TerrestrialArthropod Survey of Halona Valley, Joint Base Pearl Harbor-Hickham, Naval Magazine, Lualualei Annex August–November 2020

Hawaii Biological Survey

FFinal Report

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Terrestrial Arthropod Survey of Hālona Valley, Joint Base Pearl Harbor-Hickam, Naval Magazine Lualualei Annex, August 2020–November 2020

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EXECUTIVE SUMMARY

The Bishop Museum was contracted by the U.S. Navy to conduct surveys of terrestrial arthropods in Hālona Valley, Naval Magazine Lualualei Annex, in order to assess the status of populations of three groups of insects, including species at risk in those groups: picture-winged *Drosophila* (Diptera; flies), *Hylaeus* spp. (Hymenoptera; bees), and *Rhyncogonus welchii* (Coleoptera; weevils). The first complete survey of Lualualei for terrestrial arthropods was made by Bishop Museum in 1997. Since then, the Bishop Museum has conducted surveys in Hālona Valley in 2015, 2016–2017, 2017, 2018, 2019, and 2020. The current survey was conducted from August 2020 through November 2020, comprising a total of 12 trips; using yellow water pan traps, pitfall traps, hand collecting, aerial net collecting, observations, vegetation beating, and a Malaise trap. The area chosen for study was a *Sapindus oahuensis* grove on a southeastern slope of mid-Hālona Valley. The area had potential for all three groups of arthropods to be present, especially the *Rhyncogonus* weevil, which has previously been found in association with *Sapindus* trees. Trapped and collected insects were taken back to the Bishop Museum for sorting, identification, data entry, and storage and preservation. The results of the surveys proved negative for any of the target groups. However, by-catch of 159 species of insects and other terrestrial arthropods resulted in 27 new records for Hālona Valley and 22 for the entire Naval Magazine Lualualei. A listing of all species identified from this survey is given and added to the previous survey lists of terrestrial arthropods known from Lualualei.

INTRODUCTION

In 1997, the Bishop Museum conducted a terrestrial arthropod survey of the Joint Base Pearl Harbor-Hickam, Naval Magazine Lualualei Annex (hereinafter shortened to Lualualei) (Evenhuis, 1997) in order to provide a faunal list of all terrestrial arthropods in assisting the U.S. Navy with their conservation efforts on the base. In that survey, a total of 637 taxa were collected and identified. The majority of the taxa were found in Hālona Valley, which proved to harbor a rich and diverse assemblage of both plants and animals. Recent surveys are being conducted to update that 1997 survey by focusing on Hālona Valley and to assess the populations of three target arthropod groups that include species at risk, as well as federally listed species. The Bishop Museum was contracted in 2015 to re-survey areas of high potential for three sets of target insects that were rare or endangered. That report failed to find any of the target organisms, but the by-catch resulted in 18 new records for Lualualei and for Hālona Valley (Evenhuis *et al*., 2016). The Museum was again contracted in 2016 to survey another portion of Hālona Valley, southeast of the previous year's surveying and located in a *Sapindus* grove where the last *Rhyncogonus welchii* weevil had been collected in 1997. Surveys were conducted from November 2016 through mid-February 2017, comprising a total of 12 trips with negative results for the target organisms, but by-catch resulted in 23 new records for Hālona Valley and 19 new records for Lualualei (Evenhuis *et al*., 2017). In 2017 a survey was conducted at another *Sapindus* grove a few hundred meters southeast of the previous year's survey and comprised 12 trips from mid-August through mid-November 2017. Again, there were negative results for the target organisms, but the by-catch resulted not only in new records, but also a new endemic species of flightless dolichopodid, known previously from the summit bog of Mt. Ka‘ala (Evenhuis *et al.*, 2018; Evenhuis, 2018). The next survey was conducted from September 2018 to December 2018 (Evenhuis *et al*., 2019) at a spot a few hundred meters north of the 2016 survey and higher up the ridge at a spot with a large *Sapindus* grove and much native understory. A former Bishop Museum entomologist indicated he had collected live *Rhyncogonus* weevils near this locality. The results for target organisms were negative but the by-catch resulted in 30 new records to Hālona Valley and 23 for Lualualei. The last survey was conducted at the same location as the 2016 survey (but in different months) in a large *Sapindus* grove (Evenhuis *et al*., 2020). Results again proved negative for the target organisms, but the by-catch resulted in more species than in previous surveys in Hālona and a total of 44 new records for the valley and 34 for Lualualei. The current survey was done at the same locality as in 2017. It was planned to begin in the Spring to give us different seasonal data, but the pandemic delayed our schedule until August. We surveyed the area from August 2020 to November 2020, with negative results for the target organisms but with a by-catch of 159 species, including 27 new records for Halona and 22 new records for Lualualei. With the new records obtained during the current survey, the total number of species of terrestrial arthropods for Lualualei is now 773 (a 21% increase from 1997) and for Hālona is 524 (a 56% increase). The percent native insects in Lualualei is 23%, with 70% adventive, and 7% of unknown origin. Arthropods were observed and collected specimens brought back to the Bishop Museum for identification, data entry, and preservation. Results of collection and identification work are provided in Appendix 2.

This report contains a vegetation overview (Appendix 1) of the three sites surveyed from 2016 to 2020 (when we had a botanist help survey for insects and made observations on the plants at each site). We were unable to get to the first site again with the botanist, so the list is incomplete for all four sites surveyed from 2015–2020. Also included in Appendix 1 is a plant list for the three sites surveyed from 2016–2020.

MATERIAL AND METHODS

Survey Site and Collection Points

Hālona Valley was chosen for survey work because it is the locality where many of the target taxa were last seen. Hālona Valley is a large basin-shaped region forming the headwaters of a major drainage feeding Niuli‘i Reservoir, originating below Pōhākea Pass. This area is today accessed via bunkers located on Dent Street and Forrestal Street.

The survey site this season was a repeat survey of what we call the “Waterhole” Site (because of a human-utilized rock-waterhole in a rocky cliff near the site accessed by an old man-made trail). The first survey at this site was conducted in 2017. A small grove of *Sapindus oahuensis* trees at approximately 1280 ft elev. was selected as the primary survey area since it was the assumed host plant for the *Rhyncogonus* weevil (*R. welchii*) (Coleoptera: Curculionidae) in 1994 and had open canopy areas that could potentially allow possible observations of the other target insects: *Hylaeus* bees and *Drosophila* flies, both of which prefer sunny open vegetated areas. A flagged trail made to the site provided access through *koa haole* (*Leucaena leucocephala*) shrubland and Christmas berry (*Schinus terebinthifolius*) forest.

Surveying was done at sites within and adjacent to the *Sapindus* trees. Collecting sites were marked with a GPS to obtain latitude and longitude (Table 1).

Table 1. Collecting Sites in Naval Magazine Lualualei, Hālona Valley for the 2020 field season.

pitfall sites

Site	GPS	elev.	collecting method
1	N21.42499° W158.10336°	1358 ft.	pitfall
2	N21.42487° W158.10338°	1363 ft.	pitfall
3	N21.42465° W158.10365°	1376 ft.	pitfall
4	N21.42466° W158.10365°	1375 ft.	pitfall
5	N21.42472° W158.10373°	1372 ft.	pitfall
6	N21.42465° W158.10375°	1378 ft.	pitfall
7	N21.42474° W158.10381°	1366 ft.	pitfall
8	N21.42472° W158.10382°	1374 ft.	pitfall
9	N21.42465° W158.10276°	1382 ft.	pitfall
10	N21.42461° W158.10382°	1391 ft.	pitfall

pan trap site and Malaise trap (placed together)*

	GPS	elev.	collecting method
	N21.42492° W158.103294°	1367 ft.	yellow pans

Malaise trap site

	GPS	elev.	collecting method
	N21.42492° W158.10329°	1367 ft.	Malaise trap

*The pan traps were placed directly below the Malaise trap to catch any insects that might fall to the ground. Other insects would be directed upward and into the collection canister of the Malaise trap.

Collecting Methods

A number of collecting methods were employed during the survey to enable collection of as wide a variety of arthropods as possible. Some included observation only to avoid collecting of federally listed picture-winged *Drosophila*. A list of the trapping methods used included:

Yellow water pans (Fig. 1). These are used to collect a variety of flying insects that are attracted to the yellow color. The traps consist of small yellow bowls filled with water with a small amount of surfactant (usually soap), which causes trapped specimens to sink and drown. A small amount of eco-safe propylene glycol was added to repel fungal growth and reduce evaporation of the liquid. Pans were placed in a fairly open area (i.e., one that provided dappled sunlight) and in presumed flight paths to allow flying insects to better see the pans and be attracted to them.

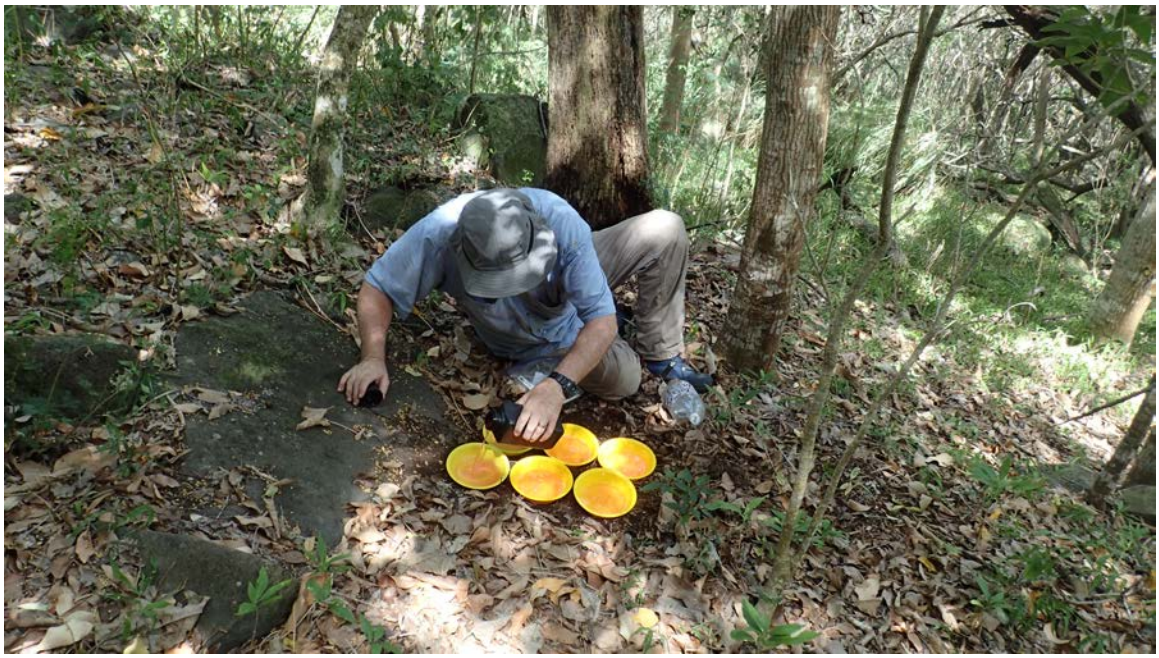

Fig. 1. Yellow Pan trap setup (non-toxic propylene glycol giving liquid a pinkish appearance). Photo: Cory Campora.

