchie^{1,2}, Craig R. Williams², Richard C. Russell³, Martin Geier⁴, Alvaro E. Eiras⁵

1. Tropical Public Health Unit, Queensland Health, PO Box 1103, Cairns, Queensland, 4870 Australia;
 2. School of Public Health and Tropical Medicine, James Cook University, PO Box 6811, Cairns, Queensland, 4870 Australia;
 3. Department of Medical Entomology, University of Sydney, ICPMR, Westmead Hospital, Westmead, NSW 2145, Australia;
 4. Institut für Zoologie, University of Regensburg, Universitätstrasse 31, 93040 Regensburg, Germany;
 5. Department of Parasitology, Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil

For correspondence:
 craig.williams1@jcu.edu.au or
 scott_ritchie@health.qld.gov.au

Established sampling methods:



Eggs – Ovitrap:

- Pros:** low tech, rapid deployment, sensitive
Cons: Indirect abundance measure, may have to rear larvae to adults for identification



Larval & pupal surveys:

- Pros:** low tech, offers control, pupae are epidemiologically relevant
Cons: time and labour expensive, cryptic sites may be missed or hard to sample (eg. roof gutters!)



Adults – man-landing catch:

- Pros:** sensitive; low tech
Cons: risk of dengue transmission to operators



Adults – aspirator collections:

- Pros:** Samples all adult physiological states, “gold standard” method
Cons: labour-intensive and intrusive; do you want to be the one to break the Ming vase?

THERE HAS TO BE A BETTER WAY!

Sticky ovitraps:



The Ritchie Sticky Ovitrap (Ritchie *et al.* 2003)

- Gravid females seek to lay eggs in the trap and become trapped on glue panels inside the trap.
- As sensitive at detecting *Ae. aegypti* as standard ovitraps with paddles

- This method allows:** rapid identification, virus-screening of specimens, direct measure of abundance
- This method is lethal to captured mosquitoes



The Ecovec MosquiTRAP (Ecovec Ltd, Brazil) ...vs the Ritchie Sticky Ovitrap

- Both traps have similar trapping efficacy for *Ae. aegypti*
- Ritchie sticky ovitrap can be used for *Culex quinquefasciatus* surveillance

Table 1. Efficacy of the Ritchie sticky ovitrap and a standard paddle ovitrap (from Ritchie *et al.* 2003)

<i>Ae. aegypti</i>	Standard ovitrap (n = 78)	Sticky ovitrap (n = 80)	P (Mann-Whitney)
% positive	64.1%	67.5%	0.713

Table 2. Efficacy of the Ritchie sticky ovitrap and the Ecovec MosquiTRAP (mean per trap pair (± SEM) deployed for 3 d)

Female mosquitoes	Ritchie sticky ovitrap (n = 16)	mosquiTRAP (n = 16)	P (t-test)
<i>Ae. aegypti</i>	1.8 ± 0.6	1.3 ± 0.3	0.819
<i>Cx. quinquefasciatus</i>	1.3 ± 0.4	0.4 ± 0.2	0.010

Sticky Ovitrap Index: A real alternative to the Breteau Index

- Ae. aegypti* surveillance was being carried out during a Dengue 2 outbreak in Cairns Australia (Ritchie *et al.* 2003)
- SOI – the Sticky Ovitrap Index, is the mean number of female *Ae. aegypti* captured per trap per week
- Peak dengue transmission coincided with the highest SOI values
- The SOI plummeted after vector control, providing a measure of control efficacy
- Specimens from sticky ovitraps were PCR'd for DENV; 6 positive pools in March
- The SOI is a potential indicator for dengue transmission

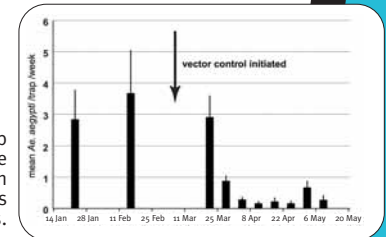


Figure 1. Sticky ovitrap index (SOI ± SEM) of female *Ae. aegypti* during an outbreak of dengue 2 virus in Cairns.

The BG-Sentinel trap: (www.bg-sentinel.com)



- Captures adult *Ae. aegypti*
- Visual attractant (black and white)
- Anemotactic attractant (counter-flow plume generation)
- Olfactory lure (with host kairomones)

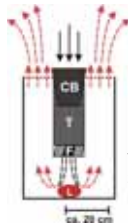


Figure 2. Functional diagram of the BG-Sentinel mosquito trap. CB: catch bag; T: black tube; F: fan; BGL: BG-Lure. Arrows symbolize the direction of the airflow.

The BG-sentinel vs CDC backpack aspirator:

Collection efficacy

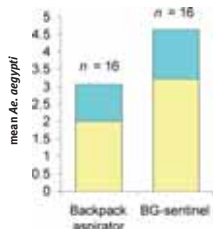
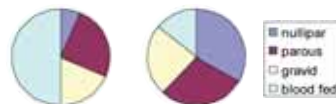


Figure 3. Mean catch of *Ae. aegypti*. Backpack aspirator was used with a sweep net as per Clark *et al.* (1994) for 10 min under houses. BG-sentinels were 24h collections

Physiological state



Backpack aspirator BG-sentinel trap

- Backpack aspiration and the BG-sentinel capture *Ae. aegypti* in a range of states.
- The CDC backpack aspirator captures more blood-feds and fewer nullipars, (chi-square = 4.368, P < 0.25)

Figure 4. Physiological state of female *Ae. aegypti* captured using a CDC backpack aspirator and BG-sentinel trap. 37 specimens dissected.

- The BG-sentinel captures more *Ae. aegypti*, although further testing required (P = 0.06, Mann-Whitney test)
- The BG-sentinel requires much less time and effort to deploy than backpack aspiration

Bibliography

- Ritchie SA, Long S, Hart A, Webb CE and Russell RC (2003). An adulticidal sticky ovitrap for sampling container-breeding mosquitoes. *J. Amer. Mosq. Cont. Assoc.* 19(3): 235-242.
- Ritchie SA, Long S, Smith G, Pyke A and Knox TB (2004). Entomological investigations in a focus of dengue transmission in Cairns, Queensland, Australia, by using the sticky ovitrap. *J. Med. Entomol.* 41(1): 1-4.
- Clark GG, Seda H and Gubler DJ (1994). Use of the “CDC backpack aspirator” for surveillance of *Aedes aegypti* in San Juan, Puerto Rico. *J. Amer. Mosq. Cont. Soc.* 10(1): 119-124.

