Mosquito Trap Modifications for Improved Utility in Abundance Monitoring

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ABSTRACT: Mosquito traps for monitoring mosquito abundance may need to be placed at sites that are prone to being disturbed by natural changes in the environment, such as increased wind or human activity. Moreover, desirable trapping locations may lack structures strong enough to support heavy objects such as the CDC EVS CO_2 or Faye-Prince traps. To address these limitations, we manufactured and deployed supports for ovi-cup traps that are resistant to tipping and sturdy supports from which weighty CDC EVS CO_2 or Faye-Prince traps can be suspended that can be driven into the soil or placed on to hard surfaces. . Use of these supports have diversified the locations in which traps have been successfully placed and improved the rates of successfully retrieving traps that contain mosquitoes, thereby enhancing mosquito surveillance activities.

INTRODUCTION

Monitoring mosquito abundance relies upon traps that remain where they are placed and do not tip or are affected by natural or anthropogenic disturbances that allow captured mosquitoes to escape (e.g wind, shifting soil, or mechanized leaf blowers). CDC EVS CO_2 traps containing dry ice can have a mass of over 3 kg, whereas Faye-Prince traps baited with CO_2 released from sublimating dry ice can weigh twice as much. Moreover, best placement sites for collecting mosquitoes with suspended CDC EVS CO_2 or Faye-Prince traps may not be near to structures that can support such weight (e.g., in a marsh or the open field of a cemetery). Additionally, obtaining permission from property owners or managers to use available supports for suspending heavy traps may not be granted. Ovi-cup traps for monitoring oviposition events by invasive *Aedes* species have a much lower mass (typically less than 0.5 kg), but most have relatively narrow bases that are unstable and prone to tipping, resulting in the contents of the trap being lost. Moreover, ovi-cup traps are often placed at sites for monitoring mosquito abundance where people are most active, thereby increasing the potential for the ovi-cup traps to be disturbed. We designed and deployed easy to manufacture supports for suspended traps and ovi-cup traps that have substantially increased stability.

METHODS

Various hand-held and consumer-grade electric tools were used to manufacture the mosquito trap supports. The ovi-cup trap supports were made from 1.9 cm aluminum channel that was cut into 30 cm long stakes with one end blunted and the other cut to a 45 degree angle. The ends were deburred to remove sharp edges. The blunt end was drilled with two parallel holes, 2.5 cm apart, and a 1.3 L capacity drink cup holder affixed using sheet metal screws. A hammer or shanked boot was used to drive the ovi-cup trap support into the soil, and the ovi-cup trap subsequently placed into the holder (Figure 1, left).

Two types of support were produced for suspending CDC EVS CO_2 and Prince-Faye traps: one for inserting the trap support into the soil (i.e., an in-ground trap support) and another for placing it atop of hard surfaces (i.e., an on-ground trap support). The base of the on-ground trap support was a 2.54 cm inner diameter (ID) anchor flange mounted to a plumber's tape-reinforced wooden plank (45 cm x 30 cm x 5 cm), weighted with sand bags. The base of the in-ground trap support was a 60 cm length of 2.54 cm ID pipe welded to a 1.25 cm diameter iron rod having a right angle bend that was used to place the rod into the soil with the strike of a shanked boot. Inserted into each base was a 150 cm length of electrical conduit (1.9 cm ID). A 90 cm length of electrical conduit (1.25 cm ID) was bent to produce a 60 cm high pole having a 30 cm horizontal extension with a downward facing hook affixed. A CDC EVS CO_2 or Fay-Prince trap was suspended from the hook near the apex of the support, and the pole inserted into the 150 cm long base pole to produce the assembled trap.

RESULTS

Unsupported ovi-cup traps are relatively unstable under typical field conditions. Within two days, one quarter or more of the ovi-cup traps we placed were tipped and the water drained. The ovi-cup trap support substantially improved the stability of the trap, resulting in less than one in twenty being tipped after 4 days in the field. The supports for suspended CDC EVS CO_2 and Fay-Prince traps have afforded the opportunity for trap placement at sites that were otherwise unavailable because of unsuitable structures *in situ* that could support the weight of the trap.

DISCUSSION

The use of ovi-cup trap supports has resulted in much higher proportion of the oviposition substrates from the traps being recovered successfully and returned to the lab for analysis, thereby increasing the efficiency of the efforts placed into surveillance for invasive species of *Aedes* mosquitoes. Use of the in-ground supports for suspended CDC EVS CO_2 traps has opened up opportunities for surveillance of *Culex erythrothorax* emerging near tule in marsh habitats. On-ground supports have increased the ease of mosquito surveillance at sites with extensive concrete ground surfaces such as urban nurseries and waste water treatment plants.

Figure 1. Ovi-cup support (left), on-ground support with suspended Faye-Prince Trap (center), and in-ground support with suspended CDC EVS CO_2 trap (right).