Pitfall traps (Fig. 2). These traps are designed to collect ground-dwelling arthropods and other invertebrates that fall into the traps. The traps consist of a plastic cup buried in the substrate, so as to be relatively level with the ground, and filled with a 50/50 mix of water and propylene glycol (non-toxic marine anti-freeze). Cups that were above ground level were provided with natural "ramps" of twigs. Traps were protected from rain and falling debris by placing a cap rock on top but still leaving space for crawling invertebrates to get to the cup. This survey modified the procedure of previous surveys by adding a second plastic cup that was used as a protective sleeve. When the inner cup containing the liquid was removed in order to collect specimens, the outer "protective" cup was kept in place, which kept loose soil and rocks from falling into the excavation, thus saving time in otherwise having to re-excavate.

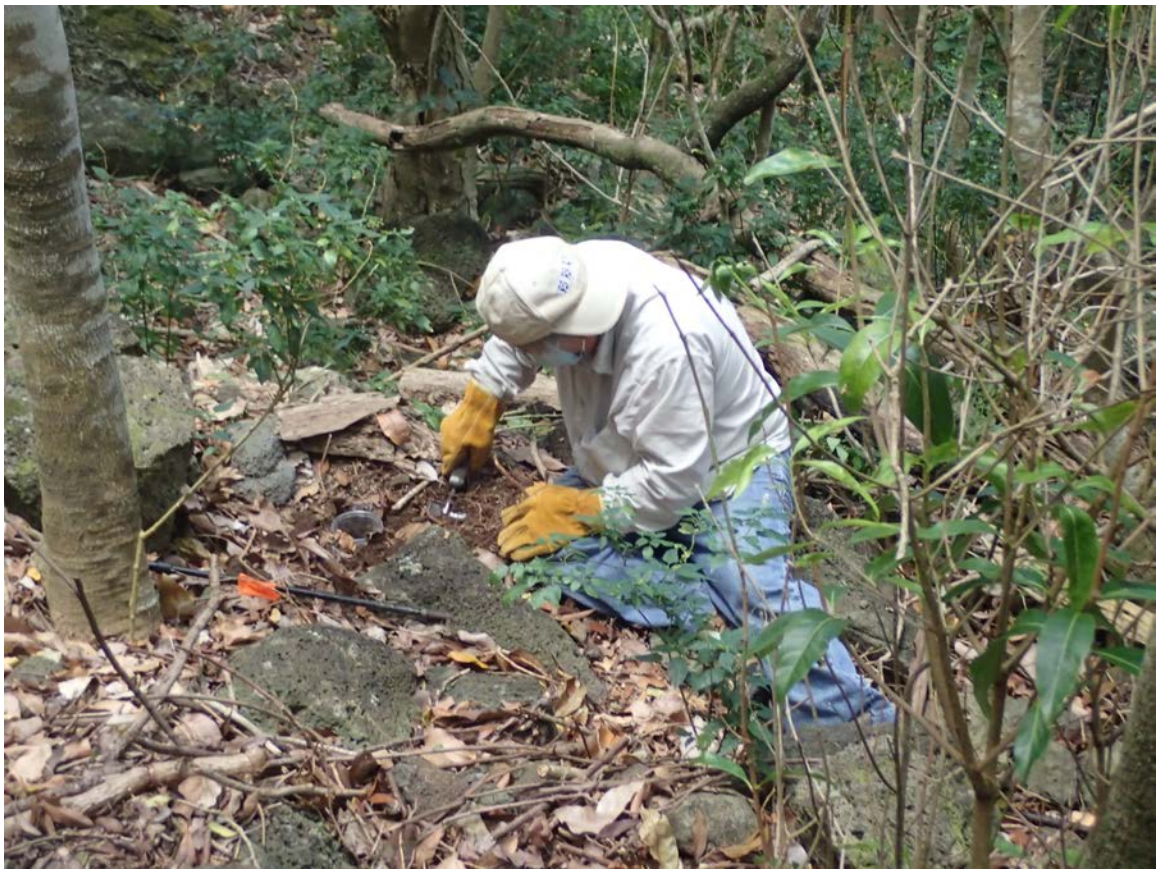

Fig. 2. Pitfall trap (plastic cup) in place. A rock protective cover will be placed on top to protect from rain but still allow insects to fall in. Orange survey flag used to mark location. Photo: Neal Evenhuis.

Bait traps. As in previous survey years, the unfortunate presence of Australian cockroaches recently introduced to the area bypassed the Tanglefoot® barrier (which was placed in order to keep ants from the baits) and would eat all the banana bait and much of the mushrooms so that observations of picture-winged *Drosophila* or other small flies that would otherwise be attracted to the baits could not be observed or collected.

Aerial sweep nets. Flying insects were collected with aerial sweep nets (Fig. 3) when they appeared. Often, insects were collected out of the net with an aspirator. Collected insects were placed in snap cap vials and brought back to the lab for identification and preservation.

Fig. 3. Using an aerial sweep net. Photo: Neal Evenhuis.

Hand collecting. This often involved using snap cap vials for collecting hard to-reach specimens (such as flies under leaves of bushes) or insects walking on substrata (or ground-dwelling spiders and amphipods and isopods). Leaf litter sifting by hand also took place in order to search for *Rhyncogonus* beetles under *Sapindus*. This involved slow removal of leaves and other debris until the ground surface was reached. Bare ground was left open and invertebrates would soon appear and were hand collected. Digging at the bases of *Sapindus* was done in hopes of finding *Rhyncogonus* that would shelter there during the day (they are only active above ground at night).

Malaise trapping. A small free-standing Townes-style Malaise trap (Fig. 4) was employed to better assess the flying insect fauna of the area. Results gave a good representation of the diversity of terrestrial arthropods in the area as well as substantially increasing the records of arthropods recorded from Hālona Valley and the Naval Magazine as a whole.

Fig. 4. Malaise trap to intercept flying insects, with pan traps set in close proximity (first week of collecting). Subsequent collecting events at the site changed the location of the pan traps to directly below the Malaise trap in order to catch insects falling from the Malaise trap. Photo: Neal Evenhuis.

Collecting Times

Six trapping episodes were conducted (12 trips overall) from August through November 2020 at the main study site, with the first day of each biweekly trip focused on placing traps and collecting in the area; the second day (usually three days later to avoid evaporation of liquid in traps) involved collecting trapped specimens and conducting further on-site collecting. As weather permitted, both collecting days during each collecting episode involved searching leaf litter and vegetation for *Rhyncogonus welchii* (see Discussion below for further details).

RESULTS

A total of 159 taxa of terrestrial arthropods were identified during this survey (see Appendix 2), but no target organisms were seen or collected. The recorded taxa included 27 new records (a mixture of native and introduced species) for Hālona Valley and 22 new records (also a mixture of native and introduced species) for Lualualei (since Hālona is by far the most diverse of the areas in Lualualei for terrestrial invertebrates, it is no surprise that if a taxon is new to Hālona, then it would probably not have been found anywhere else in Lualualei previous to this study, thus is new to all of Lualualei too). Additionally, two new families were added to the Lualualei list. A full list is given in Appendix 2, which also indicates new records, taxonomic changes, and corrected spellings, all in red.

A dearth of insects observed at the site this field season was due most likely to the extreme drought. As a result, there are no photographs of live specimens in this report. Laboratory identification did result in one **new state record**, the parasitic wasp, *Trathala annulicornis* (Tosquinet) (family Ichneumonidae) (Fig. 5). It is native to southern Africa and Madagascar, where its host is unknown. There are also records from Moorea in French Polynesia. It may be more widespread than previously recorded.

Fig. 5. Parasitic wasp, *Trathala annulicornis* (Tosquinet). Photo: WaspWeb.

Other significant finds include three endemic species of the psocopterans (bark lice): two of the genus *Kilauella* and one in the genus *Ptycta* (cf. Fig. 6) (all three undetermined below genus level and possibly representing new species). The continual finding of native species in Hālona (e.g., new species of endemic flies found in previous studies; see previous reports) indicates that the area is potentially a repository for possible relict endemics that otherwise have been extirpated from surrounding unmanaged land.

Fig. 6. *Ptycha* sp. Photo: BugGuide.

DISCUSSION

Efforts to find *Rhyncogonus*

As in previous years, we made a special effort to locate any live specimens or elytra of the weevil *Rhyncogonus welchii* that might be in the leaf litter. Leaf litter under *Sapindus* trees were diligently searched for the beetle but with no luck. The method employed in leaf litter searching was to slowly remove leaves from the surface until the lowermost layer was exposed. Then the area was cleared and the topsoil was hand-sifted in hopes of finding larvae or adults underground. Rocks and small boulders were also turned over. Although we obtained negative results for the beetle, this method revealed leaf-litter fauna that would have otherwise been missed, and we encourage further use of this method at other high-potential *Rhyncogonus* areas (e.g., *Sapindus* groves) in order to try and find evidence of the weevil itself, or its elytra. Elytra can persist for years and can give evidence of previous populations in the area.

Fig. 7. Feeding damage by *Rhyncogonus* weevils on young *Sapindus* leaf. Photo: Cory Campora.

As in previous years, searches for evidence of feeding did show some promising results. *Rhyncogonus* weevils produce a distinctive L-shaped feeding mark on leaves (Fig. 7). A number of leaves from young *Sapindus* trees were found with such feeding marks, but subsequent searches for adults or immatures near or below those trees using leaf litter searches and digging down into the soil proved fruitless.

Cockroaches

As with the previous year's surveys, the presence of a populations of the Australian cockroach, *Periplaneta australasiae* (Fig. 8), thwarted our efforts at using banana / mushroom baits, as flying adults would bypass the Tanglefoot® barrier and consume the banana bait and mushrooms shortly after they were put in place. We abandoned the baits, and visual observation for the picture-winged *Drosophila* was continued without baits, which was not optimal and had negative results. Note: The cockroach appears to be well established and slowly spreading throughout Hālona Valley. Its presence as a ground-dwelling scavenger could pose a threat to native ground-dwelling fauna as it outcompetes for resources.

