258: Enhancing Invasive Species Monitoring at Hawaii's Airports

By Leyla V Kaufman.

Hawaii Invasive Species Council (HISC). Pacific Cooperative Studies Unit (PCSU).

Invasive Species in Hawaii

• Hawaii's geographic isolation provides a natural protection for species invasions. However, the increase of globalization and trade of people and goods facilitate the arrival of invasive species into the state.
• Invasive species cause detrimental effects in the economy and Hawaii's unique biodiversity. An average 20 new arthropod species become established in Hawaii each year, some of them becoming real problems in agricultural and natural settings.
• Surveillance and control of invasive species at ports of entry can prevent invasive species from establishing in local environs and also to prevent their exportation.

Mamalu Poepoe

• Mamalu Poepoe is an interagency biosecurity program funded by the Hawaii Department of Transportation. It targets six main airports statewide on the islands of Kauai, Oahu, Molokai, Maui and Hawaii (Fig.1).

Fig.1 Airports that are currently part of the monitoring program
• It brings together different agencies such as the Hawaii Department of Health (vector control branch), Hawaii Department of Agriculture, the University of Hawaii and the Hawaii Department of Land and Natural Resources (Fig. 2). The program also partners with the different Invasive Species Committees (ISC's) statewide and the Hawaii Ant Lab (HAL) for monitoring assistance.

Fig. 2. Agencies that are currently part of the Mamalu Poepoe program
• The program aims at increasing surveillance of key target pests by filling gaps in monitoring activities and providing additional support in restricted areas.
PROGRAM GOALS:
• Foster cooperation, coordination and communication among partner agencies regarding invasive species surveillance at airport facilities in Hawaii.
• Improve the state's capability to prevent invasive species introductions through systematic monitoring efforts.
• Increase security of Hawaii's people, natural resources, food supply and economy through an interagency monitoring program of incipient pests at airports.

Selected Invasive Species, Progress Made so Far

Target species include high-risk insect pests that pose human health, economic, and environmental concern.
• Mosquitoes (*Aedes* spp., *Culex* spp., *Anopheles* spp.). So far only six species of biting mosquitoes are established in Hawaii: *A. albopictus, A. aegypti*, *A. japonicus, C. quinquefasciatus and Wyeomyia mitchellii. Aedes aegypti* is confined to the Big island.
• Invasive ants (W*asmania auropunctata* & *Solenopsis invicta*). *Wasmania auropunctata* (little fire ant) is widespread on Hawaii island. Localized infestations exist on Oahu, Kauai and Maui. *Solenapsis invicta* (RIFA) is currently not present in Hawaii.
• Coconut rhinoceros beetle (*Oryctes rhinoceros*), currently confined to the island of Oahu.
• Africanized bees (*Apis mellifera scutellata*). Currently not established in Hawaii, but intercepted in 2011 in a sea cargo container.
Progressed made so far:
• Outreach presentations for airport staff about target pests and monitoring equipment to be used at airports (Fig. 3).

Fig. 3. CRB training for HNL airport staff
• Training of the different monitoring crews on different islands (Fig. 4).

Fig. 4. CRB training for the Invasive Species Committees (ISC's)
• Setting traps at all airports. Continuous monitoring started in August 2017 for most species (Fig. 5 & 6)

Fig. 5. DoA and MoMISC staff setting up swarm traps at Molokai airport

Fig. 6. Vector Control staff setting up mosquito traps at Kona airport
• The program is sponsoring mosquito trap efficacy studies on Oahu and the Big Island. These studies are led by the University of Hawaii and the HDOH Vector Control branch, respectively. These studies evaluate the effectiveness of different traps (CDC incandescent and UV light traps, BG sentinel traps, GAT traps, ovitraps) under different environmental conditions. Results from these studies will help HDOH Vector Control select the best trap combinations and trap densities at the different airports.

Progress Made so Far

• Table 1 shows the summary statistics for baited vials deployed at different airports during 2018. Hilo airport is the only site with positive detection of little fire ants (LFA). Control measures are showing reduction of positive sites in subsequent surveys. No new invasive ant species were detected during surveys.

Table 1. Summary statistics for baited vials deployed at all airports during year 2018

Airport Facility	Vials deployed	Empty vials	Vials with ants	Vials with LFA	Lost vials
Lihue (1x)	1345	582 (43%)	543 (40%)	0 (0%)	220 (17%)
Honolulu(2x)	1538	850 (55%)	686 (45%)	0 (0%)	2 (0.1%)
Molokai (1x)	125	65 (52%)	60 (48)	0 (0%)	0 (0%)
Kahului (2x)	1739	741 (43%)	932 (54%)	0 (0%)	56 (3%)
Hilo (4x)	2027	1408 (69.5 %)	507 (25%)	110 (5.4%)	2 (0.1%)
Kona (4x)	1118	791 (71%)	327	0 (0%)	0 (0%)

• Seventy swarms were intercepted from August 2017 to June 2019 (Table 2). All swarms tested negative for Africanized genes.

Table 2. Numbers of swarm traps deployed and swarms intercepted at all airports from August 2017 to June 2019

	Lihue	Honolulu	Kahului	Hilo	Kona	TOTAL
Number of swarm traps	8	14	6	14	10	50
Swarm interceptions	4	38	9	10	9	70

• Swam trap monitoring has switched from monthly in 2018 to bi-monthly in 2019 to reduce the development of brood in traps (Fig. 7), specifically drones.

Fig. 7. Comb with capped brood (A). Brood with only eggs (B)

• Table 3 shows the summary statistics of swarm colony characteristics such as presence of varroa mite, small hive beetle, presence of capped brood, uncapped brood and presence of drones or drone cells in swarm traps.

Table 3. Swarm colony characteristics for swarms intercepted in 2018 and 2019

Year	Varroa mite	Small hive beetle	Capped brood	Uncapped brood	Drones/drone cells
2018	92%	46%	86%	0%	59%
2019	100%	17%	0%	50%	50%

• More CRB traps were added at different airport facilities (Fig. 8). No CRB detections on neighboring islands (Table 4)

Fig 8. Setting CRB traps at Hilo airport

Table 4. CRB traps at the different airport facilities

	# Existing traps	# New traps	Interception
Lihue	2	6	0
Honolulu	5	8	1 (Dec 2017)
Molokai	1	3	0
Kahului	3	7	0
Hilo	6	10	0
Kona	3	9	0
TOTAL	20	43	

• *Aedes aegypti* was intercepted at Kahului airport (Maui) in November 2017. Follow up surveys suggested that this was an isolated event. No new species of mosquitoes have been detected so far on other islands.

• The program is coordinating the development of Standard Operational Procedures (SOP's) for mosquitoes and Africanized bees at airports.

• The program is also funding an economic analysis of increased surveillance at airports. The study is lead by UH and looks at costs of systematic monitoring for invasive species versus cost of inaction.

Program End Products

• Monitoring protocols for all target species.
• SOP’s and response protocols for new detections in place.
• Strong partnerships and increased interagency collaboration.
• New monitoring technology evaluated.
• Results from this program will inform DOT whether or not it makes economic sense to invest in pest monitoring vs. no monitoring and having to control for them once they get established.