

Survey for Little Fire Ant (*Wasmannia auropunctata*) on the Island of Maui, Hawaii

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Photograph of *Wasmannia auropunctata* by April Nobile (AntWeb)

INTRODUCTION

The little fire ant (LFA), *Wasmannia auropunctata*, is a common tramp ant species native to Central and South America (Holway *et al.* 2002). It is one of the five ants included in the list of the world's 100 worst invaders (www1). There are several negative impacts associated with LFA infestations. They are able to establish rapidly in disturbed areas. They out-compete and reduce native invertebrates and vertebrates (www1). There have been reports from several areas of widespread blindness in domestic and native animals caused by LFA stings (Wetterer and Porter 2003). LFA is also a nuisance to humans, due to its painful sting, and can be a household pest, an agricultural pest, and a greenhouse pest in temperate climates (Wetterer and Porter 2003).

Through human commerce and trade, this small stinging ant has spread throughout tropical regions of the world including Africa, North and South America, islands of the Caribbean, such as the West Indies, and islands of the Pacific, including the Galapagos, New Caledonia, the Solomon Islands, Tahiti, and Hawaii (www1).

LFA IN HAWAII

In Hawaii, LFA had been previously intercepted, but not established, as early as 1930 (Swezey 1945). LFA was first found to be established in the state of Hawaii in March 1999 in the Puna District on the island of Hawaii (Conant *et al.* 1999).

Island of Hawaii

Specimens of an unknown ant were submitted to the Hawaii Department of Agriculture (HDOA) by a resident who was stung in their home in March 1999. The ants were determined to be LFA. Conant *et al.* (1999) report that in April 1999, there were 3 separate infestations in the Puna District. By 2002, there were 20 known infestations. By 2004, Krushelnycky *et al.* (2005) reported that there were 31 populations covering over 76 hectares (188 acres). Many of these infestation sites include nurseries, farms, and orchards. It was found that LFA were being dispersed by movement of infested potted plants.

Island of Kauai

Months after LFA was discovered on the island of Hawaii in early 1999, a container of plants were shipped from an infested nursery to the island of Kauai (Null and Gunderson 2006). Suspecting that LFA could have been transported, HDOA personnel conducted a survey of the property, located near Kilauea, Kauai, and confirmed their suspicions as LFA was found to be present (Null and Gunderson 2006).

An eradication project was initiated on the 20 acre site and was thought to be successful as of 2000 (Null and Gunderson 2006). However, during monitoring in 2003 by the Kauai Invasive Species Committee (KISC), LFA was again found to be present and the

area of infestation had grown (Null and Gunderson 2006). Eradication efforts were resumed in 2004. To date, the site is monitored and treated biannually. It is believed that while eradication has not yet been achieved that the infestation is contained and has not yet spread to other areas.

From 2004-2006 an island wide survey was conducted on Kauai targeting nurseries, resorts, golf courses, and other areas that received shipments from infested areas of the island of Hawaii. To date, LFA has not been encountered at any other site on Kauai, other than the original site (Null and Gunderson 2006).

Island of Maui

To date, no LFA have been found to be established on the island of Maui. However, it is known that shipments from infested areas on the Big Island are being sent to Maui. Because of this, surveys have been conducted on Maui to try to find small populations before they become widely established.

Previous LFA surveys on Maui include a brief survey we conducted in winter 2003, surveys done by students through HOIKE curriculum, and ongoing surveys conducted at certified nurseries and ports / airports by HDOA personnel. Most recently, we conducted a survey for LFA on the island of Maui during the winter/spring months of 2006-2007.

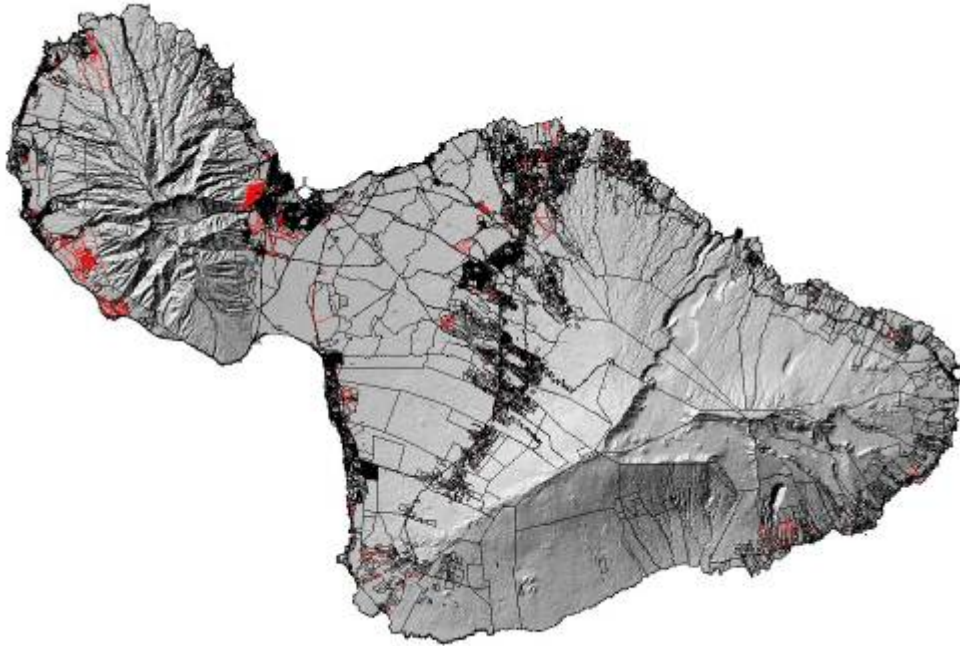
SURVEY METHODS

Methods for this survey followed protocols outlined by Conant and VanGelder (2003) which included using peanut butter baited chopsticks laid out a few meters from each other and left for about an hour, after which, ants were collected and identified.

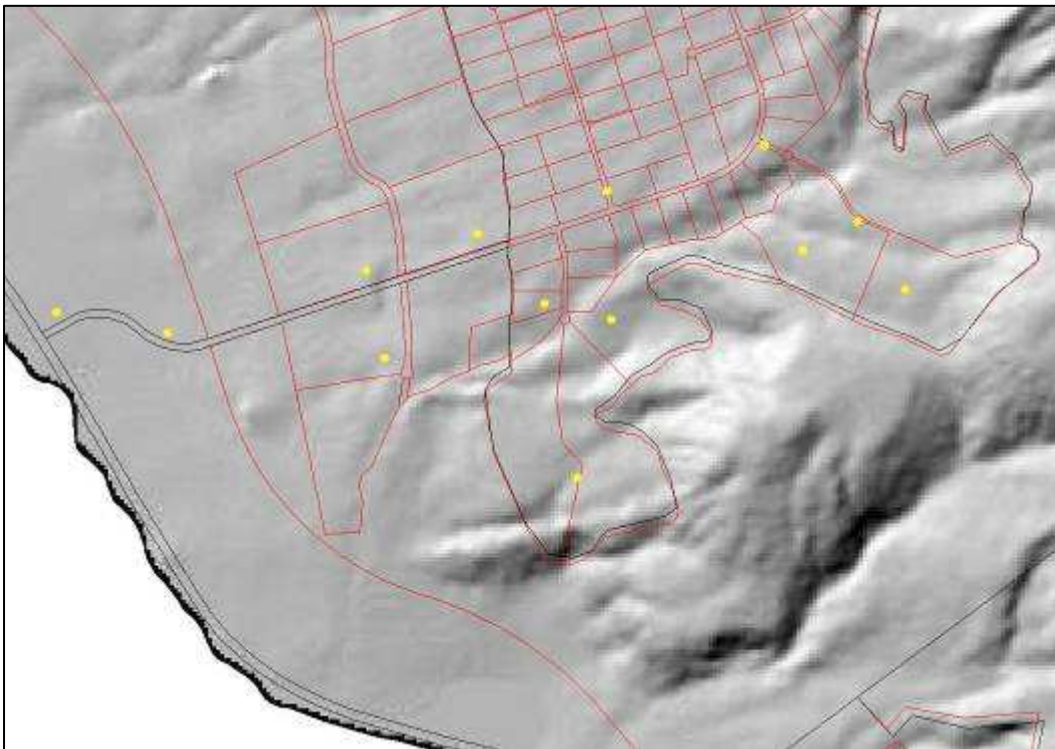
We focused our survey on high risk areas such as newly landscaped areas within new developments. To locate new developments, we used ArcView to overlay the tax map key (TMK) maps for Maui from 2000 and 2006. This showed us which land parcels had been subdivided recently. These new subdivisions generally install new plantings as part of the development process. It was these plantings where we focused our survey efforts.

Additionally, we also surveyed other high risk areas, including nurseries, gardens, and sites with plantings of species known to have been intercepted with LFA (*Caryota* palms, mondo grass). We also surveyed different habitats representing both wet and dry climates and high and low elevations.

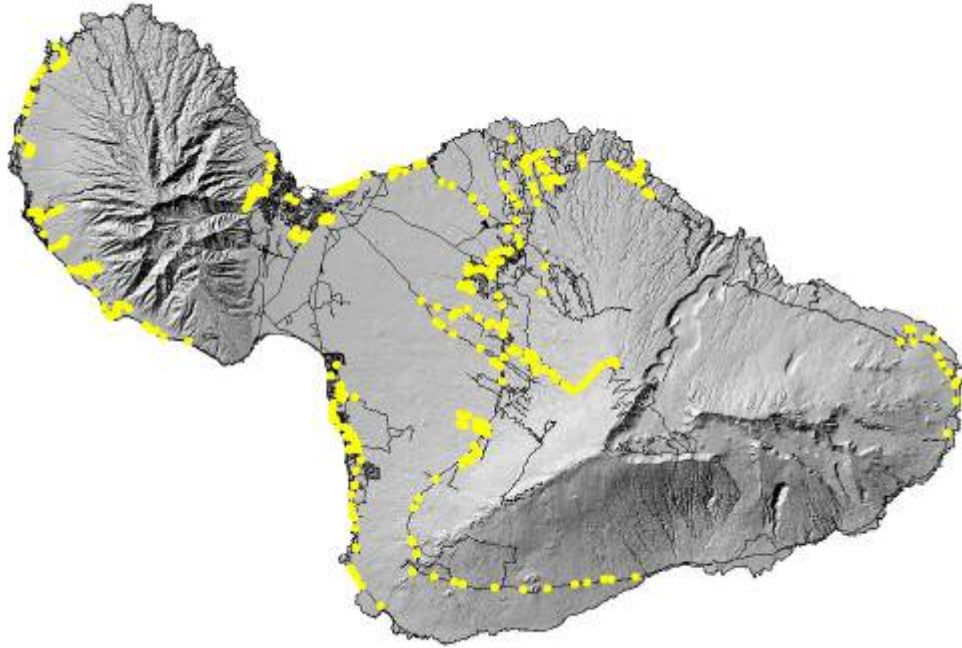
The number of sites surveyed per day was generally between 12 and 20. At each site, we recorded information about that site on a label which was placed inside a vial to be used upon retrieval of the ants. Information on each label included the date, location, GPS coordinates, site number, and collectors names. We used a Garmin etrex unit to record GPS locations and keep a track of our route to help with navigating back to our sites.



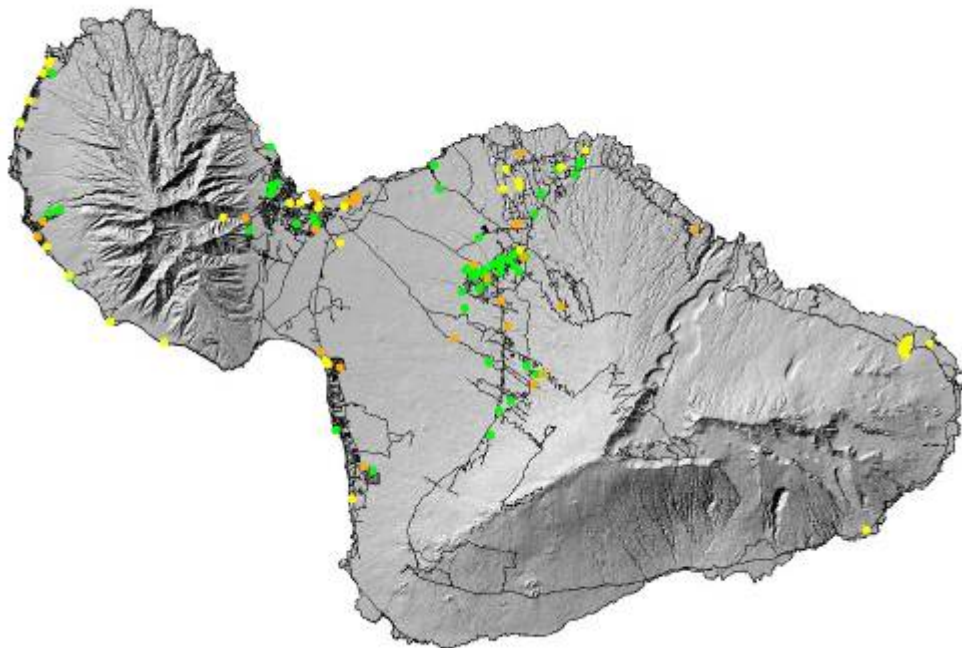
Map of subdivisions on Maui in 2000 (black lines) and new subdivisions by 2006 (red lines). The visible red areas (new subdivisions) were the primary focus of this survey.



