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# Using a new odour-baited device to explore options for luring and killing outdoor-biting malaria vectors: design and field evaluation of the Mosquito Landing Box

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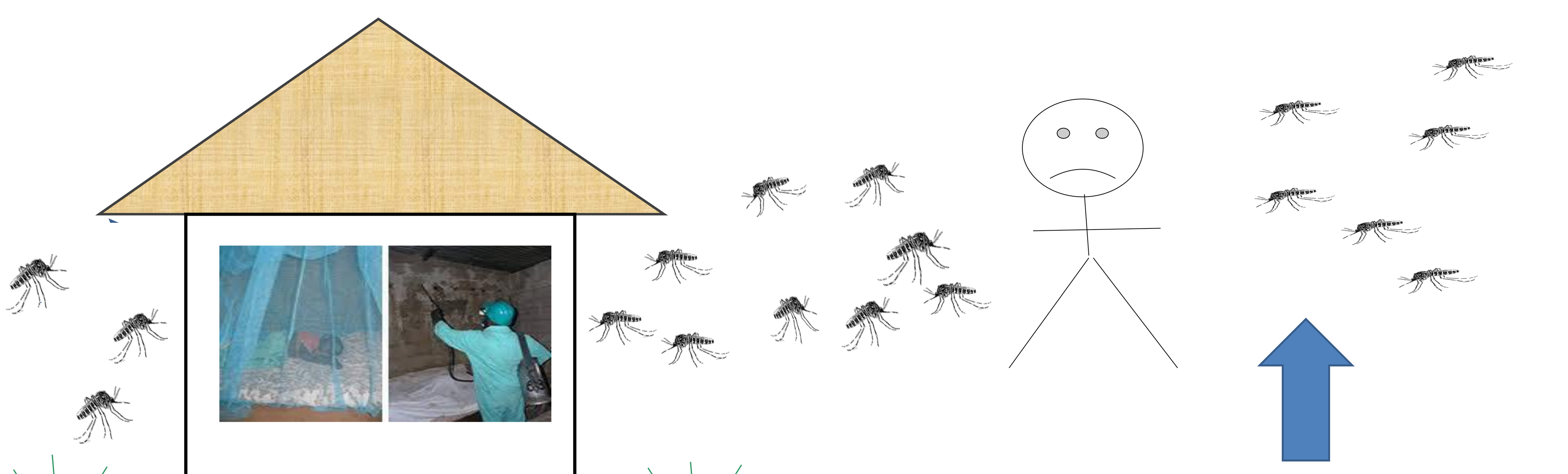
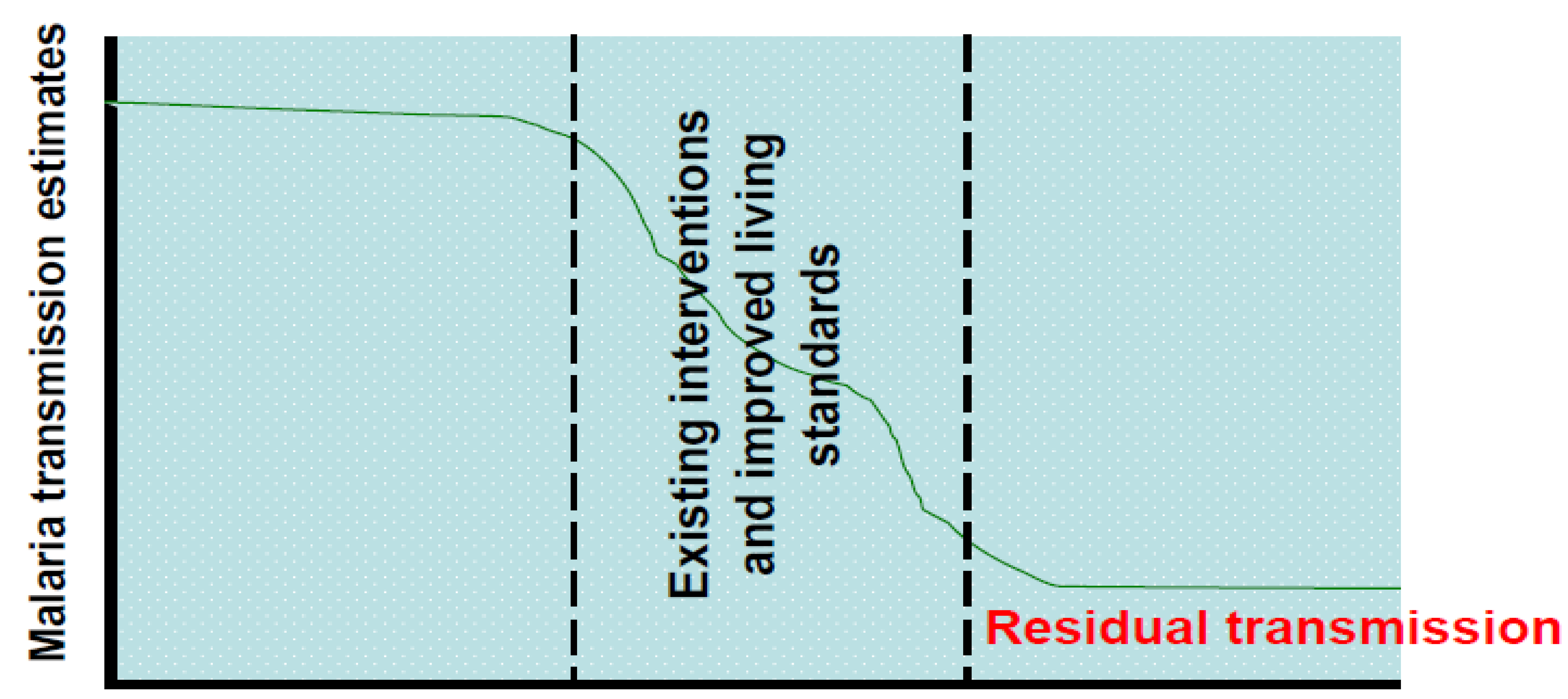
**Background**: Common mosquito methods such as long lasting insecticide treated nets (LLINs) and indoor residual spraying (IRS) target only those mosquitoes that enter houses, yet several mosquitoes also bite people outside houses. These outdoor biting mosquitoes contribute significantly to the ongoing residual malaria transmission in Africa.



