Introduction and Distribution of *Ochetellus glaber* in the Maunakea Forest Reserve on Maunakea, Hawaii- Report – 2015

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Introduction

On April 16, 2015 *Ochetellus glaber*, an invasive ant, was discovered around the protestor "Hale" located in the Mauna Kea Forest Reserve adjacent to the Visitor Information Station (VIS) at Halepōhaku (HP) on Maunakea, Hawai'i by Office of Maunakea Management (OMKM) staff Jessica Kirkpatrick and five Big Island Invasive Species Committee (BIISC) staff members. *O. glaber* was found in a residual non-native fan palm pile by visual observation. No ants were found with vial and weed pull methods. Numerous ant specimens were observed within the palm fronds and six specimens were collected on April 16, 2015. The wood of the structure was made from pressure washed bark-stripped 'Ōhi'a posts from Kalapana (according to the individuals present at the Hale during this initial survey). A ¾ inch thick and 8 inch long branch sample was collected by U.S. Fish & Wildlife Service (USFWS) enforcement officer Paul Chang and examined by Dr. Lisa Keith, Research Pathologist at U.S Department of Agriculture lab. Dr. Keith confirmed that the sample provided was not infected (no symptoms or fungus) with the 'ōhi'a fungus *Ceratocysis.* OMKM staff also observed a dead Gold dust day/ orange spotted day gecko (*Phelsuma spp)* under the palm fronds and collected an old wasp nests within the fronds.

Currently, the only other known ant populations within UH managed lands of Maunakea are isolated *Cardiocondyla kagutsuchi* populations along the road corridor shoulder up to Halepōhaku and the Halepōhaku parking lots (up to 9300ft) (Unpub. OMKM *C.kagutsuchi* Delimiting Survey, 2013). These populations are spot treated with *Talstar Insecticide* when observed. The USFWS also found this species present within the Hakalau National Wildlife Refuge and along the Keanakolu- Mana Road from 2009-2010. The greatest ant threat is *Linepithema humile*, Argentine ants. Argentine ant is found at Pu'uhuluhulu parking lot, along Keanakolu- Mana Road, and within the Mauna Kea County Park. However, this species has not been identified above Keanakolu- Mana road (Peck & Banko, 2011 and Wetterer et al., 1998).

The Halepōhaku area has been surveyed at least annually for invasive species since 2007 initially by the Bishop Museum and starting in 2012 by OMKM staff. This is the first time *O. glaber* has been found in any survey on UH Managed lands and research from literature produced no records of previous detection of this species within in the Halepōhaku area or anywhere else above the Saddle Road junction (Peck & Banko, 2011, Unpub. OMKM *C.kagutsuchi* Delimiting Survey, 2013, and Wetterer et al., 1998).

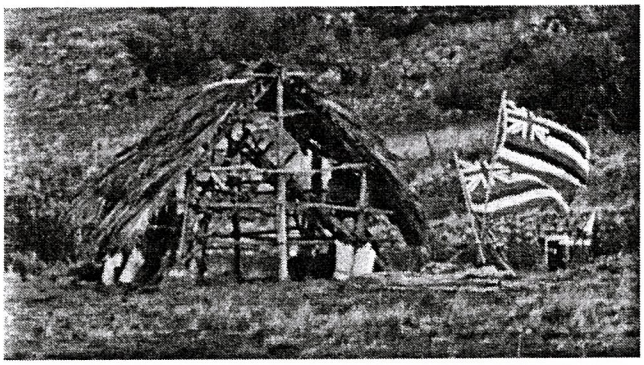

Figure 1: Protestor "Hale" in process of being built with 'ōhi'a wood and non-native palm fronds.

Rapid Response is the process of reacting to a new, recent, not previously detected invasive species. Goals in this process include: identifying known life-history information, determining if the species presents a threat, delineating spatial extent of species distribution, and developing and implementing site-specific management recommendations. OMKM initiates rapid response procedures of newly detected non-native species on University-managed lands of potential threat as outlined in the Maunakea Invasive Species Management Plan (ISMP). This report was prepared using Rapid Response guidelines from the ISMP, with the survey conducted in the Mauna Kea Forest Reserve at the request of DLNR staff.