Map of Launiupoko showing a typical new subdivision (red lines), and testing sites (yellow dots).



Map of 360 collection sites for current Maui *Wasmannia* survey.



Map of 97 collection sites for previous Maui *Wasmannia* surveys. Includes work by USGS (yellow - 2003 survey), HDOA (orange - certified nurseries and ports), and MISC (green - HOIKE curriculum).



Ants on a peanut butter baited chopstick.

Chopsticks covered lightly in Jif creamy peanut butter were used to test for presence of *Wasmannia*. Prior to use, chopsticks were cut in half and spray-painted orange on one half to make retrieval easier. At each site, we placed about 12 peanut butter baited chopsticks. Chopsticks were placed in areas that would likely harbor LFA, such as at the base of trees, near or in potted plants, in tree crotches, in leaf litter, near logs, planks, or bricks, near wet spots or water features (seeps, irrigation, etc.), and in cracks in concrete, such as sidewalks or walls.

Once the sticks were placed, we moved on to the next site. We were able to sample about a dozen sites per run, depending on terrain and distance, before our time was up and we had to retrieve the sticks.

After about an hour, we returned to the site where we started and retrieved the ants from the peanut butter baited chopsticks. We used a standard entomological aspirator to collect a representative sample of ant species from the chopsticks at that site. Ants in the vicinity of the sticks were also collected, such as those in nearby bushes, leaf litter, under rocks, or on concrete near the bait stick. Snap cap plastic 9 dram vials with ants and labels were stored in a cooler for transport back to the lab.



Collection site in newly landscaped area in new development in Kahului.

Back at the lab, ants were frozen at least overnight, then sorted and identified using a 30x power microscope (the microscope we used was sufficient for identifying most ants, but could not discern very small features), placed in smaller 5 dram plastic snap cap vials with a label, and finally put back in the freezer for storage.

Data was entered (date, site number, site description, species found, GPS coordinates) into an excel spreadsheet and maps for each species were created in ArcView. At the end of the project, ants were deposited with P. Krushelnycky for archival and further analysis.

We used several websites, such as AntWeb (www12) and a link tool developed by Will Haines (www8), as well as the current Hawaii ant key created by Neil Reimer to make determinations. Paul Krushelnycky helped calibrate our identifications by confirming a sample of our specimens early on.

RESULTS

About 18,000 ants were collected on 4,300 chopsticks at 360 sites. From these we determined 823 locations for 20+ species.

- There were no LFA or RIFA detected during this survey.
- The most commonly encountered ant was *Pheidole megacephala*, found at 55% of the sites.
- *Solenopsis geminata*, the only ant known to cause stings that welt on Maui, was not detected in "upcountry" East Maui, suggesting reports of stings in areas such as Makawao, Kula, or Haiku should be followed up on.
- *Brachymyrmex obscurior* was first detected on Maui in 1997, and is now widespread along the leeward coasts of Maui.
- Very rarely were no ants found at a site, though this did occur at a few sites (4%), especially along a stretch of Crater Rd., Kula.

Species	# of Sites	% of Sites
<i>Anoplolepis gracilipes</i>	18	5%
<i>Brachymyrmex obscurior</i>	48	13%
<i>Cardiocondyla</i> spp.	95	26%
<i>Leptogenys falcigera</i>	4	1%
<i>Linepethima humile</i>	4	1%
<i>Monomorium floricola</i>	30	8%
<i>Monomorium lilioukalanii</i>	13	4%
<i>Monomorium pharaonis</i>	26	7%
None	16	4%
<i>Ochetellus glaber</i>	68	19%
<i>Paratrechina bourbonica</i>	4	1%
<i>Paratrechina longicornis</i>	47	13%
<i>Paratrechina vaga</i>	5	1%
<i>Pheidole megacephalum</i>	199	55%
<i>Plagiolepis alluaudi</i>	21	6%
<i>Solenopsis geminata</i>	56	16%
<i>Solenopsis papuana</i>	33	9%
<i>Tapinoma melanocephalum</i>	21	6%
<i>Technomyrmex albipes</i>	8	2%
<i>Tetramorium bicarinatum</i>	14	4%
<i>Tetramorium simillimum</i>	93	26%
<i>Wasmannia auropunctata</i>	0	0%
Total sites	360	
Total locations	823	

Table showing number of sites and frequency of detection for each ant species.

CONCLUSIONS

LFA is a nuisance to humans and animals as well as an agricultural and ecological threat. LFA is known to disperse through human commerce and trade. LFA is established on the island of Hawaii, is known from a single infestation on the island of Kauai, and has yet to be detected on Maui.

Nurseries infested with LFA continue to ship inter-island, and while HDOA requires shipments to be tested for LFA prior to shipping, there is still the possibility that LFA could become, or already is, established on Maui.

Krushelnycky *et al.* (2005) report that USDA, ARS Florida had suggested to the Hawaii Ant Group that a quarantine at least as rigorous as the federal quarantine for *Solenopsis invicta* is what is needed to be successful to prevent further spread of LFA.

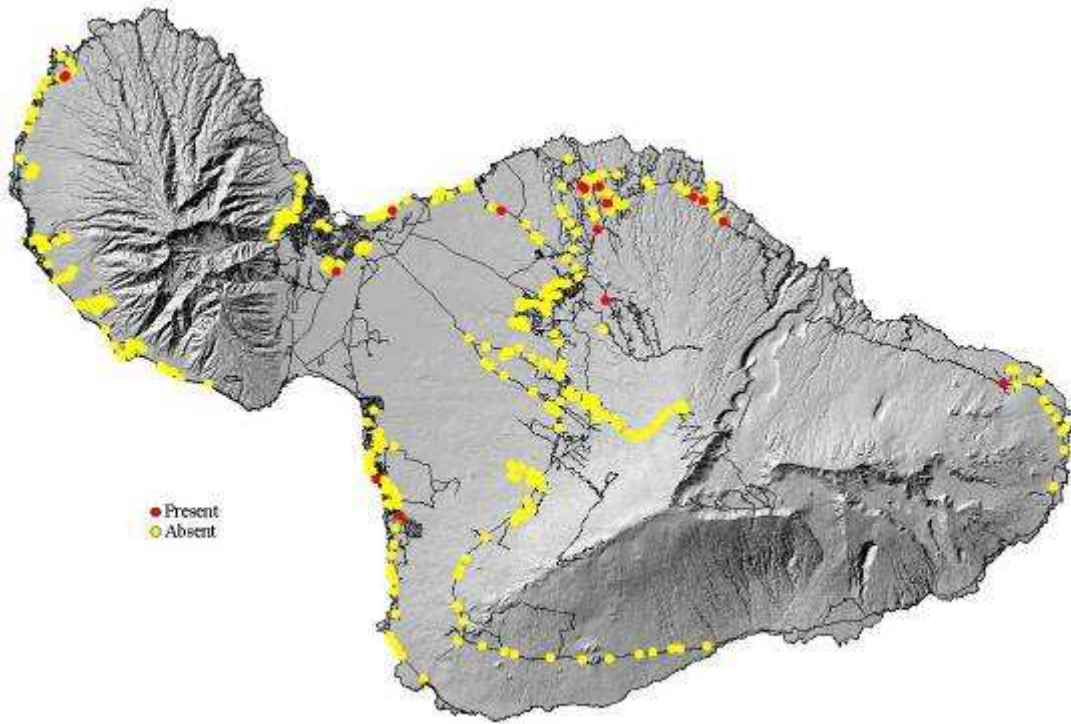
Krushelnycky *et al.* (2005) also suggest that additional surveys for LFA in high risk sights be conducted on each island.

We did not find LFA on Maui during this survey. However, there were many places we did not search and LFA could have gone undetected. Further surveys, in connection with public awareness campaigns, will help in the detection of LFA and other ants on Maui in the future.

ANNOTATED CHECKLIST

Though we did not find LFA, in the process of looking for it, we amassed distribution information for 20+ ant species. The following section provides a map, write up, and photos for each of the ant species found during this LFA survey. Each map shows all survey sites and whether an ant species was present or absent at each site. The write up for each species includes the number of sites and general location names for where it was found, a brief description of native range, worldwide distribution, impacts, previous collections on Maui from Bishop Museum's online collections database (www4), and other information. Photos for each species, generally a head and profile shot, are from AntWeb (www12).

Anoplolepis gracilipes -- Long legged ant

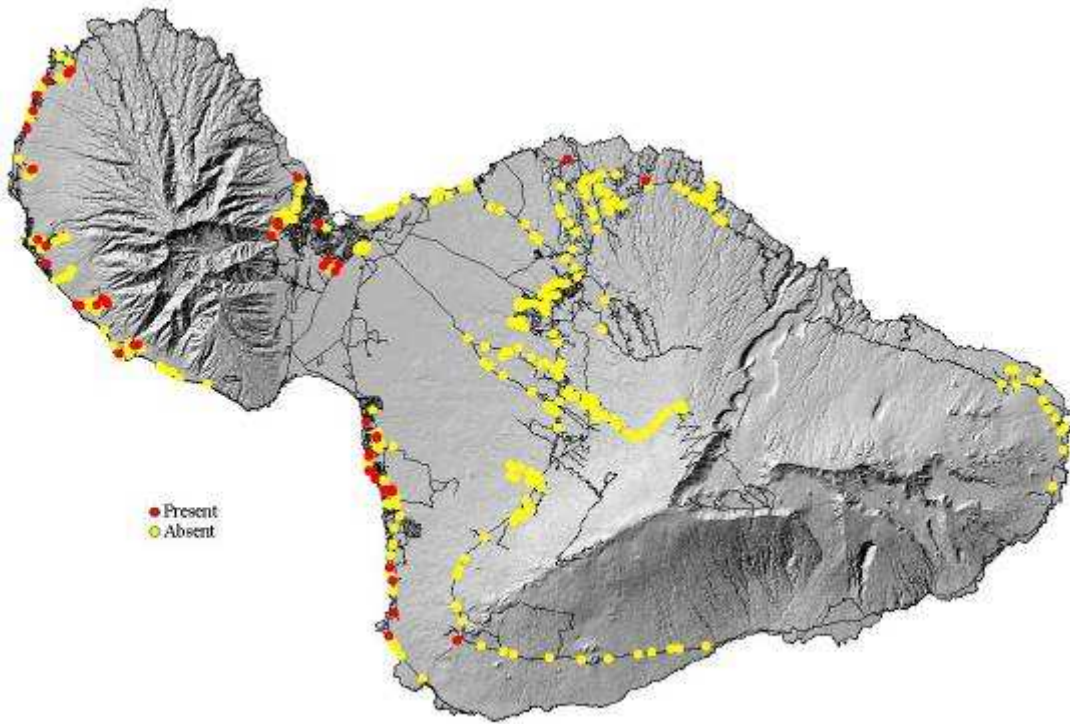


Found at 18 sites on Maui, including the areas of Kahului, Haiku, Huelo, Baldwin Ave., Makawao, Kihei, Wailea, Kapalua, and Hana. Though not greatly attracted to peanut butter, this ant was occasionally found during surveys. The native range of *A. gracilipes* is not certain, though it is thought to have originated from Africa or Asia (Holway *et al.* 2002). *A. gracilipes* is primarily a species of the lowland, tropical rainforest, and is not commonly found in arid regions or sites above 1200 m (3937 ft) in elevation (Wetterer 2005). According to the Global Invasive Species Database (www1), *A. gracilipes* is one of five ants listed among the “100 of the World’s Worst Invaders”. In the tropics and subtropics, *A. gracilipes* is a major environmental and a secondary agricultural pest, as well as a nuisance to humans. Impacts include decline of endemic species, rapid degradation of native plant and animal communities, and altered ecosystem processes (www1). In the state of Hawaii, *A. gracilipes* was first documented in 1952 (Zimmerman 1953, Krushelnycky *et al.* 2005) and is currently known from the islands of Kauai, Oahu, Maui, and Hawaii (Nishida 2002).