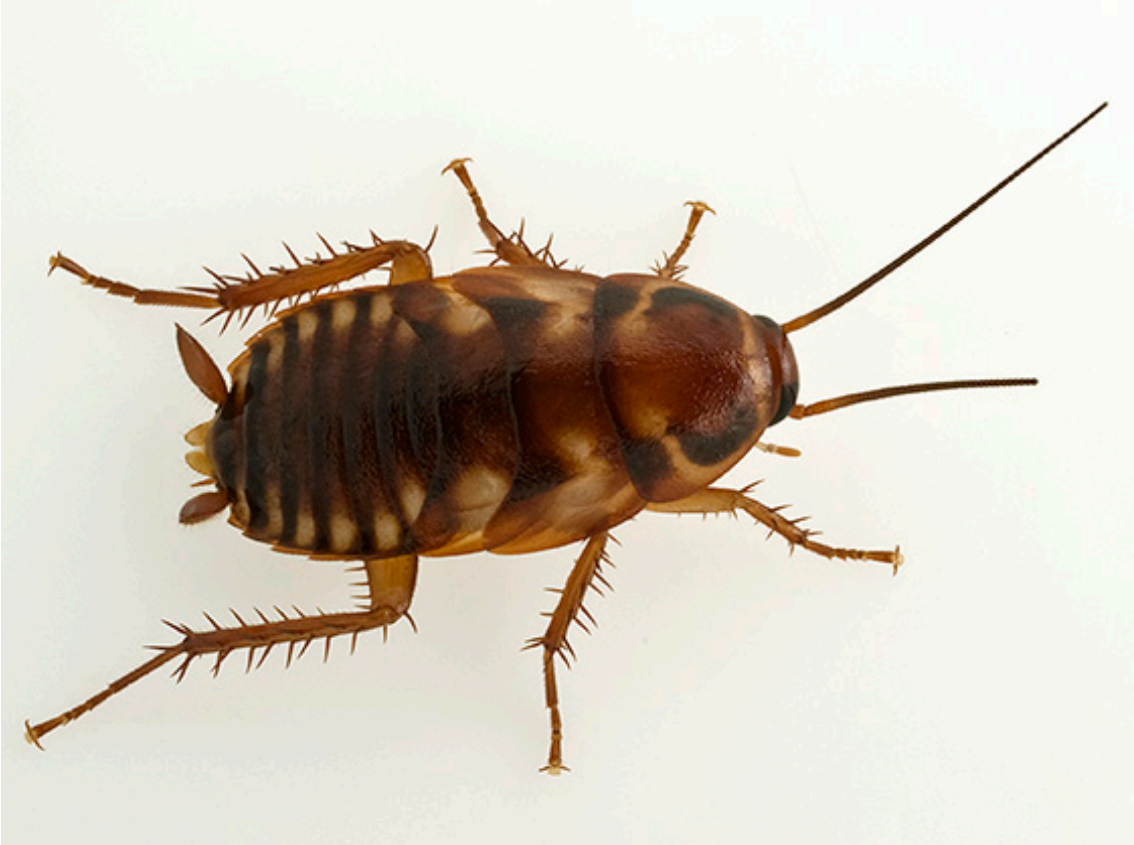

Fig. 8. The Australian cockroach, *Periplaneta australasiae*. Photo: Neal Evenhuis.

Possible threats to native invertebrate fauna

The *Anoplolepis gracilipes* (crazy ants) found the study sites in Hālona Valley could be a potential threat to any soil-dwelling or arboreal native invertebrate fauna. The *Anoplolepis* ants at the study site were part of a supercolony and could contain as many as millions of individuals. The numbers of *Anoplolepis* were significantly lower this season and could be due to the extreme drought conditions during the survey. Normally, the ants would be the dominant invertebrate seen in the leaf litter and on tree trunks. Last year, we found these ants on *Rauvolfia* tending scale insects for the honey they produce (Fig. 9). This year, we checked those plants and they had died, possibly due to the scale insects. We assume scale insects still exist in Hālona and, despite the ants decimating leaf litter prey, they will also persist by surviving on the honey that the scale insects produce. The ants, along with the Australian cockroach, may pose severe threats to the native ground-dwelling fauna. Possibly because of the drought conditions the numbers of ants were reduced this field season, and when sifting through leaf litter, we observed very few invertebrates.

Fig. 9. Yellow-legged crazy ants, *Anoplolepis gracilipes,* tending scale insects on *Rauvolfia*. Photo: Cory Campora.

CONCLUSION

Although we had negative results for the target taxa, there is no reason to believe that they do not exist in Hālona Valley, and further surveying in other areas should hopefully bear this out. At a minimum, this survey continues to increase the baseline inventory of terrestrial arthropods in Hālona Valley and Lualualei and can assist resource managers in decision-making with regard to conservation management, protection of existing native biota, and understanding and possibly mitigating possible threats to vulnerable taxa of plants and invertebrates in the area.

ACKNOWLEDGMENTS

The U.S. Navy is thanked for allowing access to the Naval Magazine Lualualei Annex to conduct these surveys. Thanks specifically to Cory Campora for inspiring us and supporting our surveys. He was our main insect photographer and his absence on our 2020 survey forays is reflected in the paucity of live photos in this report.

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Appendix 1. **Vegetation overview of survey sites (2016–2020) and plant list [by Clyde Imada]**

The lowland dry shrubland vegetation surrounding the parking area at the end of Dent Street (1,000 feet elevation) in the Hālona section of Lualualei Valley was almost completely non-native, dominated by extensive thickets of 10–15 foot tall koa haole *(Leucaena leucocephala).* The understory was dominated by Guinea grass *(Megathyrsus maximus).* However, during wet periods, we have observed the canopy clothed in the endemic cucurbit vine called kūpala *(Sicyos pachycarpus),* which dies back when the dry season returns. The *Leucaena* forest transitioned upslope into another forest type dominated by the aggressive weedy tree, Christmas berry *(Schinus terebinthifolius),* while the moister adjacent gulches were dominated by kukui, a large Polynesian-introduced tree *(Aleurites moluccana).* A common element in this zone was the middle-story shrub called tree daisy *(Montanoa hibiscifolia).* The ground cover in this zone was the ubiquitous basketgrass *(Oplismenus hirtellus)* and coral berry *(Rivina humilis),* a semiwoody herb. It was within this zone—less koa haole, more Christmas berry, kukui, and tree daisy—that pockets of native forest dominated by āulu *(Sapindus oahuensis),* the preferred host of the weevil *Rhyncogonus welchii,* could be found, primarily on moderate to steep, rocky slopes. The *Manual of the Flowering Plants of Hawai'i* (Wagner *et al*., 1990) described this vegetation type as a lowland dry forest zone called Āulu *(Sapindus)* Forest, unique to O'ahu. It is drought resistant, occurring primarily in the Waianae Mountains on steep, well-drained talus slopes, and dominated by *Sapindus oahuensis* trees up to 50 feet tall. In its purest development, the sparse understory is dominated by native trees and shrubs from 6–30 feet in height. At our chosen sampling sites, the *Sapindus* was a dominant element, but co-occurring native woody taxa were variably present, and the encroachment of non-native species was evident.

Base Camp site

The study site called "Base Camp" (named for its location central to two adjacent sampled sites in Hālona Valley) occurred on a side slope at ca 1,240 ft elevation [N21.42599 W158.10297]. In the midst of this site were some archaeological features, including a rock wall and terracing. Sampling was conducted at this site from November 2016 through February 2017, and again from July through September 2019. The moderate to steep slope here was somewhat bouldery, but not nearly to the extent that talus boulders were present at the other two sites. While 30–50 foot tall *Sapindus oahuensis* was by far the dominant native tree at this site, it was co-dominant with kukui, and only one other native tree species—hao *(Rauvolfia sandwicensis)*—was noted here, and even then it was just a handful of small plants. The understory was dominated by basketgrass and coral berry, with patches of McCoy grass *(Cyperus gracilis),* and much leaf litter. On the perimeters of the site were tracts of Christmas berry and koa haole, along with tree daisy, Guinea grass, and Australian red cedar *(Toona ciliata).* Other occasional shrub and herb aliens included hairy abutilon *(Abutilon grandifolium)* and Sacramento bur *(Triumfetta semitriloba),* as well as the vining invasive huehue haole *(Passiflora suberosa).* The *Sapindus* seemed to be holding its own here, though, as all size classes were present and seedlings and saplings were regenerating well.

Waterhole Site

The site called "Waterhole," a few hundred meters southeast of the Base Camp site and slightly higher, at approximately 1,280 feet elevation [N21.424876 W158.10342], was visited from mid-August through mid-November 2017, then again from mid-August through mid-November 2020. This sampling site included terrain that varied from relatively flat with a semi-open canopy of *Sapindus* and *Aleurites* and thick groundcover of *Oplismenus;* to a gently sloping rocky section dominated by *Schinus* and a single, very large fig tree *(Ficus* cf. *macrophylla);* to a steep, bouldery talus slope vegetated with a 30–50 foot tall, closed-canopied forest dominated by *Sapindus oahuensis,* but also with equal-sized representatives of the endemic trees olopua *(Nestegis sandwicensis)* and hame *(Antidesma pulvinatum),* and smaller *Rauvolfia* plants. Some weedy species, such as Guinea grass, tree daisy, and koa haole were more common along the edges of the dense forest, where more light was available. The dominant groundcovers in the *Sapindus* forest were basketgrass and coral berry, along with much leaf litter. Here again, there was much evidence that *Sapindus* was replacing itself in the ecosystem, but it was troubling that no saplings of *Antidesma* or *Nestegis* were noted; the latter was noted to be suckering from the trunk base, however. This site showed evidence of pig disturbance during our visits.

Resort site

The "Resort" sampling site (named for its lush vegetation and lack of disturbance), due east of the Base Camp site, was visited from September through December 2018. It was reached by climbing upslope from Base Camp to the adjoining ridgeline, then hiking sideslope mauka along the opposite side of the ridge down to its endpoint at the head of the adjacent gully. This site, at approximately 1,470 feet elevation [N21.42436 W158.10121], proved to be the richest in native habitat of the three sites profiled here. The site was likely moister than the other two, as evidenced by the presence of lush clumps of the native palapalai ground fern *(Microlepia strigosa),* absent from the other two sites. The variety and total biomass of native tree elements in this 80% close-canopied forest exceeded that of the other two sites, with a healthy mix of 50-foot tall *Sapindus, Antidesma,* and *Nestegis,* along with smaller alahe‘e *(Psydrax odorata),* absent from the other sites, and *Rauvolfia*. Additional nearby woody natives included pāpala kēpau *(Pisonia sandwicensis),* ‘a‘alii *(Dodonaea viscosa),* and nīoi *(Eugenia reinwardtiana).* The broad sideslope transitioned from native-dominated talus slope with sparse understory to a relatively flat section dominated by close-canopied kukui overstory with thick basketgrass understory and dotted with plantings of kī *(Cordyline fruticosa),* an apparently human-modified zone. The non-native trees Christmas berry and silk oak *(Grevillea robusta)* were occasional in this zone. Beyond this largely non-native zone, additional sampling was done in a more disturbed *Sapindus* forest adjacent to a large gulch on that end of the sideslope.

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Halona survey sites plant checklist

Status: end = endemic, ind = indigenous, nat = naturalized, pol = Polynesian introduction
Frequency: c = common, o = occasional, r = rare)

Scientific name	Common name	Status	Resort site	Water Hole site	Base Camp site
Dicots					
Anacardiaceae					
Schinus terebinthifolius Raddi	Christmas berry, wilelaiki	nat	c	o	o
Apocynaceae					
Alyxia stellata (J.R.Forst. & G.Forst.) Roem. & Schult.	maile	ind	r	r	
Rauvolfia sandwicensis A.DC.	hao	end	r	r	r
Aristolochiaceae					
Aristolochia littoralis Parodi	calico flower	nat		r	r
Asteraceae					
Ageratina adenophora (Spreng.) R.M.King & H.Rob.	Maui pāmakani, pāmakani haole	nat	r		
Ageratina riparia (Regel) R.M.King & H.Rob.	Hāmākua pāmakani, spreading mist flower	nat	r		
Artemisia australis Less.	ʻāhinahina, hinahina	end	r		
Conyza canadensis (L.) Cronquist var. *pusilla* (Nutt.) Cronquist	horseweed	nat	r		
Montanoa hibiscifolia Benth.	tree daisy	nat	r	o	o
Ebenaceae					
Diospyros sandwicensis (A.DC.) Fosb.	lama	end		r	
Euphorbiaceae					
Aleurites moluccana (L.) Willd.	kukui, candlenut	pol	c	o	c
Fabaceae					
Acacia confusa Merr.	Formosan koa	nat	r		
Guilandina major (DC.) Small	yellow nickers	nat?			r
Indigofera suffruticosa Mill.	indigo	nat		r	
Leucaena leucocephala (Lam.) de Wit	koa haole	nat	r	o	o
Senna sp.		nat			r
Lamiaceae					
Plectranthus parviflorus Willd.	ʻalaʻala wai nui	ind		r	
Salvia coccinea Etl.	scarlet sage	nat	r		
Malvaceae					
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	nat	r	r	o
Sida rhombifolia L.	Cuba jute	nat			r
Triumfetta semitriloba Jacq.	Sacramento bur	nat	o		o
Meliaceae					
Toona ciliata M.Roem.	Australian red cedar	nat	r	o	o
Menispermaceae					

