**FINAL REPORT**

# 2007 KAZ Inc. Innovations Mosquito Trap Evaluation Study

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## PURPOSE[1]

The aim of this study was to compare the mosquito-trapping prowess of the Kaz, Inc. Stinger Mosquito Vacuum with the Mosquito Magnet Defender and two different power configurations of the Mosquito Magnet X trap. This study was designed to compare the numbers and species caught and not to assess mosquito control efficacy.

## MATERIALS AND METHODS

*Study Site:*

The project was performed on a 10-acre peninsula surrounded by salt marsh on the campus of the Public Health Entomology Research & Education Center (PHEREC) of Florida A&M University located on the St. Andrews Bay in Panama City, Florida.

*Study Design:*

The following traps were randomly assigned in a Latin-square design one trap/location to four sites spaced over 300 ft apart:

1. Kaz Stinger Mosquito Vacuum + propane combusted $CO_2$ + octenol & lactic acid (hereafter referred to as Stinger)
2. Mosquito Magnet Defender (hereafter referred to as Defender) + propane combusted $CO_2$ + octenol
3. Mosquito Magnet X + $CO_2$ + octenol + live oak leaf infusion + a/c power (hereafter referred to as MM-X A/C)
4. MM-X + $CO_2$ + octenol + live oak leaf infusion + d/c power (hereafter referred to as MM-X D/C)

Traps were operated from 3:00 p.m. until 8:00 a.m. the following morning. Pressurized $CO_2$ gas was delivered at a rate of 200 ml / min for the MM-X traps, while the Stinger and Defender traps generated $CO_2$ via propane combustion as designed by the manufacturer. Infusion water was supplied to the MM-X traps by filling a dishpan half full with well water containing dried live oak leaves. The dishpan was sunken into the ground directly beneath the trap up to the pan lip. Additional attractants (i.e., octenol and lactic acid) were supplied according to manufacturer operating directions. The traps were rotated in a clockwise pattern from site to site until three good replications were obtained. A complete rotation through all trapping sites was considered a replication. Trap runs were repeated when equipment failed to operate properly or when unsuitable weather or poor/excessive trap catches occurred. Each trap operated a total of twelve times, three times at four trap sites. Good trap runs were conducted on: August 20-23, August 27 & 28, September 6 & 7, September 24 & 25, September 27 and October 4, 2007. Trap contents were collected each morning around 8 a.m., sorted, identified to species, counted and entered into an EXCEL database. Weather data were recorded for each day of the study from the Panama City International Airport located within a half mile from the study site.

[1] The findings in this report do not represent an endorsement or recommendation for or against the traps tested, referred to, or not mentioned in this study by Florida A&M University.

*Data Analysis:*

Total mosquitoes collected by trap and species abundance by trap were charted using Microsoft Excel 2000 pivot tables and charting functions. Analysis of variance was conducted on log-transformed data and tested for statistical differences between traps using SAS PC.

## RESULTS

*Environmental Data*:

Conditions during the study are presented in Table 1. Temperatures ranged from 72 – 80º for lows and 89 -100 º for highs. Precipitation was zero for all but two days, and on those days, rain was very light. Wind speed ranged from 3.3 – 7.0 mph. Although not indicated in the table, humidity averaged between 70-80%. In general, conditions were ideal for the trap study.