Jurisdiction:

O.glaber was found on Forest Reserve land (managed by Department of Land and Natural Resources (DLNR)), and is not within the UH Management area. Even though *O.glaber* is not within the UH Management area, this incident is a good way for OMKM to test the applicability and become familiarized with the approved Emergency Rapid Response procedures outlined in the ISMP (http://www.malamamaunakea.org/uploads/environment/MKISMP/MaunakeaInvasiveSppMgmtPlan_PCSUTechR_v191.pdf#page=65). OMKM is providing field and technical assistance, however all management decisions remain with DLNR, and OMKM will assist as requested.

Life History

The genus *Ochetellus* is comprised of 10 described species and subspecies ranging from the South of Japan, the Philippines, Fiji, New Caledonia, and Australia. The species *O.glaber* probably originated from Australia and Japan (Landcare Research & Leathers, 2015). *O.glaber* was first recorded in the Hawaiian Islands in 1977 (Kirschenbaum & Grace, 2008). It bites, and was identified as an ant pest on O'ahu (Tenorio & Nishida, 1995). They are generalist foragers that tend honeydew-producing insects and may consume parasitoids but can feed on a wide variety of sources including honeydew, insects, or worms, and sometimes forage in houses. *O.glaber* ants like sweets and are known to cluster on fruit trees, on plants bearing fruits, and on plants infested with sap-sucking insects such as aphids. They are aggressive, displacing fire ants and other species, and have been found invading subterranean termite tunnels and nests (Scott & Thomas, 2000). A study in Hawai'i showed that *O.glaber* were found in large numbers tending plant-sucking insects on trees and shrubs just outside or touching a building (Leong &

Grace, 2008). Studies in Maui show that *O.glaber* are common in dry mesic habitats from sea level to 3,000ft. elevation (Starr & Loope, 2008). The species often nests arboreally, under stones, or in fallen logs, and are adapted for living around the interface of open vegetation and scrub habitat (Leathers, 2015). They can also nest outside against paths, in rock piles, and other cracks and crevices. The species will also nest indoors, and nests have been found in between walls, ceilings, doors, and fences; but rarely nest in the soil (Control, 2012).

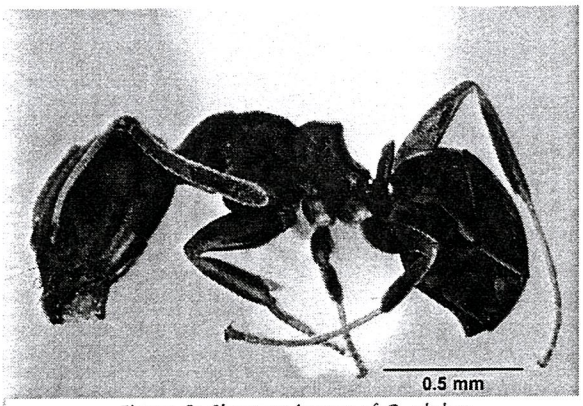

Figure 2: Close-up image of *O. glaber*

The worker ants are sterile and maintain the nests, gather food, and feed the larvae (OzAnimals.com). Larvae depend entirely on workers for food (Control, 2012). Colonies have multiple queens and may produce by budding when a queen and some workers move to a new area. This allows ants to be transported long distances when nests or queens are moved in commerce (Leathers, 2015). Should the queen die, the colony will die also (Control, 2012). *O.glaber* are extremely adaptable at establishing smaller colonies within a house or building (Control, 2012), share attributes of a tramp species such as polygyny, colony reproduction by budding, and have the ability to colonize disturbed habitats and relocate nesting sites rapidly. These characteristics make it difficult to control ant infestations (Cornelius, 1996). Their need for moisture is the most common reason for invading kitchens, bathrooms, or other sources of water in a premises. Adults cannot ingest solid food particles but ingest liquids which are pressed out of food material. They can be vectors of disease organisms such as dysentery, smallpox, and bacteria such as Salmonella. Adults will usually run in distinct trails which can assist finding nests (Control, 2012).

Identification

Ochetellus glaber, formerly known as *Iridomyrmex glaber* are small (2.5mm-3mm), and black. The males have wings, and females have wings until she mates and becomes the reproductive queen ant. (OzAnimals.com). The workers are shiny black or brown, 2.0-2.5mm long with 12 segmented antennae. Mandibles have 8 teeth and 1 or 2 denticles, with petiolar scale rounded and forming an even arch dorsally (Landcare Research).