Scientific name	Common name	Status	Resort site	Water Hole site	Base Camp site
Cocculus orbiculatus (L.) DC.	huehue	ind	r		
Moraceae					
Ficus cf. *macrophylla* Desf. ex Pers.	Moreton Bay fig	nat		r	
Myrtaceae					
Eugenia reinwardtiana (Blume) DC.	nīoi	ind	r		
Myrtaceae					
Psidium cattleyanum Sabine	strawberry guava, waiawï	nat	r		
Psidium guajava L.	common guava	nat	r		
Nyctaginaceae					
Pisonia sandwicensis Hillebr.	pāpala kēpau	end	r		
Oleaceae					
Nestegis sandwicensis (A.Gray) O.Deg., I.Deg. & L.A.S.Johnson	olopua	end	o	o	
Passifloraceae					
Passiflora edulis Sims	passion fruit, yellow liliko'i			r	
Passiflora suberosa L.	huehue haole	nat	r		o
Petiveriaceae					
Rivina humilis L.	coral berry, rouge plant	nat	o	c	c
Phyllanthaceae					
Antidesma pulvinatum Hillebr.	hame	end	o	r	
Piperaceae					
Peperomia blanda (Jacq.) Kunth var. *floribunda* (Miq.) H.Huber	ʻalaʻala wai nui	ind	r		
Peperomia tetraphylla (G.Forst.) Hook. & Arn.	ʻalaʻala wai nui	ind		r	
Plumbaginaceae					
Plumbago zeylanica L.	ilie'e	ind			r
Proteaceae					
Grevillea robusta A.Cunn. ex R.Br.	silk oak	nat	o		
Rubiaceae					
Psydrax odorata (G.Forst.) A.C.Sm. & S.P.Darwin	alaheʻe	ind	o		
Sapindaceae					
Dodonaea viscosa Jacq.	ʻaʻaliʻi	ind	r		
Sapindus oahuensis Hillebr. ex Radlk.	āulu	end	c	c	c
Sapotaceae					
Sideroxylon persimile (Hemsl.) T.D.Penn.	bumelia	nat	r		r
Verbenaceae					
Lantana camara L.	lantana	nat	r		

Scientific name	Common name	Status	Resort site	Water Hole site	Base Camp site
Monocots					
Asparagaceae					
Cordyline fruticosa (L.) A.Chev.	kī, ti	pol	c	r	r
Cyperaceae					
Carex meyenii Nees		ind	r		
Cyperaceae					
Carex wahuensis C.A.Mey. subsp. *wahuensis*		end	r		
Cyperus gracilis R.Br.	McCoy grass	nat	o		o
Poaceae					
Digitaria insularis (L.) Mez ex Ekman	sourgrass	nat	r		
Melinis minutiflora P.Beauv.	molasses grass	nat		o	
Oplismenus hirtellus (L.) P.Beauv. subsp. hirtellus	basketgrass	nat	c	c	c
Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L.Jacobs	Guinea grass	nat	o	o	o
Pteridophytes & Lycophytes					
Blechnaceae					
Blechnum appendiculatum Willd.		nat	r		
Dennstaedtiaceae					
Microlepia strigosa (Thunb.) C.Presl var. *strigosa*	palapalai	ind	o		
Polypodiaceae					
Lepisorus thunbergianus (Kaulf.) Ching	pākahakaha	ind		r	
Psilotaceae					
Psilotum nudum (L.) P.Beauv.	moa	ind	r		
Pteridaceae					
Cheilanthes viridis (Forssk.) Sw.	green cliff brake	nat	o	r	
Doryopteris decipiens (Hook.) J.Sm.	kumuniu	end		r	
Thelypteridaceae					
Christella parasitica (L.) H.Lév.		nat	r		

Appendix 2. Arthropods collected at Halona Valley August–October 2020 (new or corrected items in red)

	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
ACARI										1	phoretic
Acaridae											
Tyrophagus putrescentiae (Schrank)	adv	1		1							
Ascidae											
Asca aphidioides (Linnaeus)	adv	1		1							
Asca duosetosa Fox	adv	1		1							
Asca quinquesetosa Wharton	adv	1									
Bdellidae											
Bdella captiosa Atyeo	adv	1		1							
Bdella distincta Baker & Balock	adv	1		1							
Bdella mexicana Baker & Balock	adv	1		1							
Spinibdella depressa (Ewing)	adv	1		1							
Spinibdella sp. [immature]	??	1		1							
Brachycthoniidae											
Sellnickthonius sp.	end	1									
Caligonellidae											
Coptocheles solanii Swift	end	1									
Neognathus spectabilis (Summers & Schlinger)	adv	1									
Cepheidae/Andremaeidae											
gen. sp.	??	1		1							
Cheyletidae											
Hemicheyletia wellsi (Baker)	adv	1		1							
Cryptognathidae											
Favognathus goffi Swift	end	1		1							
Favognathus pictus (Summers & Chaudhri)	adv	1		1							
Ctenacaridae											
Ctenacarus araneolus (Grandjean)	adv	1									
Cunaxidae											
Pulaeus n.sp.	end	1		1							
Digamasellidae											
Dendroseius sp.	adv	1									
Ereynetidae											
Ereynetes sp.	adv	1		1							
Euphthiracaridae											
Euphthiracarus sp.	end	1		1							
Eupodidae											
Eupodes sigmoidensis Strandtmann & Goff	end	1		1							
Galumnidae											
Pergalumna hawaiiensis (Jacot)	ind	1		1							
Laelapidae											
Pseudoparasitus trincisus Hunter	adv	1		1							
Macrochelidae											
Macrocheles muscaedomesticae (Scopoli)	adv	1		1							
Macrocheles sp. nr. rodriguezi (Oliver & Krantz)	adv	1		1							
Nanorchestidae											
Nanorchestes sp. 1	adv	1		1							
Nanorchestes sp. 2	adv	1		1							
Nothridae											
Nothrus sp.	adv	1		1							
Ologamasidae											
Gamasiphis sp.	end	1		1							
Oppiidae											
gen. spp. (3)	??	1		1							
Oribatidae											
gen. sp.	??	1			1	1		1	1	1	
Paratydeidae											
Paratydeus sp.	adv	1									
Podocinidae											
Podocinum sagax (Berlese)	adv	1		1							
Polyaspididae											
gen. sp.	??	1		1							
Pygmephoridae											
Pygmephorus sp.	adv	1									

Appendix 2. Arthropods collected at Halona Valley August–October 2020 (new or corrected items in red)

	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
ACARI (continued)										1	phoretic
Raphignathidae											
Raphignathus n.sp.	adv	1									
Rhagidiidae											
Shibaia longisensilla (Shiba)	adv	1									
Scheloribatidae											
Scheloribates sp. nr. oahuensis Jacot	end	1		1							
Scheloribates spp.	??	1		1							
Stigmaeidae											
Eustigmaeus microsegnis (Chaudhri)	adv	1		1							
Eustigmaeus ornatus Ueckermann & Meyer	adv	1		1							
Eustigmaeus segnis grp.	adv	1		1							
Stigmaeus n.sp.	end	1		1							
Tarsonemidae											
Hemitarsonemus sp.	adv	1									
Tydeidae											
Tydeus sp.	adv	1									
Uropodidae											
gen. sp.	adv	1		1							
Veigaiidae											
Veigaia nemorensis (C.L. Koch)	adv	1									
AMPHIPODA											
Talitridae											
Talitroides topitotum Burt	adv	1		1	1	1	1	1	1	1	
ARANEAE											
Araneidae					1						
Argiope appensa (Walckenaer)	adv	1		1							
Gasteracantha mammosa C.L. Koch	adv	1		1	1	1		1	1	1	
Neoscona sp.	adv	1									
Clubionidae											
Cheiracanthium mordax L. Koch	adv	1		1							
Dysderidae											
Dysdera crocota C.L. Koch	adv	1		1					1	1	
Gnaphosidae											
Camillina elegans (Bryant)	adv	1		1							
Linyphiidae											
Orsenwelles polites Hormiga [was Labulla sp.]	end	1		1				1			
Nesticidae											
Eidmanella pallida (Emerton)	end	1		1							
Oonopidae											
Oonopinus hunus Suman	end	1									
Oonopinus n.sp.	end	1									
Opopaea lena Suman	end	1									
Orchestina sp.	adv	1									
Pholcidae											
Pholcus phalangioides (Fuesslins)	adv	1							1	1	
Salticidae	adv				1	1	1	1		1	
Cosmophasis sp.	adv								1		
Hasarius adansoni (Audouin)	adv	1							1	1	
Phintella versicolor (C.L. Koch)	adv	1									
Myrmarachne sp.	adv							1	1	1	
Tetragnathidae											
Tetragnatha n. sp.	end	1		1							
Theridiidae					1	1					
Argyrodes argyrodes (Walckenaer)	adv	1									
Latrodectus geometricus C.L. Koch	adv	1									
Steatoda grossa (C.L. Koch)	adv	1						1	1	1	
Theridion melanostictum (Pickard-Cambridge)	adv	1									
Thomisidae									1		
Misumenops sp. A	end	1									
Misumenops sp. B	end	1		1							
Misumenops sp. C	end	1		1							

Appendix 2. Arthropods collected at Halona Valley August–October 2020 (new or corrected items in red)

	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
CHILOPODA					1	1		1			
Geophilidae											
gen. sp.	adv	1									
Lithobiidae											
Lithobius sp.	??	1		1							
Scolopendridae											
gen. sp. [immatures]	adv	1									
Scolopendra subspinipes Leach	adv	1		1					1	1	
COLEOPTERA											
Alleculidae											
Pseudocistela sp.	adv	1									
Anthribidae											
Araecerus fasciculatus (De Geer)	adv	1									
Araecerus levipennis Jordan	adv	1		1			1			1	
Araecerus vieillardi (Montrouzier)	adv	1								1	
Exilis lepidus Jordan	adv	1						1	1	1	
gen. in subfamily Choraginae nr. Cisanthribus	adv						1				
gen. sp.	adv	1		1							
Ormiscus sp.	unk									1	
Belidae											
Proterhinus blackburni blackburni Sharp	end	1		1							
Proterhinus deceptor Perkins	end	1									
Proterhinus spp. (not blackburni group)	end	1		1						1	
Bostrichidae											
Amphicerus cornutus (Pallas)	adv	1							1		
Xylopsocus castenoptera (Fairmaire)	adv				1					1	
Xylopsocus religiosus (Boisduval)	adv	1		1	1						
Bruchidae											
Acanthoscelides macrophthalmus (Schaeffer)	adv	1		1					1	1	
Lithraeus atronotatus (Pic)	adv	1		1							
Stator pruininus (Horn)	adv	1		1					1		
gen. sp.	adv	1									
Buprestidae											
Chrysobothris octocola Le Conte	adv	1									
Cantharidae											
Caccodes oceaniae (Bourgeois)	adv	1									
Carabidae											
Metacolpodes buchannani Hope	adv	1									
Gnathaphanus picipes (Macleay)	adv	1		1							
Gnathaphanus upolensis (Csiki)	adv	1		1							
Stenolophus sp.	??	1		1							
Cerambycidae									1	1	
Ceresium unicolor (Fabricius)	adv	1		1					1	1	
Curtomerus flavus (Fabricius)	adv	1		1						1	
Gelonaetha hirta (Fairmaire)	adv	1		1							
Oopsis nutator (Fabricius)	adv	1		1							
Phoracantha semipunctata (Fabricius)	adv	1		1							
Placosternus crinicornis {Chevrolat)	adv	1		1		1			1		
Pterolophia camura Newman	adv	1		1							
Sybra alternans (Wiedemann)	adv	1		1			1				
Xystrocera globosa (Olivier)	adv									1	
Chrysomelidae											
Diachus auratus (Fabricius)	adv	1		1						1	
Octotoma scabripennis Guerin-Meneville	adv	1		1							
Uroplata girardi Pic	adv	1		1							
Ciidae	??							1			
gen. sp. A	end	1		1							
gen. sp. B	end	1									
Coccinellidae										1	
Cryptolaemus montrouzieri Mulsant	pur	1		1							
Curinus coeruleus (Mulsant)	pur	1		1		1		1			
Halmus chalybeus (Boisduval)	pur	1									
Nephaspis bicolor Gordon	pur								1	1	
Symnobius bilucernarius (Mulsant)	pur	1		1					1		