**Table 1. Climatological data for each day traps were operated during 2007.**

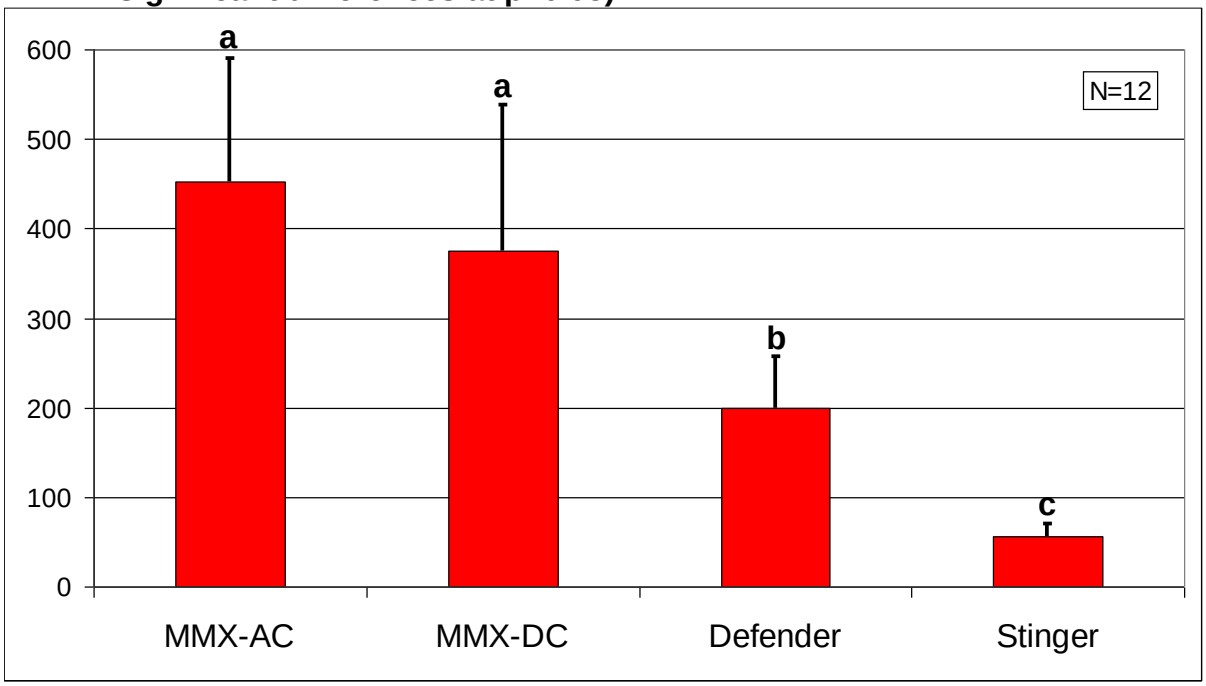
LOCAL CLIMATOLOGICAL DATA FROM PANAMA CITY AIRPORT (SOURCE: NOAA)
LATITUDE: 30 12 N LONGITUDE: 85 41 W

| | TEMPERATURE IN F: | | | | | | :PCPN: | SNOW: | WIND | | | | :SUNSHINE: | | SKY | | :PK WND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6A | 6B | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | | | | | | | | | | AVG | MX | 2MIN | | | | | | |
| DAY | MAX | MIN | AVG | DEP | HDD | CDD | WTR | SNW | DPTH | SPD | SPD | DIR | MIN | PSBL | S-S | WX | SPD | DR |
| August | | | | | | | | | | | | | | | | | | |
| 20 | 93 | 77 | 85 | 5 | 0 | 20 | 0.07 | 0.0 | 0 | 5.1 | 14 | 180 | M | M | 3 | | 18 | 230 |
| 21 | 94 | 78 | 86 | 6 | 0 | 21 | 0.00 | 0.0 | 0 | 4.3 | 14 | 210 | M | M | 1 | | 18 | 200 |
| 22 | 100 | 77 | 89 | 9 | 0 | 24 | 0.00 | 0.0 | 0 | 4.6 | 12 | 230 | M | M | 1 | | 15 | 230 |
| 23 | 91 | 80 | 86 | 6 | 0 | 21 | 0.00 | 0.0 | 0 | 4.6 | 23 | 50 | M | M | 1 | | 31 | 40 |
| 27 | 92 | 76 | 84 | 5 | 0 | 19 | 0.00 | 0.0 | 0 | 3.5 | 12 | 240 | M | M | 2 | | 17 | 250 |
| 28 | 91 | 76 | 84 | 5 | 0 | 19 | 0.29 | 0.0 | 0 | 3.3 | 13 | 40 | M | M | 3 | 13 | 17 | 110 |
| September | | | | | | | | | | | | | | | | | | |
| 6 | 93 | 77 | 85 | 6 | 0 | 20 | 0.00 | 0.0 | 0 | 6.7 | 15 | 110 | M | M | 5 | | 21 | 100 |
| 7 | 93 | 75 | 84 | 5 | 0 | 19 | T | 0.0 | 0 | 6.0 | 15 | 80 | M | M | 2 | | 22 | 80 |
| 24 | 90 | 72 | 81 | 6 | 0 | 16 | 0.00 | 0.0 | 0 | 5.3 | 13 | 60 | M | M | 3 | | 22 | 70 |
| 25 | 90 | 73 | 82 | 7 | 0 | 17 | 0.00 | 0.0 | 0 | 7.0 | 16 | 70 | M | M | 2 | 8 | 23 | 40 |
| 27 | 89 | 73 | 81 | 7 | 0 | 16 | 0.00 | 0.0 | 0 | 4.3 | 14 | 260 | M | M | 1 | 1 | 18 | 270 |
| October | | | | | | | | | | | | | | | | | | |
| 4 | 89 | 75 | 82 | 11 | 0 | 17 | 1.30 | 0.0 | 0 | 6.7 | 16 | 90 | M | M | 5 | 1238 | 20 | 90 |