Food & Bait Preferences

O.glaber tend to like sweets, but are also attracted to protein (Tenorio & Nishida, 1995) and will eat seeds, plants, fats, and grease (Control, 2012). A study in Hawai'i used tuna, peanut butter, fly pupae, moth larvae, and honey water (soaked paper towel) to determine bait preferences. The study showed that when *O.glaber* foragers were presented with a choice of tuna and sucrose, the foraging rate was always greater on sucrose, regardless of the presence of brood. When presented with fly pupae and sucrose, the foraging rate on pupae was greater than on sucrose for colonies containing brood and the foraging rate on protein and sucrose was similar for colonies without brood. They also preferred fruit fly pupae and *Plutella* larvae over tuna and peanut butter (Cornelius & Grace, 1997). Other studies in Hawai'i show that they prefer sucrose over maltose and are not attracted to oil. Sucrose based baits would be at least as acceptable to *O.glaber* as the honeydew component melezitose (Cornelius, 1996).

Threat

The Office of Maunakea Management is concerned with the finding of *O.*glaber because ant species are

social, predacious insects that have the ability to predate on or out-compete native arthropods (Leathers, 2015). They have been known to cause long-term ecological changes by lowering biodiversity, disrupting natural communities, and altering ecosystem processes (Leathers, 2015).

2015 Activity Timeline

This section includes the timeline of activities including surveys before and after the initial detection of *O.glaber* on Forest Reserve land.

Activity Type[1]	Lead	Date(s)	Location[2]	Ants obs?	Ant species observed
Facility Monitoring- Vials	OMKM	1/16 – 2/6, 2015	Halepōhaku	No	NA
Facility Monitoring- Traps (Inside & Outside)	OMKM	2/17 – 2/24, 2015	Halepōhaku & MKSR	No	NA
TMT Compliance- Weekly Monitoring	BIISC	2/19/15 – 2/26/15	TMT Site, Access Way, Halepōhaku	No	NA
Facility Monitoring- Traps (Inside only)	OMKM	2/24/15 – 3/12/15	Halepōhaku	No	NA
TMT Compliance- Weekly Monitoring	BIISC	2/26/15 – 3/4/15	TMT Site, Access Way, Halepōhaku	Yes	*C.kagutsuchi* (at HP)
Facility Monitoring- Traps (Inside only)	OMKM	3/12/15 – 4/14/15	Halepōhaku	No	Yes
UH Entomology Class, Hand Search	UH Faculty, Researcher	3/17/15	Between HP & the VIS	No	NA
Biodiversity Monitoring	Researcher	3/23 – 3/27, 2015	E, NW, N, & NE of HP	No	NA
TMT Compliance- Weekly Monitoring	BIISC	3/25/15 – 4/2/15	TMT Site, Access Way, Batch Plant, Halepōhaku	No	NA
TMT Compliance- Weekly Monitoring	BIISC	4/2/15 – 4/8/15	TMT Site, Access Way, Batch Plant, Halepōhaku	No	NA
TMT Compliance- Weekly Monitoring	BIISC	4/8/15 – 4/16/15	TMT Site, Access Way, Batch Plant, Halepōhaku	No	NA
Increased Activity Monitoring	OMKM & HAL	4/9/15	W of VIS, Forest Reserve (tents), TMT Access Road	No	NA
Facility Monitoring- Traps (Inside only)	OMKM	4/14/15 – 5/13/15	Halepōhaku	No	NA
TMT Compliance- Weekly Monitoring	BIISC	4/16/15- 4/23/15	TMT Site, Access Way, Batch Plant, Halepōhaku	No	NA

[1] Activity methods can be viewed upon request. OMKM facility monitoring procedures can be found on the OMKM website.

