

INTRODUCTION

The Hawai`i Ant Lab (HAL) is a project of the Pacific Cooperative Studies Unit (PCSU), University of Hawaii. HAL is jointly funded by the Hawaii Invasive Species Council (HISC) and the Hawaii Department of Agriculture. This report relates to DLNR contract C01440 (PCSU account 4504900).

PROJECT SUMMARY

The Hawai`i Ant Lab has a statewide mission to prevent or manage invasive ants in Hawaii. It is a point-of-contact for the public, conservation agencies, the HISC and Island ICS specifically on any matter involving identification and control of invasive ants. The HAL is developing a regional and global reputation as a center of excellence and cutting-edge research on biosecurity, pest ant management and ant taxonomy. HAL has creatively used HISC funds to leverage additional grants and build a strong state and regional capacity for incursion and established pest management. Daily established pest services provided by the Hawai`i Ant Lab include the following:

- Manages and assists with invasive ant control and eradication projects statewide.
- Operates and maintains a telephone contact service for members of the public.
- Provides a diagnostic service to members of the public and other conservation agencies.
- Develop, update and promote the www.littlefireants.com website.
- Produces “fact sheets” providing practical advice to residents and industry.
- Provides ongoing advice, expertise and assistance to island invasive species committees as needed.
- Works with Hawai`i County to manage Little Fire Ants in public access areas.
- Regular speaking engagements to associations and societies, public displays.
- Conduct regular training days for residents and industry groups.
- Provides training in identification, awareness and control practices to other agencies such as island ISCs, Hawai`i Department of Agriculture and DLNR.
- Manages new detections of LFA on neighbor islands, develops and implements eradication plans for these.
- Conducts an extensive program on Hawai`i Island to detect, prevent and mitigate infestations that threaten public safety or act as vectors for inter-island spread of invasive ants.
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PROJECT OUTCOMES

Operations

In 2019, HAL operations personnel deployed and identified 19,996 survey vials in 34 surveys; 11,165 at points of entry in 20 surveys and 8,831 in 14 surveys at eradication projects on Oahu, Maui and Kauai (Table 1). LFA have been detected at least once at every port on the big island. At Kona airport and Kawaihae seaport, these detections are infrequent. Hilo seaport is largely uninfested but small colonies are found on every survey. These are treated as they are detected. Hilo airport is extensively infested. The entire airport is prophylactically treated as well as being surveyed every three months. A total of 55 treatment events were conducted: 16 at points of entry and 39 at eradication projects statewide (Table 2)

Table 1. Details of 2019 Point of Entry survey activities on Hawaii Island and neighbor islands.

Location	Target	Q1&2		Q3&4		Total	
Big island							
		#surveys	#vials	#surveys	#vials	#surveys	#vials
Hilo Airport (ITO)	4	2	1,747	2	1,622	4	3,369
Hilo Seaport (HSP)	4	2	788	2	1,022	4	1,810
Kawaihae (KSP)	2	1	265	1	231	2	496
Kona Airport (KOA)	2	2	557	1	377	3	934
Subtotal	12	7	3,357	6	3,252	13	6,609
Neighbor islands							
Maui Airport (OGG)	2	2	799	1	810	3	1,609
Kauai Airport (LIH)	1	00	00	1	1,020	1	1,020
Oahu Airport (HNL)	2	1	924	1	918	2	1,842
Molokai Airport (MKK)	1	00	00	1	85	1	85
Subtotal	6	3	1,723	4	2,833	7	4,556
Eradication projects							
PCC		00	00	3	2,119	3	2,119
Hakipuu/Kualoa		1	1,265	00	00	1	1,265
Kauai/ Kahiliwai		00	00	1	1,591	1	1,591
Makiki Heights		00	00	1	1,095	1	1,095
Lanikai		00	00	2	546	2	546
Pauoa Vally		00	00	2	494	2	494
Ahuimanu		3	810	00	00	3	810
Kaneohe/Alokaahi st.		1	911	00	00	1	911
Subtotal		5	2,986	9	5,845	14	8,831
Total		15		19		34	19,996

Table 2. Treatment metrics for Hawaii island and eradications on neighbor islands

Location	Target	Q1&2		Q3&4		Total	
Big island treatments							
Hilo Seaport (HSP)	8		4		4		8
Hilo Airports (ITO)	8		4		4		8
Neighbor islands¹							
PCC	1		00		00		00

¹ Site names indicate the general area where treatment occurred and are only indicative of location

Kualoa	8	00	3	3
Makiki Heights	8	00	2	2
Lanikai	8	1	4	5
Pauoa Vally	8	00	2	2
Kaneohe/Alokaahi st.	8	4	4	8
Ahuimanu	8	4	4	8
Waimanalo	8	4	4	8
Nahiku	8	00	3	3
Total		21	34	55