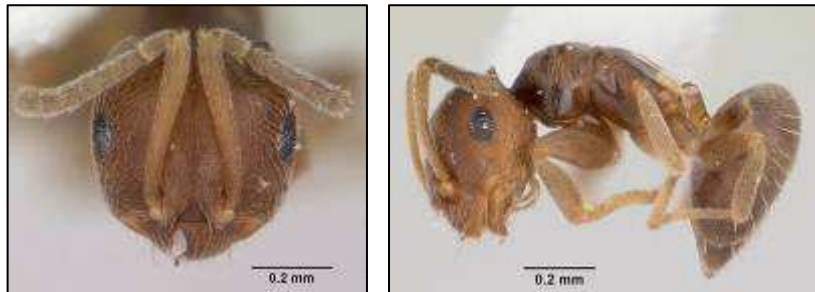


Images by April Noble (AntWeb)

Brachymyrmex obscurior -- Brachymyrmex

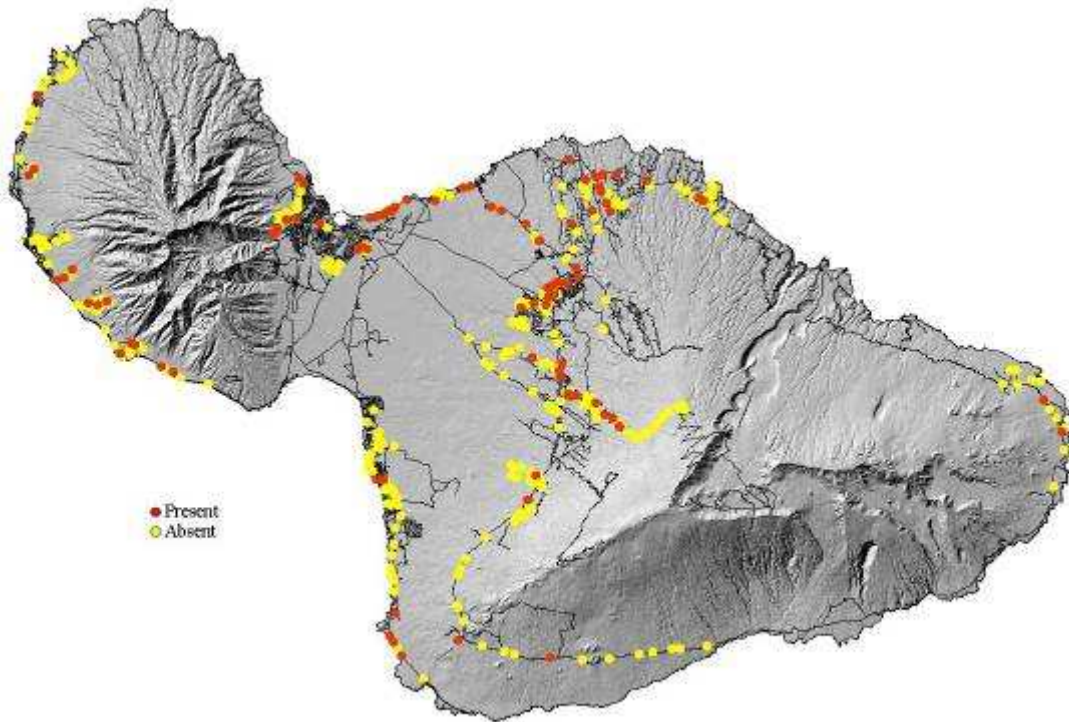


Found at 48 sites on Maui, where it was common in the lowland areas of Kihei, Wailea, Makena, Lahaina, Olowalu, Launiupoko, Kaanapali, Napili, and Kapalua, and occasional in Kahului, Waiehu, Haiku, Huelo, and Kanaio. This ant is not apparently attracted to peanut butter, but was often seen running in areas being surveyed. *B. obscurior* is native from Mexico to northern South America, and many Caribbean islands (www2). It is a widespread species that is commonly found in association with disturbed human habitats (www2). In the state of Hawaii, *B. obscurior* was first documented only once in 1914 on the island of Oahu (Timberlake 1925) and was more recently documented as established on the island of Maui in 1997 (Krushelnycky *et al.* 2005).



Images by April Noble (AntWeb)

Cardiocondyla spp. -- Cardiocondyla



Found at 95 sites on Maui in the areas of Kahului, Waiehu, Waihee, Paia, Spreckelsville, Haiku, Huelo, Baldwin Ave., Makawao, Pukalani, Kihei, Makena, Ahihi Kinau, Olowalu, Launiupoko, Puamana, Kaanapali, Napili, Omaopio, Kula, Crater Rd., Kanaio, Auwahi, and Hana. This group was difficult for us to be positive that we were identifying it to species correctly. Our microscope only had 30x magnification, which made it hard to distinguish minute features between species. In addition, according to P. Krushelnycky, the group is about to be re-evaluated in Hawaii. As a result, we lumped all *Cardiocondyla* species together. Below are descriptions for the *Cardiocondyla* spp. that were confirmed by P. Krushelnycky as encountered during our surveys. The map above is lumped to genus level.

Cardiocondyla emeryi -- Cardiocondyla

C. emeryi, possibly native to Africa, is a cosmopolitan tramp species, widespread in the tropics (Seifert 2003). In the United States, it is also known from Florida and Texas (www3). In the state of Hawaii, *C. emeryi* was first documented in 1943 (Swezey 1944, Krushelnycky *et al.* 2005) and is now known from the islands of Kauai, Oahu, Molokai, Lanai, Maui, Hawaii, Laysan, and Pearl and Hermes Atoll (Nishida 2002, www4). Previous collections from Maui (www4) include: Kipahulu, Krauss, N. L. H., 192?, Lahaina, Swezey, O. H., 1928, Wailua, Illingworth, 1926.

Cardiocondyla minutior -- Cardiocondyla

C. minutior is native to the Indomalayan region and is a cosmopolitan tramp species that is widespread in the tropics (Seifert 2003). In the state of Hawaii, *C. minutior* was first

documented in 1893 (Seifert 2003, Krushelnycky *et al.* 2005) and is now known from the islands of Necker, Kauai, Oahu, Molokai, Lanai, Maui, Hawaii, Kure Atoll, Midway Atoll, Pearl and Hermes Atoll, Laysan, and French Frigate Shoals (Nishida 2002). In Hawaii, specimens of this species were previously called *C. nuda* in error, so all previous records of *C. nuda* are now considered *C. minutior* (Krushelnycky pers comm.).

Cardiocondyla venustula -- Cardiocondyla

Native to Africa (Seifert 2003, Krushelnycky *et al.* 2005). First documented in the state of Hawaii in 1967 (Huddleston and Fluker 1968, Krushelnycky *et al.* 2005), and now known from the islands of Nihoa, Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii (Nishida 2002). *C. venustula* is considered a threat to native vertebrates and invertebrates at higher elevations on Maui and Hawaii in subalpine ecosystems (www5). Krushelnycky *et al.* (2005) reports that this species as well as a similar species, *C. kagutsuchi*, are both present in Hawaii and may be confused as they are hard to distinguish from one another.

Cardiocondyla wroughtoni -- Cardiocondyla

Native to possibly the Indomalayan region (Seifert 2003, Krushelnycky *et al.* 2005). First documented in the state of Hawaii in 1893 (Seifert 2003, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii (Nishida 2002). Collections known from Maui (www4) include: Iao Valley, Swezey, O. H., 1918.



Cardiocondyla emeryi



Cardiocondyla minutior



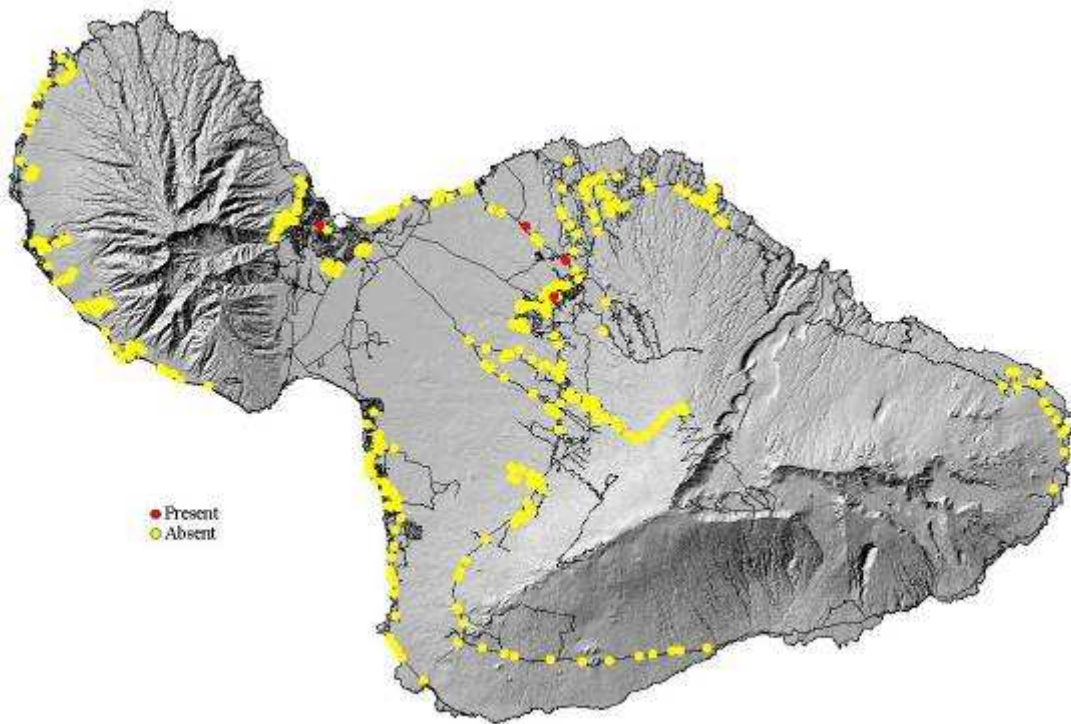
Cardiocondyla venustula



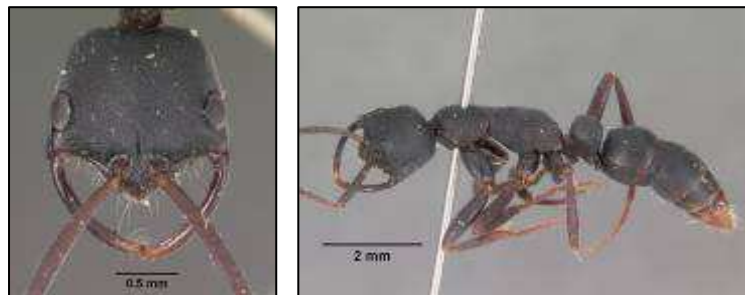
Cardiocondyla wroughtoni

Images by April Noble (AntWeb)