[2] Exact locations provided upon request of the lead agency

Increased Activity Monitoring	OMKM & BIISC	4/16/15	W of VIS, Forest Reserve (W of tents)	Yes	*O.glaber*
Ant Check up	USFWS	4/17/15	Fan Palm pile	No	NA
Facility Monitoring- Vials	OMKM & BIISC	4/17/15 – 5/7/15	Halepōhaku	Yes	*C.kagutsuchi*
Increased Activity Delimiting Survey	OMKM	4/20/15	W of VIS, Forest Reserve (W of tents)	No	NA
Ant Control, baiting stations	DOFAW	4/20/15	W of VIS, Forest Reserve (W of tents)	No	NA
TMT Compliance- Weekly Monitoring	BIISC	4/23/15 – 4/30/15	TMT Site, Access Way, Batch Plant, Halepōhaku	No	NA
TMT Compliance- Weekly Monitoring	BIISC	4/30/15 – 12/9/15	TMT Site, Access Way, Batch Plant, Halepōhaku	No	NA
Outreach	Researcher & D.Ward	5/1/15	W of VIS	NA	NA
Ant Control, baiting stations replaced	DOFAW	5/8/15	W of VIS, Forest Reserve (W of tents)	No	NA
Facility Monitoring- Traps (Inside & Outside)	OMKM	5/13/15 – 5/20/15	Halepōhaku & MKSR	No	NA
Continued Facility Monitoring and Increased Activity Monitoring	OMKM	June – August	Halepōhaku & MKSR	Yes	*C.kagutsuchi*
Facility Monitoring- Traps (Inside & Outside)	OMKM	9/16/15	Halepōhaku	*Yes	*O.glaber, T.melanocephalum, C.kagutsuchi*

* See "Introduction and Distribution of Ochetellus glaber, Tapinoma melanocephalum, & Cardiocondyla kagutsuchi at Halepōhaku on Maunakea, Hawaii – Report – 2015" for additional information.

Initial Detection

On April 16th vials were baited with peanut butter, jelly, and spam. A total of 50 vials were placed on the ground about 15 feet apart around the protestor "Hale" site. The vials were left out for about an hour and checked every 15 minutes. Hand searches were conducted around the sampling site and within the construction materials. Hand searching included pulling invasive vegetation and searching around vegetation, under rocks, and within the soil. *O.glaber* was found while hand searching the pile of palm fronds left over from the thatching of the hale. *O. glaber* was not interested in the bait even when directly in their path. The blue line on the map shows the surveyed location, and the Ant Location is approximate.

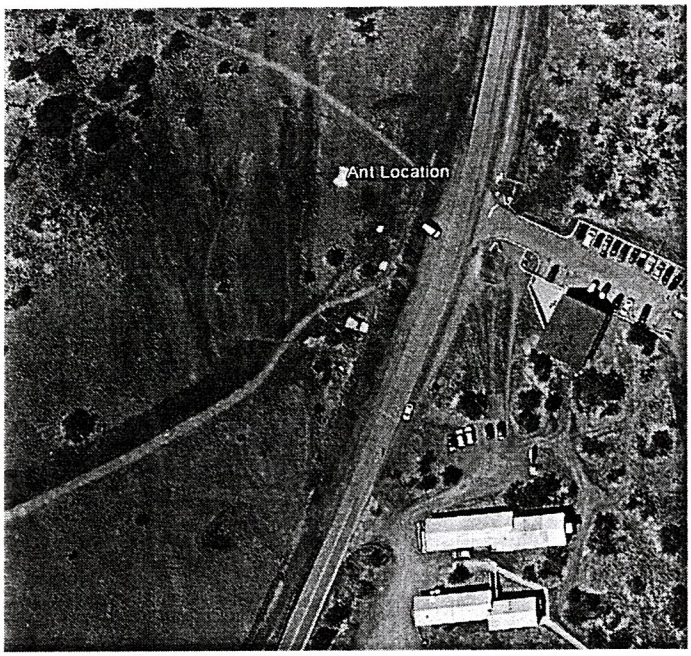

Figure 3: Initial Detection Survey & Approximate Ant Location

Initial Detection Recommendations

OMKM advised the public to not move, disturb, or attempt to treat for ants until an informed decision can be made that minimizes risk of exacerbating invasive species threats. The occupying public have questioned State jurisdiction of the lands and expressed opposition to the use of pesticides.

