Surveying for Terrestrial Arthropods (Insects and Relatives) Occurring within the Kahului Airport Environs, Maui, Hawai‘i: Synthesis Report

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Honolulu, Hawaii
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COVER

Adult male Hawaiian long-horned wood-borer, *Plagithmysus kahului*, on its host plant *Chenopodium oahuense*. This species is endemic to lowland Maui and was discovered during the arthropod surveys. Photograph by Forest and Kim Starr, Makawao, Maui. Used with permission.

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EXECUTIVE SUMMARY

This report presents a synthesis and compilation of data from field surveys designed to provide a baseline inventory and to monitor for newly established alien species of terrestrial arthropods (insects and their relatives) occurring within the Kahului Airport environs. The project was conducted as part of the requirements of the Federal-State Alien Species Action Plan for the Kahului Airport, Maui (Pursuant to the Memorandum of Understanding signed August 1998). Fieldwork for the surveys was done in three phases: from August 1999 to August 2000, June to September 2003, and June to November 2006. A total of 659 separate collecting events using 20 different methods were employed to inventory and monitor the arthropod diversity within the Kahului Airport environs. These yielded 1748 records, which contained from one to hundreds of specimens and which documented 879 species. Relevant data were entered into a searchable electronic database. Data included site description and locality information for each collecting event as well as biological, taxonomic and biogeographic data for each species record. In addition, an annotated list of all collection sites giving the GIS coordinates, method used, date and other relevant information is appended along with maps showing locations of each collecting site and descriptions and analyses of the collecting methods used.

Also included is an analysis of monitoring strategies and trap efficiency to give a better understanding of the efficacy of the collecting methods used for detecting newly arriving alien species. Malaise trap, MV bulb, blacklight, gas aspirator, window trap, general and sweep net methods were the most productive. The other methods (host search, fogging, beating sheet, sticky trap, bait station, sifting litter, Tulgren funnel, Lingren funnels, pitfall trap, pan trap, and trunk trap) worked well for specific taxa, and each captured species missed by the other methods. Of the collection methods employed, the Malaise trap catches provide the most comprehensive assessment of the arthropod fauna with over 215 species recorded from a single sample. This represents about one quarter of the total fauna. The flies were best sampled with nearly one half (85/188) the total Diptera fauna captured. Night collecting at MV bulbs and blacklights provided the best material for identification, especially for moths and fragile taxa, but it is limited by interference of the moon, urban lights and weather. Sticky traps were good for tiny wind-borne taxa, which are often poorly sampled because of their small size. However, handling sticky traps is a serious limitation. Host searches are required for sessile and some host-specific taxa.

A comprehensive list of species of arthropods now known to occur within the airport environs annotated with relevant biological and biogeographic data is included. Of the 879 species of terrestrial arthropods currently recorded from the project area, 704 (80%) are adventives; 51 (6%) were purposefully introduced; 95 (11%) are native to the islands; and 29 (3%) are of unknown biogeographic status. Of the 755 alien species, a surprising 41% (306/755) represent new records; i.e. 71 species are new state records, and 235 are new island records for Maui. An annotated list of the 49 new records that were added since the 2007 monitoring report is also appended. The continual discovery of new island and state records as well as additions to the list at such a high rate indicates that many additional species occur within the project area. Forty-seven percent of the terrestrial species known from all of Maui were found during the Kahului Airport survey. The ratio of species in the more species-rich taxa known from the project area to all of Maui (i.e. Kahului/Maui) ranges from 15% for the mites to 82% for the true bugs. Overall, 48% of the alien species known from the state have been found on Maui. For individual larger taxa, the percentage ranges from 21% for the mites to about 70% for moths and flies.

Data on the distribution and impacts of alien species of arthropods in Hawai‘i remain surprisingly incomplete. Host and prey preferences are unknown for most of the 71 new state records making risk assessments speculative. Potential pest species detected include the pentatomid stink bug *Piezodorus hyberni*, a pest of legume crops in Asia; the noctuid looper, *Ctenoplusia* cf. *albostriata*, a garden pest from the Southwest Pacific, which has

a broad host range; the wood borer *Aphanisticus cochinchinae seminulum*; the powder-post beetle *Euplatypus parallelus*; the biting midge *Culicoides* cf. *jamaicensis*, whose host range is unknown but whose relatives are serious blood-sucking pests in tropical America; and the web-spinning psocid *Archipsocus*, which is a pest of ornamentals. In addition, many of the other newly recorded species could become invasive and pestiferous: e.g. the larger generalist predators, such as the *Hogna* wolf spider and the true bugs, *Sinea rileyi* and *Stenonabis*; and the parasitic wasps, such as *Goniozus* cf. *columbianus* and the species of *Apanteles, Ascogaster, Glyptapanteles, Elasmus, Hypsicera* and eulophids, may attack native species or disrupt biocontrol programs in agriculture. The non-biting midge *Ablabesmyia* may become a nuisance pest near lakes and ponds. The host ranges of the plant-feeding moths (*Choreutis* and *Loryma* cf. *recusata*) are poorly known. Until the ability to predict the environmental effects of alien species improves, a precautionary approach is recommended that assumes non-native species are harmful unless shown to be otherwise.

More than 180 listed species (21% of the total) remain incompletely identified, largely because they either represent species new to science or are in groups for which taxonomic expertise was not available. This lack of expertise is a critical issue in biodiversity surveys and risk assessments of potential invasive species, especially since the correct taxonomic name is required to access appropriate information. Accurate identification is essential for determining whether any newly detected species is indeed an alien and potentially invasive or whether it is a locally rare or even an endangered native species. Currently for arthropods, secure identifications by non-specialists are limited to conspicuous and distinctive species. Fortunately, the advent of digital photography and the emerging DNA technologies coupled with interactive electronic software has improved the available diagnostic tools that permit rapid and accurate identification of potentially harmful species and thereby improve quarantines and rapid response initiatives. Many of these diagnostic tools are already available online although the coverage of invasive invertebrates lags behind other taxonomic groups. Online taxonomic supports include photographic galleries, illustrated taxonomic keys, DNA sequence data, and databases.

To demonstrate the usefulness of macro-photography and to assist quarantine inspectors and others who wish to recognize potentially problematic arthropods occurring near the airport, a gallery of 100 high resolution photographs was prepared that show the general habitus of 92 species of new island and new state records found during the baseline and monitoring surveys. A majority of the pictures (78) were taken using an Automontage® system, which enhances the depth of field and resolution of the image.

New diagnostic tools in molecular biology (e.g., gene probes, microarrays, real time PCR) allow rapid detection of even small numbers of tiny organisms. Species identification by analysis of a small fragment of the genome represents a promising approach that addresses some of constraints inherent in traditional morphological methods and is encouraging a renaissance in taxonomy. The approach consists of amplification and sequencing of a specified 'barcode region', followed by comparison of the recovered sequence(s) to available genetic databases to determine species identity. An important advantage of DNA barcoding is that it is able to identify material to species when morphological techniques may offer only estimates of higher taxonomic levels or no estimate at all, such as eggs, larvae or damaged specimens recovered in quarantine.

Good quality photographs, DNA analyses and other tools are important supplementary aids for making rapid preliminary identifications of potential pest species as well as for detecting newly arriving alien species. However, they are no substitute for well curated voucher specimens in long-term studies. Except for about six visual records, all of the species recorded from Kahului Airport environs are represented by properly preserved and labeled specimens that voucher (i.e. formally document) the species listed. These authoritatively identified voucher specimens will allow future workers to compare specimens from their surveys to the voucher specimens and to check on which species were actually present, especially since improving taxonomy may require changing some names in the future.

As demonstrated in this study, continual monitoring to detect invasive arthropods can be a daunting task. The huge pool of alien species not yet established in Hawai‘i exacerbates the problem. Nevertheless, such monitoring programs can provide a number of direct and indirect benefits. Such programs provide baseline data on what species are already present, data which can be used in management and control as well as facilitate the detection of new arrivals. Monitoring programs can provide the data to identify pathways of introduction, which in turn are needed to improve prevention protocols. They also ensure that the infrastructure and expertise for species identification and rapid response are available when needed.

Knowledge of the many life-forms on Earth (including arthropods) is scattered around the world in books, journals, databases, websites, specimen collections, and informal reports. Much of this information is inaccessible, and there is a critical need to provide standardized infrastructure to preserve and make them available to future workers. This approach is particularly important for rapid response and eradication, where it is imperative to know the existing range and potential distribution of the target species in a timely manner. Many agencies are developing online taxonomic databases that also link to identification aids, biological, geographic and other information sources. Improvements in software will allow linking the Kahului Airport arthropod species database to these online resources and permit quarantine officials and other stakeholders to access relevant data on the distribution and potential pest status of intercepted species.

INTRODUCTION

This report presents a synthesis and a compilation of data from field surveys of invasive arthropods occurring within the Kahului Airport environs. The surveys were done in three phases (Howarth and Preston 2002, 2006, 2007) and were performed as part of the requirements of the Federal-State Alien Species Action Plan for the Kahului Airport, Maui (Pursuant to the Memorandum of Understanding signed August 1998). In large biodiverse groups, such as insects, knowledge of what species already occur within an area is basic to being able to detect newly established alien species. To fill this gap within the Kahului Airport environs on Maui, the staff of the Hawaii Biological Survey (HBS) conducted an intensive baseline survey of the terrestrial arthropods occurring there. Subsequently, HBS conducted two alien species monitoring programs to add to the baseline survey. The objectives of the earlier studies were (1) to detect newly established alien arthropods and certain other potentially invasive taxa; (2) to complement the Hawaii Department of Agriculture's quarantine program; (3) to continually update the list of taxa known to occur within the airport environs; and (4) to provide the data to appropriate agencies.

Fieldwork for the initial baseline survey as conducted from August 1999 to August 2000 (Howarth and Preston 2002) and recorded a total of 595 species of terrestrial arthropods, of which 58 were native to the islands and 490 were alien. Of the alien species, 145 (~30%) represented new island records, and 38 (~8%) represented new state records. A similar percentage (21/58 = 36%) of new records were found among the native species, even though these species have likely occurred naturally on Maui for millennia. The discovery that over one third of both the native and alien species of terrestrial arthropods found within the Kahului Airport environs were new records for the island of Maui was surprising and demonstrated how little is known concerning the distributions of arthropod species within the state. The survey also confirmed the daunting nature of the task of keeping track of such high biodiversity.

Following the initial baseline survey, a monitoring program was developed to detect additional newly established alien arthropods as well as add to the list of species known to occur within the Kahului Airport environs. Fieldwork for the first phase of the monitoring program ran from June to September 2003 and added 79 species to the list of terrestrial arthropods occurring within the Airport environs. Of these, 75 were alien and included 24 new island records and seven new state records. These additions brought the total number of species known from the area to 703. Of the total, 594 (85%) of the listed species were alien, and 74 (11%) were considered were native to the islands (Howarth and Preston 2006). Fieldwork for the second monitoring survey was done between June and November 2006) and added 110 species bringing the total to 813. The added species included 83 aliens and ten natives; the biogeographic status of the remaining 17 is uncertain. Of the alien species, 31 represented new island records and 17 new state records. The percentage of new records remains high: 31% of the 678 alien species are new island records, and 9% are new state records.

Although each subsequent report built on the results of the previous studies, the current document synthesizes the results into a single, more comprehensive account. This was the first all-taxa arthropod survey within a defined area attempted in the Hawaiian Islands and among the few attempted anywhere. The effort demonstrated many of the complexities and problems that such a large, novel, comprehensive and complex project entails.

INVASION BIOLOGY

Non-indigenous species or "alien" species are recognized as causing major threats to the environment, resulting in species extinctions, disrupting ecosystem function, and affecting human health and economic welfare (U.S. Congress 1993, Pimentel et al. 2000, Sherley 2000, Ruiz and Carlton 2003). The Hawaiian Islands are especially

vulnerable due to their extreme mid-oceanic isolation, small land area, remarkably diverse native biota (Howarth and Mull 1992), and vulnerable agriculture and tourism industries. The impacts caused by alien species are the most important factor in population declines, endangerment, and extinctions of native organisms in Hawai‘i (Howarth and Ramsay 1991, Reimer 1994, CGAPS 1996, Holt 1996, Loope et al. 2001, Staples and Cowie 2001). Furthermore, alien species can undo all other conservation programs. Alien species are also a major impediment to agricultural and economic development (including tourism) in Hawai‘i, causing hundreds of millions of dollars in damage to the economy each year (CGAPS 1996). Introduced plants, animals and microorganisms have had devastating effects on the natural environment and on human health and economy (CCAPS 1996, Sherley 2000; Wittenberg and Cock 2001).

The most damaging species are called “invasive alien species,” but many apparently innocuous alien species may become invasive if moved to a new island or a favorable change in their environment occurs. Many apparently innocuous non-indigenous species have become invasive after a long lag time lasting several decades. The lag between time of establishment and discovery presents a problem in making accurate assessments of invasive arthropod species, especially with the more cryptic forms. Even for purposefully introduced biological control agents the lag time between introduction and detection in the field in Hawai‘i often exceeds 10 years. Nevertheless, the more conspicuous and pestiferous species are detected soon after arrival on each island and their progression across the islands demonstrates issues involved in invasion pathways of arthropods. Species with high dispersal ability have moved rapidly between islands and colonized most of the islands soon after being introduced, for example the Western yellow jacket, *Vespula pensylvanica* and some butterflies and moths. Others are quickly dispersed by human activities, for example scales, aphids and other plant-feeding insects that are moved with their host plant.

Alien species need to pass two hurdles to invade new areas: first, they require means of transport to disperse across a geographic barrier; and second, they must successfully establish a reproducing population. Although in theory, a single pregnant or gravid female could establish a population in a new area, experience indicates that the chance of establishment increases significantly with the number of introductions and the number of individuals in each introduction. The chance of establishment is also strongly correlated with how close the new environment matches the species’ home or preferred habitat.

Over 5,000 alien species have established wild populations in Hawai‘i. Most are terrestrial arthropods (~3,300) or plants (>1,300), followed by over 110 terrestrial vertebrates, at least 50 mollusks, and several hundred untallied invertebrates, fungi, and microorganisms. Many invasive alien species have not dispersed to all islands in the archipelago. Once an invasive alien species becomes established, it may remain on one island for many years or spread rapidly into all suitable habitats throughout the islands. The majority of records for the occurrence of non-indigenous species are on the island of O‘ahu. This seems intuitive because Honolulu has been the principal port for overseas arrivals by both air and sea for more than a century. Therefore, Honolulu’s ports would be the first point of disembarkation and establishment of arriving non-indigenous species. In addition, the number of records also reflects the fact that Honolulu is the principal city where most biologists live and work and thus where alien species are most likely to be recognized and recorded. Nevertheless, there are abundant data, especially for conspicuous and pestiferous species, that confirm that the general pattern of patchy distributions of invasive alien species is real.

Most of the alien arthropods in Hawai‘i came as stowaways or contaminants in shipments to Hawai‘i, but a few hundred were purposefully introduced as biological control agents, food, or pollinators of crops. The number of introduced species is increasing by more than 20 per year (Beardsley 1979, Kumashiro et al. 2002a, 2002b, Loope and Howarth 2003, Howarth and Preston 2007). On average, a new pestiferous species arrives about once a

year. Many of the most serious agricultural, urban, and environmental pests are invasive alien insect species. Their damage to economic crops is well documented and indicative of their potential for damage to natural systems (CGAPS 1996). The most damaging groups include the following (Howarth 1985, 1997):

- Social insects (ants, wasps, bees, and termites) and colonial species (scales, whiteflies, and aphids).
- Disease transmitters (e.g., mosquitoes, bark beetles, and many plant bugs).
- Species with mutualistic relationships with other organisms (e.g., pollinators, honeydew producers).
- Some generalists, when the match to local environment is good and alternative hosts are abundant (e.g., tachinids, parasitic wasps, and many plant-feeding species).
- Specialists, when their host(s) is of economic, cultural, or aesthetic value (e.g., some agricultural pests, endangered species pests, aesthetic plant pests, and veterinary pests).
- Species that disrupt reproduction of valuable or native organisms or that favor the reproduction and spread of other harmful alien species.

Each successfully established alien species enhances the environment or creates suitable habitat for its associated species; thus each establishment increases the chances that additional species can establish (Mueller-Dombois and Howarth 1981). This positive feedback can lead to a phenomenon called 'invasional meltdown' in which the ecosystem collapses and most functions in an ecosystem are performed by alien species (Parker et al. 1999). Considerable research effort has focused recently on predicting which species might become invasive to better manage potential problematic species before they become serious (Hayes 2003, Pheloung 2003). Until the ability to predict the outcomes of species introductions improves, a precautionary approach is recommended that assumes all introduced species are harmful unless shown to be otherwise (McNeely 2001).

SCOPE OF WORK

The objectives of this synthesis report include the following:

- A searchable electronic database that includes collection site and species data;
- An annotated list of all collection sites giving the GIS coordinates, method used date and other relevant information;
- Maps showing locations of each collecting site;
- Descriptions and analyses of the collecting methods used including discussion of monitoring strategies and trap efficiency to give a better understanding of the efficacy of the collecting methods used for detecting newly arriving alien species;
- A comprehensive list of species of arthropods now known to occur within the airport environs annotated with relevant biological and biogeographic data;
- An annotated list of specimens that document species that represent new island and state records;
- A set of summary tables and analyses synthesizing the results of the three field surveys;
- A set of authoritatively identified voucher specimens; and
- A gallery of high resolution photographs to serve as identification aids for a set of potentially invasive alien species.

It should be noted that a major goal of the project was the detection of species new to the list of species. The more comprehensive goal of determining the abundance and distribution of all species within the airport environs was beyond the scope of the project.

METHODS

THE AREA

The project area surveyed in this study included all terrestrial habitats within the boundary of Kahului Airport, including the Airport Operations Area (AOA) and the Kanaha Pond Wildlife Preserve (**Figure 1**). The airport property is located along the windward coast of Maui east of Kahului and west of Sprecklesville. The project area totals approximately 1447 acres (586 hectares), which originally contained the following natural habitats: sandy and rocky shorelines, strand, lowland shrub, lowland open dry forest with grass and shrub understory, and wetlands (Gagne and Cuddihy 1990). The Kanaha Pond Wildlife Preserve contains about 235 acres (95 hectares) and is currently managed to promote native species. The preserve includes permanent ponds and associated seasonal wetlands, keawe (*Prosopis pallida*) with mixed understory forest, and small areas of native and alien shrub lands. Urbanization and development of the airport has modified most of the area, and currently, the airport environs contain the habitats and vegetation types listed in **Table 1**. The acreages given are modified from those given in the Final EIS (U.S. Department of Transportation 1997) and are approximate, as vegetation cover changes over time from succession and changes in land use.

Figure 1. Map of the Kahului Airport environs showing the project boundary and approximate location of habitat types.