Leptogenys falcigera -- Leptogenys

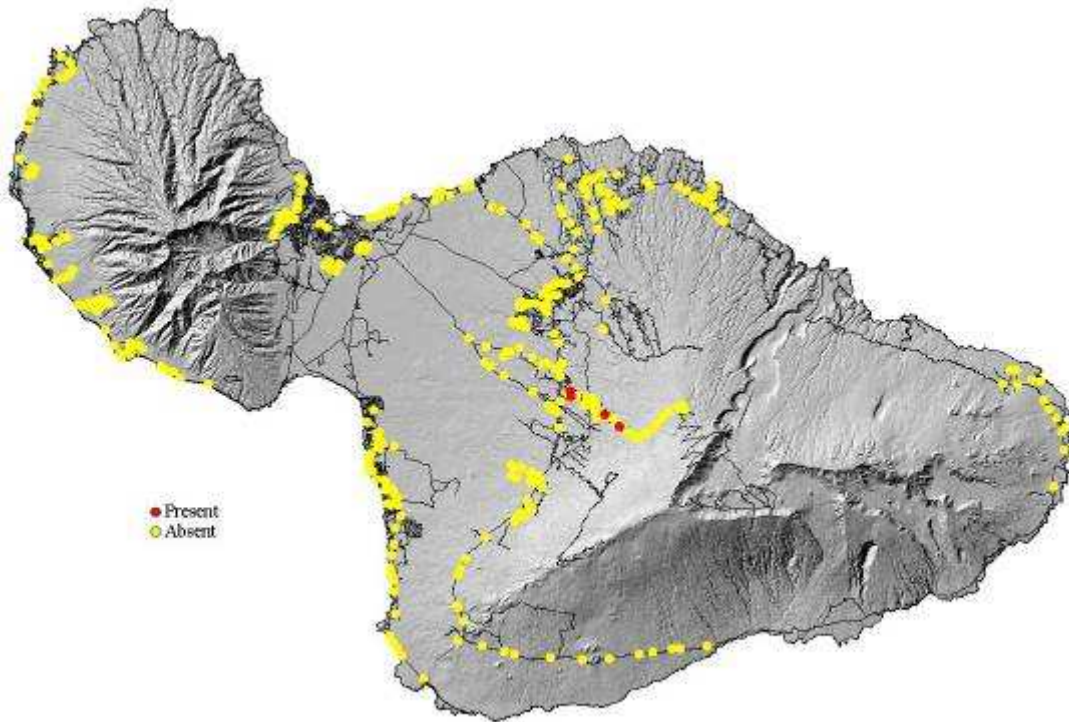


Found at 4 sites in Kahului, Baldwin Ave., and Makawao. This ant is apparently not attracted to peanut butter, but would occasionally be seen during surveys. Native to Africa (McGlynn 1999, Krushelnycky *et al.* 2005). First documented in the state of Hawaii in 1879 (Smith 1879, Krushelnycky *et al.* 2005) and now known from the islands of Niihau, Kauai, Oahu, Molokai, Kahoolawe, Lanai, Maui, and Hawaii (Nishida 2002, Starr *et al.* 2004). Previous collections from Maui (www4) include: Olinda, Krauss, N. L. H., 1932; Wailuku, Perkins, R. C. L., 1894.



Images by April Noble (AntWeb)

Linepethima humile - Argentine Ant

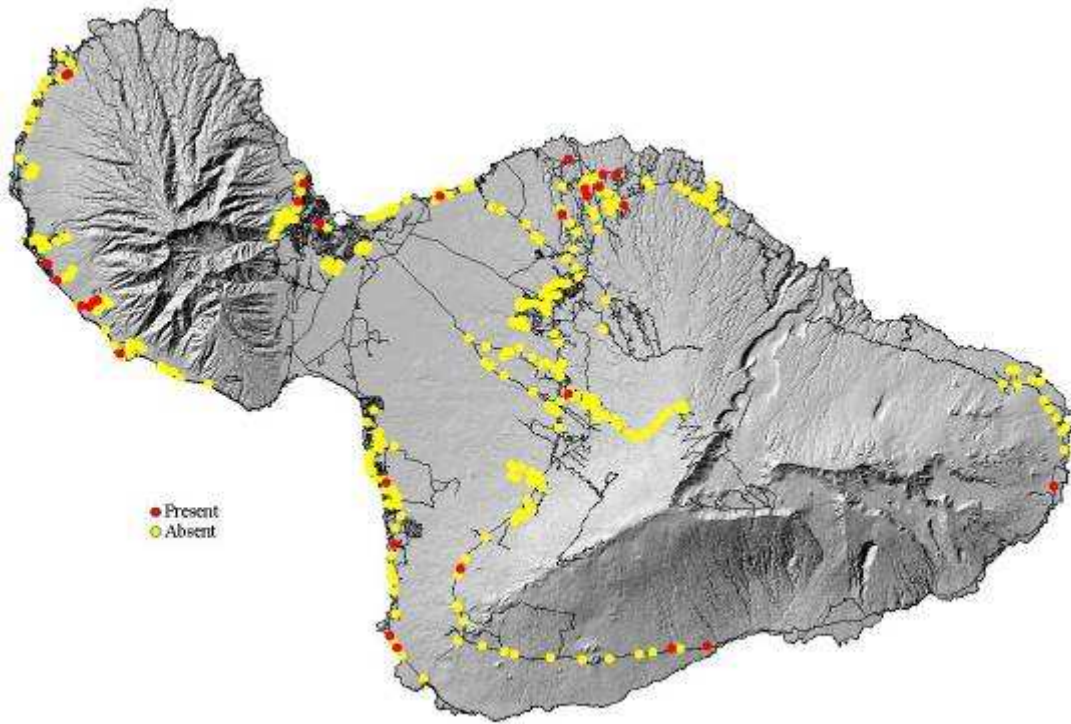


Found at 4 sites in upland areas of Kula. Native to mesic subtropical or mesic mild-temperate regions of northern Argentina (Tsutsui *et al.*, 2001, in Holway 2002b) and South America (McGlynn 1999, Krushelnycky *et al.* 2005). *L. humile* are invasive ants that have invaded six continents and many oceanic islands (www1). In Hawaii, *L. humile* poses a direct threat to native arthropods at higher elevations, and an indirect threat to plants, such as the rare Haleakala silversword (*Argyroxiphium sandwicense* subsp. *macrocephalum*) which are dependent on native invertebrates for pollination (Krushelnycky *et al.* 2005). First documented in the state of Hawaii in 1940 (Zimmerman 1941, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii (Nishida 2002). Previous collections from Maui (www4) include: Olinda, Krauss, N. L. H., 1960.



Images by April Noble (AntWeb)

Monomorium floricola -- Bicolor trailing ant

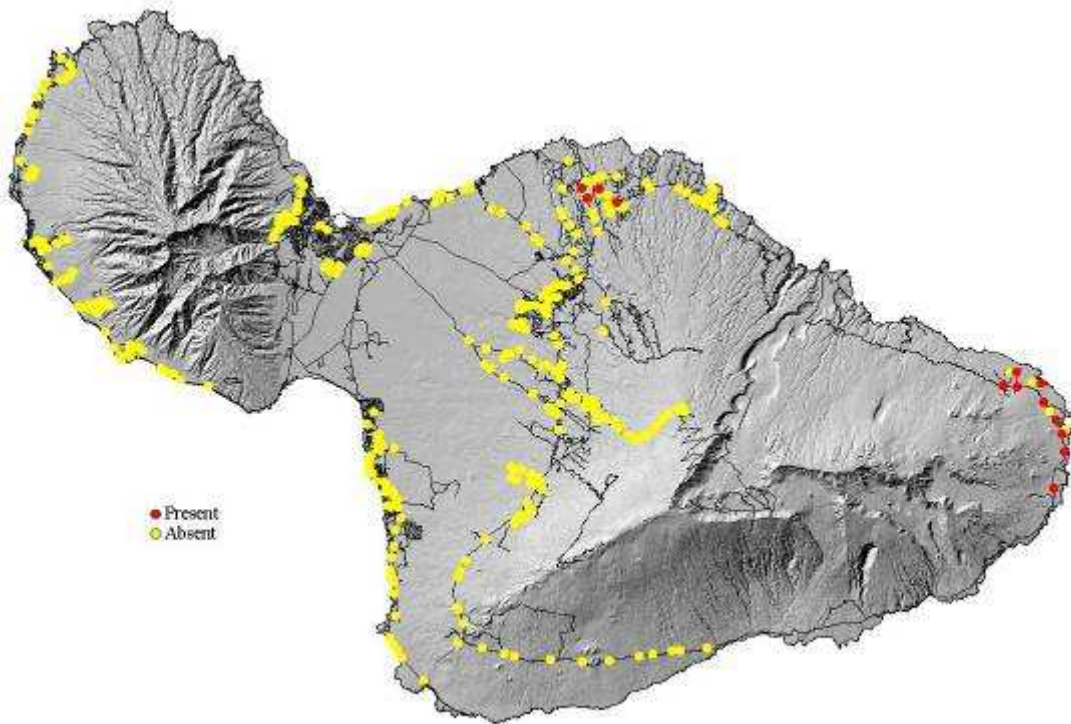


Found at 30 sites in the following areas: Kahului, Waiehu, Spreckelsville, Haiku, Kihei, Wailea, Makena, Olowalu, Launiupoko, Lahaina, Kapalua, Kula, Kahikinui, and Hana. Native to India and SE Asia (McGlynn 1999, Krushelnycky *et al.* 2005) and widespread in the tropics (www6). In the state of Hawaii, first documented in 1899 (Forel 1899, Krushelnycky *et al.* 2005), and now known from the islands of Nihoa, Kauai, Oahu, Molokai, Lanai, Maui, Hawaii, Midway Atoll, Laysan, and French Frigate Shoals (Nishida 2002). Previous collections from Maui (www4) include: N, M., 1894-1895.



Images by April Noble (AntWeb)

Monomorium liliuokalanii -- Liliuokalani's ant

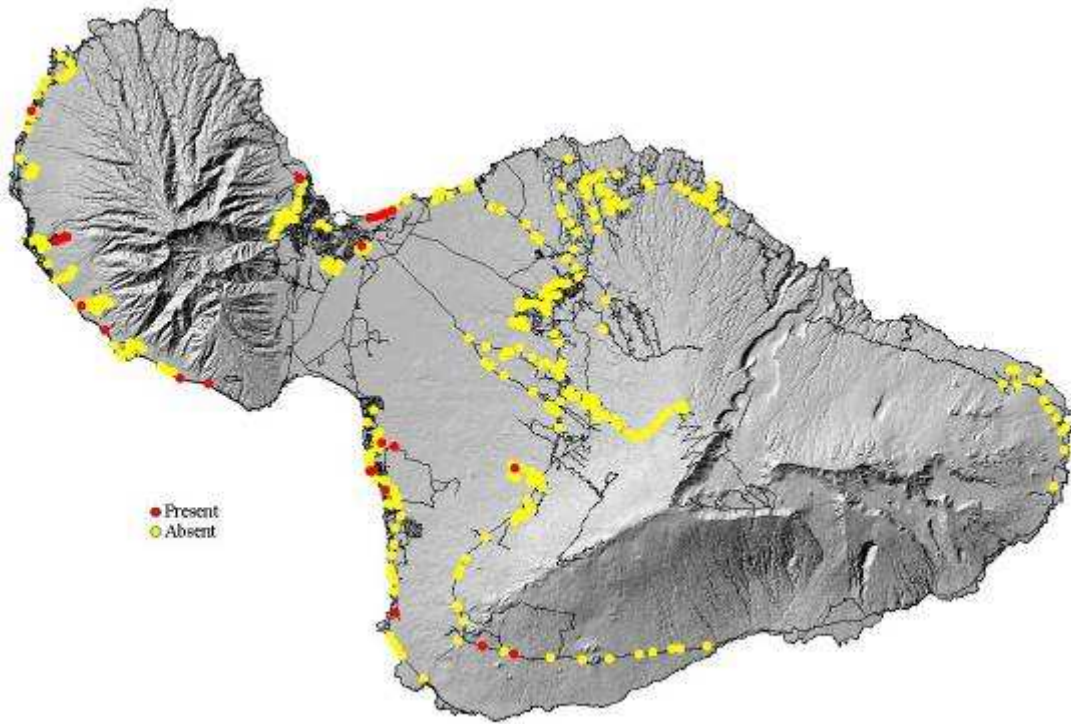


Found at 13 sites in Haiku and Hana. Native to Europe (McGlynn 1999, Krushelnycky *et al.* 2005). First documented in Hawaii in 1899 (Forel 1899, Krushelnycky *et al.* 2005), and now known from the islands of Necker, Kauai, Oahu, Molokai, Maui, Hawaii, Midway Atoll, and Laysan (Nishida 2002).