Initial Detection Notification

The same day the ants were collected on Forest Reserve Land, it was identified as *Ochetellus glaber* by the Hawai'i Ant Lab (HAL). From there DLNR, Natural Area Reserve (NAR), and Department of Forestry and Wildlife (DOFAW) were notified of the situation within 12 hours of initial detection. The HAL provided initial control, and long term eradication and monitoring recommendations. See *Management Recommendations* section below.

Public Relations

The public present at the hale area are willing to help resolve this issue and want to stay informed about necessary actions in regards to this situation. Protestors are willing to remove thatching and also plan to soak future thatching in salt water for 1 week prior to construction. Jessica Kirkpatrick has the contact information of two members of occupying public group, Jojo Henderson & Clare Loprinzi, in order to formally communicate in regards to the invasive ant issues.

Delimiting Survey

On April 20th, a delimiting survey was conducted on Forest Reserve land by OMKM staff as requested by DLNR using the same methods as described above (baited vials and hand searching). A total of 10 baited vials were placed on the ground near the hale checked every 10 min, and retrieved after 30 min. No ants, and no new threats were detected during this survey effort.

From April 17th thru May 7th, OMKM and BIISC conducted perimeter searches around all Halepōhaku facilities using baited vials and hand search methods. This type of facility monitoring is already ongoing, occurs quarterly, and just so happened to be scheduled around the same time *O.glaber* was detected.

Therefore, this OMKM routine survey will also be used as the delimiting survey for Halepōhaku. It should be noted that more effort (time, and staff) was put into OMKM's delimiting survey on UH lands, and some areas within this time frame were surveyed twice (VIS parking lot, VIS building, Ranger Parking lot) to be confident that ants were not in the area. No ants, and no new threats were detected during this survey effort.

Delimiting Survey Locations

The two sampling locations in the delimiting survey include UH managed areas at Halepōhaku and the VIS and the Maunakea Forest Reserve lands adjacent to the VIS. See map below for exact survey locations. Red identifies areas (perimeters) that were monitored including hand searches, and baited vials. At least 10 vials were placed at each site (perimeter polygon) for no more than 30 min, and hand searches conducted around each perimeter for at least 10 min.