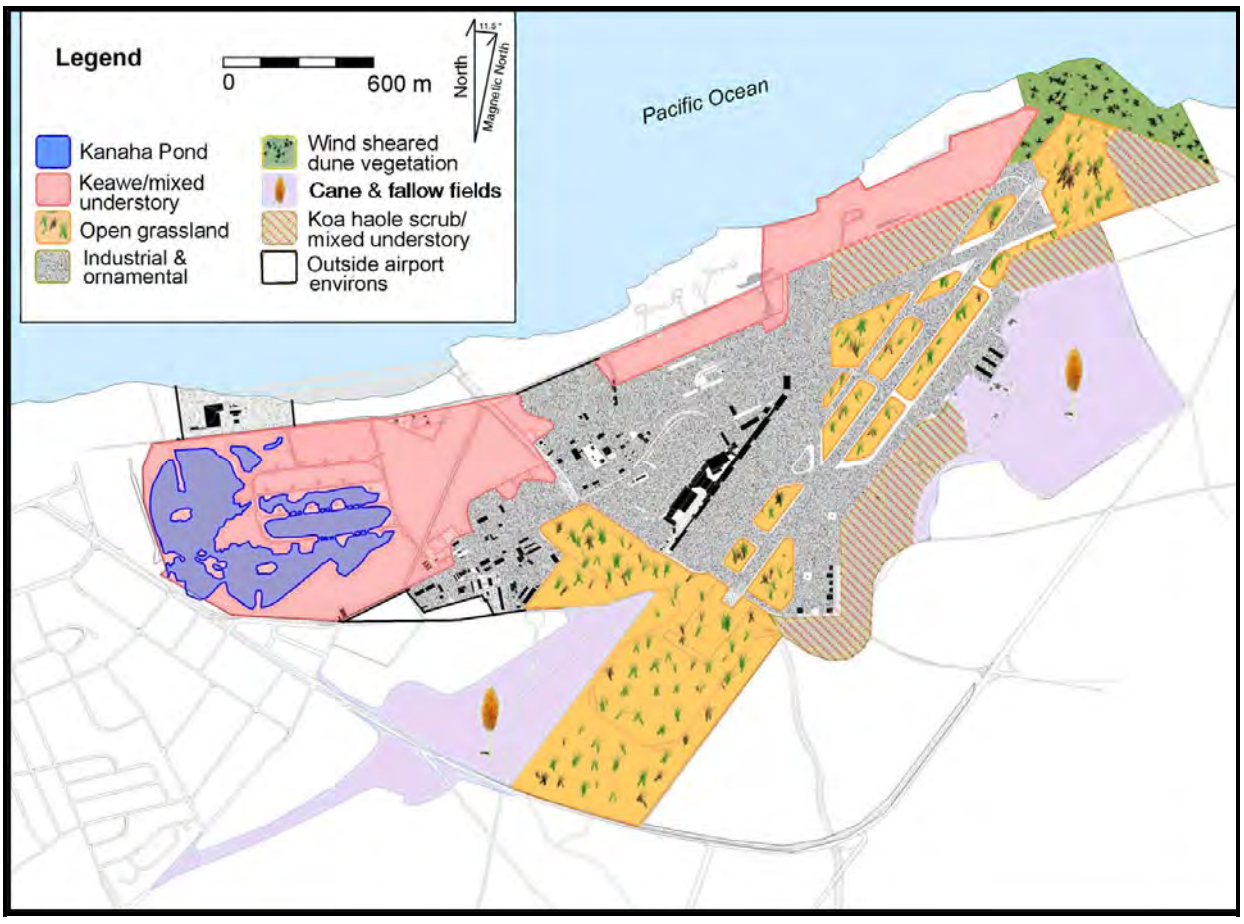


Table 1. Major habitats found within the Kahului Airport environs.

- Wind-sheared dune vegetation (including native strand and littoral habitats) (40 acres [16 hectares]).
- Keawe/mixed understory (265 acres [107 hectares]).
- Koa haole shrub/mixed understory (121 acres [49 hectares])
- Open grassland (286 acres [116 hectares]).
- Cane fields and ruderal borders (258 acres [104 hectares]).
- Airfield (including the terminal, industrial and paved areas and ornamental plantings) (394 acres [160 hectares]).
- Kanaha Pond (water area) and wetlands (83 acres [34 hectares]).

FIELDWORK

The fieldwork was conducted in three phases: baseline survey from August 1999 to November 2000 (Howarth and Preston 2002); first monitoring phase from June to September 2003) (Howarth and Preston 2006); and second monitoring phase from June to November 2006 (Howarth and Preston 2007). A variety of collecting methods were used to inventory and monitor the arthropod diversity within the Kahului Airport Environs. Over 650 samples were collected, which contained from one specimen (e.g. incidental captures made while traveling on foot between collection sites) to many thousands of specimens (e.g. some trap catches) (**Table 2**). An annotated list of each collection event is presented in **Appendix I;** these records are listed by an alpha-numeric code for easy retrieval of the data on species distribution. A detailed description of each collecting method is presented in **Appendix II**. These descriptions include illustrations of the method, table of sites arranged by date, and maps showing the location of each of the collection sites. Overviews of arthropod collecting and preservation methods are given in Millar et al. (2000) and Schauff (2001). Nearly all major habitat types were intensively investigated, including the keawe/mixed understory woodland, the margins of Kanaha Pond and other significant wetlands, former sugarcane fields and ruderal habitats, koa haole dominated scrub, wind-sheared vegetation, marine littoral habitats, roadside vegetation, and irrigated ornamental plantings and lawns. Portions of the airfield, terminal buildings, and paved industrial areas were also surveyed. Fieldwork was usually scheduled to coincide with the period preceding the new moon to ensure a dark evening sky since a dark sky improves the results of night collecting. The more comprehensive goal of determining the abundance and distribution of all species within the airport environs was outside the scope of the project.

LABORATORY WORK

The collected specimens were sorted to separate each morphologically similar form (= "morpho-species," which usually correspond to species), and representative specimens of each morpho-species were appropriately labeled and prepared (i.e. curated) for identification. Larger insects were mounted on pins and stored dry. Individuals of many soft-bodied groups were collected and stored in ethanol, while the smaller species were mounted on microscope slides to be identified and preserved. Each morpho-species was identified as far as practical and sent to experts if available. All recognized morpho-species have been identified as far as possible. Some species could not be named and are indicated by letter (e.g., as species A). Some of these are species new to science (and therefore unnamed), and others belong to groups for which a qualified taxonomic authority who is able to identify species within the group is not currently available. Generally, morpho-species that could be identified to genus and securely separated from related species are listed as 'identified'. Names and status follow Nishida (1992, 2002), except where updated to include recent changes.

In processing the material, two separate but complementary strategies were used to fulfill the goals of this project: 1) to sort through the material searching especially for species new to the list; that is, monitor for new state and island records; and 2) to identify as far as possible all species within representative samples of each collection method. Both strategies are time-consuming, especially given the large number of species involved. The first strategy directly addresses the main goals of the project, which were to determine the total arthropod diversity within the project area and to monitor for new alien organisms entering the state. The second strategy provides additional information on which methods are most effective at detecting new arrivals.

Vouchers

To properly document (i.e. voucher) the study, authoritatively identified specimens of each species recorded received an additional label, which included their name and the name of the identifier. Two sets of voucher specimens were prepared. The first set will remain in the Hawaii Biological Survey collections at Bishop Museum, the second set will be deposited in the Hawaii Department of Agriculture collections. As is customary in entomology, the collaborating specialists may retain a third set of duplicate specimens representing the species they identify.

DATABASE

The large number of taxa and specimens collected during the survey present challenges to retrieving and analyzing the associated taxonomic, collection and geographic data in a meaningful way. Fortunately, the advances in computer technology promises to address this need, and more sophisticated programs continue to be developed (Schuh et al. 2010). A comprehensive electronic database was created to manage and retrieve the information associated with each of the thousands of specimens collected more efficiently. The database uses Microsoft Access®. A copy is included with this report as a separate file (filename is "kahului.mdb"). Although modeled after widely used specimen databases [e.g. PBIN (Pacific Biological Information Node) and TDWG (Taxonomic Database Working Group)], the individual fields were modified to accommodate the Kahului specimen data. The types of data included are details on each collection event (e.g. where, when, and how each species was collected), as well as taxonomic status and available information on each species. The Kahului database can be adapted for use at other ports of entry as well as other areas or habitats. **Appendix III** includes an illustrated set of directions for using the database.

PHOTOGRAPHS

To assist quarantine inspectors and others who wish to recognize potentially problematic arthropods occurring near the airport, a set of photographs were prepared that show the general gestalt of some of the voucher specimens of new island and new state records found during the baseline and monitoring surveys (**Appendix IV**). The advent of high-quality digital imaging has greatly improved the usefulness of macro photography for arthropod identification. The majority of images were prepared using an auto-montage imaging system. The Bishop Museum's auto-montage imaging station consists of two research grade microscopes: a stereo-dissecting microscope (Leica M165 C ®) and a compound microscope (Leica DM2500®). Both microscopes are equipped with a programmable precision mechanical stage and a digital camera (Leica DFC420® 5MP). About 30 images were taken of each specimen, each precisely aligned and at a prescribed focal length to capture in focus the entire depth of the specimen. The stack of images was edited with specific auto-montage software, which condenses the images into a single photograph using the pixels from the appropriate depth of field to ensure accurate focus. The resulting 30 Mb tif files were edited and condensed to jpg files, and a scale bar added. Additional photographs were taken by the authors using conventional digital cameras.

RESULTS

COLLECTING METHODS

A total of 659 separate collecting events yielded 1748 records documenting 879 species (**Table 2)**. The numbers of species recorded for each collecting method represent minimum values partly because only a set of representative voucher specimens of each species have been entered into the database. Since the primary goals of the project were to detect unknown and recently established alien species as well as to provide a comprehensive list of arthropods occurring within the airport environs, both field and laboratory work was concentrated on finding new or unusual species. After species became adequately vouchered and could be securely recognized in the field or while sorting in the laboratory, additional specimens of that species were no longer actively collected or curated; e.g. the honey bee. In the laboratory, collection samples were searched for new records and poorly represented species. Thus MV bulb and blacklights, which allowed for preliminary sorting in the field and which provided excellent specimens, were more completely sorted and identified, whereas some traps, [especially sticky, bait, and Lingren funnels] were difficult to process because of extraneous material or poor quality specimens. The Malaise trap, window trap, and gas aspirator provided large numbers of specimens per sample and, therefore, often contained an adequate number of good quality specimens including examples of unusual species. Host searches, sweep net samples and general collections were usually individual events that each captured a targeted species, and therefore include a relatively large number of events with one or a few species for each. In spite of these limitations, the resulting data in **Table 2** provide a useful relative measure of effectiveness of the different methods for surveying for arthropods.

Table 2. Number of samples during each survey period and number of species recorded for each collecting method.

Method	**1999-2000**	**2003**	**2006**	**Total samples**	**Number of species recorded**
Gas Aspirator	127	19	51	197	253
Malaise Trap	43	4	3	50	391
Window Trap	-	-	3	3	77
MV Bulb	16	7	7	30	501
MV & Blacklight	3	-	-	3	[139]*****
General	50	20	23	93	125
Sweep Net	32	10	8	50	110
Host Search	18	18	30	66	51
Beating Sheet	13	3	-	16	6
Dip Net	-	1	-	1	2
Fogging	23	3	8	34	34
Sticky Trap	-	-	22	22	47
Ant Baits	29	-	1	30	13
Trunk Trap	8	-	-	8	8
Yellow Pan Trap	6	-	-	6	19
Lingren Funnels (Beetle Trap)	10	-	3	13	44
Bait Trap	11	3	1	15	1+
Pitfall Trap	1	-	1	2	11
Tulgren Funnel (Berlese funnel)	5	-	-	5	40
Sifting Litter & soil	8	2	5	15	15
TOTALS	**403**	**90**	**166**	**659**	**1748 records for 879 species**

*****Out of the 139 species recorded from the combined MV/blacklight samples, 40 were not found in the samples that were collected with the MV bulb without the accompanying blacklight.

SPECIES INVENTORY

A total of 115 names have been added to the list of terrestrial arthropods occurring within the Kahului Airport environs. However, revised identifications of 28 previously listed species and 21 deletions of poorly known species result in a net gain of 66 species since Howarth and Preston (2007). The additions bring the total number of species known from the airport environs to 879. The comprehensive list of species is presented in **Appendix V.** This table also includes annotations on the biogeographic status in Hawai‘i along with a list of collection sites and collection methods for each listed species. **Appendix VI** contains a list of the additions, name changes and deletions made to the list; and **Appendix VII** presents an annotated list of new state and island records for 49 species. The biogeographic data for the 879 species are summarized for each major taxonomic group in **Table 3.** Of the 879 species 704 (80%) are adventives; 51 (6%) were purposefully introduced; 95 (11%) are native to the islands; and 29 (3%) are of unknown biogeographic status.

Alien Species - Summary of New Records

Ninety-five species of alien arthropods were added to the list of species known to occur within the Kahului Airport environs (**Table 4**). Of these, 27 (28%) represent new island records, and 11 (12%) represent new state records. However, name and status changes and deletions of previously listed species result in a net gain of 77 alien species to the list (**Appendix VI**). The additions bring the total recognized alien species to 755, of which 235 (31%) are new records for the island of Maui, and an additional 71 (9%) species are new records for the state (**Table 4**). The ratio of new records to total species remains the same as the ratios found during the baseline and two monitoring surveys; that is, about four out of ten. An annotated list of the new records of alien species, including specimen collection data, is presented as **Appendix VII.** The terrestrial Arthropod Checklist (Nishida 2002) listed 1311 alien species from Maui, which is 40% of the 3290 species then known in the state. The 306 new state and island records bring the total number known from Maui to 1617, which represents an increase of 23% (**Figure 2**). Nearly one half of the alien species recorded in the state are now known from Maui.

Native Species – Summary of Status

Thirteen native species (ten endemic and three indigenous) were added to the list. However, six represent revised names; and seven species were deleted or moved to adventive or unknown. Thus, the number of native species remains at 95 (86 endemic and nine indigenous species). The biogeographic status for each species is indicated in the Comprehensive list of taxa in **Appendix V**, and the data summarized by major group in **Table 3**. A significant number (about four in ten) of the native species represent new records for Maui or new species (**Table 5**). Since all of the native species, or at least the majority, have been on Maui for millennia, the new records corroborate the hypothesis that there is a significant lag time between successful colonization of an alien species and its eventual discovery. For example, the Maui *Chenopodium* long-horned beetle (*Plagithmysus kahului*) was discovered and described as a new species during this survey (Samuelson 2006). It is still only known from the airport area. The genus *Plagithmysus* is endemic to the Hawaiian Islands and contains about 140 species.

Table 3. Total numbers and biogeographic status of species within the major arthropod groups collected within the Kahului Airport environs from August 1999 through November 2006 during the arthropod survey and monitoring programs.

Taxon	**Total Species**	**ID Species**	**Biogeographic Status***				
			End	**Ind**	**Pur**	**Adv**	**Unk**
Arachnida (Spiders & relatives)	**76**	**42**	**9**	**1**	**0**	**47**	**19**
• Acari (Mites)	37	14	6	1	-	14	16
• Araneae (Spiders)	37	27	3	-	-	32	2
• Pseudoscorpionida (False scorpions)	1	-	-	-	-	-	1
• Scorpiones (Scorpions)	1	1	-	-	-	1	-
Insecta (Insects)	**790**	**643**	**74**	**8**	**51**	**647**	**10**
• Blattodea (Cockroaches)	11	10	-	-	-	11	-
• Coleoptera (Beetles)	165	133	7	2	19	136	1
• Collembola (Springtails)	6	1	2	-	-	2	2
• Dermaptera (Earwigs)	3	3	-	-	-	3	-
• Diptera (Flies)	188	158	27	3	6	149	3
• Embiidina (Webspinners)	1	1	-	-	-	1	-
• Hemiptera: Heteroptera (True bugs)	58	50	6	-	2	50	-
• Hemiptera: Homoptera (Hoppers & scales)	46	42	2	-	-	44	-
• Hymenoptera (Bees & wasps)	146	97	6	-	17	119	4
• Isoptera (Termites)	3	3	-	-	-	3	-
• Lepidoptera (Moths & butterflies)	113	102	21	-	5	87	-
• Mantodea (Mantids)	2	2	-	-	-	2	-
• Neuroptera (Lacewings)	4	4	-	-	2	2	-
• Odonata (Dragonflies & damselflies)	4	4	-	2	-	2	-
• Orthoptera (Grasshoppers & crickets)	12	12	-	-	-	12	-
• Psocoptera (Bark lice)	21	14	3	1	-	17	-
• Siphonaptera (Fleas)	1	1	-	-	-	1	-
• Strepsiptera (Stylopids)	1	1	-	-	-	1	-
• Thysanoptera (Thrips)	2	2	-	-	-	2	-
• Thysanura (Silverfish)	1	1	-	-	-	1	-
• Trichoptera (Caddisflies)	2	2	-	-	-	2	-
Crustacea (Crabs and relatives)	**9**	**7**	**2**	**-**	**-**	**7**	**-**
• Amphipoda (Sandhoppers)	1	-	1	-	-	-	-
• Isopoda (Sow bugs & slaters)	8	7	1	-	-	7	-
Chilopoda (Centipedes)	**2**	**2**	**-**	**-**	**-**	**2**	**-**
• Geophilomorpha (Soil centipedes)	1	1	-	-	-	1	-
• Scolopendromorpha (Giant centipedes)	1	1	-	-	-	1	-
Diplopoda (Millipedes)	**2**	**1**	**1**	**-**	**-**	**1**	**-**
• Polydesmida (Flat-backed millipedes)	1	1	-	-	-	1	-
• Polyxenida (Bristly millipedes)	1	-	1	-	-	-	-
All **Arthropoda** (Arthropods)	**879**	**695**	**86**	**9**	**51**	**704**	**29**
Percentage of total # species	100%	79%	10%	1%	6%	80%	3%
Percent change since 2007	108%	93%	101%	90%	98%	112%	73%

* End = endemic; Ind = indigenous; Pur = purposeful introduction; Adv = adventive; and Unk = unknown origin. The unknown category includes species whose origins remain obscure. Most unidentified species belong to known native or alien groups and, therefore, could be categorized.

Table 4. Numbers of alien species representing new state records and new island records among the major arthropod groups collected within the Kahului Airport environs during the arthropod survey and monitoring programs from August 1999 through November 2006 including the current synthesis.