*Trap Catch Comparison:*

The total number of mosquitoes caught by trap is presented in Figure 1. The MM-X traps powered by either a/c or d/c collected significantly ($p<0.05$) more mosquitoes than the Defender and Stinger. The Defender collected significantly ($p<0.05$) more mosquitoes than did the Stinger. There was no significant difference ($p>0.05$) between the two MM-X traps.

**Fig. 1. Mean number of mosquitoes caught and 95% confidence limits by trap configuration (different letters represent statistically significant differences at p<0.05).**



Species composition for the four traps is presented in Figures 2-5. *Ochlerotatus taeniorhynchus*, the salt marsh mosquito, was the most abundant species collected in all traps. The Stinger collected 11 species (Figure 2), the same number as did the MM-X DC trap (Figure 5). The MMX AC (Figure 3) and Defender (Figure 4) traps collected 13 species each. The abundant species were similar for all traps. Aside from Oc. taeniorhynchus, other prevailing species were: Anopheles atropos, *Anopheles crucians*, *Ochlerotatus sollicitans*, *Culex quinquefasciatus* and various *Psorophora* spp.

**Fig. 2. Mosquito species composition and number caught by the Stinger.**

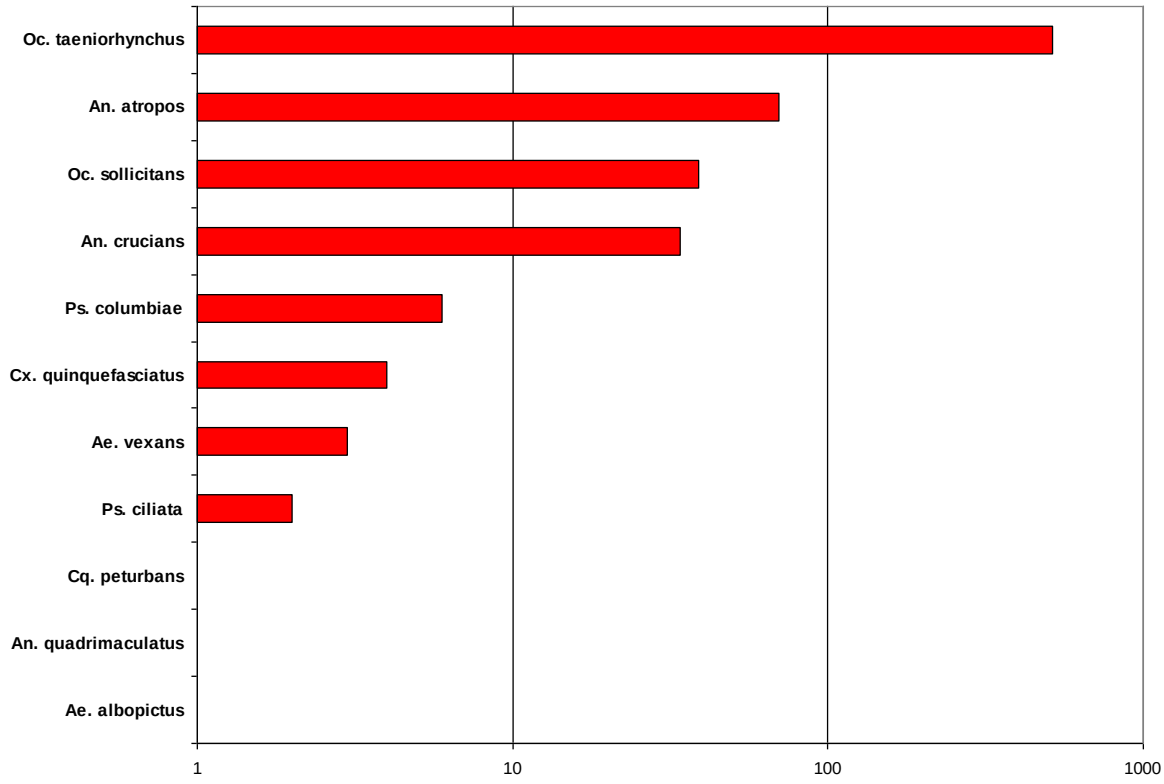


**Fig. 3. Mosquito species composition and number caught by the MM-X A/C.**

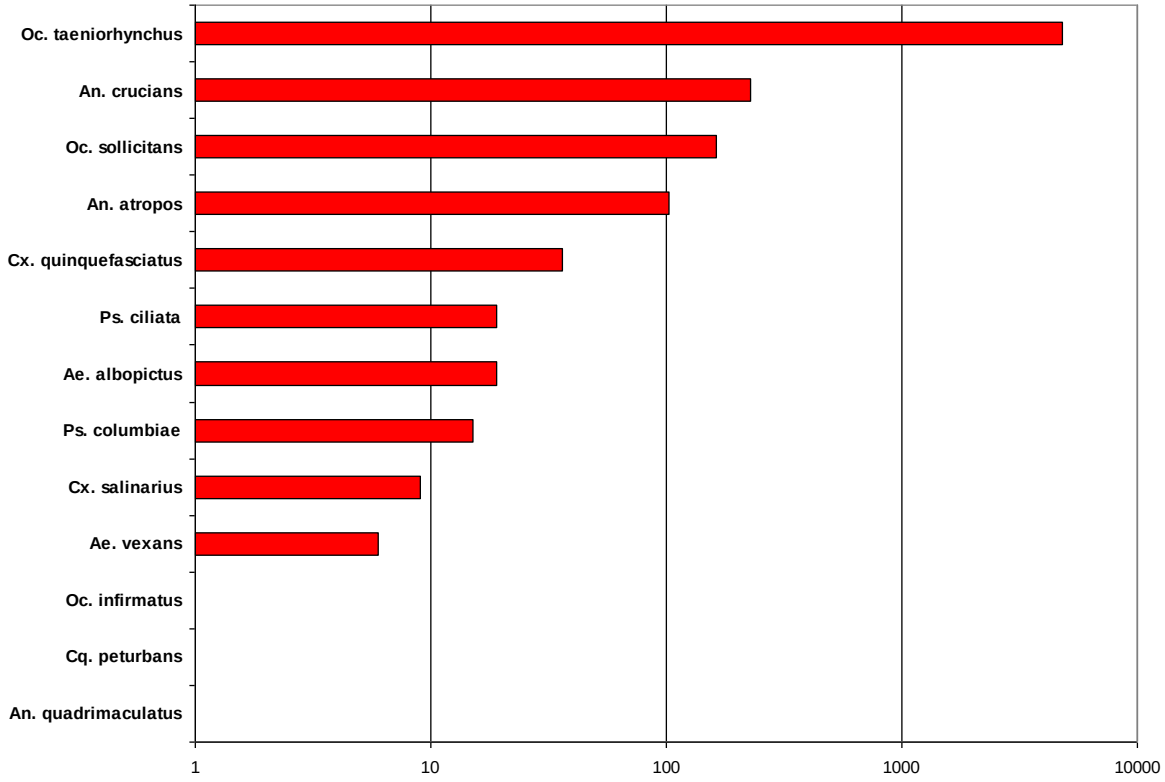


**Fig. 4. Mosquito species composition and number caught by the Defender.**

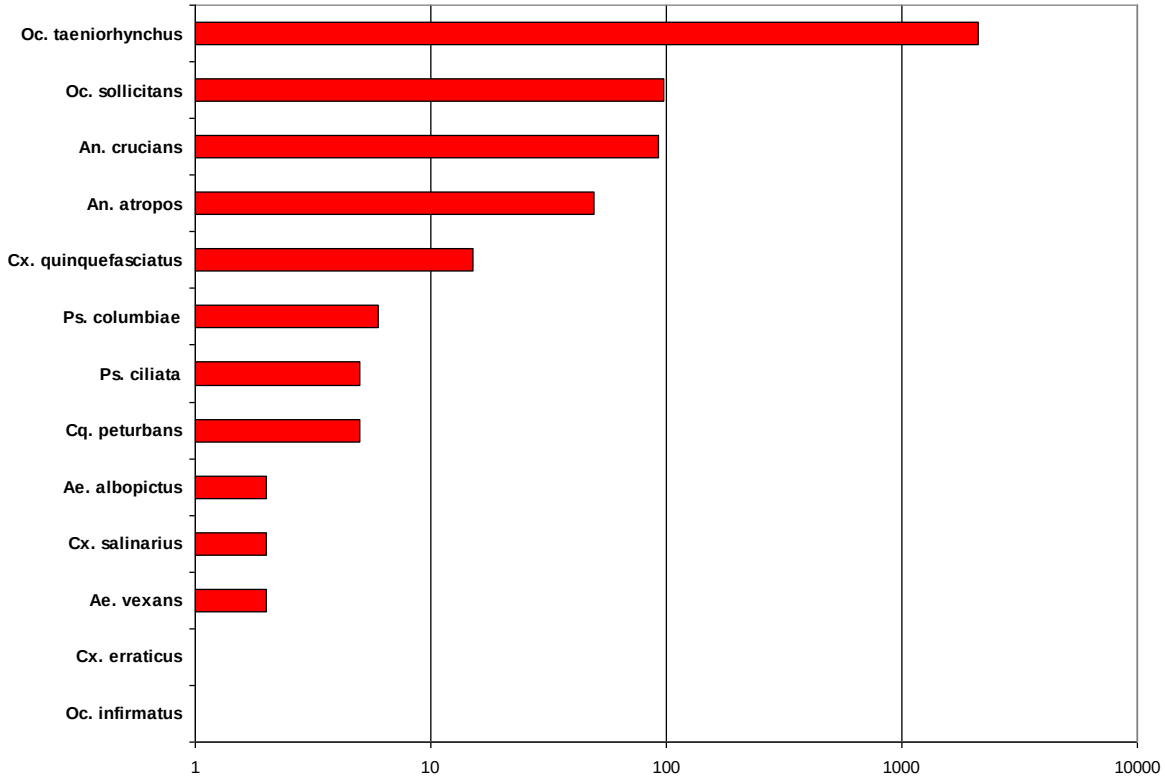
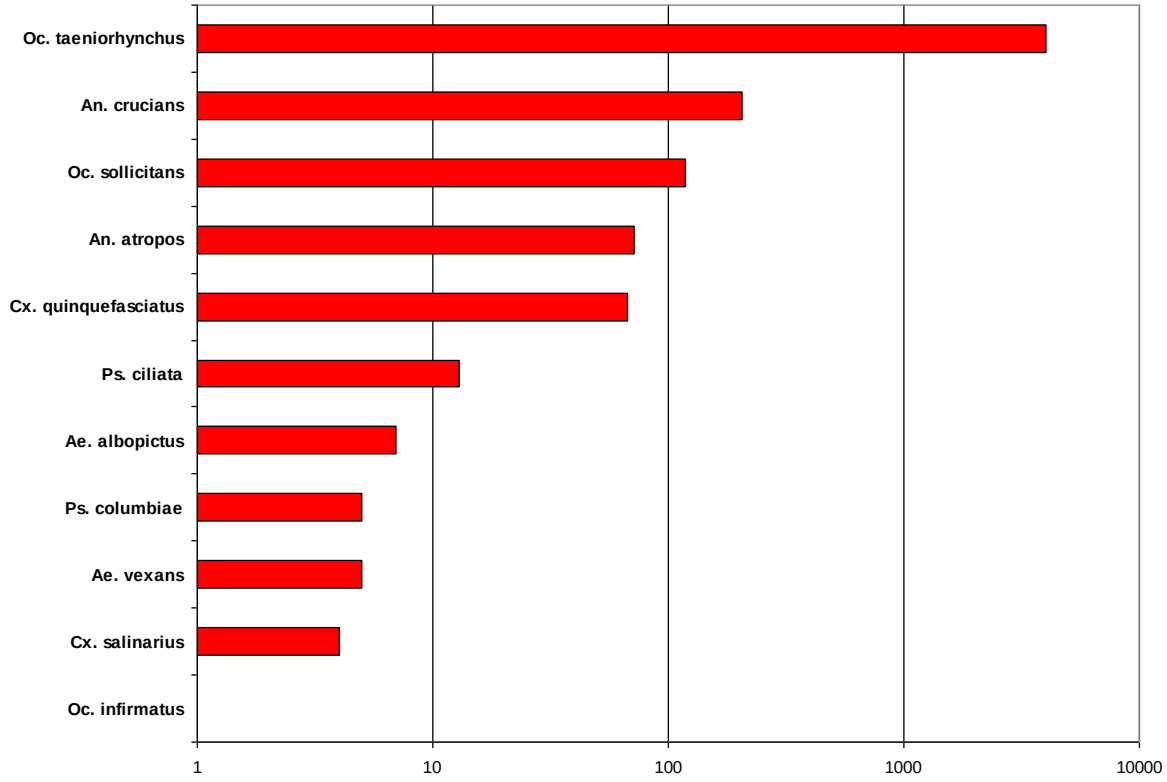