The outdoor biting and outdoor resting vectors contribute to residual transmission in areas where LLINs and IRS are already widely used.




**Materials and Methods:** Field experiments were conducted in Tanzania to assess if wild host-seeking mosquitoes 1a) visited the MLBs, 1b) stayed long or left shortly after arrival at the device, 2) visited the devices at times when humans were also outdoors, and 3) could be killed by contaminants applied on the devices. Odours suctioned from volunteer-occupied tents were also evaluated as potential low-cost bait, by comparing baited and un baited MLBs .

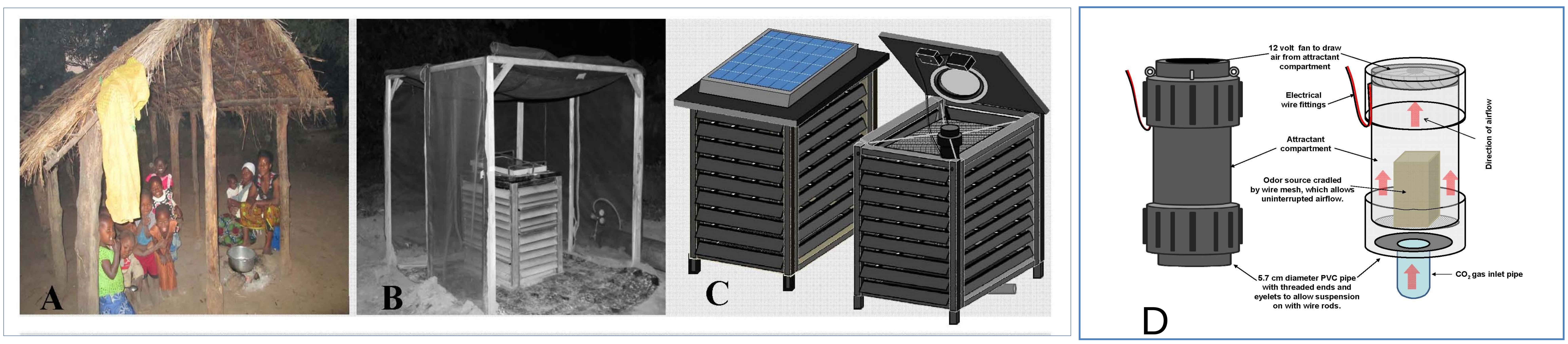
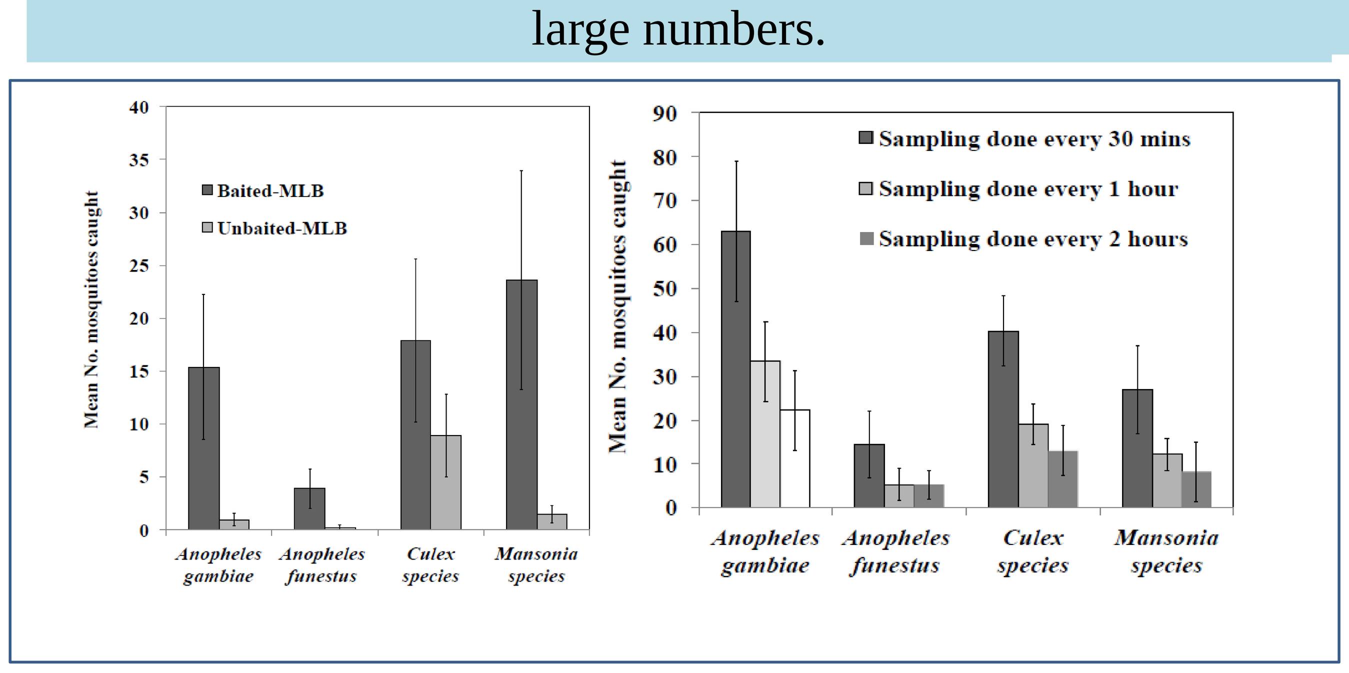
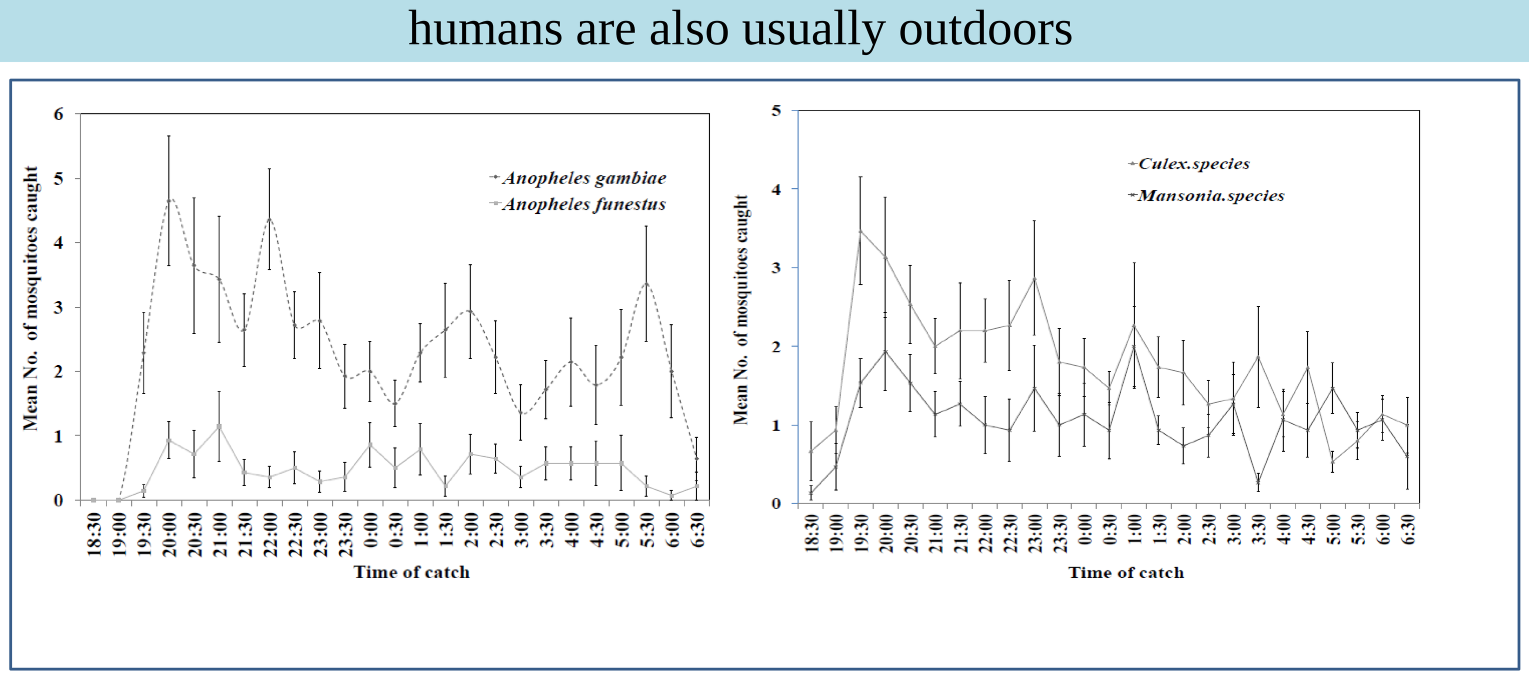