Taxon	**Total No. Alien Species**	**No. Recorded on Maui Prior 2002**	**New Island Records**				**New State Records**			
			'02	**'06**	**'07**	**'11**[†]	**'02**	**'06**	**'07**	**'11***
Arachnida (Spiders & relatives)	**47**	**21**	**11**	**7**	**1**	**4**	**2**	**-**	**1**	**1**
• Acari (Mites)	**14**	**5**	**7**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
• Araneae (Spiders)	**32**	**15**	**4**	**7**	**1**	**4**	**-**	**-**	**1**	**1**
• Pseudoscorpionida (False scorpions)	**?**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Scorpiones (Scorpions)	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Insecta (Insects)	**698**	**423**	**140**	**24**	**24**	**21(1)**	**30**	**9**	**18**	**10(5)**
• Blattodea (Cockroaches)	**11**	**9**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**
• Coleoptera (Beetles)	**155**	**79**	**48**	**3**	**3**	**2**	**14**	**2**	**1**	**3**
• Collembola (Springtails)	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Dermaptera (Earwigs)	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Diptera (Flies)	**155**	**96**	**13**	**14**	**10**	**10**	**2**	**2**	**8**	**1(2)**
• Embiidina (Webspinners)	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Hemiptera: Heteroptera (True bugs)	**52**	**31**	**13**	**1**	**2**	**1(1)**	**2**	**-**	**2**	**(1)**
• Hemiptera: Homoptera (Hoppers, etc.)	**44**	**33**	**7**	**2**	**1**	**1**	**-**	**-**	**-**	**-**
• Hymenoptera (Bees & wasps)	**136**	**70**	**37**	**-**	**6**	**1**	**10**	**3**	**6**	**3**
• Isoptera (Termites)	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Lepidoptera (Moths & butterflies)	**92**	**65**	**18**	**2**	**1**	**2**	**2**	**1**	**1**	**(2)**
• Mantodea (Mantids)	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Neuroptera (Lacewings)	**4**	**4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Odonata (Dragonflies & damselflies)	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Orthoptera (Grasshoppers & crickets)	**12**	**8**	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**
• Psocoptera (Bark lice)	**17**	**9**	**1**	**-**	**-**	**3**	**-**	**1**	**-**	**3**
• Siphonaptera (Fleas)	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Strepsiptera (Stylopids)	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Thysanoptera (Thrips)	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Thysanura (Silverfish)	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Trichoptera (Caddisflies)	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Crustacea (Crabs & relatives)	**7**	**4**		**1**	**-**	**2**	**-**	**-**	**-**	**-**
• Isopoda (Sow bugs & slaters)	**7**	**4**	**-**	**1**	**-**	**2**	**-**	**-**	**-**	**-**
Chilopoda (Centipedes)	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Geophilomorpha (Soil centipedes)	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Scolopendromorpha (Giant centipedes)	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Diplopoda (Millipedes)	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Polydesmida (Flat-backed millipedes)	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Alien Arthropoda (Arthropods)	**755**	**451**	**151**	**32**	**25**	**27(1)**	**32**	**9**	**19**	**11(5)**
Percentage of total # of alien species	**100%**	**60%**	**20%**	**4%**	**3%**	**3%**	**4%**	**1%**	**3%**	**1%**
Cumulative % of alien species	**100%**	**60%**	**20%**	**24%**	**28%**	**31%**	**4%**	**5%**	**8%**	**9%**

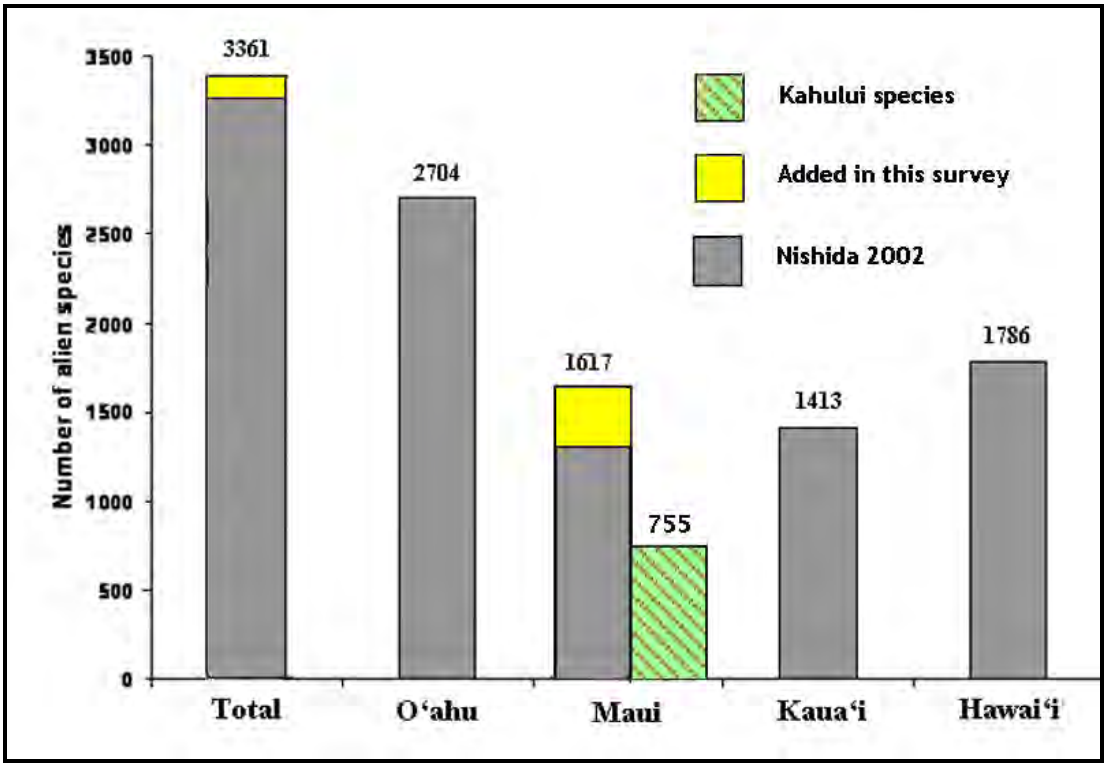
*****New records for 2011 are given as the number of species added to the list. The number in parentheses represents the number of additional records resulting from name changes and revised taxonomy of earlier records and is not included in the percentages.

Table 5. Numbers of species of terrestrial arthropods added since the Howarth and Preston (2007) to the list of species known to occur within the Kahului Airport environs.

Taxon	**Native Species**			**Alien Species**	**Unknown**	
	***Added to List**	**New Island Records**	**New Species**	**Added to List**	**Added to List**	**New Island Records**
Arachnida (Spiders & relatives)	**1**	**1**	**?**	**6**	**2**	
• Acari (Mites)	-	-	-	-	2	
• Araneae (Spiders)	1	1	?	6	-	
Insecta (Insects)	**6(6)**	**2(1)**	**1(1)**	**72(14)**	**4(1)**	**3**
• Coleoptera (Beetles)	-	-	-	7(1)	(1)	
• Collembola (Springtails)	-	-	-	-	1	
• Diptera (Flies)	3(3)	2(1)	1(1)	24(6)	-	
• Hemiptera: Heteroptera (True bugs)	-	-	-	4(2)	-	
• Hemiptera: Homoptera (Hoppers, scales, etc.)	-	-	-	5(1)	-	
• Hymenoptera (Bees & wasps)	-	-	-	17	3	3
• Lepidoptera (Moths & butterflies)	(2)	-	-	3(2)		
• Orthoptera (Grasshoppers & crickets)	-	-	-	1		
• Psocoptera (Bark lice)	3(1)	-	-	11(2)		
Crustacea (Crabs & relatives)	**-**			**3**		
• Isopoda (Sow bugs & slaters)	-	-	-	3		
TOTALS	**7(6)**	**3(1)**	**1(1)+**	**81(14)**	**6(1)**	**3**

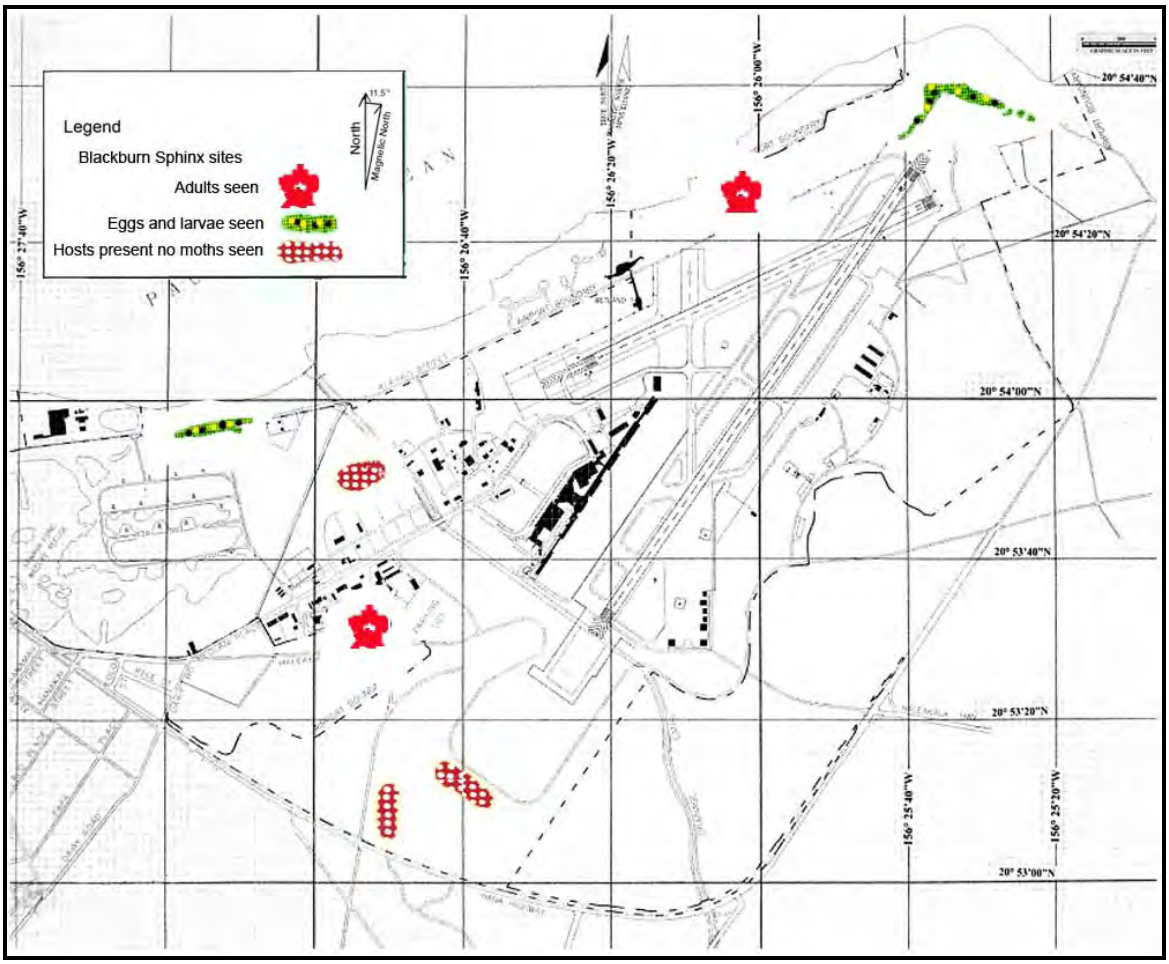
***Number of species added to the list is given first followed by the number (in parentheses), which represents the number of additional records resulting from name changes and revised taxonomy of earlier records.

Figure 2. Alien terrestrial arthropod species recorded from each island (Nishida 2002) along with the total now known from the Kahului Airport environs and the new state and island records added from the Kahului Airport baseline and monitoring surveys.



The federally endangered Blackburn's sphinx moth (*Manduca blackburni*) was usually present as eggs or larvae on tree tobacco shrubs at the eastern end of the airport runway near Sprecklesville. One adult came to an MV bulb collection site near the bike path, and one came to the security lights at the DLNR baseyard. In addition, larval feeding damage was noted on tree tobacco in the Kanaha Pond Wildlife Preserve. No evidence of the moth was found on tree tobacco growing in fallow sugarcane fields at the west end of the airport runway. The observed distribution of the sphinx within the airport environs is shown in **Figure 3**.

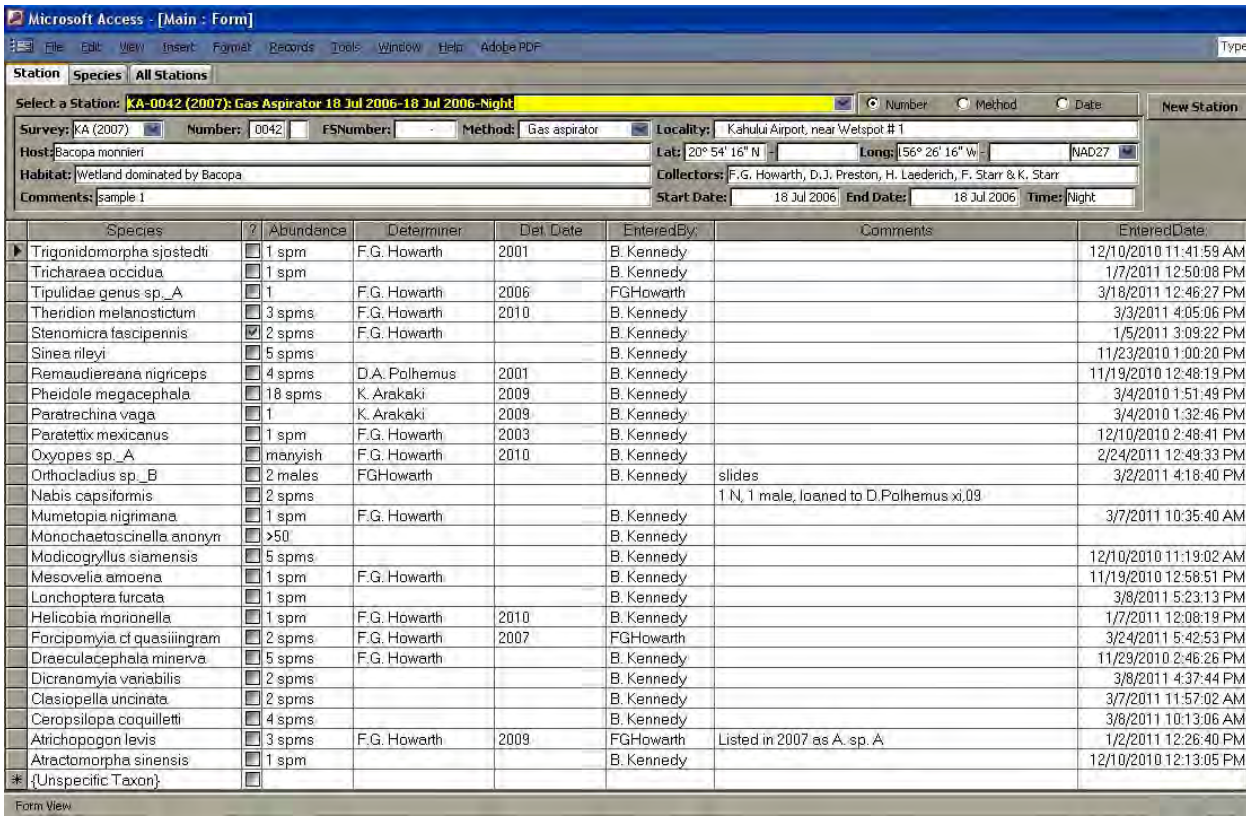
Figure 3. Sightings of Blackburn's sphinx moth within Kahului Airport environs during the field surveys.



ELECTRONIC DATABASE

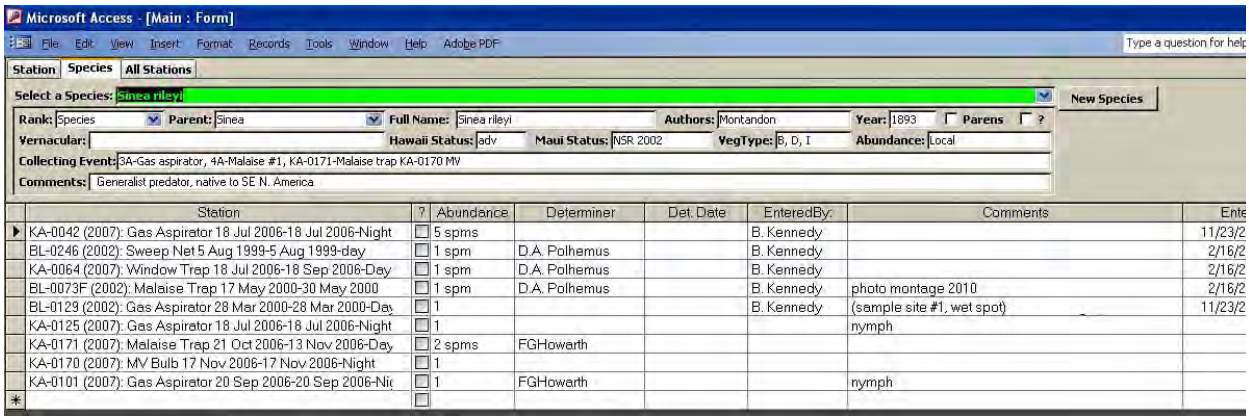
The relevant taxonomic and biological data on each of the 879 species occurring within the airport environs along with the associated collection data for each of the 659 sampled sites have been entered into a comprehensive database. The database was created in Microsoft Access® (filename is "kahului.mdb") and delivered on disk separately. **Appendix III** includes an illustrated set of directions for using the database. The types of data included are where, when, and how each species was collected, potential pest status, and details on each collection event. Querying any of the 659 collection sites presents a window with details on the method, time and location of the collection and a dropdown window with an annotated list of species collected at that site (**Figure** 4).

Figure 4. Screen capture image of the Kahului.mdb entry for collection site KA-0042 (2007).



Querying any of the 879 species will present a window giving relevant information on its taxonomy, biogeography and available details on biology, as well as an annotated list of collection sites where the species was found (**Figure 5**). The database is expandable; that is, new sites and species can be added easily. The database also can be adapted for collections from other areas and other surveys.

(**Figure** 5. Screen capture image of the Kahului.mdb entry for *Sinea rileyi*.



VOUCHER COLLECTION

Nearly all of the species recorded in the database and listed in **Appendix V** are represented by authoritatively identified and labeled voucher specimens. The few exceptions are sight records of conspicuous species not captured (e.g. the endangered Blackburn sphinx) or missing specimens from Dr. Beardsley's Hymenoptera identifications that were lost after his death. A second set of labeled and identified voucher specimens representing of all species reported from the airport environs for which there are available specimens has been prepared for deposit in the insect collection at the Hawaii Department of Agriculture. The first part of this voucher collection, the Lepidoptera (moths and butterflies) has been deposited in the HDOA collection on Maui.

SPECIES IDENTIFICATION AIDS

A gallery of 107 photographs was prepared (**Appendix IV**), which shows the general habitus of 92 species of arthropods. Nearly all of the photographs represent species that are new state or island records discovered during the baseline and monitoring surveys. A majority of the pictures (78) were taken using an Automontage® system, which enhances the depth of field and resolution of the image (**Appendix IV**). Good quality photographs are important supplementary aids for detecting and making rapid preliminary identifications of newly arriving alien species.

DISCUSSION

COLLECTING METHODS

Although survey methods have been developed to collect large numbers of specimens, the great diversity of both body forms and lifestyles of arthropods makes developing general monitoring strategies to detect newly established invasive species especially daunting. Each taxonomic group usually requires the use of one or more specialized techniques to sample the species occurring in an area. Even closely related species respond differently to the same trap or collecting method. Many species require a specific method used at the right time and in the right habitat. Nevertheless, general collecting techniques can be used to sample a wide variety of arthropods.

Each of the collecting methods has advantages depending on the objectives of the survey; e.g., bait traps, emergence traps, host searches, sticky traps and Lingren funnels work well for detecting specific target species. Gas aspirators are possibly the best method for rapid unbiased sampling of specific areas or vegetation, particularly if the substrate is dry and free of small debris. Although sorting of the samples is labor-intensive and the more fragile specimens may be damaged, only sessile, subsurface and some larger, more active animals are missed; everything else is captured in the net. Sticky traps worked very well at capturing unusual species, but they are difficult to process if usable voucher specimens are desired (Murphy 1985, Miller 1993). Well-placed Malaise traps can provide a continuous record of the activity of a majority of volant insect species present. The addition of window traps to Malaise traps significantly increases their effectiveness. However, Malaise traps are limited to use in suitable sites; e.g., security from vandalism and presence of natural flyways. Night collecting at lights can accurately sample the majority of flying nocturnal insects; however, the method works best during dark periods and away from artificial lights. Generally, ultraviolet lights (MV bulbs and blacklights) are more effective than lights in visible wavelengths. We did not use light traps, even though these can be left unattended and would be expected to capture mostly the same species. However, light traps (like Malaise and many other traps) are designed to capture and kill all taxa together indiscriminately, which can damage fragile specimens as the more

robust and resistant animals thrash around in the container. Traps also transfer the sorting and preliminary processing of specimens to the laboratory, which adds several time-consuming steps to the preparation of specimens of moths and some other targeted groups, which is the reason we did not attempt to identify moths from the Malaise and other traps. These collecting methods are most effective when the collectors know the fauna being sought since such knowledge minimizes time and effort wasted on collecting and processing duplicate and undesired specimens. Importantly, all of these methods also are limited by the availability of the time, taxonomic expertise and facilities necessary for sorting and identification.