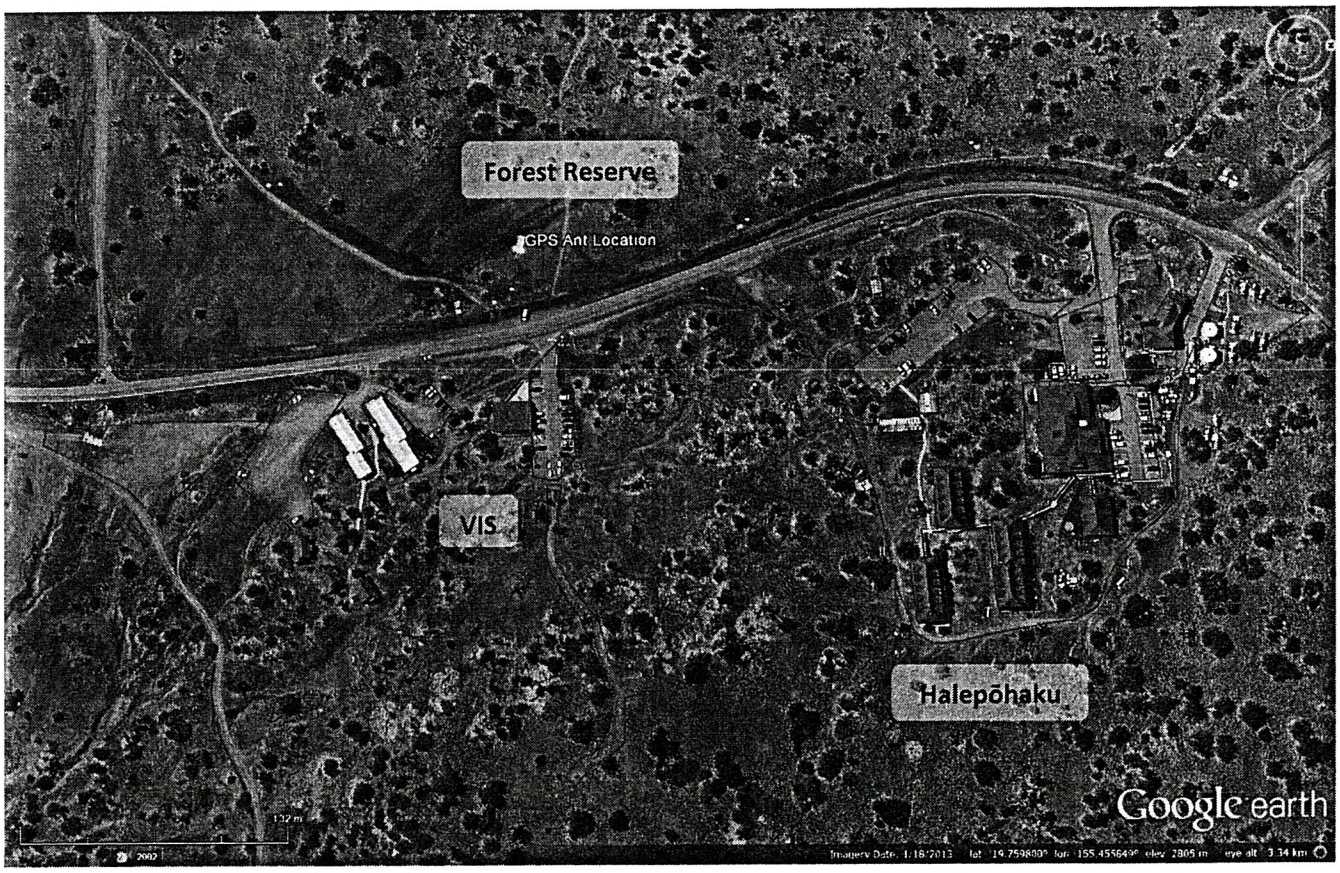

Figure 4: Delimiting Survey Locations conducted April 17th- May 7th

Public Control Efforts

Jojo Henderson & Clare Loprinzi had informed Jessica Kirkpatrick about their efforts to manage the ants with organic neem oil applications. Dr. Jesse Eiben responded to this notification with a cautionary warning against the use of neem oil because it is not appropriate for eradication goals. Eiben cautioned that neem oil is an ant repellant, which could cause the spread of ants away from the initial introduction site. Like most other oil extracts any mortality will only be due to suffocation by the liquid and therefore type and style of spray must be thoroughly assessed for effectiveness. Nonetheless, Eiben mentioned

that neem oil could be used as a supplementary method along with soapy water soaking for pre-treatment of any further materials brought up to 9000 ft.

Outreach

The week after initial detection, OMKM made 'A'ole Ant handouts and distributes them when present on the mountain and in public meetings. OMKM also verbally informs the public group about the survey being conducted that day, and invites them to come along and watch how ant surveys are conducted. Deborah Ward and Dr. Jesse Eiben have also been educating the protesting group about ant threats.

OMKM held an Open House at Halepōhaku on May 28, 2015 to educate the public and generate valuable discussions. This will allow for OMKM to show the public what we are doing on the mountain, while giving the public a chance to ask questions and talk story.

Management Recommendations

Initial Control Recommendations

After contacting Hawaii Ant Lab, control recommendations were provided to OMKM. They recommended placing *Enforcer's AntMax* (Abamectin) bait stations around the hale area for several days. After the bait stations are extracted, then all affected materials are recommended to be removed from the mountain in a tarp in order to contain remaining ants. Finally, a barrier Talstar spray should be applied around the area to prevent further introductions. Fifteen bait stations were placed by DOFAW staff Jay & Clem on April 20, 2015 per Hawaii Ant Lab Recommendation. After two weeks, bait stations were checked and no signs of ant feeding were observed (not all stations were still present as some had been removed). An additional 8 bait stations were placed, but never retrieved due to 'volatile conditions' with protesters as reported by DLNR staff.

Long-term Eradication & Monitoring Recommendations

OMKM will continue to work with DLNR in regards to future surveys in the Forest Reserve from further construction by protestors. However, surveys will only be conducted if the occupying public is welcoming as past discussions show the public questions the land manager authority and motives. Surveys are projected to continue weekly at Halepōhaku and less frequently on the Forest Reserve land with the permission of the occupying public group (surveys in the Forest Reserve were discontinued in May 2015 due to volatile conditions and OMKM has not been asked by Forest Reserve staff to resume surveys).

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