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
COLEOPTERA (continued)											
Coccinellidae (continued)										1	
Olla v-nigrum (Mulsant)	pur	1		1	1						
Orcus australasiae (Boisduval)	pur	1		1							
Rhyzobius forestieri (Mulsant)	pur	1		1							
Scymnus sp.	pur	1		1							
Sticholotis ruficeps Weise	pur	1		1					1	1	
Telsimia nitida Chapin	pur	1		1							
Colydiidae											
Penthelispa rufipennis (Montrouzier)	adv	1									
Corylophidae											
Gronevus rotundus (Sharp)	end	1					1	1	1		
Gronevus sp.	end	1									
Orthoperini sp. (not Orthoperus aequalis Sharp)	??	1									
Sericoderus pubipennis Sharp	end	1		1		1	1	1	1	1	
Curculionidae											
Acalles sp.	end						1		1		
Anotheorus sp.	end	1									
Dryophthorus distinguendus Perkins	end	1		1				1			
Oodemas punctulatissimum Perkins	end	1		1							
Oxydema fusiforme Wollaston	adv	1		1							
Pantomorus cervinus (Boheman) [was Asyonychus godmanni]	adv	1		1			1	1	1		
Pentarthrum sp.	adv					1				1	
Pholidophorus advena Zimmerman	adv	1		1							
Rhyncogonus welchii Perkins	end	1		1							
Sibinia sp.	adv	1		1							
Dermestidae											
Orphinus terminalis (Sharp)	ind	1									
Dytiscidae											
Rhantus pacificus (Boisduval)	end	1									
Rhantus pseudopacificus Balke	end	1		1							
Elateridae											
Chalcolepidius erythroloma Candeze	end	1							1		
Conoderus exsul (Sharp)	adv	1		1			1	1	1	1	
Endomychidae											
Eidoreus minutus Sharp	end	1									
Hydrophilidae											
Cryptopleurum minutum (Fabricius)	ind	1									
Enochrus sayi Gundersen	adv	1									
Helochares sp.	adv	1									
Tropisternus lateralis humeralis Motschulsky	adv	1									
Jacobsoniidae											
Derolathrus atomus Sharp	end	1		1							
Languriidae											
Cryptophilus integer (Heer)	adv	1					1			1	
Lathridiidae											
Corticaria longicollis (Zetterstedt)	adv	1									
Mycetophagidae											
Litargus vestitus Sharp	ind	1									
Nitidulidae											
Carpophilus dimidiatus (F.)	adv						1	1			
Carpophilus hemipterus (Linnaeus)	adv	1									
Carpophilus humeralis (Fabricius)	adv	1		1							
Carpophilus mutilatus Erichson	adv	1									
Carpophilus oculatus Murray	adv					1	1		1	1	
Epuraea (Haptoncus) mundus Sharp	adv	1		1							
Epuraea (Haptoncus) ocularis (Fairmaire)	adv	1		1		1					
Nesopeplus roridus Sharp	end	1									
Phenolia limbata tibialis (Boheman)	adv					1	1		1		
Stelidota geminata (Say)	adv					1	1	1	1	1	
Oedemeridae											
Thelyphassa apicata (Fairmaire)	adv								1		
Phalacridae											
Gen. sp.	unk									1	

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
COLEOPTERA (continued)											
Ptiliidae											
Ptiliodes sp.	end	1									
gen. sp.	??	1								1	
Rhizophagidae											
Hesperobaenus capito (Fairmaire)	ind	1			1			1		1	
Scarabaeidae											
Adoretus sinicus Burmeister	adv	1		1					1	1	
Copris incertus prociduus Say	adv	1		1				1	1	1	
Onthophagus incensus Say	adv	1		1						1	
Scirtidae											
gen. sp.	adv	1									
Scolytidae											
Cryphalus sylvicola (Perkins)	adv						1	1		1	
Euwallacea fornicatus (Eichhoff)	adv				1						
Euwallacea similis (Ferrari)	adv									1	
Hypothenemus birmanus (Eichhoff)	adv	1			1						
Hypothenemus crudiae (Panzer)	adv	1									
Hypothenemus eruditus (Westwood)	adv	1								1	
Hypothenemus seriatus (Eichhoff)	adv						1				
Wallacellus denticulatus (Motschulsky)	adv					1					
Xyleborinus andrewsi (Blandford)	adv				1	1	1	1	1	1	
Xyleborinus saxeseni (Ratzeburg)	adv	1			1					1	
Xyleborus affinis Eichhoff	adv	1					1	1			
Xyleborus ferrugineus (Fabricius)	adv	1		1			1				
Xyleborus interjectus Blandford	adv	1					1				
Xyleborus lanaiensis Perkins	end	1		1	1						
Xyleborus perforans (Wollaston)	adv	1		1	1		1	1		1	
Xyleborus spinulosus Blandford	adv				1		1			1	
Xylosandrus compactus (Eichhoff)	adv				1		1	1			
Xylosandrus crassiusculus (Motschulsky)	adv						1	1		1	
Silvanidae											
Cryptamorpha desjardinsi (Guérin-Méneville)	adv	1		1	1			1	1		
Psammoechus sp.	adv	1									
Staphylinidae									1	1	
Aleocara sp.	adv					1					
Anotylus sp. prob. nitidifrons (Wollaston)	adv				1		1	1			
Atheta coriaria (Kraatz)	adv	1									
Atheta sp. (not coriaria)	??	1					1				
Coproporus sp.	adv	1									
Ctenandropus sp.	adv	1									
Philonthus discoideus (Gravenhorst)	adv	1									
Philonthus longicornis Stephens	adv	1		1							
Philonthus sp.	adv	1									
Philonthus sp. (Newton sp. 1)	adv	1									
Philonthus turbidus Erichson	adv	1		1							
Sunius sp.	adv	1		1			1	1		1	
Thyreocephalus albertisi (Fauvel)	adv	1		1					1		
gen. sp.	??	1									
gen. sp. (Piestinae)	??	1		1							
Tenebrionidae											
Blapstinus dilatatus Le Conte	adv	1									
Gnathocerus cornutus (Fabricius)	adv	1									
Microcrypticus obscurus (Sharp)	adv								1		
Platydema subfascia (Walker)	adv	1									
Trogositidae											
Neaspis ?variegata (Macleay)	adv	1		1	1					1	
COLLEMBOLA											
Dicyrtomidae											
Dicyrtoma (Papirioides) dubia (Folsom)	end								1	1	
Entomobryidae										1	
Entomobrya nyhusae Christiansen & Bellinger	end	1									
Salina celebensis (Schäffer)	adv				1	1		1	1		

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
COLLEMBOLA (continued)											
Hypogastruridae											
Neanura sp.	??	1									
Neelidae											
Neelus minutus Folsom	adv	1						1	1	1	
Sminthuridae											
gen. spp.	??	1			1		2	1		1	
DERMAPTERA	adv					1					
Carcinophoridae											
Euborellia annulipes (Lucas)	adv	1		1				1	1	1	
Euborellia eteronoma (Borelli)	end	1		1			1		1		
Chelisochidae											
Chelisoches morio (Fabricius)	adv	1									
Labiidae											
Sphingolabis hawaiiensis (Bormans)	adv	1									
Spirolabia dubronyi (Hebard)	adv	1		1			1				
DICTYOPTERA											
Blaberidae											
Diploptera punctata (Eschscholtz)	adv	1		1							
Pycnoscelus indicus (Fabricius)	adv	1					1		1	1	
Blattellidae					1						
Balta noctulata (Stål) [= Onchostylus notulatus]	adv					1	1	1	1	1	
Balta similis (Saussure)	adv	1		1				1			
Balta sp. (not similis)	adv	1		1							
Blattella germanica (Linnaeus)	adv	1		1							
Blattella lituricollis (Walker)	adv	1									
Lobopterella dimidiatipes (Bolivar)	adv					1	1	1	1	1	
Blattidae											
Periplaneta americana (Linnaeus)	adv	1									
Periplaneta australasiae (Fabricius)	adv	1					1	1	1	1	
Platyzosteria soror (Brunner)	adv	1		1							
Polyphagidae											
Euthyrrhapha pacifica (Coquebert)	adv	1									
DIPLOPODA	??					1					
Cambalidae											
Nannolene sp.	end	1		1							
Paradoxosomatidae											
Asiomorpha coarctata (Saussure)	adv	1									
Oxidus gracilis (C.L. Koch)	adv	1									
Polyxenidae											
Polyxenus sp.	??	1					1	1	1	1	
Pyrgodesmidae											
Aporodesminus wallacei Silvestri	adv	1					1	1			
Spirobolidae											
Spirobolellus immigrans (Chamberlain)	adv	1							1		
DIPTERA											
Agromyzidae											
Amauromyza maculosa (Malloch)	adv	1									
Calycomyza sp.	adv							1	1		
Liriomyza sp.	adv							1			
Liriomyza sp. nr. sativae Blanchard	adv	1		1							
Melanagromyza metallica Thomson	adv	1									
Phytoliriomyza montana Frick	adv	1		1							
Pseudonapomyza spicata (Malloch)	adv	1									
Anthomyiidae											
Anthomyia vicarians Schiner	adv	1									
Anthomyzidae											
Amygdalops nigronotum Sueyoshi & Roháček	adv							1		1	
Asteiidae											
Asteia sabroskyi Hardy & Delfinado	end	1		1							
Calliphoridae											
Calliphora vomitoria (Linnaeus)	adv	1						1	1	1	
Chrysomya megacephala (Fabricius)	adv	1		1	1				1		

Appendix 2. Arthropods collected at Halona Valley August–October 2020 (new or corrected items in red)