Results of Selected Monitoring Methods

To provide additional information on which methods might be more effective at detecting new arrivals, all species in representative samples of selected collecting methods were identified as far as possible. Because the process is time-consuming, only a few samples were processed, but the results are informative. Collections processed include one Malaise trap, one sticky trap and the moths and selected taxa from four MV bulb samples. This exercise became feasible because the voucher collection is now sufficiently comprehensive to allow rapid identification of the majority of species.

Malaise Trap. All species of arthropods captured in Malaise trap sample KA-0171, which was set in keawe and koa haole woodland within the AOA and which ran from 21 October to 13 November 2006 (**Appendix II, Table II-2**), were identified as far as possible. The sample contained at least 215 species, of which 186 could be identified to species level. The unidentified material includes species in groups for which there is presently no expertise as well as immature specimens that cannot be unidentified at the present time. The total catch represents about one quarter (24%) of the total number of terrestrial arthropods presently known from the airport environs. Malaise traps are excellent for sampling the true flies (Diptera). This single sample contained 85 species of flies, which is nearly one half (45%) of the total number of species of flies currently known from the airport environs. In addition, the 85 species included four new state records, eleven new island records, and 17 additions to the list. Other groups were less well represented. For some groups, this was expected. Studies elsewhere have shown that many wasps (Hymenoptera) and beetles (Coleoptera) avoid entering malaise traps, which may explain the relatively low catches in these orders. At least 36 species of wasps were found. These included seven species new to the list and three possible new state records. This total represents about one quarter (25%) of the species of wasps known to occur within the airport environs. Only 24 species of beetles were captured, including five new to the list. This represents about 15% of the airport environs beetle fauna. Only 18 species of moths (Lepidoptera) were collected, even though moths made up about 90% of the volume of the catch. However, most of the mass consisted of 50 to more than 100 specimens each of just three species of large moths: *Anacamptodes fragilaria, Macaria abydata,* and *Melipotis indomita*. The first two species feed on koa haole, and the third feeds on keawe, reflecting the local dominant flora. Five, or possibly more, tiny species remain unidentified because the fluid obscured the characters normally used to distinguish them. However, if properly mounted and identified voucher specimens are available for comparison, most species of Hawaiian moths can be identified even if preserved in fluid. Overall, 50 Malaise trap samples contained 391 species, which is 44% of the fauna (**Table 2**).

Sticky Trap. Sticky traps capture smaller arthropods being carried on the wind, sometimes called 'aerial plankton.' Except for the mess required to process the material, the method is excellent for collecting tiny species often missed in other survey techniques, such as the coniopterygid lacewing. Larger flying insects can avoid the traps unless attracted by the color or presence of prey or food. Moths and some hairy species escape because the scales or hairs keep the animals from being ensnared. Sticky trap sample KA-0265 contained at least 28 species

including two new state records, one new island record, and two species new to the list. In addition, some of the unidentified wasps may represent new records. Overall, 47 species (5%) were recorded from 22 sticky trap samples (**Table 2**).

MV Bulb. MV bulb samples consisted of arthropods captured as they alighted on a large white sheet hung about 2 feet from an MV bulb. Both the bulb and sheet were set in relatively dark areas away from urban lights and monitored for arthropods from sunset to at least 10 pm or occasionally to midnight. Site descriptions are given in **Appendix II**. Sixteen species of moths were collected at KA-0168; 25 species at KA-0169, and 20 species at KA-0170. The number of species for the three collections combined is 35 or nearly one third of the total lepidopteran diversity within the airport environs (35/113 = 31%). No new records of moths were found, but one individual of the endangered sphinx moth was seen and photographed at KA-0170. Sixty-six arthropods other than moths have been identified from KA-0170. Thirty-two species of beetles were found, including one new island record. Three other species were added to the airport fauna: two flies and a true bug. Overall, 33 MV bulb samples contained 501 species or 57% of the known fauna (**Table 2**).

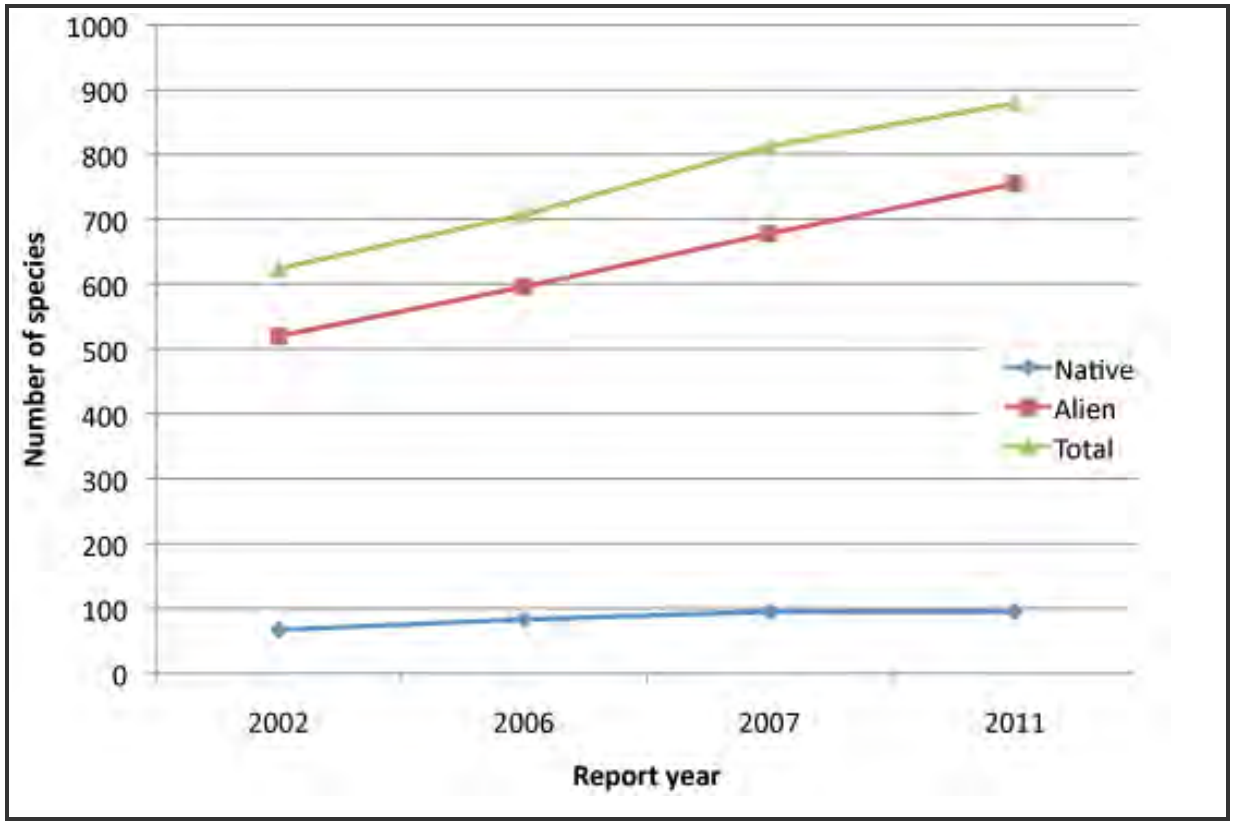
A significant advantage of the method is the ability to obtain excellent specimens that facilitate identification. This is especially true for the moths, certain hairy flies, and fragile insects that do not preserve well in fluid. Even the fluid preserved material is often in good condition because each specimen is collected directly off the sheet. The method can be biased in that rare species can be overlooked amongst individuals of the more abundant species. Ideally, the method requires sufficient knowledge of the fauna to judiciously collect appropriate specimens that represent all taxa present. The obverse strategy is to try to collect everything, but this method taxes resources for processing and identification, which can lead to poorer material. We compromised between these two extremes but preferred the former strategy.

COMPLETENESS OF THE ARTHROPOD SURVEY

Sixty-six species (an 8% increase) were added to the list of species of terrestrial arthropods occurring within the Kahului Airport environs. In addition, improved identifications and revised status of already listed species resulted in a net increase of 77 alien species (11%), zero native and minus 11 species whose biogeographic origins remain unknown. The trend in accumulation of both alien and total number of species continues upward although at a slower rate; that is, from 15 and 13% increase respectively between 2002 and 2006 to 11 and 8% increase between 2007 and the current compilation (**Figure 6**). These trends suggest that the survey remains incomplete and that many additional species occur within the study area. In contrast, the trend for native species has leveled from a 24% increase initially to 0% currently suggesting that few additional native species would be expected unless additional collecting methods targeting native species are used or restoration projects in the area allow populations of rare species to recover.

Sampling of the different taxonomic groups is variably complete. Trends in species accumulation within each order can be seen in **Tables 6, 7, 8 and Table 3.** An independent measure of relative completeness can be deduced by comparing the number of alien species recorded from Maui with those from the state as a whole. The overall ratio for all alien terrestrial arthropods occurring on Maui verses the state is 48% and within the larger orders ranges from 21% for mites to about 70% for the flies and moths (**Table 9**). The two large orders (Hymenoptera and Coleoptera) remain relatively poorly known on Maui largely because they have not yet been fully treated in Zimmerman's *Insects of Hawaii* series (Zimmerman 1948-1978, Hardy 1960-1981, Hardy and Delfinado 1980, Christiansen and Bellinger 1992, Liebherr and Zimmerman 2000, Daly and Magnacca 2003).

Figure 6. Species accumulation curves for the number of native, alien and total species recorded within the Kahului Airport environs during the four phases of this study.



Overall, nearly 1/2 (47%) of the alien arthropods recorded from Maui were found within the project area (**Table 9**). The mites, springtails, homopterans, lice, fleas and thrips are not well represented in the survey. The mites, springtails and some thrips are generally tiny, cryptic soil and leaf litter inhabitants and require special collecting techniques; the lice and fleas are vertebrate parasites, which were outside the scope of the survey. Many plant-feeding homopterans and thrips are host-specific, and their host either did not occur at Kahului or the host was rare and not sampled.

Many of the smaller orders (i.e. those with fewer than 25 species in the state) are possibly well sampled although additional species are expected. The moths and butterflies are also relatively well sampled (82% of the species known from Maui were collected from the airport.) although some nocturnal species that do not come to lights may have been missed. The survey of moths benefitted from the necessity of preliminary sorting and processing specimens in the field. Curating specimens in the field facilitates subsequent identification, but it is labor intensive and detracts from time and effort spent on collecting other groups. Collaborating taxonomists for the mites, beetles and wasps were available only during the baseline survey, and with the exception of the more conspicuous species, these groups have received less coverage during the later monitoring surveys. Many additional species are expected especially among the mites, beetles, flies, wasps and Homoptera and among the minute species.

Table 6. Numbers and geographic status of species within the major Arthropod groups collected within the Kahului Airport environs between August 1999 and November 2000 (from Howarth and Preston 2002).

Taxon	**Total Species**	**ID Species**	**Geographic Status***				
			End	**Ind**	**Pur**	**Adv**	**Unk**
Arachnida (Spiders & relatives)	**53**	**41**	**7**	**1**	**-**	**26**	**19**
• Acari (Mites)	38	29	6	1	-	13	18
• Araneae (Spiders)	13	12	1	-	-	12	-
• Pseudoscorpionida (False scorpions)	1	-	-	-	-	-	1
• Scorpiones (Scorpions)	1	-	-	-	-	1	-
Insecta (Insects)	**567**	**540**	**52**	**7**	**47**	**444**	**17+**
• Blattodea (Cockroaches)	8	8	-	-	-	8	-
• Coleoptera (Beetles)	141	135	8	2	22	109	-
• Collembola (Springtails)	2+	-	-	-	-	-	2+
• Dermaptera (Earwigs)	3	3	-	-	-	3	-
• Diptera (Flies)	103	101	12	2	6	80	3
• Embiidina (Webspinners)	1	1	-	-	-	1	-
• Hemiptera: Heteroptera (True bugs)	39	38	3	-	1	35	-
• Hemiptera: Homoptera (Hoppers & scales)	36	30	2	-	-	28	6
• Hymenoptera (Bees & wasps)	100	98	6	-	12	80	2
• Isoptera (Termites)	2	2	-	-	-	2	-
• Lepidoptera (Moths & butterflies)	102	100	20	1	5	76	-
• Mantodea (Mantids)	2	-	-	-	-	2	-
• Neuroptera (Lacewings)	4	4	1	-	1	2	-
• Odonata (Dragonflies & damselflies)	4	4	-	2	-	2	-
• Orthoptera (Grasshoppers & crickets)	9	9	-	-	-	9	-
• Psocoptera (Bark lice)	5	1	-	-	-	1	4+
• Siphonaptera (Fleas)	1	1	-	-	-	1	-
• Strepsiptera (Stylopids)	1	1	-	-	-	1	-
• Thysanoptera (Thrips)	1	1	-	-	-	1	-
• Thysanura (Silverfish)	1	1	-	-	-	1	-
• Trichoptera (Caddisflies)	2	2	-	-	-	2	-
Chilopoda (Centipedes)	**1**	**1**	**-**	**-**	**-**	**1**	**-**
• Scolopendromorpha (Giant centipedes)	1	1	-	-	-	1	-
Crustacea (Crabs and relatives)	**3**	**2**	**-**	**-**	**-**	**2**	**1**
• Amphipoda (Sandhoppers)	1	-	-	-	-	-	1
• Isopoda (Sow bugs & slaters)	2	2	-	-	-	2	-
All **Arthropoda** (Arthropods)	**624**	**584**	**59**	**8**	**47**	**473**	**37+**
Percentage of total # species	**100%**	**94%**	**9%**	**1%**	**7%**	**76%**	**6%**

* End = endemic; Ind = indigenous; Pur = purposeful introduction; Adv = adventive; and Unk = unknown origin. The unknown category includes species whose origins remain obscure. Most unidentified species belong to known native or alien groups and, therefore, could be categorized.

Table 7. Numbers and geographic status of species within the major arthropod groups collected within the Kahului Airport environs between August 1999 and November 2000 and between June and September 2003 during both the arthropod survey and first monitoring program (from Howarth and Preston 2006).

Taxon	**Total Species**	**ID Species**	**Geographic Status***				
			End	**Ind**	**Pur**	**Adv**	**Unk**
Arachnida (Spiders & relatives)	**67**	**57**	**8**	**1**		**40**	**18**
• Acari (Mites)	38	29	6	1	-	14	17
• Araneae (Spiders)	27	27	2	-	-	25	-
• Pseudoscorpionida (False scorpions)	1	-	-	-	-	-	1
• Scorpiones (Scorpions)	1	1	-	-	-	1	-
Insecta (Insects)	**629**	**606**	**65**	**8**	**48**	**502**	**9**
• Blattodea (Cockroaches)	10	10	-	-	-	10	-
• Coleoptera (Beetles)	149	143	7	2	21	119	-
• Collembola (Springtails)	5	3	2	-	-	2	1
• Dermaptera (Earwigs)	3	3	-	-	-	3	-
• Diptera (Flies)	127	123	22	3	6	95	1
• Embiidina (Webspinners)	1	1	-	-	-	1	-
• Hemiptera:Heteroptera (True bugs)	46	45	3	-	2	41	-
• Hemiptera: Homoptera (Hoppers & scales)	45	38	2	-	-	37	6
• Hymenoptera (Bees & wasps)	105	101	6	-	12	86	1
• Isoptera (Termites)	3	3	-	-	-	3	-
• Lepidoptera (Moths & butterflies)	106	104	22	1	5	78	-
• Mantodea (Mantids)	2	2	-	-	-	2	-
• Neuroptera (Lacewings)	4	4	-	-	2	2	-
• Odonata (Dragonflies & damselflies)	4	4	-	2	-	2	-
• Orthoptera (Grasshoppers & crickets)	10	10	-	-	-	10	-
• Psocoptera (Bark lice)	5	5	1	-	-	4	
• Siphonaptera (Fleas)	1	1	-	-	-	1	-
• Strepsiptera (Stylopids)	1	1	-	-	-	1	-
• Thysanoptera (Thrips)	2	2	-	-	-	2	-
• Thysanura (Silverfish)	1	1	-	-	-	1	-
• Trichoptera (Caddisflies)	2	2	-	-	-	2	-
Crustacea (Crabs and relatives)	**5**	**4**	**-**	**-**	**-**	**4**	**1**
• Amphipoda (Sandhoppers)	1	-	-	-	-	-	1
• Isopoda (Sow bugs & slaters)	4	4	-	-	-	4	-
Chilopoda (Centipedes)	**1**	**1**	**-**	**-**	**-**	**1**	**-**
• Scolopendromorpha (Giant centipedes)	1	1	-	-	-	1	-
Diplopoda (Millipedes)	**2**	**2**	**1**			**1**	
• Polydesmida (Flat-backed millipedes)	1	1	-	-	-	1	-
• Polyxenida (Bristly millipedes)	1	1	1	-	-	-	
All **Arthropoda** (Arthropods)	**704**	**670**	**74**	**9**	**48**	**548**	**28**
Percentage of total # species	**100%**	**95%**	**11%**	**1%**	**7%**	**78%**	**4%**
Percentage change from 2002	**113%**	**122%**	**125%**	**113%**	**102%**	**116%**	**76%+**

* End = endemic; Ind = indigenous; Pur = purposeful introduction; Adv = adventive; and Unk = unknown origin. The unknown category includes species whose origins remain obscure. Most unidentified species belong to known native or alien groups and, therefore, could be categorized.

Table 8. Numbers and geographic status of species within the major terrestrial arthropod groups collected within the Kahului Airport environs between August 1999 and November 2006 during the arthropod survey and two monitoring programs (from Howarth and Preston 2007).

Taxon	**Total Species**	**ID Species**	**Geographic Status***				
			End	**Ind**	**Pur**	**Adv**	**Unk**
Arachnida (Spiders & relatives)	**72**	**62**	**9**	**1**		**42**	**20**
• Acari (Mites)	38	29	6	1	-	14	17
• Araneae (Spiders)	32	32	3	-	-	27	2
• Pseudoscorpionida (False scorpions)	1	-	-	-	-	-	1
• Scorpiones (Scorpions)	1	1	-	-	-	1	-
Insecta (Insects)	**731**	**674**	**74**	**9**	**52**	**577**	**19**
• Blattodea (Cockroaches)	11	11	-	-	-	11	-
• Coleoptera (Beetles)	165	158	8	2	22	130	3
• Collembola (Springtails)	5	3	2	-	-	2	1
• Dermaptera (Earwigs)	3	3	-	-	-	3	-
• Diptera (Flies)	164	150	25	4	6	125	4
• Embiidina (Webspinners)	1	1	-	-	-	1	-
• Hemiptera: Heteroptera (True bugs)	54	46	6	-	2	46	-
• Hemiptera: Homoptera (Hoppers & scales)	48	39	2	-	-	40	6
• Hymenoptera (Bees & wasps)	131	116	6	-	15	105	5
• Isoptera (Termites)	3	3	-	-	-	3	-
• Lepidoptera (Moths & butterflies)	112	109	23	1	5	83	-
• Mantodea (Mantids)	2	2	-	-	-	2	-
• Neuroptera (Lacewings)	4	4	-	-	2	2	-
• Odonata (Dragonflies & damselflies)	4	4	-	2	-	2	-
• Orthoptera (Grasshoppers & crickets)	11	11	-	-	-	11	-
• Psocoptera (Bark lice)	7	7	2	-	-	5	
• Siphonaptera (Fleas)	1	1	-	-	-	1	-
• Strepsiptera (Stylopids)	1	1	-	-	-	1	-
• Thysanoptera (Thrips)	2	2	-	-	-	2	-
• Thysanura (Silverfish)	1	1	-	-	-	1	-
• Trichoptera (Caddisflies)	2	2	-	-	-	2	-
Crustacea (Crabs and relatives)	**6**	**5**	**1**	**-**	**-**	**4**	**1**
• Amphipoda (Sandhoppers)	1	-	-	-	-	-	1
• Isopoda (Sow bugs & slaters)	5	5	1	-	-	4	-
Chilopoda (Centipedes)	**2**	**2**	**-**	**-**	**-**	**2**	**-**
• Geophilomorpha (Soil centipedes)	1	1	-	-	-	1	-
• Scolopendromorpha (Giant centipedes)	1	1	-	-	-	1	-
Diplopoda (Millipedes)	**2**	**2**	**1**			**1**	
• Polydesmida (Flat-backed millipedes)	1	1	-	-	-	1	-
• Polyxenida (Bristly millipedes)	1	1	1	-	-	-	
All **Arthropoda** (Arthropods)	**813**	**745**	**85**	**10**	**52**	**626**	**40**
Percentage of total # species	**100%**	**92%**	**10%**	**1%**	**6%**	**77%**	**5%**
Percentage change from 2006	**116%**	**111%**	**115%**	**111%**	**108%**	**114%**	**143%**

* End = endemic; Ind = indigenous; Pur = purposeful introduction; Adv = adventive; and Unk = unknown origin. The unknown category includes species whose origins remain obscure. Most unidentified species belong to known native or alien groups and, therefore, could be categorized.