Extension and training

HAL receives ant samples for identification, e-mails, and calls on an almost daily basis for community assistance (Table 2). The entire team is constantly assisting the public in choosing prevention and management strategies that best fit their particular situation. Extension crew specific activities also include managing booths at events and presentations to detailed trainings and site assessments for community members as well as various industries (Table 3). These site assessments, presentations and booths are held all across Hawaii Island and occasionally on other islands in support of their outreach programs. Booths and presentations at events are less targeted, however most attendees are allowed to ask questions and contact us after for specific advice. The extension team's primary focus for 2019 was farming, landscaping, nurseries, and other industry activities. For farmers, nurseries, and other industry we perform site assessments and give specific feedback and best management plans to those members

Table 2. public contact metrics for HAL for 2019.

	2019 target	Q1	Q2	Q3	Q4	west Hawaii ²	Total
public calls and emails	700	157	153	142	180	279	911
public walk-ins		59	68	60	81	133	401
public ant samples	300	205	130	346	100	364	781
website visits ³	5000				-		9601
interaction at presentations	1,500	342	1316	473	430	-	2561
Ant management clinic participants	100	18	23	31	19	-	91
total	2511	781	1690	1052	810	776	13,934

² West Hawaii data are for the period 3 June to 31 Dec

³ This does not represent the number of users because the new reporting system only counts page views.

Table 3. HAL extension and training events in 2019

Date	Group	Type of outreach	# people
1/21/2019	HTFG Kona Meeting	Presentation	22
1/25/2018	AMC	Training	5
2/4/2019	What's Shakin' Farm Site	Training	1
2/6/2019	Rebels' Roost Farm Site Assessment	Training	1
2/22/2019	AMC	Training	3
2/23/2019	Avocado Festival	Booth	60
2/25/2019	OK Farms Site Assessment	Training	1
2/28/2019	Volcano Isle Fruit Co. Site Assessment	Training	3
3/8/2019	BIAN	Booth	100
3/9/2019	BIAN	Booth	100
3/13/2019	Hamakua Macnuts Assessment	Training	1
3/29/2019	AMC	Training	3
3/30/2019	Kona coffee farmers association event	Booth	60
4/11/2019	Markley farm Assessment	Training	2
4/11/2019	Ulu cooperative meeting	Presentation	3
4/11/2019	ISC Planning Workshop	Training	11
4/13/2019	Cacao Festival (Hilo)	Booth	70
4/15/2019	Home Depot	Presentation	11
4/15-4/18	Foresters of the Pacific	Presentation	75
4/20/2019	Farm Supply Coop annual meeting/ sale	Booth	30
4/24-27/2019	Merrie Monarch	Booth	500
4/26-29/2019	Airport booth for MM	Booth	50
4/26/2019	UH Earth Day	Booth	150
4/29-5/2/2019	International Society for Arboriculture	Booth	200
5/10-5/11/2019	Kona Orchid Show	Booth and Presentation	105
5/31/2019	AMC	Training	10
6/22/2019	Kaumana City Community Meeting	Presentation	12
6/28-6/30/2019	Hilo Orchid Show	Booth	110
7/26/2019	AMC	Training	13
8/9/2019	Fiji Biosecurity visitors	Training	3
8/20/2019	Mauna Kea Cacao Site Assessment	Training	1
8/22/2019	Invasive Species Conference	Presentation	80
8/22/2019	Invasive Species Conference	Presentation	80
8/23/2019	AMC	Training	14
8/30/2019	BIAN	Booth	50
8/31/2019	BIAN	Booth	75
9/7/2019	Taste of the Hawaii Range	Booth	50
9/13/2019	MIDPAC	Booth	35
9/20/2019	AMC	Training	3
9/28/2019	HTFG Conference	Booth	100
10/1/2019	Pacific Aina Management	Training	2

10/2/2019	Macnut Farms Site Assessment	Training	2
10/14/2019	LICH Conference	Booth	100
10/15-16/2019	Hawaii Agricultural Conference	Booth	100
10/22/2019	Hawaii Global Nursery Site Assessment	Training	1
10/24/2019	Kona LFA forum	Presentation	60
10/25/2019	HILA Conference	Booth and Presentation	80
10/25/2019	AMC	Training	11
10/26/2019	Dry Forest Run	Booth	20
10/30/2019	Johnson Family Farm Site Assessment	Training	2
11/9/2019	Kona Coffee Festival	Booth	60
11/22/2019	AMC	Training	8
11/29/2019	Alta Fea Farms Site Assessment	Training	3

Research and Development

For 2019, the research and development team have focused on developing and testing organic bait formulations and identifying specific industry needs as related to specialty crops.