Images by April Noble (AntWeb)

Monomorium pharaonis -- Pharaoh ant

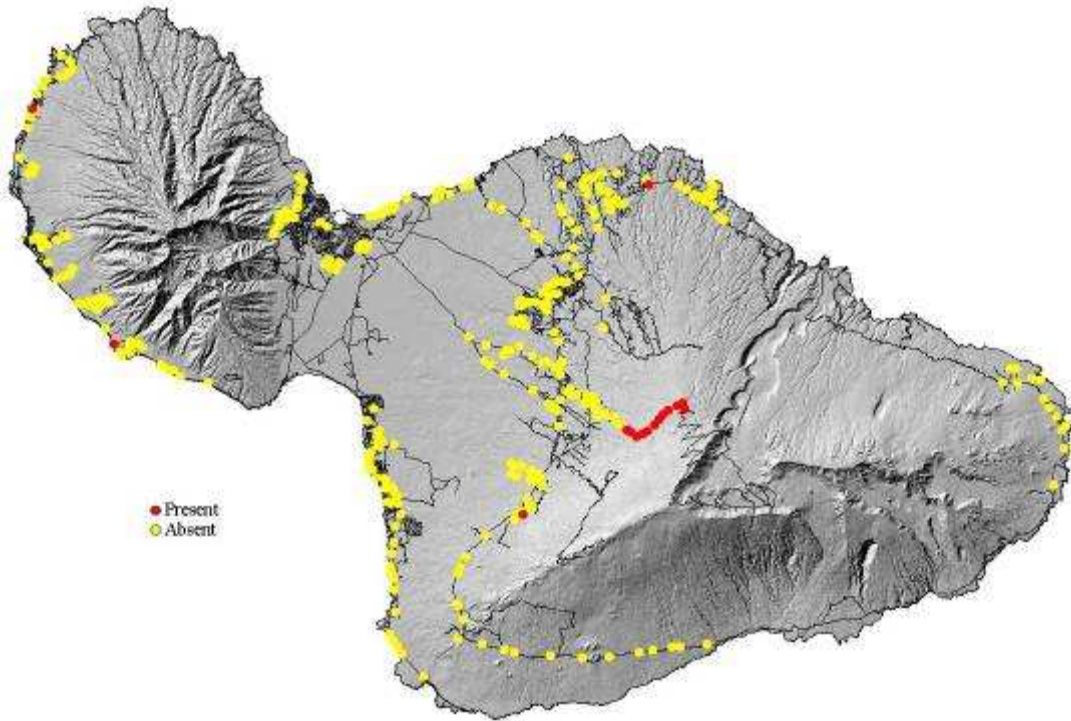


Found at 26 sites in the areas of Kahului, Waihee, Kihei, Makena, Ukumehame, Olowalu, Launiupoko, Lahaina, Napili, Kula, and Kanaio. Native probably to Africa (www7). *M. pharaonis*, distributed throughout the world, is one of the most common household ants and is known for being difficult to control (www7). First documented in Hawaii in 1913 (Gulick 1913, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Maui, Hawaii, and French Frigate Shoals (Nishida 2002). Previous collections from Maui (www4) include: Makawao Forest Reserve, Montgomery, S. L., 1979; Paia, 1909.



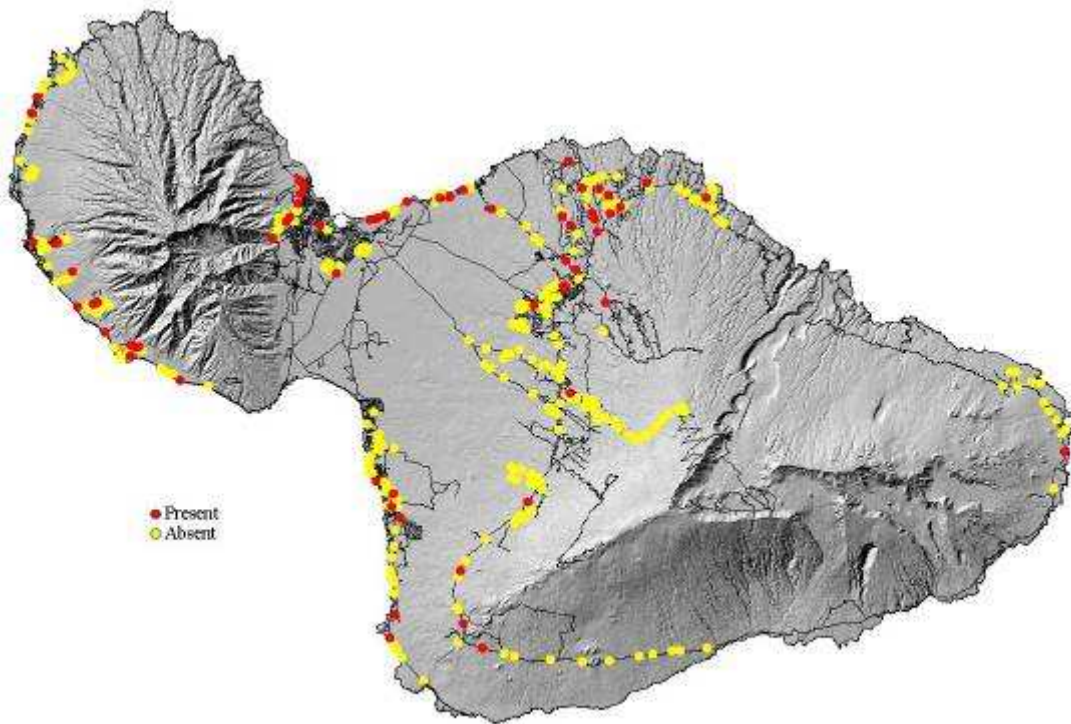
Images by April Noble (AntWeb)

None -- No ants found



There were no ants found at 16 sites on Maui, mostly in the Crater Rd. area and also at single sites in Huelo, Olowalu, Napili, and Kula. It was not common to encounter zero ants at a station, but occasionally, this did occur. It is not certain why no ants were found at these locations.

Ochetellus glaber -- Black house ant

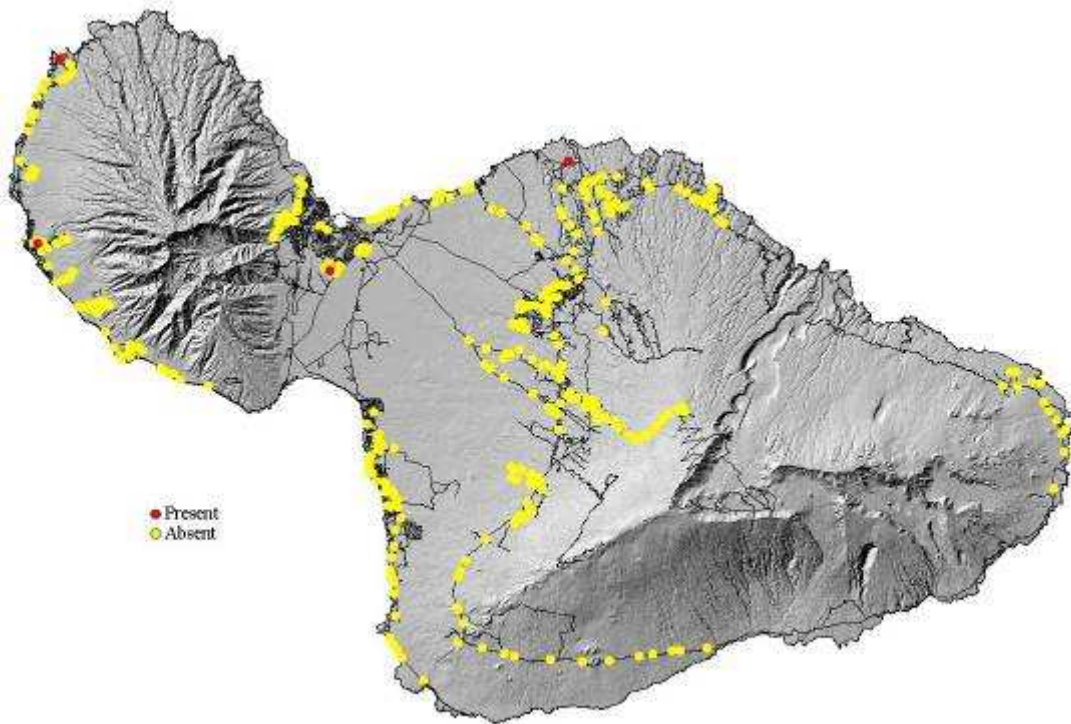


Found at 68 sites in the areas of Kahului, Waiehu, Waihee, Paia, Haiku, Huelo, Baldwin Ave., Makawao, Pukalani, Kihei, Wailea, Makena, Ukumehame, Olowalu, Launiupoko, Lahaina, Napili, Kula, Keokea, Ulupalakua, Kanaio, and Hana. Native to Australia and New Caledonia (McGlynn 1999, Krushelnycky *et al.* 2005). Introduced elsewhere in the world mostly in urban areas of Japan south through Burma and the Philippines to Australia and Fiji (Shattuck 1992), the United States (Smith 1979) and New Zealand (Brown 1958). First documented in Hawaii in 1977 (Beardsley 1980, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Kahoolawe, Maui, and Hawaii (Nishida 2002, Starr *et al.* 2004).

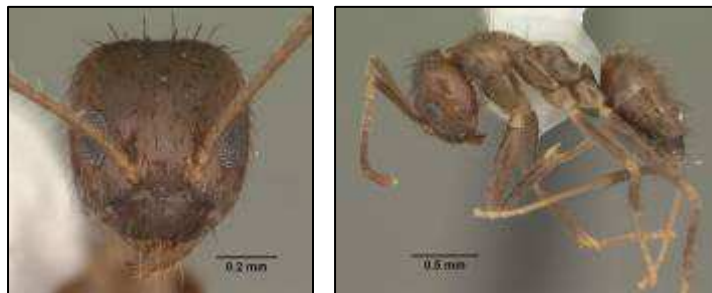


Images by April Noble (AntWeb)

Paratrechina bourbonica -- Robust crazy ant, flesh eating ant

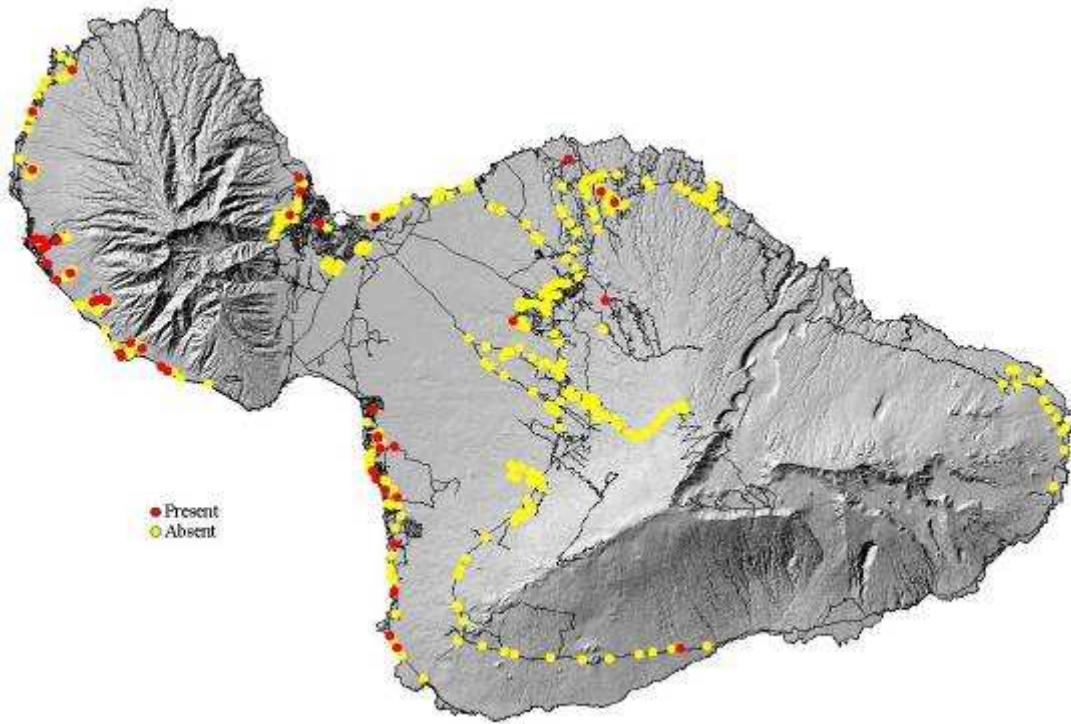


Found at 4 sites in the areas of Kahului, Haiku, Lahaina, and Kapalua. Native probably from the old world tropics (Asia) (Wilson & Taylor 1967, Deyrup *et al.* 2000). *P. bourbonica* is a widespread tropical tramp species (Trager 1984). First documented in Hawaii in 1879 (Smith 1879, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Molokai, Lanai, Maui, Hawaii, and Midway Atoll (Nishida 2002). Previous collections from Maui (www4) include: Honomanu, Bryan, E. H., Jr., 1920; Iao Valley, Bryan, E. H., Jr., 1927; West Maui, Gressitt, J. L., 1971.