Table 9. Numbers of alien terrestrial arthropod species by major taxonomic group recorded from the state of Hawaii and the Island of Maui from Nishida (2002) and the Kahului Airport survey.

TAXA	Numbers in Nishida 2002		Added in This study		New Totals		Percentages	
	State	Maui	NSR	NIR	State	Maui	Maui/State	Kahului/Maui
Class Arachnida	**547**	**120**	**4**	**23**	**551**	**147**	**27%**	**32%**
Acari (Mites)	437	83	2	7	439	92	21%	15**%**
Araneae (Spiders)	105	36	2	16	107	54	50%	59**%**
Other arachnids	5	1	-	-	5	1	20%	100**%**
Class Insecta (Insects)	**2672**	**1164**	**67**	**209**	**2739**	**1440**	**53%**	**48%**
Blattodea (Cockroaches)	21	14	-	2	21	16	76%	69%
Coleoptera (Beetles)	590	192	20	56	610	268	44%	58**%**
Collembola	71	36	-	-	71	36	51%	6**%**
Dermaptera (Earwigs)	12	5	-	-	12	5	42%	60**%**
Diptera (Flies)	385	210	13	47	398	270	68%	57**%**
Embiidina (Webspinners)	2	1	-	-	2	1	50%	50**%**
Ephemeroptera (Mayflies)	1	-	-	-	1	-	0	0
Hemiptera: Heteroptera (True Bugs)	106	42	4	17	110	63	57%	82**%**
Hemiptera: Homoptera (Plant bugs)	321	161	-	11	321	172	54%	26**%**
Hymenoptera (Wasps)	676	270	22	44	698	336	48%	40**%**
Isoptera (Termites)	6	4	-	-	6	4	67%	75%
Lepidoptera (Moths)	193	110	4	23	197	137	70%	67**%**
Mantodea (Mantids)	6	3	-	-	6	3	50%	67**%**
Neuroptera (Lacewings)	6	4	-	-	6	4	67%	100**%**
Odonata (Dragonflies)	8	4	-	-	8	4	50%	50**%**
Orthoptera (Grasshoppers, etc.)	28	13	-	4	28	17	61%	71**%**
Phthiraptera (Lice)	55	18	-	-	55	18	33%	0
Protura (Proturans)	1	-	-	-	1	-	0	0
Psocoptera (Barklice)	41	20	4	4	45	28	62%	61**%**
Siphonaptera (Fleas)	10	6	-	-	10	6	60%	17**%**
Strepsiptera (Twisted wings)	3	1	-	-	3	1	33%	100**%**
Thysanoptera (Thrips)	120	48	-	-	120	48	40%	4**%**
Thysanura (Silverfish)	6	-	-	1	6	1	17%	100**%**
Trichoptera (Caddisflies)	3	2	-	-	3	2	67%	100**%**
Zoraptera (Zorapterans)	1	-	-	-	1	-	0	0
Class: Crustacea	**40**	**14**	**-**	**3**	**40**	**17**	**43%**	**41%**
Amphipoda (Amphipods)	3	-	-	-	3		0	0
Isopoda (Isopods)	37	14	-	3	37	17	46%	41**%**
Class Chilopoda (Centipedes)	**16**	**7**	**-**	**-**	**16**	**7**	**44%**	**29%**
Class Diplopoda (Millipedes)	**15**	**6**	**-**	**-**	**15**	**6**	**40%**	**17%**
TOTALS	**3290**	**1311**	**71**	**235**	**3361**	**1617**	**48%**	**47%**

IDENTIFICATION AIDS

More than 180 listed species (21% of the total) remain incompletely identified. Many of these represent species new to science, and therefore, valid names are not available. Some of the species found will require revision of their group on a regional or sometimes world-wide level before the Hawaiian species can be identified. In addition, many belong to groups for which taxonomic expertise is not currently available. This lack of expertise (the 'taxonomic impediment') is a critical issue in biodiversity surveys and invasion species risk assessments (Lodge et al. 2006, Drew 2011). For some species, the material is inadequate for species determination; for example in some groups, specimens of both sexes are necessary, whereas in other groups, data on the species' host associations are needed. Many species require special collection and curation methods to preserve the distinguishing characters required for identification. Among the unidentified species, only those that were clearly

distinguishable from other listed species and usually belonging to groups not otherwise represented are included in the 2011 list of species. An additional 21 doubtful species records, which were included on previous lists, were deleted from the current compilation.

Identification of the better-known and distinctive species currently reported from the project area is straightforward; however, others require more sophisticated methods. In fact, species identification often requires considerable time and effort, especially as many species require appropriate mounting of the specimens and microscopic examination and specialized knowledge to identify. A major obstacle to monitoring for invasive arthropods is the absence or poor availability of taxonomic keys and other diagnostic tools to identify species; not only adults but also different stages in their life cycle (Miller 2007, Lodge et al. 2006). Given the large number of species present and the even larger number of potential invasive species, there is a critical need for accessible aids to quickly identify potential pest species. These identification aids should be web-based and therefore accessible to any stakeholder who has a computer and needs to check on the identity of a species. A critically important (but sometimes overlooked) aspect of species identifications is the determination of what it is **not**; that is, identification aids must rule out other possibilities as part of the identification process. For most arthropod species, well-preserved and labeled voucher specimens are necessary to confirm the name. These vouchers also allow revisions of the names as taxonomy improves as well as allow comparisons with follow-up studies; for example, they provide a long-term record of the biology including where and when the species occurred.

Online Resources

Fortunately, the advent of digital photography and the emerging DNA analyses coupled with interactive electronic software has improved the available diagnostic tools to rapidly identify potentially harmful species and thereby improve quarantines and rapid response initiatives. Many of these diagnostic tools are already available online although the coverage of invasive invertebrates lags behind other taxonomic groups, and most sites require the correct taxonomic name to access appropriate information. Online taxonomic supports include photographic galleries, illustrated taxonomic keys, DNA reference data, and databases.

Photographic Galleries

Good quality photographs are important supplementary aids for identifying potential pest species as well as for detecting newly arriving alien species. Although extremely useful, they are no substitute for well curated voucher specimens in long-term studies. Ideally, the photographic aids would be hierarchical with nested levels; that is, from pictures that show the overall gestalt of each species to detailed illustrations of critical characters that allow the user to make at least a preliminary determination and to assist inspectors to recognize high risk taxa. Illustrations of feeding damage and different life stages should be included. The different levels would allow preliminary identifications in the field, while the higher levels would allow confirmation of the identification, as well as provide the user with scientific names necessary to access additional information. The resulting product will be flexible so that additional species or links to taxonomic keys and information can be added at any time. Web searches for images of specific taxa can be very helpful, but the names can be suspect unless the site is reputable. Regional and taxonomy based sites often include photographic images of species within their purview, such as the Hawaiian Ecosystems At Risk website (http://www.hear.org/) contains links to images of Hawaiian insects as well as to information and reports on invasive species of importance in Hawai‘i and the forestry images site (http://www.forestryimages.org/insects.cfm) includes a gallery of forest insects of North America emphasizing native and alien pest species.

Taxonomic Keys

Photographically illustrated taxonomic keys that offer step by step decisions leading to a determination of a species or higher taxonomic group need to be made more readily available. They should use multiple, easily recognized characteristics tailored for quarantine inspectors, amateur biologists, students and other stakeholders, and they should include comprehensive coverage of life stages and morphologic variation. Keys to a few groups are already available on-line, and the Key to All Life (www.identifylife.org) is developing an online system designed to provide a single, integrated, flexible environment for identifying any organism anywhere in the world.

Lucid-based and Intkey-based keys allow users to select the most apparent character from a suite of illustrated features. After each selection, a new set of features is displayed; each new set is based on the earlier selections; and so on until one has identified the organism. Thus there are several different ways to reach the correct identification depending on which characters are visible or recognizable. Good keys provide an additional description of the diagnostic features to confirm the identification, as well as a list and links to illustrations of taxa likely to be confused with the one selected. Currently not many keys are online, but the key to world genera of Xyleborini by Hulcr and Smith (2010) demonstrates the promise of the technology. Since the xyleborine ambrosia beetles are among the most commonly intercepted arthropods at ports-of-entry and include many important invasive pest species, the key is highly relevant. The URL is http://itp.lucidcentral.org/id/wbb/xyleborini/. The Pacific invasive ant key provides an illustrated lucid key to the problematic ant species in the region, along with beautiful automontage photographs and detailed fact sheets on each species. The URL is http://keys.lucidcentral.org/keys/v3/PIAkey/index.html. Additional keys to ant species from other regions can be found at (http://www.discoverlife.org/20/q?search=Formicidae). Intkeys to some Hymenoptera groups are linked to http://www.hymatol.org/keys.html.

DNA Sequences

New diagnostic tools in molecular biology allow rapid detection of even small numbers of small organisms (e.g., gene probes, microarrays, real time PCR). Species identification by analysis of a small fragment of the genome represents a promising approach that addresses some of constraints inherent in traditional morphological methods and is encouraging a renaissance in taxonomy (Miller 2007). The approach consists of amplification and sequencing of a specified 'barcode region', followed by comparison of the recovered sequence(s) to available genetic databases to determine species identity (Hebert et al. 2003, Marshall 2005, Hajibabaei et al. 2007). An important advantage of DNA barcoding is that it allows for identification of species when morphological identification may offer only estimates of higher taxonomic levels or no estimate at all, such as eggs, larvae or damaged specimens recovered in quarantine (Hajibabaei et al. 2006b, Darling and Blum 2007). It can distinguish cryptic species and is rapid and cost-effective (Janzen et al. 2005, Miller 2007, Briski et al. 2010). Mitochondrial cytochrome *c* oxidase subunit I (COI) and 16S rDNA (16S) have been shown to be broadly applicable for use as DNA barcode regions in animals because the evolution of these genes is rapid enough to discriminate to the species level (Hajibabaei et al. 2007*)*, and because of the availability of robust, universal primers (Zhang and Hewitt 1997). On-line libraries exist for known sequences of these and other gene regions at the following sites GenBank (http://www.ncbi.nlm.nih.gov/), and for the COI gene in the BOLD (http://www.barcodinglife.org). Increasing the utility of DNA identifications is the fact that the most notorious invaders are well represented in existing DNA sequence libraries, rendering these non-indigenous species detectable using molecular methods (Briski et al. 2010).

DNA identification has already been applied to a wide variety of taxa including Lepidoptera (Brown et al. 1999, Janzen et al. 2005, Hajibabaei et al. 2006a), Coleoptera (Monaghan et al. 2005), Araneae (Paquin and Hedin

2004, Barrett and Hebert 2005) and even masticated prey items of invasive wasps (Wilson et al. 2009) and tree roots in caves (Howarth et al. 2007). Rugman-Jones et al. (2006) successfully tested the method for distinguishing pest species of *Scirtothrips* (Thysanoptera), and Briski et al. (2010) demonstrated the strategy using eggs of marine species in ballast water as model. The latter researchers used DNA barcoding with mitochondrial cytochrome *c* oxidase subunit I and 16S rDNA from diapausing eggs collected in ballast sediment of ships to identify correctly many of the species present. However, use of barcodes to identify species can be limited by overlap of genetic variation among closely related species (Monaghan et al. 2005, Shaw 2004), and by the lack of reference sequences in existing genetic databases (Darling and Blum 2007, Moritz and Cicero 2004). The former problem occurs within some rapidly evolving groups when intraspecific variation masks the interspecific divergence in the selected molecular marker. Both problems are rapidly being solved as DNA sequencing technology evolves and becomes more widely available.

ELECTRONIC DATABASES

Knowledge of the many life-forms on Earth (including arthropods) is scattered around the world in books, journals, databases, websites, specimen collections, and in the minds of people everywhere. Much of this information is hidden within inaccessible files or lost, and there is a critical need to provide standardized infrastructure to preserve and make them available to future workers (Goddard et al. 2011). Several groups are attempting to gather together this information into online sources, which will be available to everyone, anywhere on linked websites; e.g. Encyclopedia of Life (http://eol.org/), Discover Life (http://www.discoverlife.org/), Global Biodiversity Information Facility (GBIF http://www.gbif.org/) and Catalogue of Life (http://www.catalogueoflife.org/) . Together, these sites already include more than two million pages of biodiversity data; and are adding thousands of pages daily. When complete, these sites will link and integrate information from a wide variety of sources. This approach is particularly important for rapid response and eradication, where it is imperative to know the existing range and potential distribution of the target species. These systems show great promise, but accurate species identification is necessary to access the appropriate information, and currently for arthropods, secure identifications are limited to conspicuous and distinctive species. Furthermore, for most invertebrates including insects, these data should be associated with well-preserved voucher specimens if they are to be valuable in future.

As electronic databases become more powerful and interactive, they will become more useful for handling the vast amount of data associated with invasive species. Several databases are already available online, and more are being added. Taxonomic databases that attempt to list all valid species names already exist online and are exceptionally useful for invasive species surveys; e.g. Encyclopedia of Life, Zipcodezoo (http://zipcodezoo.com/) and Discoverlife. These are supplemented and already partially linked to databases for specific taxonomic groups; e.g. Diptera (http://www.diptera.org/), Hymenoptera (http://www.hymatol.org/index.html) and Lepidoptera (http://www.nhm.ac.uk/research-curation/research/projects/lepindex/).

Regional online biodiversity databases address invasive species issues; e.g. The U.S. National Invasive Species Information Center [http://www.invasivespeciesinfo.gov/index.shtml] has links to reports on invasive species issues in the US and territories lists of species e.g. Integrated Taxonomic Information System (http://www.itis.gov/), the Hawaii terrestrial arthropod checklist (Nishida 2002); and survey data such as in the present report. Eventually, these databases will be fully linked, making most of the available data needed for invasive species assessments accessible with a few keystrokes. A thorough and illuminating description of insect biodiversity databases is provided by Schuh et al. (2010) including value, rationale, organization and structure. They also describe the issues and limitations, such as problems with consistency of data entry. Unfortunately,

several useful sites are not being updated or worse are being terminated because of cutbacks in funding. For example, the Global Invasive Species Programme (http://www.gisp.org/), which linked online resources and produced reports on invasive species, recently has had to cut back on its services. The Pacific Basin Information Node (PBIN) has been a regional node of the U.S. National Biological Information Infrastructure (NBII), which compiled data and provided information on biodiversity in the Pacific Region including island distribution and impacts of invasive species; however, the project will terminate early 2012 because of budget cuts.

THE EVOLUTION OF INVASION RISK

Recent empirical studies have corroborated the theory that invading organisms evolve a suite of characteristics, which enhance their ability to invade (Phillips et al. 2006, Shine et al. 2011). The traits involved include increased fecundity, more rapid maturity and especially greater dispersal ability. These adaptations make sense since the spoils in the new land go to the swiftest offspring. In other words, slower individuals at the leading edge of an invasion wave get left behind. This realization has important implications in invasion biology. Most relevant is the fact that invading populations are far more likely to continue to invade new areas than are established populations. This explains in large part why many invasive species have been able to spread so rapidly from island to island across the Pacific. It also explains some of the lag-times that have been observed since the requisite adaptations accumulate slowly in small initial colonizing populations. This realization can be used to predict which species pose the greatest risk and, therefore, design better and more specific quarantine, interception and monitoring protocols. A highly beneficial and pro-active advance would be development of a system to prioritize potentially invasive arthropods in the Pacific Basin (Nishida and Evenhuis 2000) and based on a suite of characteristics analogous to the system developed for assessing the risk of plant invasions (Daehler and Denslow 2004, Lodge et al. 2006).

MONITORING FOR INVASIVE SPECIES

This study was focused on monitoring protocols to detect newly arriving alien species. Monitoring is one of a series of steps involved in addressing invasive species issues (Wittenberg and Cock 2001, Lodge et al. 2006). Other steps, such as prevention, quarantine, interception, rapid response and control measures were outside our purview. Also beyond our scope were the related administrative and legal concerns. Ideally, invasive alien species management research should engage stakeholders and accept any tradeoffs necessary to ensure that more effective management strategies are implemented.

As demonstrated in this study, continual monitoring to detect invasive arthropods can be a daunting task. The huge pool of alien species not yet established in Hawaii exacerbates the problem. Nevertheless, such monitoring programs can provide a number of direct and indirect benefits (Kenis et al. 2007). Such programs provide baseline data on what species are already present, data which can be used in management and control as well as facilitate the detection of new arrivals. Monitoring programs can provide the data to identify pathways of introduction, which in turn are needed to improve prevention protocols. Monitoring programs also ensure that the infrastructure necessary for rapid response to identify and manage newly arriving invasive species is available in a timely manner. Finally, continually testing and improving monitoring and sampling techniques will enhance their sensitivity thereby increasing the likelihood of detecting recent arrivals.

Monitoring for newly established invasive species requires rapid and accurate identification of unknown organisms (Nishida and Evenhuis 2000). However, the taxonomic impediment hinders the efficient identification of arthropods. Accurate identification is essential for determining whether any newly detected species is indeed an alien and potentially invasive or whether it is a locally rare or even an endangered native species (Bax et al. 2001).

Inaccurate or incomplete species identifications may result in misdirected resources against false positives, or worse, inaction against false negatives. False negatives can lead to late recognition of an invasive species and delay appropriate, cost-effective management (Bax et al. 2001). The success of both prevention and rapid response efforts critically depends on a rapid, accurate and reliable approach to species identifications. The enhanced identification methods outlined above will increase the efficacy and efficiency of monitoring programs.

Monitoring should be concentrated in areas where the initial introductions are most likely to occur, including areas surrounding seaports and airports, and other areas where large numbers of shipping containers are received or opened (Toy 2007, Toy and Newfield 2010, Reiter 2010). Habitats that may be vulnerable to invasions should also be monitored. Sampling techniques that maximize search area per unit cost, and minimize laboratory costs are likely to return the best cost–benefit ratios (Hayes et al. 2005). In addition to the specimen-oriented survey used in the present study, DNA technology can be adapted for monitoring for non-indigenous species (Darling and Mahon 2011). Examples include the use of gene probes, shotgun sequencing, microarrays, and genetic polymerase chain reaction (PCR)-based tools for quickly detecting small or cryptic organisms, especially hard to identify life stages. Both specimen-based and DNA-based surveys are valuable and complement one another.