	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
DIPTERA (continued)											
Calliphoridae (continued)											
Dyscritomyia cuprea James	end	1		1							
Dyscritomyia fasciata (Grimshaw)	end	1		1							
Dyscritomyia limbipennis (Thomson)	end	1		1							
Lucilia sp. nr. cuprina (Wiedemann)	adv	1									
Lucilia sericata (Meigen)	adv	1									
Melinda pusilla (Villeneuve)	adv	1									
Cecidomyiidae								1		2	
Contarinia sp.	???									1	
Dasineura mangiferae Felt	adv	1			1				1	1	
Lestodiplosis obtusilobata Hardy	end							1	1		
Gen. sp.	???								1		
Ceratopogonidae										1	
Forcipomyia brevis (Johannsen)	adv							1	1	1	
Forcipomyia hardyi Wirth & Howarth	end	1		1	1						
Chironomidae	??							1			
Chironomus hawaiiensis Grimshaw	end	1									
Corynoneura sp.	adv	1									
Cricotopus bicinctus (Meigen)	adv	1									
Orthocladius sp. nr. wirthi Hardy	end	1									
Orthocladius williamsi Hardy	end	1		1							
Pseudosmittia maculiventris (Edwards)	adv							1	1	1	
Chloropidae											
Cadrema pallida (Loew)	adv					1	1	1		1	
Conioscinella formosa (Becker)	adv	1		1							
Gampsocera hardyi Kanmiya	adv									1	
Gaurax bicoloripes (Malloch)	adv	1		1				1			
Rhodesiella scutellata (Meijere)	adv	1		1	1		1	1	1	1	
Tylopterna sp.	adv								1		
Cryptochetidae											
Cryptochetum iceryae (Williston)	pur	1		1							
Culicidae											
Aedes albopictus (Skuse)	adv	1			1	1	1	1	1	1	
Dixidae											
Dixa longistyla Takahashi	adv	1									
Dolichopodidae											
Amblypsilopus pallidicornis (Grimshaw)	adv								1	1	
Campsicnemus gloriosus Van Duzee	end	1									
Campsicnemus halonae Evenhuis	end	1		1					1	1	
Campsicnemus hao Evenhuis	end						1				
Campsicnemus miser Parent	end	1		1							
Campsicnemus patellifer Grimshaw	end	1		1				1			
Campsicnemus planitibia Parent	end	1									
Chrysosoma globiferum (Wiedemann)	adv	1		1	1		1		1		
Chrysotus longipalpis Aldrich	adv	1			1						
Dolichopus exsul Aldrich	adv	1									
Eurynogaster sp.	end	1									
Medetera grisescens Meijere	adv	1								1	
Pelastoneurus lugubris Loew	adv	1		1							
Syntormon flexibile Becker	adv	1									
Tachytrechus sp.	adv	1									
Drosophilidae											
Chymomyza procnemis (Williston)	adv	1									
Dettopsomyia formosa Lamb	adv	1						1			
Drosophila cf. ?hydei Sturtevant	adv					1					
Drosophila immigrans Sturtevant	adv	1			1	1	1	1	1	1	
Drosophila nasutoides Okada	adv					1					
Drosophila cf. ?repleta Wollaston	adv					1					
Drosophila simulans Sturtevant	adv					1		1		1	
Drosophila sulfurigaster bilimbata Bezzi	adv	1				1					
Drosophila suzukii (Matsumura)	adv	1		1		1	1			1	
Drosophila tamashiroi Hardy	end	1		1							
Scaptomyza buccata Hackman	end	1								1	

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
DIPTERA (continued)											
Drosophilidae (continued)											
Stegana sp.	??	1									
Zaprionus indianus Gupta	adv					1	1	1	1	1	
Empididae											
Hemerodromia stellaris Melander	adv	1									
Ephydridae											
Brachydeutera hebes Cresson	end	1									
Donaceus nigronotatus Cresson	adv	1									
Hydrellia williamsi Cresson	end	1									
Nostima niveivenosa Cresson	adv	1									
Scatella hawaiiensis Grimshaw	end	1									
Heleomyzidae											
Trixoscelis ornata (Johnson)	adv								1		
Keroplatidae											
Tylparua hawaiiensis (Grimshaw)	end	1						1			
Tylparua "apicalis" Evenhuis, n. sp. MS	end								1		
Lauxaniidae											
Homoneura hawaiiensis (Grimshaw)	end						1	1	1	1	
Homoneura unguiculata (Kertész)	adv	1		1	1		1			1	
Poecilominettia sexseriata Hendel	adv	1		1			1	1			
Limoniidae	end								1		
Dicranomyia hawaiiensis Grimshaw	end	1		1	1			1			
Dicranomyia jacoba Alexander	end	1									
Dicranomyia nigropolita Alexander	end							1			
Dicranomyia stygipennis Alexander	end				1			1			
Dicranomyia swezeyi Alexander	end	1			1			1			
Libnotes perkinsi (Grimshaw)	end	1		1						1	
Lonchaeidae											
Lonchaea polita Say	adv	1									
Micropezidae											
Taeniaptera angulata (Loew)	adv	1									
Milichiidae											
Desmometopa inaurata Lamb	adv	1		1							
Muscidae											
Atherigona orientalis Schiner	adv	1		1						1	
Atherigona reversura Villeneuve	adv	1		1							
Brontaea quadristigma (Thomson)	adv	1		1							
Haematobia irritans (Linnaeus)	adv	1									
Lispocephala sp.	end	1							1		
Musca sorbens Wiedemann	adv							1	1		
Stomoxys calcitrans (Linnaeus)	adv	1									
Neriidae											
Telostylinus lineolatus (Wiedemann)	adv	1			1	1	1	1	1	1	
Phoridae									1	3	
Chonocephalus sp.	end	1									
Chonocephalus simiolus Beyer	end									1	
Diplonevra peregrina (Wiedemann)	adv					1	1		1		
Dohrniphora cornuta (Bigot)	adv	1									
Megaselia (Megaselia) sp.	??	1						1			
Megaselia furcatilis Beyer	end					1		1	1		
Puliciphora sp.	adv	1		1	1	1	1	1	1	1	
Psychodidae										1	
Psychoda sp. nr. wirthi Quate	end	1			1						
Psychoda sp. (?new to Hawaii)	adv							1	1	1	
Rhiniidae											
Rhinia apicalis (Wiedemann)	adv	1									
Sarcophagidae											
Helicobia morionella (Aldrich)	adv	1		1							
Lepidodexia elegans (Coquillett) [was Johnsonia]	adv	1		1				1	1		
Sarcophaga peregrina (Rohdendorf)	adv								1	1	
Sarcophaga princeps Wiedemann	adv	1									
Sarcophaga ruficornis (Fabricius)	adv	1									

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
DIPTERA (continued)											
Sarcophagidae (continued)											
Tricharaea occidua (Fabricius) [was Sarcophagula]	adv	1		1				1			
Scatopsidae											
Holoplagia guamensis (Johanssen)	adv				1					1	
Scenopinidae											
Scenopinus adventicius Hardy	ind	1		1							
Scenopinus lucidus Becker	adv	1				1	1		1		
Sciaridae									2	2	
Bradysia molokaiensis (Grimshaw)	end	1									
Bradysia spatitergum (Hardy)	adv							1			
Corynoptera prominens Hardy	adv								1		
Ctenosciara hawaiiensis (Hardy)	end	1						1			
Epidapus pallidus (Séguy)	adv								1		
Hyperlasion magnisensoria (Hardy)	end							1			
Scatopsciara nigrita Hardy	end							1			
Scaptosciara sp. (not nigrita)	??							1			
Sepsidae											
Sepsis sp.	adv	1		1							
Sepsis thoracica (Robineau-Desvoidy)	adv	1									
Sphaeroceridae										2	
Coproica sp.	adv	1		1							
Leptocera erythrocera (Becker)	adv	1								1	
Poecilosomella punctipennis (Wiedemann)	adv	1		1	1	1	1	1	1	1	
Pseudopterogramma brevivenosum (Tenorio)	adv							1		1	
Spinilimosina rufifrons (Duda)	adv					1					
Stratiomyidae											
Gobertina picticornis Bigot	adv	1								1	
Hermetia illucens (Linnaeus)	adv	1		1			1		1		
Merosargus sp.	adv	1					1	1			
Syrphidae											
Allograpta exotica (Wiedemann)	adv	1									
Allograpta obliqua (Say)	adv	1		1			1	1	1		
Copestylum apicale (Loew)	adv	1		1							
Copestylum tamaulipanum (Townsend)	adv	1									
Eristalinus arvorum (Fabricius)	adv	1									
Eumerus aurifrons (Wiedemann)	adv	1								1	
Ocyptamus dimidiatus (Fabricius)	adv				1						
Ornidia obesa (Fabricius)	adv	1		1	1	1			1		
Syritta sp.	adv				1			1			
Toxomerus marginatus (Say)	adv	1		1							
Tachinidae											
Archytas cirphis Curran	pur	1		1							
Chaetogaedia monticola (Bigot)	pur	1									
Eucelatoria armigera (Coquillett)	adv	1		1							
Lespesia archippivora (Riley)	pur	1		1							
Trichopoda pilipes (Fabricius)	pur	1		1							
Tephritidae											
Acinia picturata (Snow)	adv	1		1							
Bactrocera cucurbitae (Coquillett)	adv	1		1			1	1			
Bactrocera dorsalis (Hendel)	adv				1						
Ensina sonchi (Linnaeus)	adv	1									
Eutreta xanthochaeta Aldrich	adv	1									
Procecidochares alani Steyskal	pur	1						1			
Tetraeuaresta obscuriventris (Loew)	adv	1									
Ulidiidae					1						
Acrosticta apicalis (Williston)	adv	1		1							
Euxesta stigmatais Loew	adv	1		1						1	
Notogramma cimiciforme Loew	adv	1									
Xylomyidae											
Solva sp.	adv					1	1		1	1	

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
EMBIIDINA											
Oligotomidae											
Oligotoma saundersii (Westwood)	adv	1		1		1	1		1		
HETEROPTERA											
Anthocoridae											
Paratriphleps laeviusculus Champion	adv	1									
Cydnidae											
Geotomus pygmaeus (Dallas)	adv	1		1							
Rhytidoporus indentatus Uhler	adv	1		1	1				1		
Lasiochilidae											
Lasiochilus denigratus (White)	end								1		
Lygaeidae											
Clerada apicornis Signoret	adv									1	
Metrarga nuda White	end	1		1							
Nysius communis Usinger	end	1									
Pachybrachius sp.	adv	1		1							
Miridae										1	
Halticus bractatus (Say)	adv	1		1							
Hyalopeplus pellucidus (Stal)	end	1		1							
Kamehameha n.sp.	end	1									
Koanoa n.sp.	end	1									
Lygus (prob.) sp. (not elisae)	adv	1		1							
Nesidiorchestes hawaiiensis Kirkaldy	end	1		1					1	1	
Orthotylus n.sp. A [sensu Asquith]	end	1									
Orthotylus n.sp. B [sensu Asquith]	end	1									
Orthotylus n.sp. C [sensu Asquith]	end	1									
Orthotylus n.sp. D [sensu Asquith]	end	1									
Orthotylus spp.	end	1									
Rhinacloa forticornis Reuter	adv	1									
Stenotus sp. (not binotatus)	adv	1		1							
Taylorilygus apicalis (Fieber)	adv	1		1					1		
Nabidae											
Nabis blackburni White	end	1		1							
Nabis sp.	??	1		1							
Pentatomidae											
Nezara viridula (Linnaeus)	adv	1		1				1			
Plautia stali Scott	adv	1		1							
Plataspidae											
Coptosoma xanthogramma (White)	adv	1		1							
Reduviidae									1		
Empicoris rubromaculatus (Blackburn)	adv	1		1					1		
Gallobelgicus saevus Bergroth	adv				1				1		
Haematoloecha rubescens Distant	adv	1		1							
Zelus renardii Kolenati	adv	1									
Rhopalidae											
gen. sp.	??	1		1							
Tingidae											
Corythucha morrilli Osborn & Drake	adv	1		1					1	1	
Leptobyrsa decora Drake	pur	1		1							
Teleonemia scrupulosa Stal	pur	1		1							
Veliidae											
Microvelia vagans White	end	1									
HOMOPTERA											
Aleyrodidae											
Aleurodicus dispersus Russell	adv								1		
Aphididae											
Aphis gossypii Glover	adv	1									
Aphis sp.	adv	1			1		1	1	1	1	
Neotoxoptera formosana (Takahashi)	adv							1			
Aphrophoridae											
Clastoptera xanthocephala Germar	adv	1		1	1						