Images by April Noble (AntWeb)

Paratrechina longicornis -- Crazy ant

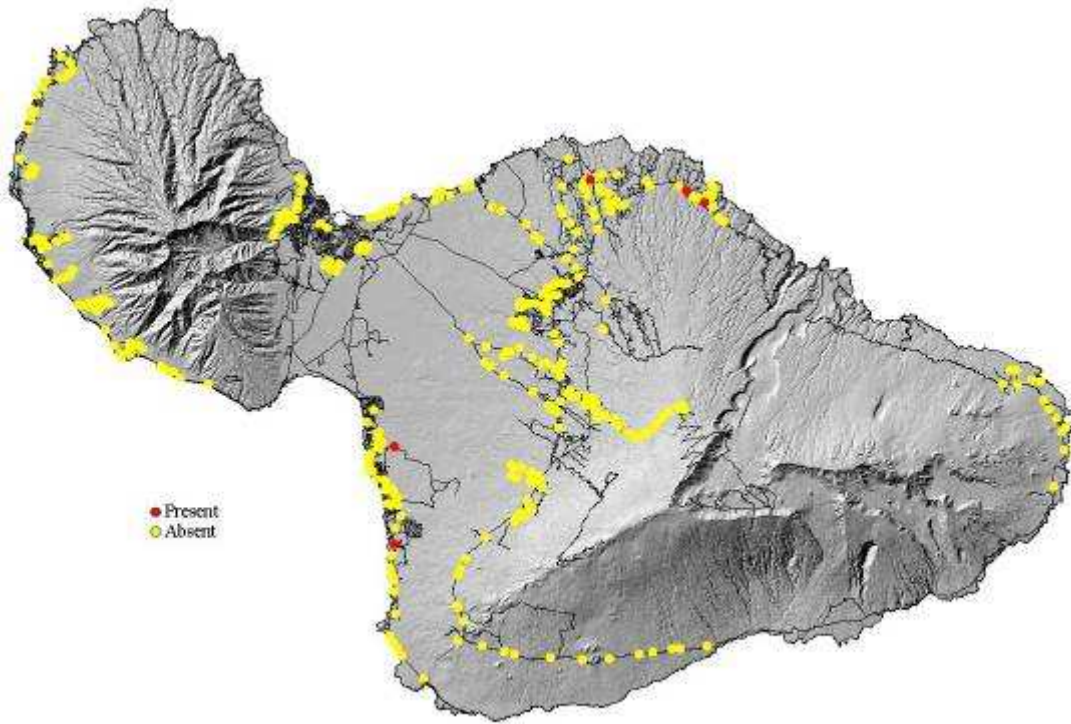


Found at 47 sites in the areas of Kahului, Waiehu, Waihee, Haiku, Makawao, Pukalani, Kihei, Wailea, Makena, Ukumehame, Olowalu, Launiupoko, Lahaina, Kaanapali, Napili, Kapalua, and Kahikinui. Native to possibly Asia or Africa and found in tropical urban areas worldwide (Trager 1984). The crazy ant is named so because of their erratic and fast movements. First documented in Hawaii in 1899 (Forel 1899, Krushelnycky *et al.* 2005) and now known from the islands of Nihoa, Kauai, Oahu, Molokai, Lanai, Kahoolawe, Maui, Hawaii, Midway Atoll, and French Frigate Shoals (Nishida 2002, Starr *et al.* 2004). Previous collections from Maui (www4) include: N, M., 1894-1895.

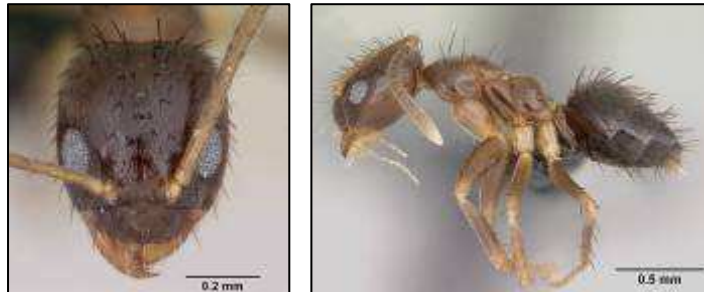


Images by April Noble (AntWeb)

Paratrechina vaga -- Paratrechina

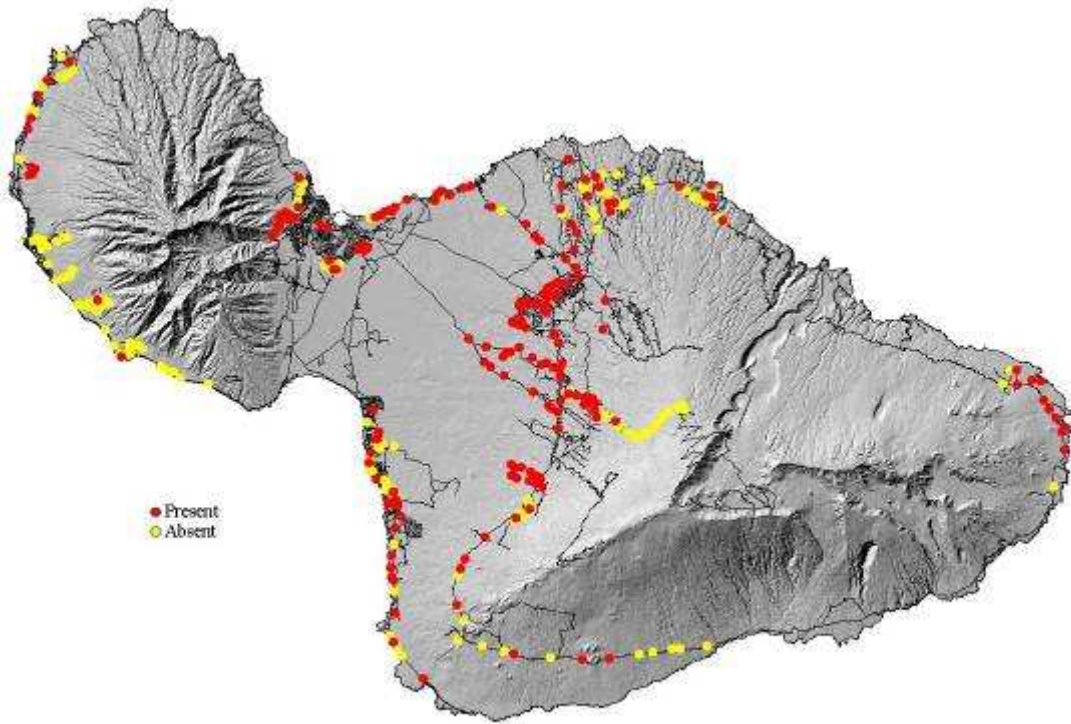


Found at 5 sites on Maui, including Haiku, Huelo, Kihei, and Wailea. Native to Australia and Southeast Asia (McGlynn 1999, Krushelnycky *et al.* 2005). This species has been introduced to many Pacific Islands. In Hawaii, it is a pest of pineapple (Carter 1967) and is mostly found in disturbed habitats in the lowlands (Reimer 1994). First documented in Hawaii in 1899 (Forel 1899, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii (Nishida 2002). Previous collections from Maui (www4) include: Keanae, Joyce, C. R., 1953.



Images by April Noble (AntWeb)

Pheidole megacephala -- Big headed ant

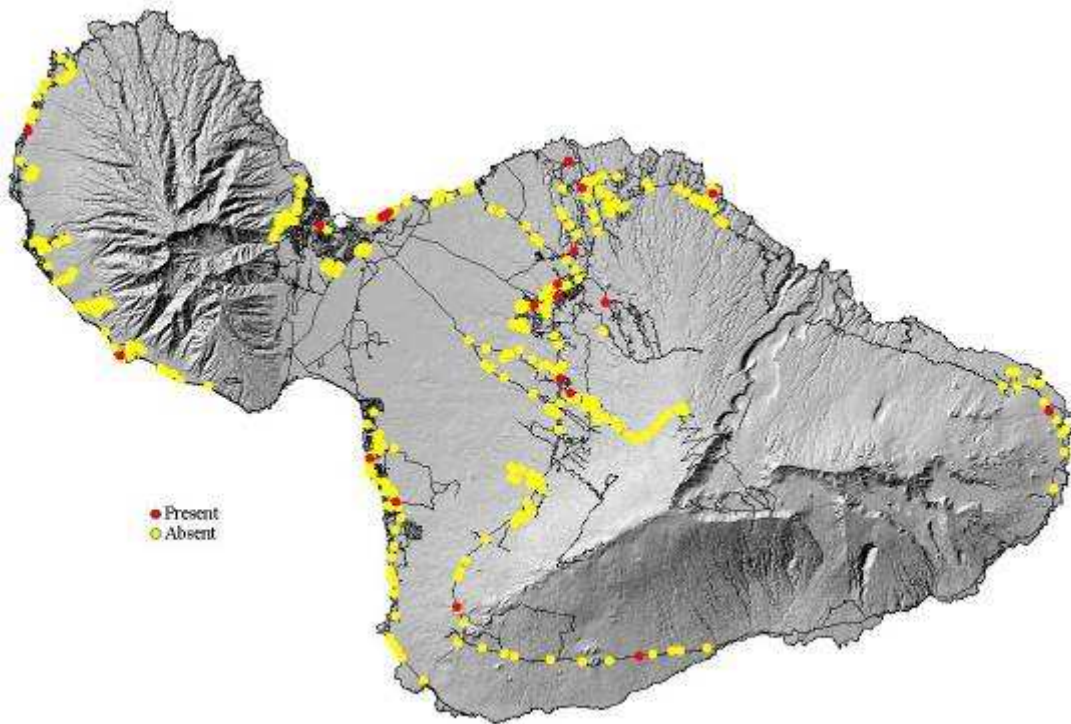


Found at 199 sites in the areas of Kahului, Paia, Spreckelsville, Haiku, Baldwin Ave., Makawao, Pukalani, Olinda, Kula, Omaopio, Pulehu, Kihei, Wailea, Makena, Ahihi Kinau, Ukumehame, Launiupoko, Olowalu, Waiehu, Waihee, Kaanapali, Napili, Kapalua, Huelo, Keokea, Ulupalakua, Kanaio, Lualailua, Kahikinui, and Hana. *P. megacephala* was the most common and dominant ant found during our survey. Listed as one of the "100 world's worst pests" by the Invasive Species Specialist Group (www1) this well known ant is a pest worldwide in many tropical and temperate regions. Impacts include displacement of native invertebrates, agriculture damage, and domestic nuisance (www1). First documented in Hawaii in 1879 (Smith 1879, Krushelnycky *et al.* 2005) and now known from all the main Hawaiian Islands and Midway Atoll, Pearl and Hermes Atoll, and Laysan (Nishida 2002, Starr *et al.* 2004). Previous collections from Maui (www4) include: Iao Valley, Bryan, E. H., Jr., 1927; Yoshimoto, C. M., 1965; Kahului, Perkins, R. C. L., 1894; Kipahulu, Bryan, E. H., Jr., 1920; Maui, N. M., 1894-1895; Maui, 1915; Lahaina, near, Yoshimoto, C. M., 1965.