Monitoring by farmers, amateur biologists and other stakeholders should be encouraged. Farmers already detect and report suspected pest species in their fields and represent the first line of defense for many crop pests. Because members of the public who explore the natural world greatly outnumber professional field biologists, establishing methods for the public to bring previously unseen or unknown species to government laboratories, universities, museums, or nature centers should be expanded and widely publicized. Volunteer amateur naturalists and other citizens have often been the first to discover invasive species. (Wasson et al. 2002), and providing standard protocols for citizens to use in monitoring local aquatic and terrestrial habitats can be extremely cost effective, as long as the potentially high cost of false positive reports can be controlled (Lodge et al. 2006). The Hawai‘i Early Detection Network provided educational tools and instructions for encouraging the public to report new or unknown potentially invasive species. Initially, the program emphasized plants, and only a few pest insects were included. Unfortunately, the program is being terminated in early 2012 due to federal budget cuts. The program should be reinstated and expanded or a new program created to include a range of arthropod pests and facilities for handling reported sightings. Web-based identification aids can be developed to reduce the number of false negatives. Illustrations and descriptions of diagnostic features of the high-risk invasive species that are not yet recorded in Hawai‘i should be included.

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APPENDIX I

COMPREHENSIVE LIST OF COLLECTING EVENTS FOR ARTHROPODS SAMPLED WITHIN THE KAHULUI AIRPORT ENVIRONS, MAUI, BETWEEN AUGUST, 1999, AND NOVEMBER, 2006

Appendix I. Comprehensive list of collecting events for arthropods sampled within the Kahului Airport environs, Maui, between August, 1999, and November, 2006.

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-1	Gas Aspirator	(20° 54' 07" N, 156° 26' 33" W)		4 Aug 1999	Keawe Forest	Keawe and under-story shrubs	
BL2002-2	Gas Aspirator	(20° 54' 07" N,156° 26' 34" W)	F.G. Howarth & D.J. Preston	4 Aug 1999	Keawe Forest	Keawe and under- story shrubs	5m near Kanaha Beach Park 20° 54.1'N 156° 26.59'W
BL2002-3	Sweep Net	(20° 54' 38" N,156°25' 22"W)	F.G. Howarth & D.J. Preston	5 Aug 1999	Beach strand	-	3 m elev.; Near Papaula Point
BL2002-3A	Gas Aspirator	(20° 54' 38" N,156° 25' 22" W)		5 Aug 1999	Strand shrubland	*Heliotrope, Scaevola, Schinus*, etc.	
BL2002-4A	Gas Aspirator	(20° 54' 37" N,156° 25' 21" W)	F.G. Howarth & D.J. Preston	5 Aug 1999	Beach and strand	Rocky shore and *Schinus*, *Ricinus*, etc.	Papaula Point
BL2002-4B	Sweep Net	(20° 54' 37" N,156° 25' 21" W)		5 Aug 1999	Beach and strand	Rocky shore and *Schinus, Ricinus*, etc.	
BL2002-5	Gas Aspirator	(20° 54' 17" N,156° 26' 09" W)	F.G. Howarth & D.J. Preston	5 Aug 1999	Roadside	*Schinus, Pluchea*, etc.	Gas Aspirator #4
BL2002-5A	Gas Aspirator	(20° 54' 18" N,156° 26' 12" W)	F.G. Howarth, D.J. Preston & R.A. Englund	5 Aug 1999	Mixed shrub	*Schinus, Pluchea*, etc.	Near Kanaha Beach Park, Gas Aspirator #3
BL2002-6A	Host Search	(20° 54' 29" N,156° 26' 05" W)		5 Aug 1999	“Cook’s Beach”	*Scaevola taccada*	Host Inspection
BL2002-6B	Gas Aspirator	(20° 54' 24" N,156° 26' 05" W)		5 Aug 1999	Dry shrubland	*Pluchea, Waltheria*, grass, etc.	3 samples
BL2002-6C	General	(20° 54' 24" N,156° 26' 05" W)		8 Sep 1999	Dry shrubland	*Pluchea, Waltheria*, grass, etc.	
BL2002-6D	Gas Aspirator	(20° 54' 24" N,156° 26' 05" W)		8 Sep 1999	Dry shrubland	*Cenchrus*	
BL2002-6E	Trunk Traps	(20° 54' 26" N,156° 26' 06" W)		8 Sep 1999-10 Sep 1999	Dry shrubland	On *Causarina*	
BL2002-7	Gas Aspirator	(20° 54' 28" N,156° 26' 07" W)		5 Aug 1999	Strand	*Paspalum*? grass, strand shrubs	
BL2002-8	Gas Aspirator	(20° 54' 47" N,156° 25' 33" W)		6 Aug 1999	Beach	Rocky shoreline	
BL2002-9	Gas Aspirator	(20° 54'17" N,156° 26' 09" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999	Roadside and keawe	*Schinus* (Christmas berry)	Site #5
BL2002-9A	Gas Aspirator	(20° 53' 58" N,156° 26' 38" W)		8 Sep 1999	Roadside and keawe	Keawe, *Pluchea, Abutilon*, etc.	
BL2002-9B	Yellow Pan Trap	(20° 54' 03" N,156° 26' 35" W)		9 Sep 1999-10 Sep 1999	Keawe, *Leucaena* forest	Under keawe	
BL2002-10	Pitfall Trap	(20° 54' 26" N,156° 26' 06" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999-10 Sep 1999	Dry shrubland	In compost pile	Road off bike path, "site 6" [2 pit fall traps set in wood chip pile]
BL2002-10A	Gas Aspirator	(20° 54' 26" N,156° 26' 05" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999	Dry shrubland	*Pluchea*	
BL2002-10B	General	(20° 54' 26"N,156° 26' 05"W)	GA. Samuelson, F.G. Howarth & D.J. Preston	8 Sep 1999	Dry shrubland	*Pluchea*	Kanaha Beach nr crash site
BL2002-11	Host Search	(20° 54' 28" N,156° 26' 08" W)		8 Sep 1999	Keawe forest	*Chenopodium*	Host Inspection

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-11A	Sweep Net	(20° 54' 28" N,156° 26' 08" W)		8 Sep 1999	"Cook's Beach"	Coast and flotsam	
BL2002-11B	Gas Aspirator	(20° 54' 28" N,156° 26' 08" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999	"Cook's Beach"	Coast and flotsam	
BL2002-12	Gas Aspirator	(20° 54' 24" N,156° 26' 00" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999	Wetland # 2 at night	*Sesuvium, Pluchea* etc.	
BL2002-13	Gas Aspirator	(20° 54' 24" N,156° 25' 59" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999	Wetland # 2 at night	Sesuvium, Pluchea, etc.	prob same as bl-0348
BL2002-14	Gas Aspirator	(20° 54' 12" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston & R.A. Englund	9 Sep 1999	Wetland # 1	Sedges and grass	Kanaha drainage culvert, C1
BL2002-14A	Gas Aspirator	(20° 54' 12" N,156° 26' 16" W)	D.J. Preston, R.A. Englund & FG Howarth	9 Sep 1999	Wetland # 1 at night	Sedges and grass	Wetland # 1, some spmns may be labeled KA-0175
BL2002-15	Gas Aspirator	(20° 54' 09" N,156° 26' 23" W)	F.G. Howarth, D.J. Preston & R.A. Englund	9 Sep 1999	*Leucaena* shrubland	*Leucaena* and grass (*Cenchrus*)	C2
BL2002-16	Gas Aspirator	(20° 54' 03" N,156° 26' 35" W)	D.J. Preston, R.A. Englund & FG Howarth	9 Sep 1999	Keawe forest and lawn boundary	Keawe, *Leucaena*, grass, herbs	
BL2002-16A	Trunk Traps	(20° 54' 03" N,156° 26' 35" W)	D.J. Preston, R.A. Englund & FG Howarth	9 Sep 1999-10 Sep 1999	Keawe forest	On keawe	
BL2002-17	Gas Aspirator	(20° 54' 03" N,156° 26' 36" W)	D.J. Preston, R.A. Englund	9 Sep 1999	Hedge at night	*Leucaena* and vines	
BL2002-18	Gas Aspirator	(20° 54' 02" N,156° 26' 36" W)	D.J. Preston, R.A. Englund	9 Sep 1999	Lawn at night Legume ground cover Grass and herbs.	Legume ground cover, Grass and herbs	
BL2002-19A	Ant Baits	(20° 53' 22" N,156° 26' 40" W)		6 Oct 1999	Ruderal	Nicotiana, Cenchrus ciliarus, barren	West end of runway
BL2002-19B	Host Search	(20° 53' 22" N,156° 26' 40" W)		4 Oct 1999	Ruderal*; Nicotiana*, *Cenchrus*, barren	*Nicotiana*	West end of runway, Host Inspection
BL2002-20A	Host Search	(20° 53' 20" N,156° 26' 48" W)		4 Oct 1999	Ruderal*; Nicotiana, Cenchrus, Saccharum, Ricinus*, etc	*Nicotiana,*	West end of runway
BL2002-20B	Ant Baits	(20° 53' 20" N,156° 26' 48" W)		6 Oct 1999	Ruderal	*Nicotiana, Cenchrus, Saccharum, Ricinus*, etc	West end of runway
BL2002-21	Gas Aspirator	(20° 53' 45" N,156° 26' 38" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	5 Oct 1999	Hedge	*Hibiscus* and lawn	Voucher sample D3
BL2002-22	Gas Aspirator	(20° 53' 46" N,156° 26' 37" W)	D.J. Preston & J.E. Dockall	5 Oct 1999	Ornamental plantings	Cycads, palms, hedge	Terminal Road
BL2002-22A	Gas Aspirator	(20° 53' 46" N,156° 26' 37" W)		5 Oct 1999	Ornamental plantings	Lilies, hedge	
BL2002-23	Gas Aspirator	(20° 54' 39" N,156° 25' 33" W)		7 Oct 1999	Dry shrubland	Chenopodium	
BL2002-24	Gas Aspirator	(20° 54' 34" N,156° 25' 40" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	7 Oct 1999	Wetland # 3	*Pluchea, Hibiscus*, etc.	East end of runway
BL2002-25	Gas Aspirator	(20° 53' 46" N,156° 27' 24" W)		7 Oct 1999	Kanaha Res.	Dried mud, sedges, and *Sesuvium*	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-26	Gas Aspirator	(20° 53' 49" N,156° 27' 12" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	7 Oct 1999	Kanaha Res.	Dried mud and sedges	Kanaha Pond
BL2002-27	Host Search	(20° 53' 51" N,156° 27' 21" W)		7 Oct 1999	Kanaha Res.	*Sesuvium, Sporobolus, Pluchea*	Host Inspection
BL2002-27A	Gas Aspirator	(20° 53' 51" N,156° 27' 21" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	7 Oct 1999	Kanaha Res. Wetland	*Sporobolus*	Kanaha Pond Reserve
BL2002-28A	Gas Aspirator	(20° 53' 34" N,156° 26' 56" W)		2 Nov 1999	Lawn and ornamental plantings	*Cyanodon, Wedalia, Gossipium, Erythrina*, Bougainvillea, Juniper, weeds, and low herbs	6 samples E1
BL2002-29	Gas Aspirator	(20° 53' 41" N,156° 26' 50" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	2 Nov 1999	Ornamental plantings, at night	*Verbesina* lawn	
BL2002-29A	Gas Aspirator	(20° 53' 34" N,156° 26' 56" W)	D.J. Preston & J.E. Dockall	2 Nov 1999	Lawn and ornamental plantings	*Cyanodon, Wedalia, Gossipium, Erythrina,* Bougainvillea, Juniper, weeds, and low herbs	6 samples E1
BL2002-30	Gas Aspirator	(20° 53' 34" N,156° 27' 04" W)		2 Nov 1999	Ornamental plantings, at night	*Thevetia, Wedalia, Cyanodon*	
BL2002-31	Gas Aspirator	(20° 53' 33" N,156° 27' 05" W)		2 Nov 1999	Ornamental plantings, at night	*Bougainvillea*, *Wedalia, Cyanodon*,	
BL2002-32A	Ant Baits	(20° 53' 34" N,156° 27' 06" W)	D.J. Preston, F. Starr, K. Martz & F.G. Howarth	2 Dec 1999	Ornamental plantings	*Bougainvillea*, *Cyanodon*, weeds	Roadside near HDOA
BL2002-32B	Gas Aspirator	(20° 53' 34" N,156° 27' 06" W)		2 Nov 1999	Ornamental plantings, at night	*Bougainvillea*, *Cyanodon*, weeds	Roadside near HDOA
BL2002-33	Gas Aspirator	(20° 53' 54" N,156° 27' 06" W)		3 Nov 1999	Kanaha Res.	*Chenopodium*, *Pluchea, Sesuvium*, grass, keawe	
BL2002-34	Host Search	(20° 53' 51" N,156° 27' 05" W)		3 Nov 1999	Native shrub-land at night	*Scaevola*	Host Inspection
BL2002-34	Gas Aspirator	(20° 53' 51" N,156° 27' 05" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	3 Nov 1999	Kanaha Res.	*Sesuvium, Sporobolus, Pluchea*	
BL2002-35	MV Bulb	(20° 53' 42" N,156° 27' 05" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	3 Nov 1999	Kanaha Res.	Ruderal with keawe, *Sporobolus*, *Sesuvium*,	Kanaha Pond Reserve, E1
BL2002-35A	Gas Aspirator	(20° 53' 42" N,156° 27' 05" W)		3 Nov 1999	Kanaha Res.	Ruderal with keawe, *Sporobolus*, *Sesuvium*,	Kanaha Pond Reserve
BL2002-36	Gas Aspirator	(20° 53' 41" N,156° 27' 12" W)		4 Nov 1999	Kanaha Res.	*Chenopodium*	
BL2002-37	Gas Aspirator	(20° 53' 44" N,156° 27' 10" W)		4 Nov 1999	Kanaha Res.	Pond margin: sedges and mud cracks	
BL2002-38	Gas Aspirator	(20° 53' 47" N,156° 27' 21" W)	D.J. Preston & F.G. Howarth	4 Nov 1999	Kanaha Res.	*Sporobolus virginicus*	
BL2002-39	Gas Aspirator	(20° 53' 45" N,156° 27' 29" W)		4 Nov 1999	Kanaha Res.	*Sesbanea tomentosa*	
BL2002-40	Gas Aspirator	(20° 53' 40" N,156° 27' 23" W)		4 Nov 1999	Kanaha Res.	*Bolboschoenus* sedge	
BL2002-41	Gas Aspirator	(20° 53' 56" N,156° 27' 15" W)		4 Nov 1999	Kanaha Res. at night	*Myoporum* (Naio)	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-42A	Gas Aspirator	(20° 53' 56" N,156° 27' 16" W)	D.J. Preston, R. Takumi & J.E. Dockall	4 Nov 1999	Kanaha Res. at night	Dodonaea (A`ali`i)	
BL2002-42B	Gas Aspirator	(20° 53' 56" N,156° 27' 16" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Martz	2 Dec 1999	Kanaha Pond Res. at night	*Dodonaea*	Kanaha Pond Reserve, F17
BL2002-42C	Gas Aspirator	(20° 53' 56" N,156° 27' 16" W)	F.G. Howarth, D.J. Preston, K. Martz & F. Starr	6 Mar 2000	Native shrub-land, Kanaha Pond Res.	*Dodonaea viscosa*	Kanaha Pond
BL2002-42D	Gas Aspirator	(20° 53' 56" N,156° 27' 16" W)		6 Mar 2000	Native shrub-land, Kanaha Pond Res.	*Vitex rotundifolia*	
BL2002-42E	Sifting Litter	(20° 53' 56" N,156° 27' 16" W)		3 Mar 2000	Kanaha Res. At night	Aalii litter	Kanaha Pond Reserve
BL2002-43	Gas Aspirator	(20° 53' 56" N,156° 27' 23" W)	D.J. Preston, R. Takuml & J.E. Dockall	4 Nov 1999	Kanaha Res. at night	*Sporobolus*	Kanaha Pond
BL2002-44	Gas Aspirator	(20° 53' 56" N,156° 27' 19" W)		4 Nov 1999	Kanaha Res. at night	*Scaevola*	
BL2002-45	Gas Aspirator	(20° 53' 55" N,156° 25' 45" W)	F.G. Howarth & D.J. Preston	1 Dec 1999	*Leucaena* scrub	*Leucaena, Ricinus, Panicum, Botriochloa, Melinus, Cenchrus,* etc.	
BL2002-45A	Gas Aspirator	(20° 53' 55" N,156° 25' 45" W)		2 Dec 1999	*Leucaena* scrub	*Leucaena, Ricinus, Panicum, Botriochloa, Melinus, Cenchrus,* etc.	Tower Road
BL2002-46	Gas Aspirator	(20° 54' 00" N,156° 25' 41" W)		1 Dec 1999	Lawn	*Cyanodon* & mixed grasses, *Wedalia* & weeds	Near fire station
BL2002-47	Gas Aspirator	(20° 54' 01" N,156° 25' 40" W)		1 Dec 1999	Sugar cane & ruderal	Sugar cane and ground	Tower Road
BL2002-48A	Gas Aspirator	(20° 54' 14" N,156° 25' 40" W)	F.G. Howarth & D.J. Preston	1 Dec 1999	*Leucaena* scrub	*Leucaena, Ricinus, Cenchrus, Waltheria* etc.	Tower Road, F4
BL2002-48B	Ant Baits	(20° 54' 14" N,156° 25' 40" W)	F.G. Howarth & D.J. Preston	1 Dec 1999	*Leucaena* scrub	Bare ground beneath *Leucaena*	Ant baits 1
BL2002-49	Gas Aspirator	(20° 53' 28" N,156° 26' 10" W)		2 Dec 1999	Ruderal & ornamentals	*Leucaena, Hibiscus*, palms, ground	
BL2002-50	Sifting Litter	(20° 53' 56" N,156° 27' 18" W)	G.A. Samuelson, F.G. Howarth & D.J. Preston	31 Mar 2000	-	*Dodonaea* litter	Kanaha Pond (N boundary)
BL2002-50A	Gas Aspirator	(20° 53' 54" N,156° 27' 24" W)		2 Dec 1999	Kanaha Pond Res. at night	*Scaevola, Sporobulus*	Gas Aspirator 1
BL2002-50B	Gas Aspirator	(20° 53' 54" N,156° 27' 24" W)		6 Mar 2000	Dry Shrubland	*Nicotiana*	
BL2002-51	Gas Aspirator	(20° 53' 56" N,156° 27' 22" W)	F.G. Howarth & D.J. Preston	2 Dec 1999	-	*Dodonaea viscosa*	Kanaha Pond Reserve
BL2002-52	Gas Aspirator	(20° 53' 56" N,156° 27' 18" W)	F.G. Howarth & D.J. Preston	2 Dec 1999	Kanaha Pond Res. at night	*Myoporum*	Gas Aspirator 3
BL2002-53	MV Bulb	(20° 54' 23" N,156° 25' 54" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	2 Feb 2000	*Leucaena*, wetland margin	*Sesuvium, Leucaena, Pluchea,*	Wetland near Malaise site #1 (=BL0249)
BL2002-54	Gas Aspirator	(20° 54' 47" N,156° 25' 34" W)		4 Feb 2000	Beach at night	Algae and rocks at low tide	
BL2002-55A	Gas Aspirator	(20° 53' 56" N,156° 26' 52" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	2 Mar 2000	Water margin	Sedge	Kanaha drainage culvert, H-6