**Figure 1:The odor-baited mosquito landing box** is designed to mimic humans sitting outside houses, e.g. people cooking in open kitchens in rural communities **(A)**. It has a solar panel on its top surface **(C)**, which powers the odor-dispensing system inside (D). A semi-open screen cage**(B)** (not an essential component of the device) can be used to intermittently entrap and sample host-seeking mosquitoes visiting the device.

Findings **1:** Free flying mosquito vectors can visit the MLB in large numbers.




**Findings 2:** The mosquitoes visit the devices at about the same time that humans are also usually outdoors




**Findings 3:** The visiting vectors can be contaminated and killed using appropriate mosquito-killing agents

**Table 1:** Comparison of percentages of mosquitoes (± 2SE) that died after visiting insecticide-treated odour-baited mosquito landing boxes or the controls.

| | | *Anopheles arabiensis* | *Anopheles funestus* | Other *Anopheles* | *Culex* species | *Mansonia* species |
|---|---|---|---|---|---|---|
| Tests conducted using 1% pirimiphos methyl mixed in paint | Control | 0.32 ± 0.622 | 0.89 ± 0.000 | 0.00 ± 1.441 | 0.00 ± 0.000 | 0.00 ± 0.000 |
| | Treated MLB with 12 louvers | 6.78 ± 2.769 | 17.95 ± 8.820 | 16.23 ± 9.944 | 2.16 ± 2.584 | 7.58 ± 4.316 |
| | Treated MLB with 8 louvers and treated internal surfaces | 32.07 ± 9.016 | 33.91 ± 13.200 | 33.03 ± 12.827 | 22.20 ± 14.324 | 25.69 ± 13.429 |
| Tests conducted using 5% pirimiphos methyl mixed in paint | Control | 4.07 ± 3.741 | 0.00 ± 0.000 | No data | 1.09 ± 1.442 | 1.62 ± 1.106 |
| | Treated MLB with 8 louvers and treated internal surfaces | 50.64 ± 5.128 | 25.00 ± 13.056 | No data | 37.76 ± 7.311 | 47.98 ± 11.315 |

The MLB was painted with locally prepared pirimiphos-methyl oil based paint while the inner suspended net was also treated by soaking it in the same mixture of pirimiphos-methyl then drying under a shade

**Conclusion:** While odour-baited devices such as the MLBs clearly have potential against outdoor-biting mosquitoes in communities where LLINs are used, candidate contaminants must be those that are effective at ultra-low doses even after short contact periods, since important vector species such as *An. arabiensis* make only brief visits to device. Natural human odours suctioned from occupied dwellings could constitute affordable sources of attractants to supplement odour baits for the devices. The killing agents used should be environmentally safe, long lasting, and have different modes of action (other than pyrethroids as used on LLINs), to curb risk of physiological insecticide resistance.

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