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
HOMOPTERA (continued)											
Cicadellidae											
Cameocephala sagittifera (Uhler)	adv	1		1							
Linnavouriella sp.	adv	1									
Nesolina lineata Osborn	adv									1	
Nesosophryne sp. nr. myrsines Kirkaldy	end	1		1			1				
Nesosophryne sp. A	end								1		
Nesosophryne sp. B	end								1		
Scaphytopius loricatus (Van Duzee)	adv								1		
Sophonia rufofascia (Kuoh & Kuoh)	adv	1		1			1	1	1	1	
Cixiidae											
Oliarus discrepans Giffard	end	1									
Oliarus kaiulani Giffard	end	1		1							
Oliarus sp. prob. olympus Giffard	end	1		1							
Oliarus sp.	end	1		1			1	1	1	1	
Oliarus myoporicola Giffard	end							1			
Coccidae											
Ceroplastes rubens Maskell	adv	1			1		1		1		
Delphacidae											
Aloha artemisiae (Kirkaldy)	end	1									
Aloha campylothecae Muir	end	1									
Aloha swezeyi Muir	end	1									
Dictyophorodelphax mirabilis Swezey	end	1									
Nesosydne sp.	end	1									
Nesothoe terryi Kirkaldy	end	1		1							
Perkinsiella saccharicida Kirkaldy	adv	1									
Toya dryope (Kirkaldy)	adv									1	
Flatidae											
Melormenis basalis (Walker)	adv	1		1	1			1	1	1	
Siphanta acuta (Walker)	adv	1		1							
Membracidae											
Vanduzeea segmentata (Fowler)	adv	1									
Psyllidae	??							1	1	1	
Heteropsylla mimosae Crawford	adv	1									
Heteropsylla sp.	adv	1		1						1	
Kuwayama pisonia Caldwell	end	1									
Trioza sp.	end	1									
Tropiduchidae					1						
Kallitaxila granulata (Stal)	adv				1				1	1	
HYMENOPTERA											
Agaonidae											
Pleistodontes sp. prob. froggatti	adv	1					1	1	1	1	
gen. sp. (Epichrysomallinae)	adv	1		1							
Ampulicidae											
Ampulex compressa (Fabricius)	pur	1		1	1		1		1		
Dolichurus stantoni (Ashmead)	pur	1			1				1		
Anthophoridae											
Xylocopa sonorina F. Smith	adv	1									
Aphelinidae											
Aphelinus sp.	??	1		1							
Aphidiidae											
Aphidius smithi Sharma & Rao	pur	1		1							
Lysiphlebus testaceipes (Cresson)	pur	1		1							
Apidae											
Apis mellifera Linnaeus	pur	1		1	1		1	1	1	1	
Bethylidae											
Epyris extraneus Bridwell	adv	1		1							
Epyris sp. (not extraneus)	adv	1									
Sierola sp.	end	1		1			1				
Sierola laupapa Magnacca (MS)	end							1	1		
gen. sp.	??	1									

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
HYMENOPTERA (continued)											
Braconidae											
Apanteles sp.	??	1									
Apanteles trifasciatus Muesebeck	adv	1		1				1			
Aphaereta pallipes (Say)	adv	1									
Glyptocolastes texanus Ashmead	adv	1									
Heterospilus sp.	??							1			
Macrocentrus calacte Nixon	adv	1		1				1			
Meteorus laphygmae Viereck	pur	1		1					1		
Ontsira palliatus (Cameron)	adv	1		1							
Opius dissitus Muesebeck	pur	1		1							
Opius lantanae Bridwell	adv	1									
Phanerotoma hawaiiensis Ashmead	pur	1		1				1	1	1	
Phanerotoma myeloisae Fullaway	adv	1		1							
Pholetesor bedeliiae (Viereck)	pur?									1	
Psyttalia incisi Silvestri	pur	1		1							
Rhaconotus vagrans (Bridwell)	adv	1		1				1	1		
Spathius prusias Nixon	adv	1		1					1		
Stenocorse bruchivora (Crawford)	pur	1		1							
gen. sp. A (Agathidinae)	??								1		
gen. sp. B (Euphorinae)	??								1		
Ceraphronidae											
Ceraphron plebeius Perkins	adv	1									
Chalcididae											
Antrocephalus apicalis (Walker)	adv	1									
Conura sp.	adv	1		1							
Dirhinus anthracia Walker	pur	1		1							
Dirhinus sp.	??	1		1							
Chrysididae											
Trichrysis triacantha (Mocsary)	adv	1			1						
Colletidae											
Hylaeus spp.	end	1		1							
Diapriidae											
Stylaclista sp.	adv	1									
Trichopria sp.	end	1		1			1		1		
Encyrtidae											
Aenasius advena Compere	pur	1		1							
Anagyrus sp.	??	1									
Blepyrus sp.	??	1									
Cheiloneuromyia javensis Girault	adv	1									
Cheiloneurus sp.	??								1		
Copidosoma sp.	??	1		1							
Encyrtus sp.	adv	1		1							
Homalotylus sp.	adv	1									
Microterys flavus (Howard)	adv	1									
Prochiloneura rex (Girault)	adv	1									
Eulophidae											
Aprostocetus cf hagenowii (Ratzeburg)	adv						1		1		
Elasmus atratus Howard	adv									1	
Euderus sp. nr. metallicus (Ashmead)	adv	1		1							
Euplectrus platyhypenae Howard	pur	1		1			1				
Setelacher fasciatus Boucek	??	1									
Symplesis sp.	??	1									
gen. sp. (Entedoninae)	??	1									
gen. sp. (Tetrastichinae)	??	1		1						1	
Eupelmidae											
gen. #1 sp.	??	1									
gen. #2 sp.	??	1									
gen. #3 sp.	??	1									
Anastatus sp.	??	1		1					1		
Eupelmus sp.	end?	1		1				1			
Reikosiella melina Yoshimoto	adv	1		1							

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
HYMENOPTERA (continued)											
Eurytomidae											
Eurytoma tephritidis Fullaway	adv	1		1							
Sycophila sp.	??	1									
Evaniidae											
Evania sp. prob. appendigaster (Linnaeus)	adv	1			1				1	1	
Figitidae (was Eucoilidae)											
gen. sp.	??	1									
Formicidae											
Anoplolepis gracilipes [was longipes]	adv	1		1	1	1	1	1	1	1	
Camponotus variegatus (Smith)	adv								1		
Cardiocondyla emeryi Forell	adv				1					1	
Leptogenys falcigera Roger	adv				1		1				
Pheidole megacephala (Fabricius)	adv	1		1	1		1				
Pseudomyrmex gracilis mexicanus (Roger)	adv	1									
Solenopsis papuana Emery	adv				1	1	1	1	1	1	
Technomyrmex albipes (F. Smith)	adv	1		1	1			1			
Technomyrmex difficilis Forel	adv					1	1	1	1	1	
gen. sp. A	adv	1		1							
gen. sp. B	adv	1									
Halictidae					1						
Halictus sp.	adv	1									
Lasioglossum impavidum (Sandhouse)	adv						1		1		
Heloridae											
Helorus ruficomis Foerster	adv	1		1							
Ichneumonidae											
Barichneumon califomicus Heinrich	adv	1		1							
Casinaria infesta (Cresson)	adv	1		1							
Diadegma blackbumi (Cameron)	adv	1		1							
Echthromorpha agrestoria fuscator (Fabricius)	end	1		1							
Echthromorpha sp. (not fuscator)	end	1		1							
Enicospilus sp.	end	1		1							
Gotra sp.	adv	1		1							
Hyposoter exiguae (Viereck)	adv	1		1							
Megastylus sp. prob. flavopictus (Gravenhorst)	adv							1			
Pachysomoides stupidus (Cresson)	adv	1									
Pimpla punicipes Cresson	adv	1		1			1				
Pristomerus sp.	??	1									
Rubicundiella perturbatrix Heinrich	adv	1									
Trathala annulicornis (Tosquinet)	adv									1	New State Record
Trathala flavoorbitalis (Cameron)	adv	1		1				1			
Tromatobia ovivora (Boheman)	adv	1		1							
Vulgichneumon diminutus (Matsumura)	??									1	
gen. sp. (Gelinae)	??	1									
Megaspilidae											
Dendrocerus sp.	adv							1			
Mymaridae					1						
Alaptus sp. 3 [of Beardlsy & Huber 2000]	adv		1								
Chaetomymar sophoniae Huber	adv								1		
Chaetomymar sp. [not sophoniae]	adv								1		
Dicopus sp. nr. psyche Girault	adv								1		
Erythmelus (Parallelaptera) funiculi (Annecke & Doutt)	adv		1								
Gonatocerus californicus Girault	adv		1								
Gonatocerus dolichocerus Ashmead	adv	1					1	1	1	1	
Polynema sp.	??	1		1			1				
Schizophragma bicolor (Dozier)	adv		1								
Platygastridae											
gen. #1 sp.	adv	1									
gen. #2 sp.	adv	1									
gen. #3 sp.	adv	1									
gen. #4 sp.	adv	1		1							
Aphanomerus sp.	??							1			

Appendix 2. Arthropods collected at Halona Valley August–October 2020 (new or corrected items in red)