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-55B	Sweep Net	(20° 53' 56" N,156° 26' 52" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	2 Mar 2000	Water margin	Sedges	2 samples H3
BL2002-55C	Gas Aspirator	(20° 53' 56" N,156° 26' 52" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & J.E. Dockall	2 Mar 2000	Water margin	Mud & sedge edge	Kanaha drainage culvert; near Malaise #1. H5
BL2002-56	Gas Aspirator	(20° 53' 37" N,156° 26' 44" W)		2 Mar 2000	*Leucaena* thicket	Mixed alien grasses, *Leucaena*	
BL2002-57	MV Bulb	(20° 53' 57" N,156° 26' 53" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Martz	2 Mar 2000	Keawe wood-land, ruderal, wetland margin	Keawe, *Pluchea, Chenopodium*	Kanaha drainage canal margin. Some Labels say Kanaha Pond but the site is near the culvert
BL2002-57A	Gas Aspirator	(20° 53' 57" N,156° 26' 53" W)		2 Mar 2000	Keawe wood-land at night	*Chenopodium*	
BL2002-58	General	(20° 54' 42" N,156° 25' 29" W)		4 Mar 2000	Native shrub-land at night	Sedge & grasses	
BL2002-58A	Gas Aspirator	(20° 54' 42" N,156° 25' 29" W)	F.G. Howarth, D.J. Preston, J.E. Dockall F. Starr & K. Martz	4 Mar 2000	Native shrub-land at night	Sedge & grasses	sample H37
BL2002-59	General	(20° 54' 42" N,156° 25' 31" W)		4 Mar 2000	Native shrub-land at night	*Scaevola*	
BL2002-59A	Gas Aspirator	(20° 54' 42" N,156° 25' 31" W)		4 Mar 2000	Native shrub-land at night	*Scaevola*	
BL2002-60	General	(20° 54' 39" N,156° 25' 34" W)		4 Mar 2000	Native shrub-land at night	*Nicotiana, Ipomea, Chenopodium*, roadway, etc.	
BL2002-60A	Gas Aspirator	(20° 54' 39" N,156° 25' 34" W)		4 Mar 2000	Native shrub-land at night	*Chenopodium*	
BL2002-61	Gas Aspirator	(20° 53' 32" N,156° 26' 37" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	5 Mar 2000	Keawe wood-land at night	*Prosopis pallida* (Keawe)	Haleakala Hwy
BL2002-62	Gas Aspirator	(20° 53' 34" N,156° 26' 38" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	5 Mar 2000	Keawe wood-land at night	Mixed alien grasses, *Solanum americanum, Lycopersicon pimpinellifolium, Amaranthus* sp.	
BL2002-63	Gas Aspirator	(20° 53' 39" N,156° 26' 42" W)		5 Mar 2000	Keawe wood-land at night	*Pluchea symphytifolia*	
BL2002-64	Host Search	(20° 54' 40" N,156° 25' 34" W)		5 Aug 1999	Dry Shrubland	*Pluchea* flowers & *Chenopodium*	Host Inspection
BL2002-65	Host Search	(20° 54' 11" N,156° 26' 27" W)		9 Sep 1999	Keawe forest	*Chenopodium*	Host Inspection
BL2002-66	Gas Aspirator	(20° 53' 45" N,156° 26' 40" W)		5 Oct 1999	Ornamentals UPS Road & Main drive.	Road edge *Bougainvillia*	Gas Aspirator #1
BL2002-67	Trunk Traps	(20° 54' 24" N,156° 26' 05" W)		8 Sep 1999-10 Sep 1999	Dry shrubland	On Klu	
BL2002-68	Trunk Traps	(20° 54' 11" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston & R.A. Englund	9 Sep 1999-10 Sep 1999	Keawe forest	On keawe	Drainage canal, site 10", Wet spot #1

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-69A	Ant Baits	(20° 53" 45' N,156° 26' 40" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	5 Oct 1999	Ruderal and hedge	On ground and leaflitter	Near UPS junction; 3 samples: voucher sample D20
BL2002-69B	Trunk Traps	(20° 53" 45' N,156° 26' 40" W)		5 Oct 1999-7 Oct 1999	*Leucaena* scrub	On *Leucaena* and *Erythrina*	
BL2002-69C	Yellow Pan Trap	(20° 53" 45' N,156° 26' 40" W)	F.G. Howarth & D.J. Preston	5 Oct 1999-7 Oct 1999	*Leucaena* scrub and hedge	Under *Leucaena* and Hibiscus hedge	
BL2002-70	Yellow Pan Trap	(20° 54' 25" N,156° 25' 58" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	4 Oct 1999-7 Oct 1999	Wetland # 2	Keawe forest/ ground: *Sesuvium*, grass, sand	Pan #2
BL2002-71	Yellow Pan Trap	(20° 54' 14" N,156° 25' 41" W)		1 Dec 1999-3 Dec 1999	Roadside	Bare ground beneath *Leucaena*	Date recorded as "1-x Dec 1999" -- check range. 1-3 Dec.
BL2002-72A	Malaise Trap	(20° 54' 16" N,156° 25' 42" W)	F.G. Howarth & D.J. Preston	30 Nov 1999-3 Dec 1999	*Leucaena* shrubland	*Leucaena, Panicum, Cenchrus*, etc.	Malaise Trap #2
BL2002-72B	Ant Baits	(20° 54' 16" N,156° 25' 42" W)	F.G. Howarth & D.J. Preston	30 Nov 1999-3 Dec 1999	*Leucaena* shrubland	*Leucaena, Panicum, C*enchrus, etc.	Ant bait station 1 F18 @ Malaise trap # 2
BL2002-73A	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Martz	16 Dec 1999-28 Dec 1999	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Malaise Trap #1
BL2002-73B	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth & D.J. Preston	10 Aug 2000-1 Sep 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Malaise Trap #1
BL2002-73C	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth & D.J. Preston	29 Sep 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Malaise trap #1, probably 1-29 Sep 2000.
BL2002-73D	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	1 May 2000-17 May 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Malaise Trap #1
BL2002-73E	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston, K. Starr & F. Starr	5 Jun 2000-3 Jul 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	AOA; Malaise Trap #1
BL2002-73F	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	17 May 2000-30 May 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asy*stasia, etc.	Malaise Trap #1
BL2002-73G	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	30 May 2000-6 Jun 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasi*a, etc.	Malaise Trap #1
BL2002-73H	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, K. Starr & K. Martz	17 Feb 2000-1 Mar 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Malaise Trap #1
BL2002-73I	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F.Starr	18 Apr 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Malaise trap #1 either start or end date
BL2002-73J	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	5 Feb 2000-17 Feb 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia,* etc.	Malaise Trap #1
BL2002-73K	Malaise Trap	(20° 54' 22",156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	2 Nov 1999-3 Dec 1999	*Leucaena* shrubland	*Leuceana, Pluchea, Cenchrus, Asystasia*, etc.	Malaise trap #1, site #73, Sample E19
BL2002-73L	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth et al.	1 Mar 2000-7 Mar 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Malaise Trap #1
BL2002-74	Bait Trap	(20° 53' 35" N,156° 26' 37" W)		7 Mar 2000	Keawe woodland	Keawe, *Leucaena, Cenchrus*, etc.	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-75	Bait Trap	(20° 53' 37" N,156° 26' 41" W)		7 Mar 2000	Keawe woodland	Keawe, *Leucaena, Cenchrus*, etc.	
BL2002-76	Malaise Trap	(20° 54' 25" N,156° 25' 58" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	4 Oct 1999-8 Oct 1999	Wetland # 2	Palms, milo, keawe	Near bike path; "site 1"
BL2002-76A	MV Bulb	(20° 54' 25" N,156° 25' 58" W)	F.G. Howarth & D.J. Preston	6 Oct 1999	Wetland # 2	Palms, milo, keawe	
BL2002-77A	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth & D.J. Preston	29 Sep 2000-6 Nov 2000	*Leucaena* shrubland	*Leucaena, Panicum, Cenchrus*, etc.	Malaise Trap #2
BL2002-77B	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	1 May 2000-17 May 2000	*Leucaena* shrubland	*Leucaena, Panicum, Cenchrus*, etc.	Malaise Trap #2
BL2002-77C	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	1 Feb 2000-1 Mar 2000	*Leucaena* shrubland	*Leucaena, Panicum, Cenchrus*, etc.	Malaise trap #2 (20 54' 16" N); 2nd site ~100 ft north; i.e. 20° 54' 18" N
BL2002-78	MV Bulb	(20° 54' 13" N,156° 26' 17" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	5 Oct 1999	Wetland # 1 at night	*Leucaena, Panicum*, sedges, keawe.	Drainage ditch near Kanaha Beach near start of bike path; sample D18
BL2002-79	MV Bulb	(20° 53' 42" N,156° 27' 10" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	4 Nov 1999	Kanaha Pond Res., wetland.	Open keawe woodland at pond margin,	
BL2002-80	MV Bulb	(20° 54' 29" N,156° 25' 52" W)	F.G. Howarth & D.J. Preston	1 Dec 1999	Wetland / Keawe	*Sesuvium, Paspalum, Pluchea*	Sample F5
BL2002-81	MV Bulb	(20° 53' 54" N,156° 27' 23" W)	F.G. Howarth, D.J.Preston, F.Starr & K.Martz	2 Dec 1999	Kanaha Pond Res.	Sporobolus, keawe, pond margin	(= BL0247)
BL2002-82	MV Bulb	(20° 53' 46" N,156° 27' 07" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	3 Feb 2000	Keawe wood-land, ruderal, wetland margin	*Sesuvium*, keawe, *Pluchea*,	Kanaha Pond Reserve
BL2002-83	MV Bulb	(20° 53' 57" N,156° 27' 14" W)	F.G. Howarth, D.J. Preston, K. Martz, F. Starr & J.E. Dockall	3 Mar 2000	Kanaha Pond Res.	Keawe, *Sesuvium*, native shrubs	
BL2002-84	MV Bulb	(20° 53' 35" N,156° 26' 38" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	5 Mar 2000	Keawe woodland	Keawe, *Leucaena, Cenchrus*, etc.	E of A`alele St. & Haleakala Rd
BL2002-85	Ant Baits	(20° 54' 14" N,156° 25' 41" W)		1 Dec 1999	Roadside	Bare ground beneath *Leucaena*	Ant baits 2
BL2002-86	Ant Baits	(20° 54' 13" N,156° 25' 42" W)		1 Dec 1999	Tarmac & ruderal	Wood pile	Ant baits 3
BL2002-87	Ant Baits	(20° 54' 12" N,156° 25' 42" W)	F. Starr & K. Martz	1 Dec 1999	Tarmac & ruderal	Wood pile	Ant baits 4 & 5
BL2002-88	Ant Baits	(20° 53' 36" N,156° 26' 59" W)	D.J. Preston, F. Starr, K. Martz & F.G. Howarth	2 Dec 1999	Lawn and ornamental plantings	Near HDOA office	Near HDOA office; longitude approximate.
BL2002-89	Ant Baits	(20° 53' 09" N,156° 27' 06" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	2 Feb 2000	Fallow cane field w/ ruderal borders	*Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena,* etc.	
BL2002-90	Ant Baits	(20° 53' 08" N,156° 27' 07" W)		2 Feb 2000	Fallow cane field w/ ruderal borders	*Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc.	

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StationNum	**Method**	**Loc**	**Collectors**	**Coll. Date**	**Habitat**	**Host**	**Comments**
BL2002-91	Ant Baits	(20° 53' 07" N,156° 27' 08" W)		2 Feb 2000	Fallow cane field w/ ruderal borders	*Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc.	
BL2002-92	Ant Baits	(20° 53' 06" N,156° 27' 09" W)		2 Feb 2000	Fallow cane field w/ ruderal borders	*Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena,* etc.	
BL2002-93	Ant Baits	(20° 53' 05" N,156° 27' 10" W)		2 Feb 2000	Fallow cane field w/ ruderal borders	*Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc.	
BL2002-94	Ant Baits	(20° 53' 06" N,156° 27' 11" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	2 Feb 2000	Fallow cane field w/ ruderal borders	*Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc.	
BL2002-95	Gas Aspirator	(20° 53' 10.5" N,156° 27' 08.5" W)		2 Feb 2000	Fallow cane field w/ ruderal boarders	*Waltheria*	
BL2002-96	Gas Aspirator	(20° 53' 09.5" N,156° 27' 09.6" W)		2 Feb 2000	Fallow cane field w/ ruderal boarders	*Pluchea*	
BL2002-97	Gas Aspirator	(20° 53' 08.4" N,156° 27' 10.8" W)		2 Feb 2000	Fallow cane field w/ ruderal boarders	*Sida fallax*	
BL2002-98	Gas Aspirator	(20° 53' 07" N,156° 25' 10" W)	D.J. Preston & J.E. Dockall	2 Feb 2000	Fallow cane field w/ ruderal boarders	*Sida fallax*	GIS (or date & site desc.) incorrect: 20° 53' ~10" N;156° 27' ~10" W (or ruderal, *Leucaena* shrub, 3Feb2000)
BL2002-99	Gas Aspirator	(20° 53' 09.5" N,156° 27' 12" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	2 Feb 2000	Fallow cane field w/ ruderal boarders	*Nicotiana, Bidens, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Sida Portulaca Leucaena,* etc.	
BL2002-100	Ant Baits	(20° 53' 33" N,156° 26' 49" W)		4 Feb 2000	Industrial area/buildings	Alien ornamentals in State Nursery misting house	
BL2002-101	Ant Baits	(20° 53' 34" N,156° 26' 50" W)		4 Feb 2000	Industrial area/buildings	Under *Gossypium tomentosum*	
BL2002-102	Ant Baits	(20° 53' 35" N,156° 26' 49" W)		4 Feb 2000	Industrial area/buildings	Under citrus tree	
BL2002-103	Ant Baits	(20° 53' 35" N,156° 26' 48" W)		4 Feb 2000	Industrial area/buildings	Next to pile of Keawe wood/lumber	
BL2002-104A	Ant Baits	(20° 53' 36" N,156° 26' 44" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	3 Mar 2000	Ground	On perimeter of car lot next to airport nursery	Sample H20
BL2002-104B	Ant Baits	(20° 53' 36" N,156° 26' 44" W)		3 Mar 2000	Ground	On perimeter of car lot next to airport nursery	
BL2002-105	Ant Baits	(20° 53' 35" N,156° 26' 42" W)		3 Mar 2000	Ground	On perimeter of car lot next to airport nursery	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-106	Ant Baits	(20° 53' 32" N,156° 26' 44" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	3 Mar 2000	Ground	On perimeter of car lot next to airport nursery	
BL2002-107A	Ant Baits	(20° 53' 35" N,156° 26' 45" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	3 Mar 2000	Ground	Near potted plants within airport nursery area	
BL2002-107B	Beating Sheet	(20° 53' 35" N,156° 26' 45" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	3 Mar 2000	Plant nursery	Potted plants within airport nursery area	
BL2002-108B	Beating Sheet	(20° 53' 43" N,156° 26'46" W)		3 Feb 2000	Main roadside Terminal area	Ornamental planting, Bougainvillea hedge	
BL2002-109	Beating Sheet	(20° 53' 48" N,156° 26' 28" W)		3 Feb 2000	Terminal area	Ornamental planting	
BL2002-110	Beating Sheet	(20° 53' 47" N,156° 26' 27" W)		3 Feb 2000	Terminal area	Ornamental planting	
BL2002-111	Beating Sheet	(20° 53' 47" N,156° 26' 29" W)		3 Feb 2000	Terminal area	Ornamental planting	
BL2002-112	Beating Sheet	(20° 53' 34" N,156° 26' 47" W)		4 Feb 2000	Industrial area/buildings	Next to *Mommordica char*antia on fence, next to large gravel pile	
BL2002-113	Beating Sheet	(20° 53' 30" N,156° 26' 50" W)		4 Feb 2000	Industrial area/buildings	*Scaevola coriaceae*	
BL2002-114	Beating Sheet	(20° 53' 31" N,156° 26' 49" W)		4 Feb 2000	Industrial area/buildings	*Osteomeles anthidydifolia*	
BL2002-115	Beating Sheet	(20° 53' 32" N,156° 26' 49" W)		4 Feb 2000	Industrial area/buildings	*Bonamia menziesii*	
BL2002-116	Beating Sheet	(20° 53' 33" N,156° 26' 50" W)		4 Feb 2000	Industrial area/buildings	*Abutilon menziesii*	
BL2002-117	Beating Sheet	(20° 53' 41" N,156° 26' 31" W)		4 Feb 2000	Industrial area/buildings	*Acacia confusa* = Formosan koa	G33
BL2002-118	Beating Sheet	(20° 53' 39" N,156° 26' 46" W)	F. Starr, K. Martz, F.G. Howarth & D.J. Preston	4 Feb 2000	Industrial area/buildings / plant nursery	*Leucana leucocephala*	Beating sheet # G-36
BL2002-119	Beating Sheet	(20° 53' 38" N,156° 26' 45" W)		4 Feb 2000	Industrial area/buildings	*Panicum maximum*	
BL2002-120	Sweep Net	(20° 53' 53" N,156° 27' 08" W)		6 Mar 2000	Pond margin, Kanaha Pond Res.	*Sesuvium*, sedges	
BL2002-120A	Sweep Net	(20° 53' 53" N,156° 27' 08" W)		6 Mar 2000	Pond margin, Kanaha Pond Res.	*Chenopodium*, grasses	
BL2002-121	Gas Aspirator	(20° 53' 22" N,156° 26' 41" W)		4 Oct 1999	Dry shrubland	*Nicotiana* mixed weeds	West end of runway; field at proposed cargo facility
BL2002-122	Gas Aspirator	(20° 53' 20" N,156° 26' 48" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	4 Oct 1999	Dry shrubland	*Nicotiana* mixed weeds	West end of runway; sample 2, near proposed area for cargo facility