**Fig. 5. Mosquito species composition and number caught by the MM-X D/C.**




## Discussion and Recommendations

The primary purpose of this study was to evaluate the Stinger in comparison to the Defender. We also tested MM-X traps as a "golden standard" for comparison. Our past studies have shown the MM-X to be one of, if not the most powerful mosquito trap. Unfortunately, the Stinger did not perform nearly as well; however, this should not be viewed as entirely negative. Hopefully, this study will help encourage and guide improvements to the ongoing development made to the trap.

We had several suggestions that should improve operations of the Stinger as follows:

1. Installing and removing the bug basket (mosquito catch basin) involved more than Figure 6 and 7 illustrated in the operator's manual. In order to install the basket where it would align, and mount flush with the top of the vacuum head, the basket handle had to be forced in the desired direction resulting in failure of the locking mechanism. One suggestion would be to refine and simplify the locking mechanism; the other would be to use a more durable material as a substitute for the clear plastic.

2. The vacuum that this machine created was incredible, but we felt that it may be directing to much air flow away from the inlet where the mosquitoes are suppose to enter. On either side of the lure chamber there are vacuum inlets with screens that allow for incoming air to help create a vacuum, it appeared to us that the angle of these baffles would probably help mosquito collection if they where slanted down instead of slanting up. We think this might aid in the amount of suction generated toward the inlet of the collection area.

3. The only other problem we encountered concerned maneuverability of the trap. The machine was a little on the heavy side, even with the tank removed. We suggest wheels under the propane end of the trap and a tall collapsible handle for ease of movement.

It is our opinion that these changes would not only improve the catch rate, but also marketability of this trap.