	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
HYMENOPTERA (continued)											
Pompilidae											
Anoplius Juctuosus (Cresson)	adv	1									
Tachypompilus analis (Fabricius)	adv	1		1							
Proctotrupidae											
Brachyserphus hawaiiensis (Ashmead)	adv	1				1					
Pteromalidae										1	
Callocleonymus swezeyi (Yoshimoto & Ishii)	adv	1									
Pteromalus sp.	??	1									
Trichomalopsis sp.	adv	1		1							
Scelionidae											
Anteromorpha dubiosa (Perkins)	adv	1									
Aporophlebus sp.	adv	1									
Baryconus sp.	adv	1									
Caenoteleia elegans (Perkins)	adv	1									
Dyscritobaeus comitans Perkins	adv						1				
Telenomus sp. A	??	1		1							
Telenomus sp. B	??	1									
Trissolcus basalis (Wollaston)	pur	1		1							
Sphecidae											
Chalybion bengalense (Dahlbom)	adv	1									
Ectemnius sp. A	end	1		1							
Ectemnius sp. B	end	1		1							
Ectemnius sp. C	end	1		1							
Isodontia mexicana (Saussure)	adv	1									
Pison insulare F. Smith	adv	1		1	1						
Pison iridipenne F. Smith	adv	1		1							
Tachysphex apicalis Fox	adv	1									
Tachysphex morosus (F. Smith)	adv	1		1							
Trypoxylon bicolor F. Smith	adv	1									
Trypoxylon philippinense Ashmead	adv	1									
gen. sp. (Pemphredoninae)	??	1									
Torymidae											
Megastigmus transvaalensis (Hussey)	adv	1		1				1			
Megastigmus sp.	adv	1		1							
Torymus advenus (Osten Sacken)	adv	1		1							
Trichogrammatidae											
gen. sp.	??	1									
Vespidae											
Delta campaniforme campaniforme (Fabricius)	adv	1									
Delta curvata (Saussure)	adv	1									
Delta pyriformis philippinense (Bequaert)	adv	1					1		1	1	
Nesodynerus pseudochromoides Perkins	end	1		1							
Nesodynerus sp.	end	1		1					1		
Nesodynerus sp. nr. waianaeanus	end	1									
Pachyodynerus nasidens (Latreille)	adv	1									
Polistes aurifer Saussure	adv	1		1							
Polistes exclamans Viereck	adv				1		1				
ISOPODA											
Armadillidae											
Reductoniscus costulatus Kesselyak	adv	1									
Philosciidae											
Australophiloscia societatis (Maccagno)	ind	1		1		1					
Burmoniscus meeusi (Holthuis)	adv	1									
Burmoniscus okinawaensis (Nunomura)	adv	1		1							
Platyarthridae											
Trichorhina tomentosa (Budde-Lund)	adv	1		1							
Porcellionidae											
Porcellio laevis Latreille	adv	1		1	1	1	1	1	1	1	
Porcellio scaber Latreille	adv	1				1				1	
Porcellionides pruinosus (Brandt)	adv	1		1				1			
Styloniscidae											
Clavigeroniscus riquieri (Arcaneli)	adv	1		1							
Styloniscus spinosus (Patience)	adv	1		1							

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
ISOPODA (continued)											
Trachelipodidae											
Nagurus cristatus (Dollfus)	adv	1									
ISOPTERA											
Kalotermitidae											
Neotermes connexus Snyder	adv	1		1			1	1	1	1	
Rhinotermitidae											
Coptotermes formosanus Shiraki	adv	1									
LEPIDOPTERA											
Alucitidae											
Alucita objurgatella (Walsingham)	adv	1		1				1	1	1	
Cosmopterigidae											
Hyposmocoma sp. A	end	1						1	1	1	
Hyposmocoma sp. B	end	1							1		
Hyposmocoma sp. C	end	1							1		
Crambidae										1	
Euchromius ocelleus (Haworth}	adv	1		1							
Eudonia geraea (Meyrick)	end	1									
Eudonia n. sp. 1 [of Munroe]	end	1		1							
Eudonia n. sp. 2 [of Munroe]	end	1		1							
Eudonia n. sp. 3 [of Munroe]	end	1									
Eudonia ombrodes (Meyrick)	end	1									
Glyphodes sp. nr. cyanomichla Meyrick	end	1		1							
Herpetogramma licarsisalis (Walker)	adv	1		1							
Crambidae (continued)										1	
Mestolobes sp. prob. minuscula (Butler)	end	1		1							
Nomophila noctuella (Denis & Schiffermueller)	adv	1		1							
Orthomecyna sp. nr. exigua (Butler)	end	1									
Orthomecyna spp.	end	1		1							
Salbia haemorrhoidalis Guenee	pur	1		1							
Spoladea recurvalis (Fabricius)	adv	1		1							
Tamsica sp. nr. oxyptera (Meyrick)	end	1									
Tamsica sp.	end	1		1							
Gelechiidae											
Crasimorpha infuscata Hodges	pur	1									
Stoeberhinus testaceus Butler	adv	1		1							
Geometridae											
Anacamptodes fragilaria (Grossbeck)	adv	1		1							
Cyclophora nanaria (Walker)	adv	1									
Euacidalia brownsvillea Cassino	adv	1		1							
Eupithecia sp.	end	1									
Macaria abydata Guenée	adv									1	
Psamatodes abydata (Guenée)	adv	1		1					1		
Hesperiidae						1					
Hylephila phyleus (Drury)	adv	1									
Lycaenidae					1	1					
Lampides boeticus (Linnaeus)	adv							1	1		
Strymon bazochii (Godart)	adv	1					1				
Udara blackburni {Tuely)	end	1		1							
Zizina otis	adv									1	
Noctuidae										1	
Achaea janata (Linnaeus)	adv	1		1							
Agrotis ipsilon (Hufnagel)	adv	1		1							
Anomis flava (Fabricius)	adv	1		1							
Ascalapha odorata (Linnaeus)	adv	1									
Athetis thoracica (Moore)	adv	1		1							
Callopistria maillardi Guenee	adv	1									
Chrysodeixis eriosoma (Doubleday)	adv	1		1							
Elaphria nucicolora (Guenee)	adv	1		1							
Hypena laceratalis Walker	pur	1		1							
Hypocala deflorata (Fabricius)	adv	1		1							
Leucania striata Leech	adv	1		1							
Lycophotia porphyrea (Denis & Schiffermueller)	adv	1		1							
Megalographa biloba (Stephens)	adv	1									

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
LEPIDOPTERA											
Noctuidae (continued)										1	
Melipotis indomita (Walker)	adv	1		1							
Neogalea sunia (Guenee)	pur	1		1							
Ophiusa disjungens (Walker)	adv	1		1							
Pandesma anysa Guenee	adv	1		1							
Penicillaria jocosatrix Guenee	adv	1		1							
Spodoptera mauritia (Boisduval)	adv	1		1							
Nymphalidae											
Agraulis vanillae (Linnaeus)	adv	1					1	1	1	1	
Danaus plexippus (Linnaeus)	adv	1		1							
Vanessa sp. (cardui or virginiensis)	adv	1		1							
Vanessa cardui (Linnaeus)	adv	1		1							
Vanessa tameamea Eschscholtz	end	1									
Oecophoridae											
Thyrocopa sapindiella Swezey	end	1									
Thyrocopa sp.	end	1									
Olethreutidae											
Cryptophlebia illepida (Butler)	adv	1		1							
Cydia sp.	??	1									
Papilionidae											
Papilio xuthus Linnaeus	adv	1		1							
Pieridae											
Abeis nicippe	adv									1	observed at end of Dent Road
Pieris rapae (Linnaeus)	adv	1		1				1	1	1	
Psychidae											
Brachycyttarus griseus De Joannis	adv	1									
Pterophoridae											
Anstenoptilia marmorodactyla (Dyar)	adv	1		1							
Stenoptilodes littoralis littoralis (Butler)	adv	1		1							
Pyralidae											
Homoeosoma albosparsum (Butler)	end	1		1							
Sphingidae											
Agrius cingulata (Fabricius)	adv	1		1							
Deilephila nerii (Linnaeus)	adv				1						
Hyles calida (Butler)	end	1		1				1			
Hyles lineata (Fabricius)	adv	1									
Hyles wilsoni perkinsi (Swezey)	end	1		1							
Macroglossum pyrrhostictum (Butler)	adv	1		1							
Psilogramma menephron (Cramer)	adv	1		1							
Tineidae											
Erechthias simulans (Butler)	adv	1		1							
Opogona omoscopa (Meyrick)	adv	1									
Opogona sp.	??	1									
Trichophaga sp. prob. mormopis Meyrick	adv								1		
Tortricidae											
Amorbia emigratella Busck	adv	1		1							
Eccoptocera sp.	end	1		1							
Episimus unguiculus Clark	end	1		1	1			1		1	
Platynota stultana Walsingham	adv	1		1							
Spheterista sp.	end	1									
MANTODEA											
Mantidae											
Brunneria borealis Scudder	adv	1			1						
Tenodera australasiae (Leach)	adv								1		
NEUROPTERA											
Chrysopidae											
Anomalochrysa sp.	end	1		1							
Anomalochrysa sylvicola Perkins	end	1		1							
Mallada basalis (Walker)	adv	1		1				1	1	1	adult and immature
Hemerobiidae											
Micromus timidus Hagen	pur	1		1							
Micromus vagus (Perkins)	end	1									

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
ODONATA											
Aeshnidae											
Anax junius (Drury)	ind	1									
Anax strenuus Hagen	end	1									
Coenagrionidae											
Ischnura posita (Hagen)	adv	1							1		
Ischnura ramburii (Selys-Longchamps)	adv	1									
Libellulidae											
Orthemis ferruginea (Fabricius)	adv	1									
Pantala flavescens (Fabricius)	ind	1			1		1	1	1	1	
Tramea abdominalis (Rambur)	adv	1									
ORTHOPTERA											
Acrididae											
Oedaleus abruptus {Thunberg)	adv	1									
Schistocerca nitens (Thunberg)	adv	1									
Gryllidae	??										
Gryllus bimaculatus DeGeer	adv	1									
Laupala sp. nr. hapapa Otte	end	1									
Tetrigidae											
Paratettix mexicanus (Saussure)	adv	1									
Tettigoniidae											
Conocephalus saltator (Saussure)	adv	1		1							
Elimaea punctifera (Walker)	adv	1									
Euconocephalus nasutus {Thunberg)	adv	1		1				1		1	
Phaneroptera furcifera Stål	adv	1									
Xiphidiopsis lita Hebard	adv	1		1							
PSEUDOSCORPIONIDA											
Undetermined family											
gen. sp.	??	1		1		1			1		
PSOCOPTERA	??				1	1					
Ectopsocidae											
Ectopsocus sp.	adv	1									
Elipsocidae											
Kilauella micramaura (Perkins)	end								1		
Kilauella sp. A	end									1	
Kilauella sp. B	end									1	
Hemipsocidae											
Hemipsocus sp.	???									1	
Lepidopsocidae											
Lepidopsocus fasciatus	adv									1	
Lepidopsocus marmoratus (Banks)	adv								1	1	
Psocidae											
Ptycta sp. A	end								1		
Ptycta sp. B	end								1		
Ptycta sp. C	end									1	
Ptycta kaala Thornton	end							1			
SCHIZOMIDA											
Schizomidae											
Schizomus siamensis (Hansen)	adv	1									
SIPHONAPTERA											
Pulicidae											
Ctenocephalides felis	adv								1		
STREPSIPTERA											
Elenchidae											
Elenchus sp.	adv	1		1							
THYSANOPTERA											
Fam. Undet.										2	
Gen. sp. A	??								1	1	
Gen. sp. B	??								1		
Gen. sp. C	??								1		

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	status*	Lualualei 1997	post-1997 literature	Halona 1997	Halona 2015	Halona 2016-17	Halona 2017	Halona 2018	Halona 2019	Halona 2020	Notes
TRICHOPTERA											
Hydropsychidae											
Cheumatopsyche analis (Banks)	adv	1									
Hydroptilidae											
Oxyethira maya Denning	adv	1						1	1	1	
		638	**4**	**334**	**77**	**53**	**89**	**126**	**161**	**163**	
new species records for Lualualei			4		21	19	11	23	34	22	
new species records for Halona			0		41	23	25	30	44	27	

		Lualualei		Halona
1997 totals		638		334
Plus new records				
post-1997 literature		4		0
2015		21		41
2016-2017		19		23
2017		11		25
2018		23		30
2019		34		44
2020		22		27
totals		**772**		**524**

* Abbreviations: adv = adventive; end = endemic; ind = indigenous; pur = purposeful introduction; ?? = unknown

Status totals	Lualualei	%	Halona	%
Native (endemic + indigineous)	175	22.7%	83	15.8%
Non-native (adventive + purposeful intro)	539	69.8%	402	76.7%
unknown status	58	7.5%	39	7.4%
	772		524	