Highlights

Two new bait products with OMRI potential, Firefighter and Antixx, were registered for use in Hawaii in September 2019. We worked with the manufacturer to evaluate product (Firefighter) efficacy via field trial and comparison against an industry standard (Siesta). Treatments were applied every 28 days between September and November 2019 and LFA activity was measured 1, 3, 5, 7, 14, and 28 days after treatment. The results indicated a reduction of ants in plots treated with Firefighter and Siesta over the course of the experiment (Fig 3).

Publications

We published one manuscript and had another accepted for publication in 2019

- Published: Montgomery, M.P., et al., *Laboratory evaluation of egg whites and milk external biomarkers for Wasmannia auropunctata (Hymenoptera: Formicidae)*. Journal of Insect Science, 2019. **19**(6): p. 1-5.
- Accepted: Montgomery, M.P., et al., *The effects of laboratory rearing diet on recruitment behavior of Wasmannia auropunctata (Hymenoptera: Formicidae)*. Florida Entomologist, 2020. **103**(1): p. 103-111.

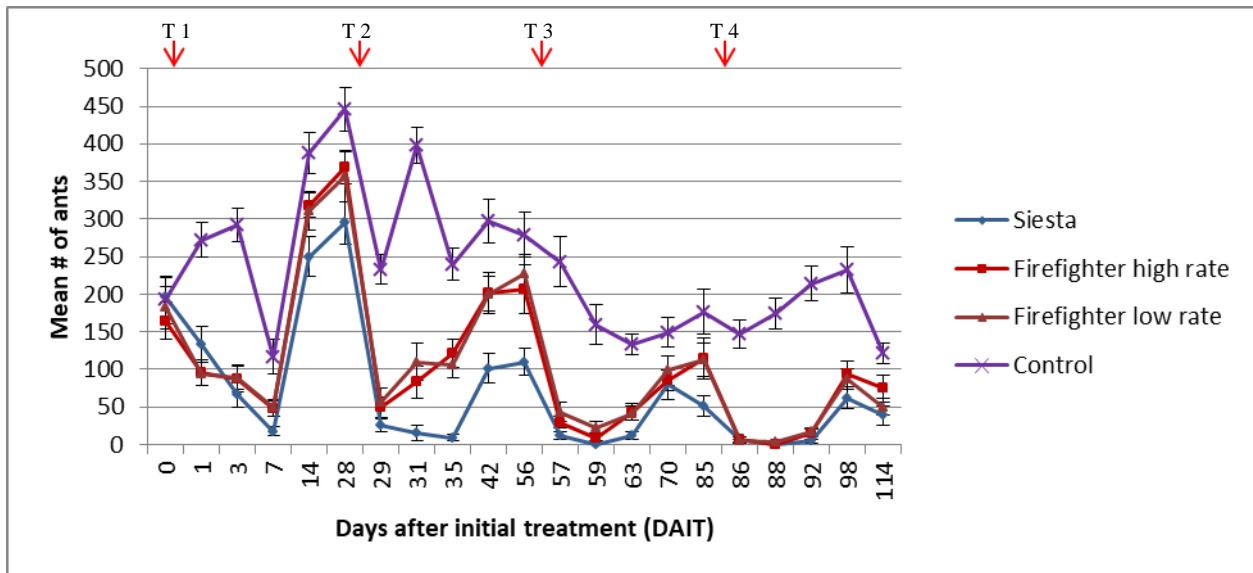


Figure 3: Little Fire Ant populations and activity steadily declined over time in plots treated with Siesta™ Insecticide Fire Ant Bait and Firefighter™ Fire Ant Bait with repeated treatments. Data points shown in the graph represent the mean number of ants per sample for each sampling measurements over the course of the experiment. Linear trend lines are displayed and reflective of overall population change over time within each treatment group. Arrows with above alpha-numeric labels indicate each treatment event

Other Experiments

We conducted numerous experiments in 2019 including various preliminary screening and trials for main experiments. The other main experiments conducted and not mentioned above are

- Laboratory evaluation of 3 insect growth regulators: The HAL gel bait with methoprene, pyriproxyfen, and azadirachtin were evaluated in the laboratory for efficacy over the course of 4.5 months (140 d). Results showed baits with methoprene and pyriproxyfen were more effective than bait with azadirachtin and the control. Since azadirachtin baits appeared to be repellent (thus ineffective), further testing is recommended to determine a proper concentration of azadirachtin for use in LFA bait.
- Organic treatment trial: Two barrier/repellent products (Captiva [garlic oil] and cedar shavings) and 2 baits (the HAL gel bait with neem oil and spinosad) were evaluated in the laboratory for efficacy. Results suggested neither barrier/repellent products tested were effective at deterring LFA from the foraging area of experimental containers. The HAL gel bait with spinosad was effective at killing LFA, confirming results from previous studies; however, similar mortality was observed from neem oil bait and the control.