Images by April Noble (AntWeb)

Plagiolepis alluaudi -- Little yellow ant

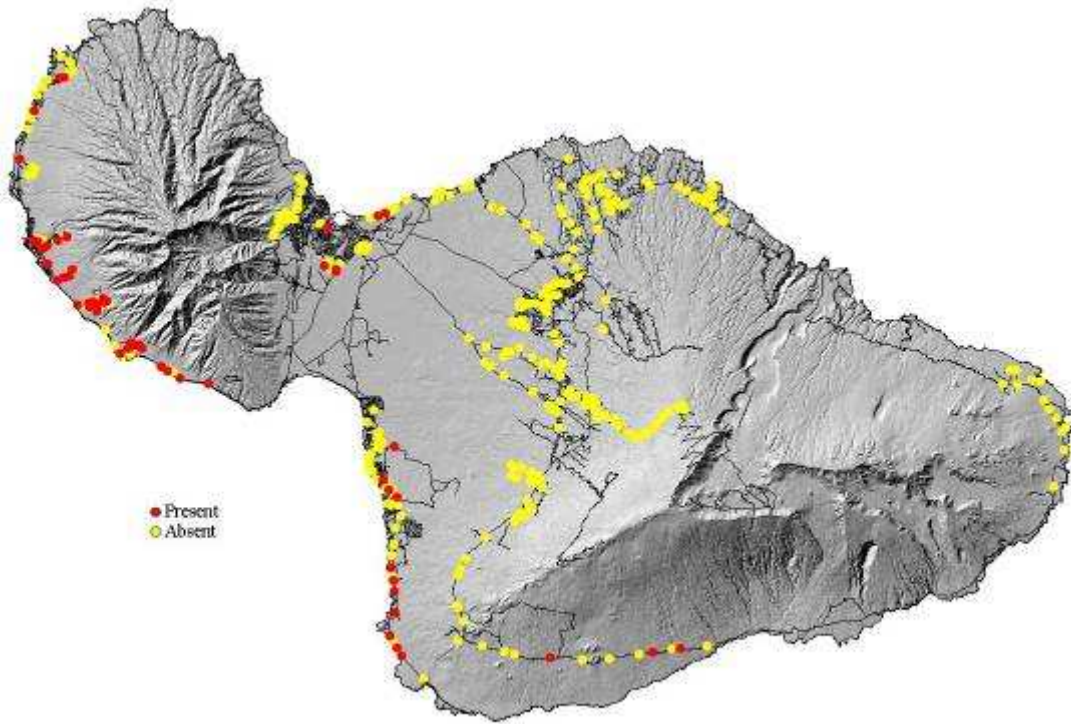


Found at 21 sites in the areas of Kahului, Haiku, Huelo, Makawao, Pukalani, Kihei, Olowalu, Napili, Kula, Ulupalakua, Kahikinui, and Hana. Native to possibly India (McGlynn 1999, Krushelnycky *et al.* 2005). First documented in Hawaii in 1913 (Gulick 1913, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Molokai, Lanai, Maui, Hawaii, Midway Atoll, and Laysan (Nishida 2002).



Images by April Noble (AntWeb)

Solenopsis geminata -- Tropical fire ant

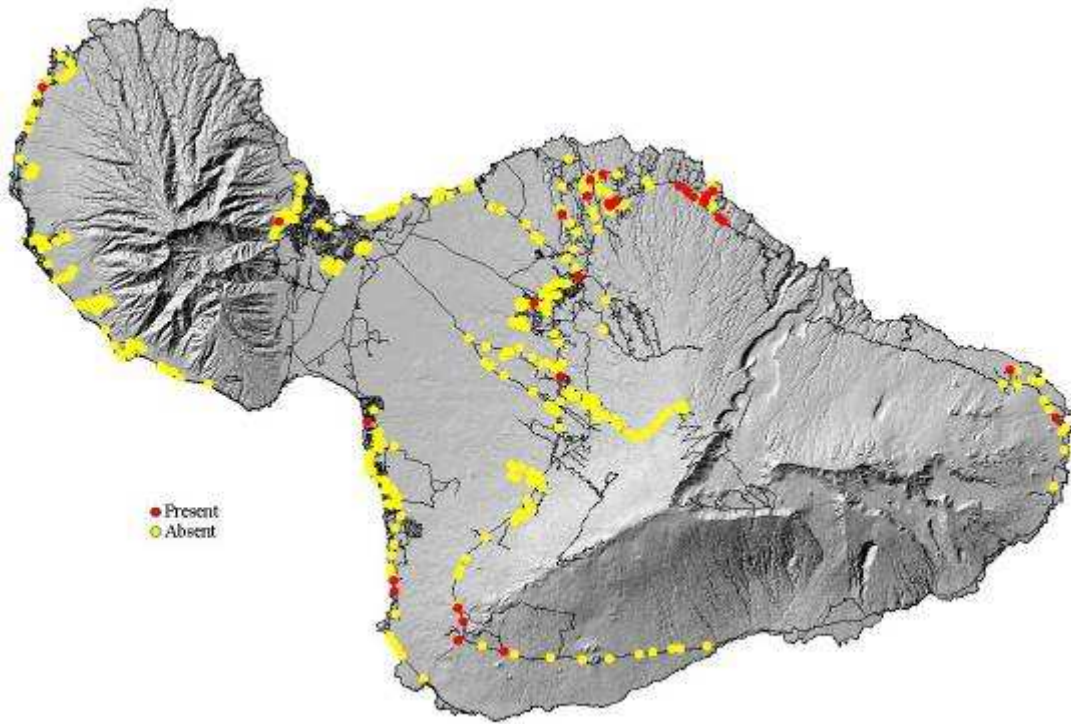


Found at 56 sites in the lowland areas of Kahului, Kihei, Wailea, Makena, Ahihi Kinau, Ukumehame, Olowalu, Launiupoko, Puamana, Lahaina, Kaanapali, Napili, Kapalua, Auwahi, and Kahikinui. All *S. geminata* were closely inspected to be sure they were not RIFA. Native to the Neotropics (McGlynn 1999, Krushelnycky *et al.* 2005), *S. geminata* has been introduced throughout the world and establishes in disturbed warm lowland sites (www1). This ant is notorious for its painful sting and rapid aggressive behavior towards any disturbance of the colony or food source (www1). A single fire ant can sting multiple times causing an intense burning (fiery) sensation, followed by reddening and swelling of the skin. The sting may sometimes cause a severe, systemic allergic reaction (www1). *S. geminata* are also pest of seeds (www1). First documented in Hawaii in 1879 (Smith 1879, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Molokai, Lanai, Kahoolawe, Maui, Hawaii, and Midway Atoll (Nishida 2002, Starr *et al.* 2004).



Images by April Noble (AntWeb)

Solenopsis papuana -- Papuan thief ant

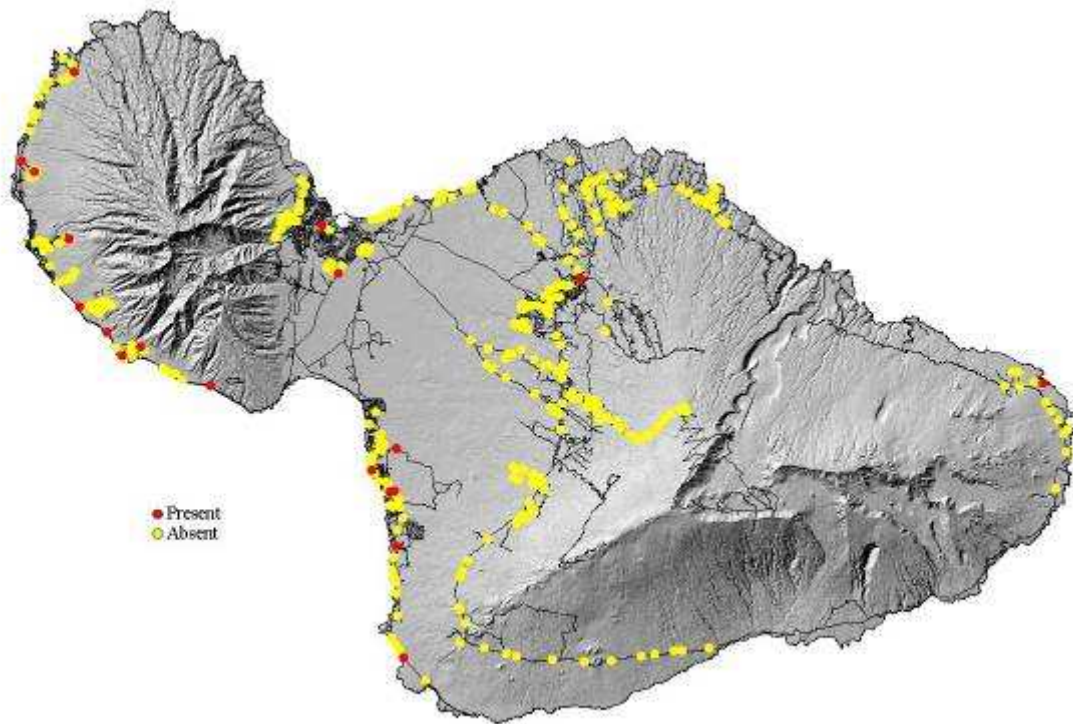


Found at 33 sites in the areas of Haiku, Huelo, Makawao, Pukalani, Kula, Kihei, Wailea, Napili, Ulupalakua, Kanaio, and Hana. Most prevalent in moist soils. Native to the Papuanal Region (McGlynn 1999, Krushelnycky *et al.* 2005). First documented in Hawaii in 1967 (Huddleston and Fluker 1968, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii (Nishida 2002).



Images by April Noble (AntWeb)

Tapinoma melanocephalum -- Ghost ant

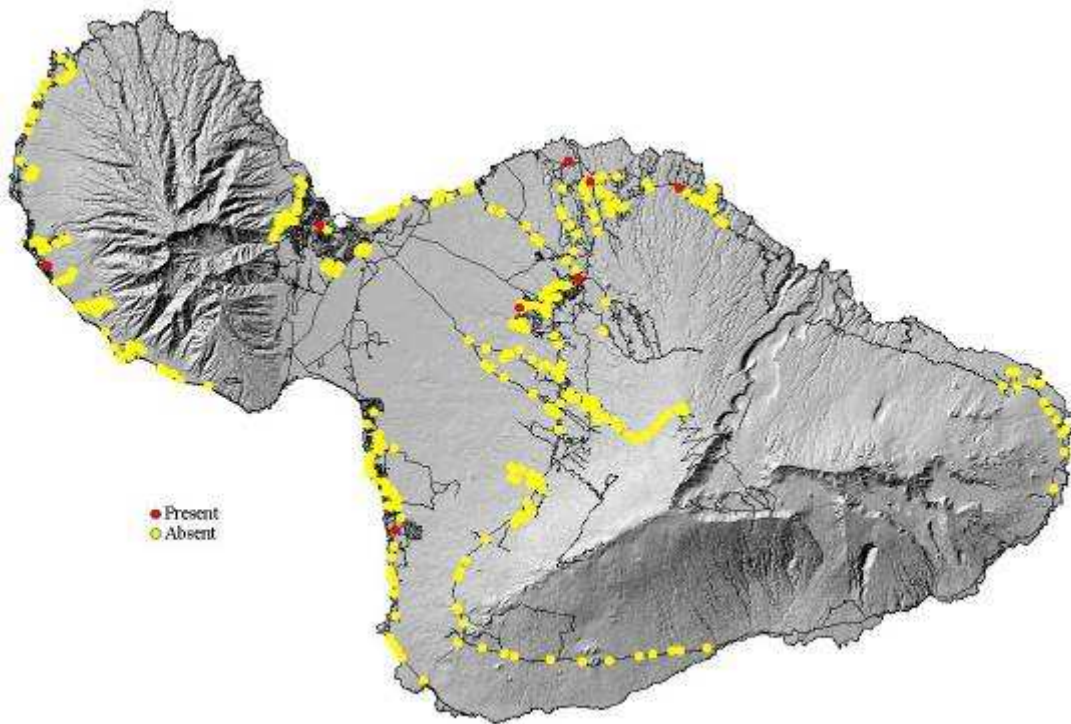


Found at 21 sites on Maui, mostly near houses, in the areas of Kahului, Makawao, Kihei, Wailea, Ahihi Kinau, Lahaina, Olowalu, Launiupoko, Kaanapali, Kapalua, and Hana. Native origin unknown. This tramp ant species is widespread throughout the world and is commonly associated with human habitat and is generally considered a household pest (www1). First documented in Hawaii in 1899 (Forel 1899, Krushelnycky *et al.* 2005) and now known from the islands of Nihoa, Kauai, Oahu, Molokai, Lanai, Maui, Hawaii, Kure Atoll, Midway Atoll, and Laysan (Nishida 2002).

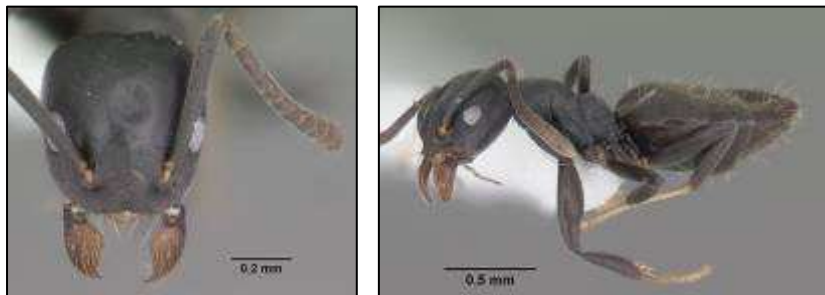


Images by April Noble (AntWeb)

Technomyrmex albipes -- White footed ant

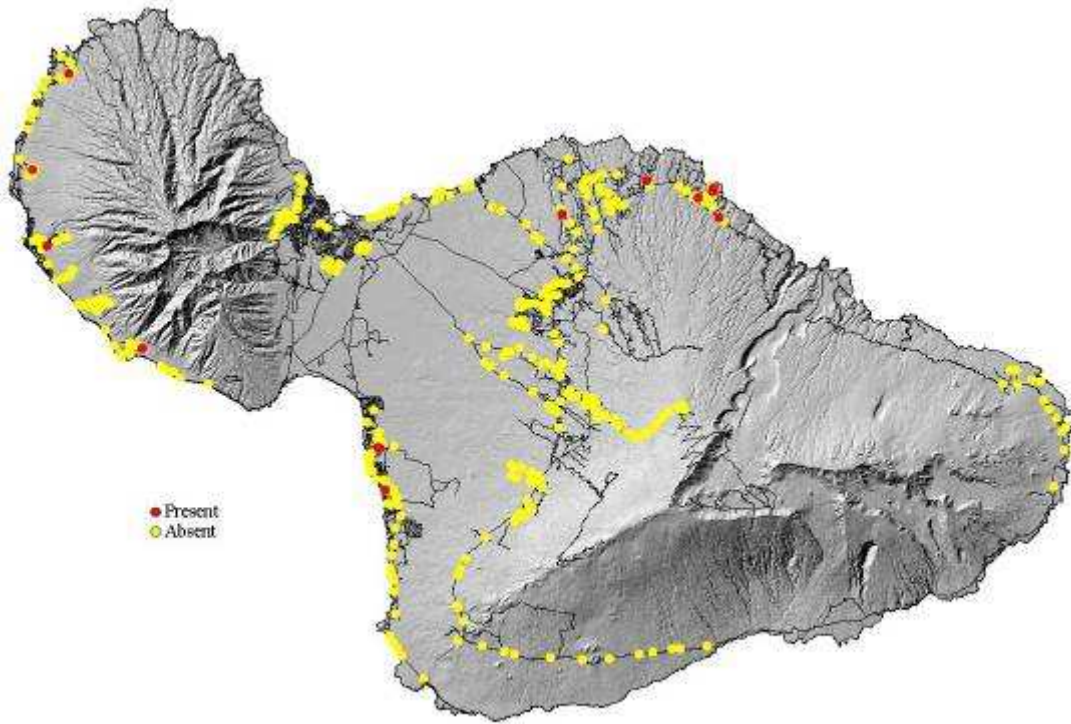


Found at 8 sites in the areas of Kahului, Haiku, Makawao, and Wailea. Native to the Indo-Pacific area (McGlynn 1999, Krushelnycky *et al.* 2005). A pest ant in households that has been introduced to the southern United States and Hawaii, Japan, Australia, New Zealand, Africa, Polynesia, and the West Indies (www9). First documented in Hawaii in 1911 (Swezey 1914, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Molokai, Kahoolawe, Maui, and Hawaii (Nishida 2002, Starr *et al.* 2004). Previous collections from Maui (www4) include: Iao Valley, Bryan, E. H., Jr., 1927; Waihee, Bryan, E. H., Jr., 1919; Wailua, Isenberg, C. A., 1956.

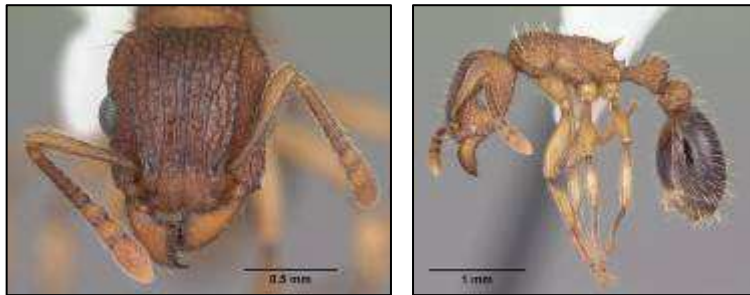


Images by April Noble (AntWeb)

Tetramorium bicarinatum -- Pennant ants

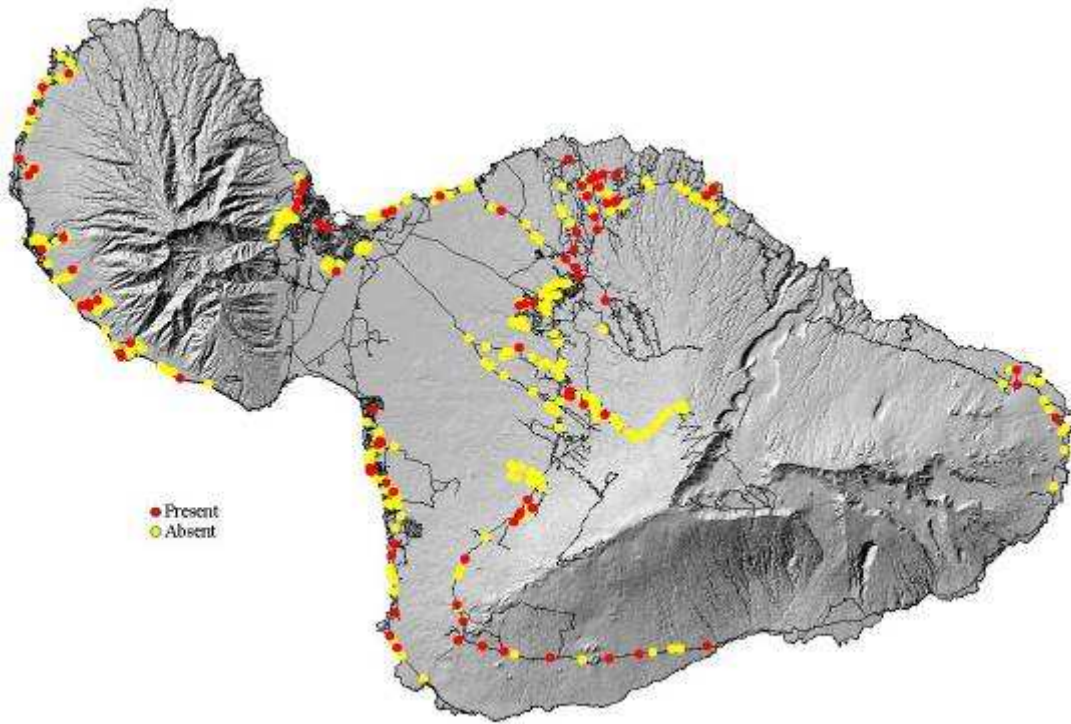


Found at 14 sites in the areas of Kahului, Haiku, Huelo, Kihei, Olowalu, Lahaina, Kaanapali, and Kapalua. A cosmopolitan tramp ant species usually found near houses (www10). Native to southeast Asia (McGlynn 1999, Krushelnycky *et al.* 2005). First documented in Hawaii in 1879 (Smith 1879, Krushelnycky *et al.* 2005) and now found on the islands of Necker, Nihoa, Kauai, Oahu, Molokai, Maui, Hawaii, Kure Atoll, Midway Atoll, Pearl and Hermes Atoll, Laysan, and French Frigate Shoals (Nishida 2002). Previous collections from Maui (www4) include: Nahiku, Swezey, O. H., 1929.

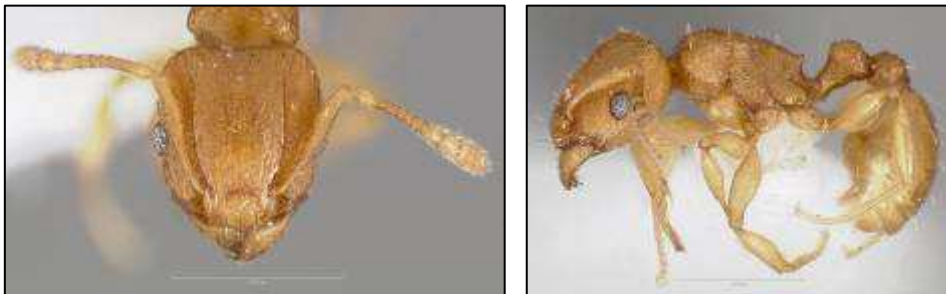


Images by April Noble (AntWeb)

Tetramorium simillimum -- Tetramorium

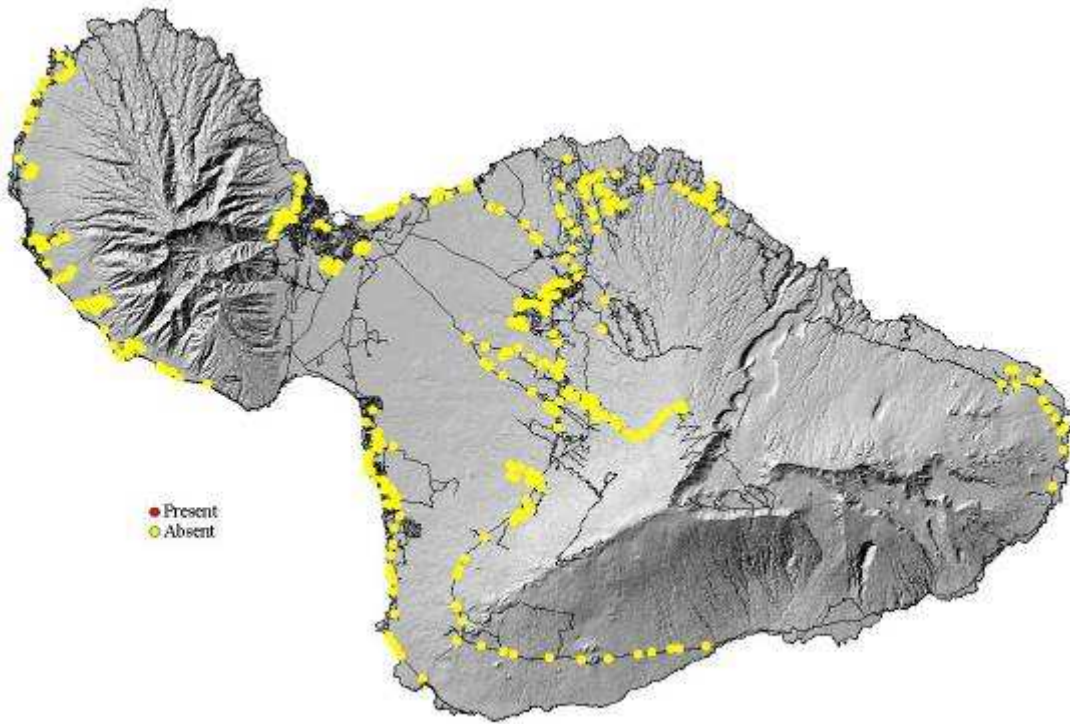


Found at 93 sites in the areas of Kahului, Waiehu, Paia, Spreckelsville, Haiku, Huelo, Kihei, Wailea, Makena, Ukumehame, Olowalu, Launiupoko, Puamana, Lahaina, Kaanapali, Napili, Kapalua, Makawao, Pukalani, Omaopio, Kula, Keokea, Ulupalakua, Kanaio, Auwahi, Kahikinui, and Hana. Native to Europe (McGlynn 1999, Krushelnycky *et al.* 2005). A cosmopolitan tramp ant species that is widespread in the tropics (www11). It is a small red ant similar in appearance to *Wasmannia auropunctata*, but *W. auropunctata* has longer setae on the face and dorsum and longer propodeal spines (www11). First documented in Hawaii in 1934 (Wheeler 1934, Krushelnycky *et al.* 2005) and now known from the islands of Kauai, Oahu, Lanai, Kahoolawe, Maui, and Hawaii (Nishida 2002, Starr *et al.* 2004).



Images by April Noble (AntWeb)

Wasmannia auropunctata -- Little Fire Ant



Not found during this survey. Native to Central and South America (Holway *et al.* 2002). This small but powerful stinging ant has hitch-hiked on shipments to many regions of the world, including the Hawaiian Islands. Common impacts of the presence of LFA include being a nuisance in agricultural settings, blinding domestic pets, and harming native wildlife. In the Hawaiian Islands, first documented in 1999 (Conant and Hirayama 2000, Krushelnycky *et al.* 2005), and now known from the islands of Hawaii and Kauai (Nishida 2002, Null and Gunderson 2006).



Images by April Noble (AntWeb)

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