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-123	Gas Aspirator	(20° 53' 58" N,156° 26' 53" W)		5 Oct 1999	Keawe woodland	*Chenopodium*	
BL2002-124	Gas Aspirator	(20° 53' 45.5" N,156° 26' 41" W)		6 Oct 1999	Dry shrubland	*Leucaena, Ricinus, Cenchrus,* Australian salt bush, *Ipomea, Pluchea, Boerhavia, Bidens*	
BL2002-125	Gas Aspirator	(20° 53' 45" N,156° 26' 40.5" W)		6 Oct 1999	Dry shrubland	*Leucaena, Ricinus, Cenchrus,* Australian salt bush, *Ipomea, Pluchea, Boerhavia, Bidens*	
BL2002-126	Gas Aspirator	(20° 53' 45" N,156° 26' 40" W)		6 Oct 1999	Dry shrubland	*Leucaena, Ricinus, Cenchrus*, Australian salt bush, *Ipomea, Pluchea, Boerhavia, Bidens*	
BL2002-127	Gas Aspirator	(20° 53' 56" N,156° 27' 16" W)		3 Nov 1999	Kanaha Res. At night	Aalii, *Scaevola*	
BL2002-128	General	(20° 54' 34" N,156° 25' 40" W)		27 Mar 2000	Wetland #3 under stones	Mixed alien grasses, *Pluchea*	
BL2002-129	Gas Aspirator	(20° 54' 13" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, F. Starr & K. Martz	28 Mar 2000	Wetland # 1	Sedges and grass	
BL2002-129A	Gas Aspirator	(20° 54' 43" N,156° 25' 30" W)		28 Mar 2000	Native beach strand	*Sporobolis*	
BL2002-130	Gas Aspirator	(20° 53' 55" N,156° 25' 45" W)		28 Mar 2000	Leucaena scrub	*Leucaena, Ricinus, Panicum, Botriochloa, Melinus, Cenchrus*, etc.	
BL2002-131	Gas Aspirator	(20° 54' 16" N,156° 26' 15" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & K. Martz	29 Mar 2000	lawn	*Waltheria*, Mixed grasses and weeds	Gate 6
BL2002-131A	Gas Aspirator	(20° 54' 45" N,156° 25' 33" W)		29 Mar 2000	Beach strand	*Scaevola, Sporobolis*, Mixed grasses	
BL2002-132	Gas Aspirator	(20° 53' 45" N,156° 26' 40" W)		30 Mar 2000	Industrial area/buildings	Lawn, grassed, mixed weeds	
BL2002-133	Gas Aspirator	(20° 54' 12" N,156° 26' 16" W)	F.G. Howarth & D.J. Preston	27 Apr 2000	Wetland # 1 day time	Sedges and grass	Along bike path between plane crash and Gate 6.1
BL2002-134	Gas Aspirator	(20° 54' 26" N,156° 26' 05" W)		29 Apr 2000	Dry shrubland	*Casuarina*	
BL2002-134A	Gas Aspirator	(20° 54' 40" N,156° 25' 20" W)	F.G. Howarth, D.J. Preston & G.A. Samuelson	29 Apr 2000	Sprecklesville beach	wind shear shrubs	Sprecklesville
BL2002-135	Gas Aspirator	(20° 54' 19" N,156° 26' 10" W)		30 Apr 2000	Roadside	*Schinus, Pluchea*, etc.	
BL2002-136	Gas Aspirator	(20° 54' 22" N,156° 25' 56" W)	D.J. Preston & R.A. Englund	1 May 2000	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Vegetation around malaise trap #1
BL2002-137	Gas Aspirator	(20° 53' 46" N,156° 26' 40" W)		30 May 2000	Industrial area/buildings	*Bougainvillia*	
BL2002-138	Gas Aspirator	(20° 53' 46.5" N,156° 27' 01.5" W)		30 May 2000	Keawe woodland	Keawe, *Pluchea*, low weeds, grasses	
BL2002-139	Gas Aspirator	(20° 53' 45.5" N,156° 26' 41" W)		30 May 2000	Ornamentals UPS Road & Main Drive.	Planted lawn	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-140	Gas Aspirator	(20° 53' 40.5" N,156° 26' 45" W)		30 May 2000	Ornamentals UPS Road & Main drive.	Mixed weeds, castor bean, *Pluchea*, grasses	
BL2002-141	Gas Aspirator	(20° 53' 42.5" N,156° 26' 38.5" W)		30 May 2000	*Leucaena* scrub mixed weeds	*Leucaena*, grass, *Asystasia*	
BL2002-142	Gas Aspirator	(20° 53' 40" N,156° 26' 45" W)		30 May 2000	Ornamentals UPS Road & Main drive.	Road edge *Bougainvillea*	
BL2002-143	Gas Aspirator	(20° 53' 46.5" N,156° 27' 01.5" W)		30 May 2000	Keawe wood-land, ruderal, wetland margin	*Sesuvium*, Keawe, *Pluchea*,	
BL2002-145	Gas Aspirator	(20° 53' 48.5" N,156° 26' 46.7" W)		1 Jun 2000	Industrial Buildings	Keawe, grasses, low weeds *Pluchea*	
BL2002-146	Gas Aspirator	(20° 53' 50" N,156° 26' 53" W)		2 Jun 2000	*Leucaena*-Keawe scrub	Kou tree	
BL2002-147	Gas Aspirator	(20° 53' 51" N,156° 26' 53" W)		2 Jun 2000	*Leucaena*-Keawe scrub	Roadside weeds	
BL2002-148	Gas Aspirator	(20° 53' 52" N,156° 26' 56" W)		2 Jun 2000	*Leucaena* scrub mixed weeds	*Nicotiana*	
BL2002-149	Gas Aspirator	(20° 53' 48" N,156° 26' 28" W)		3 Jun 2000	Terminal area	Grass strip, ornamental pea, shower trees	
BL2002-150	Gas Aspirator	(20° 53' 47" N,156° 26' 27" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & J.E. Dockall	3 Jun 2000	Terminal area	Philodendron (*Defenbachia)*, *Spathodea, Anthurium*, grass, weeds	
BL2002-151	Yellow Pan Trap	(20° 53' 46.7" N,156° 26' 59.4" W)		1 Jun 2000-3 Jun 2000	Keawe woodland	Keawe, *Pluchea*, low weeds, grasses	
BL2002-152	Bait Trap	(20° 54' 13" N,156° 26' 17" W)		28 Mar 2000-30 Apr 2000	Keawe woodland	On keawe	Near Wetland #1
BL2002-153	Bait Trap	(20° 54' 14" N,156° 26' 16" W)		28 Mar 2000-30 Apr 2000	Keawe woodland	On keawe	Near wetland #1
BL2002-154	Bait Trap	(20° 54' 29" N,156° 25' 52" W)		31 Mar 2000-29 Apr 2000	Near wetspot 3	Keawe, *Pluchea*, low weeds, grasses	
BL2002-155	Lingren Funnels (Beetle Trap)	(20° 54' 30" N,156° 25' 50" W)	F.G. Howarth, D.J. Preston & G.A. Samuelson	31 Mar 2000-29 Apr 2000	-	*Causurina/Pluchea*	Near wetland 3; Bait Trap #2
BL2002-156	Bait Trap	(20° 54' 26" N,156° 26' 07" W)		29 Apr 2000	Keawe woodland	*Causurina*	Bike path, near crash site
BL2002-157	Bait Trap	(20° 54' 27" N,156° 26' 05" W)		29 Apr 2000	Keawe woodland	*Causurina*	Bike path, near crash site
BL2002-158	Bait Trap	(20° 54' 12" N,156° 26' 17" W)		30 Apr 2000	Keawe woodland	*Schinus*	Near wetland # 1
BL2002-159	Lingren Funnels (Beetle Trap)	(20° 54' 30" N,156° 25' 51" W)		31 Mar 2000-29 Apr 2000	Open keawe woodland / wetspot 3	Keawe, *Schinus*	
BL2002-160	Bait Trap	(20° 54' 31" N,156° 25' 50" W)		31 Mar 2000-29 Apr 2000	Woodland / wetspot 3	*Auricaria* , keawe	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-161	Lingren Funnels (Beetle Trap)	(20° 54' 30" N,156° 25' 51" W)		29 Apr 2000-2 Jun 2000	Open keawe woodland / wetspot 3	Keawe, *Schinus*	
BL2002-162	Bait Trap	(20° 54' 31" N,156° 25' 50" W)		29 Apr 2000-2 Jun 2000	Woodland / wetspot 3	*Auricaria*, keawe	
BL2002-163	MV & Blacklight	(20° 53' 35" N,156° 26' 38" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, F. Starr, K. Martz & J.E. Dockall	28 Mar 2000	Keawe woodland	Keawe, *Leucaena*, *Cenchrus*, etc.	A`alele dump area; 15m; MV light #1. (=BL0258)
BL2002-163A	MV & Blacklight	(20° 54' 29" N,156° 25' 52" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, K. Martz & F. Starr	29 Mar 2000	near wet spot 3	*Sesuvium*, keawe, *Pluchea*,	Bike path; MV light #2 *Bacopa* dominated wetland, keawe, mixed understory
BL2002-164	MV Bulb	(20° 54' 07" N,156° 26' 28" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, F. Starr & K. Martz	26 Apr 2000	Keawe woodland	Keawe, *Cenchrus*	Near N AOA fenceline; MV light #1
BL2002-165	MV Bulb	(20° 54' 04" N,156° 26' 40" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, A. Allison, R.E. Englund, K. Martz & F. Starr	27 Apr 2000	Keawe woodland	Keawe, *Cenchrus, Asystacia*	Kanaha Beach R; MV light #2 (=BL0264)
BL2002-166	MV Bulb	(20° 54' 26" N,156° 26' 05" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, R.E. Englund, K. Martz & F. Starr	30 Apr 2000	Keawe woodland	Keawe, *Causurina*, mixed weeds	Crash site near bike path; MV light #3
BL2002-167	MV Bulb	(20° 53' 36" N,156° 27' 05.2" W)	D.J. Preston, J.E. Dockall, K. Martz & F. Starr	31 May 2000	Keawe woodland	Keawe, near wetland	Kanaha Pond, bunkers; MV site#1, near south gate. (=BL0301)
BL2002-168	MV Bulb	(20° 53' 46.5" N,156° 27' 01.5" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, G.A. Samuelson, K. Martz & F. Starr	2 Jun 2000	Keawe woodland	Keawe, *Pluchea*, low weeds, grasses	Between Kanaha drainage canal and T-shirt factory building; MV site#2
BL2002-169	MV & Blacklight	(20° 53' 51" N,156° 26' 54" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, R. Takumi & G.A. Samuelson	4 Jun 2000	*Leucaena*-Keawe scrub, mixed weeds	*Leucaena*-Keawe, grasses	Between Kanaha drainage canal and T-shirt factory building; MV & BL site #3. (=BL0280 and =BL0296)
BL2002-170	Sweep Net	(20° 54' 43" N,156° 25' 33" W)		4 Feb 2000	Beach strand	Scaevola, mixed grasses	
BL2002-171	Sweep Net	(20° 53' 56" N,156° 27' 16" W)		27 Mar 2000	Kanaha Res.	A`ali`i & *Scaevola*	
BL2002-172	General	(20° 54' 34" N,156° 25' 40" W)	F.G. Howarth, D.J. Preston & G.A. Samuelson	27 Mar 2000	Ruderal	Bare ground @ wetspot #3	
BL2002-173	General	(20° 54' 43" N,156° 25' 30" W)		28 Mar 2000	Ruderal	Mixed weeds	
BL2002-174	Sweep Net	(20° 54' 43" N,156° 25' 32" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, F. Starr & K. Martz	29 Mar 2000	Beach strand	*Scaevola*, *Sporobolis*, Mixed grasses	Sample site #1.
BL2002-175	General	(20° 54' 26" N,156° 26' 05" W)		30 Apr 2000	Dry shrubland, keawe	Mixed weeds, koa haole	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-176	General	(20° 53' 46" N,156° 27' 00" W)		31 May 2000	Keawe woodland	Keawe, mixed shrubs	
BL2002-177	Sweep Net	(20° 53' 45.7" N,156° 26' 58.5" W)		1 Jun 2000	Keawe woodland daytime	Keawe, *Pluchea, Chenopodium*, grasses, mixed weeds	General Ariel net sweeps
BL2007-178	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	16 Nov 1999	Koa haole scrub	NA	Near crash fire station; Malaise trap #1 Date is probably pick up day
BL2002-178A	Host Search	(20° 53' 46.7" N,156° 26' 59.4" W)		1 Jun 2000	Keawe wood-land daytime	ex Dead Keawe branches	
BL2007-179	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)		18 Apr 2000	Koa haole scrub	NA	
BL2002-179A	General	(20° 53' 48" N,156° 25' 53" W)		2 Jun 2000	*Leucaena*-Keawe scrub	Roadside, mixed weeds	
BL2002-180	General	(20° 53' 10" N,156° 27' 10" W)	F.G. Howarth & D.J. Preston	2 Jun 2000	Ruderal fallow cane field	*Waltheria*, mixed weeds	
BL2002-181	Sweep Net	(20° 53' 43" N,156° 26' 31" W)		3 Jun 2000	Terminal Ornamentals	Grass, Shower tree, Ilima,	General search/ Sweep
BL2002-182	Tulgren Funnel (Berlese Funnel)	(20° 54' 26" N,156° 26' 05" W)	G.A. Samuelson, D.J. Preston & F.G. Howarth	28 Apr 2000-1 May 2000	Dry shrubland, *Pluchea*, *Casuarina*	*Pluchea, Casuarina*, old bird nest	Makai of Bike Path; Tulgren innel extraction of old Bird nest in keawe
BL2007-183	Malaise Trap	(20° 54' 16" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	30 Nov 1999	Koa haole scrub	NA	Near crash fire station; Malaise Trap #2
BL2002-183A	Sifting Litter	(20° 54' 42" N,156° 25' 31" W)		29 Mar 2000	Beach strand	*Scaevola* leaf litter	
BL2002-184	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	1 Feb 2000	Koa haole scrub	NA	Malaise Trap #1
BL2002-184A	Fogging	(20° 54' 29.5" N,156° 25' 50.5" W)		29 Apr 2000	Open keawe woodland	Keawe	
BL2002-185	Fogging	(20° 54' 39" N,156° 25' 36" W)	F.G. Howarth, D.J. Preston & R.A. Englund	29 Apr 2000	Native shrubland	*Chenopodium*	East end of runway
BL2002-186	Fogging	(20° 54' 04" N,156° 26' 35" W)		29 Apr 2000	Keawe woodland	Keawe	
BL2002-187	Host Search	(20° 54' 05" N,156° 26' 34" W)		29 Apr 2000	Keawe woodland	Dead keawe branches	In termite gallery
BL2002-188	Fogging	(20° 54' 26" N,156° 26' 06" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & R.A. Englund	29 Apr 2000	Keawe woodland	*Causurina*	
BL2002-189	Fogging	(20° 53' 44" N,156° 26' 40" W)		30 May 2000	*Leucaena* scrub	*Leucaena, Ipomea*	
BL2002-190	Fogging	(20° 53' 45" N,156° 27' 02" W)		31 May 2000	Keawe woodland	Keawe, *Pluchea*, low weeds, grasses	
BL2002-191	Fogging	(20° 53' 46" N,156° 27' 02" W)		31 May 2000	Keawe woodland	Keawe, *Pluchea*, low weeds, grasses	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-192	Fogging	(20° 53' 50" N,156° 26' 52" W)		31 May 2000	Keawe woodland	Keawe, *Pluchea*, low weeds, grasses	
BL2002-193	Fogging	(20° 53' 46" N,156° 27' 00" W)		31 May 2000	Keawe woodland	Keawe, *Pluchea*, low weeds, grasses	
BL2002-194	Fogging	(20° 53' 48" N,156° 26' 58" W)		1 Jun 2000	Keawe woodland	Keawe, *Pluchea*, low weeds, grasses	
BL2002-195	Fogging	(20° 53' 49" N,156° 26' 54" W)		1 Jun 2000	Keawe wood-land daytime	Keawe, *Pluchea, Chenap*odium, grasses, mixed weeds	
BL2002-196	Fogging	(20° 53' 46" N,156° 26' 57.8" W)		1 Jun 2000	Keawe wood-land daytime	Keawe, *Pluchea, Chenapodium*, grasses, mixed weeds	
BL2002-197	Fogging	(20° 53' 45" N,156° 27' 02" W)	D.J. Preston & J.E. Dockall	1 Jun 2000	Keawe wood-land	Keawe, *Pluchea*, mixed weeds	Kanaha Pond drainage channel
BL2002-198	Fogging	(20° 53' 48.5" N,156° 27' 05" W)		1 Jun 2000	Keawe wood-land	Keawe, *Pluchea*, mixed weeds	
BL2002-199	Fogging	(20° 53' 50" N,156° 27' 00" W)	F.G. Howarth & G.A. Samuelson	1 Jun 2000	Keawe wood-land	Keawe, *Pluchea*, mixed weeds	Behind t-shirt factory, Kanaha Pond. (=BL0304)
BL2002-200	Fogging	(20° 53' 46" N,156° 27' 02" W)		1 Jun 2000	Keawe wood-land	Keawe, *Pluchea*, mixed weeds	
BL2002-201	Fogging	(20° 53' 52" N,156° 26' 57" W)		1 Jun 2000	open Keawe woodland	*Pluchea, Leucaena*	
BL2002-202	Fogging	(20° 53' 51" N,156° 26' 59" W)		1 Jun 2000	open Keawe woodland	*Pluchea, Leucaena*	
BL2002-203	Fogging	(20° 53' 56" N,156° 27' 16" W)		2 Jun 2000	Native shrubs	*Scaevola*	
BL2002-204	Fogging	(20° 54' 36" N,156° 25' 37" W)		2 Jun 2000	Mixed shrubland	*Chenopodium*	
BL2002-205	Tulgren Funnel (Berlese Funnel)	(20° 53' 56" N,156° 27' 16" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & K. Martz	3 Mar 2000	Kanaha Res. At night	Aalii litter	Tulgren #1
BL2002-206	Tulgren Funnel (Berlese Funnel)	(20° 54' 16" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston & G.A. Samuelson	31 Mar 2000	*Leucaena* shrubland	Leucaena, Panicum, Cenchrus, etc.	Tulgren #2 at Malaise trap #2
BL2002-208	Lingren Funnels (Beetle Trap)	(20° 54' 21" N,156° 25' 56" W)		2 Jun 2000-6 Nov 2000	*Leucaena* shrubland	*Leucaena, Cenchrus, Asystasia*	Date recorded as "2 VI - XI 2000"
BL2002-208A	Lingren Funnels (Beetle Trap)	(20° 54' 21(2)" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & G.A. Samuelson	27 Mar 2000-31 Mar 2000	*Leucaena* shrubland	*Leucaena, Cenchrus, Asystasia*	Near malaise trap site 1; Pinene attractant
BL2002-209	Gas Aspirator	(20° 54' 22" N,156° 25' 56" W)		11 Sep 1999	*Leucaena* shrubland	*Leucaena, Pluchea, Cenchrus, Asystasia*, etc.	Gas aspirator #2 at Malaise #1 site
BL2002-210	General	(20° 53' 22" N,156° 26' 49" W)		4 Oct 1999	Ruderal	*Pluchea*	West end of runway
BL2002-211	General	(20° 53' 49" N,156° 26' 56" W)		1 Jun 2000	Keawe wood-land daytime	Keawe, mixed weeds	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-215A	Gas Aspirator	(20° 54' 23" N,156° 25' 54" W)	D.J. Preston, J.E. Dockall, F. Starr & K. Martz	3 Feb 2000	Mixed shrubs	*Atriplex semibacata* = Australian salt bush	Gas Aspirator G12
BL2002-215B	Gas Aspirator	(20° 54' 23" N,156° 25' 54" W)		3 Feb 2000	Bare pond bottom	Dry pond pan w/a few sedges	
BL2002-215C	Gas Aspirator	(20° 54' 23" N,156° 25' 54" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	3 Feb 2000	Mixed shrub	*Sesuvium portulacastrum*	G11
BL2002-215D	Gas Aspirator	(20° 54' 23" N,156° 25' 54" W)		3 Feb 2000	Mixed shrubs	*Pluchea indica, Atriplex semibacata, Soudnus, Solanum americanum, Chenopodium murale*	
BL2002-215E	Gas Aspirator	(20° 54' 23" N,156° 25' 54" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	3 Feb 2000	Mixed shrubs	*Marisum javanicus*, in understory of *Pluchea odorata, Leucaena, Pluchea indica, Pluchea* hybrid, etc.	
BL2002-216	General	(20° 53' 36"N,156°26' 59"W)	J.E. Dockall	5 Mar 2000	Flying near citrus tree. Clear, hot, sunny day.	-	HDOA station
BL2002-218	General	(20° 54' 24"N,156° 25' 54"W)	F.G. Howarth	1 Feb 2000	-	*Leucaena* and weeds, *Pluchea* etc.	E of Malaise Trap #1
BL2002-219	Host Search	(20° 54'40"N,156° 25' 36"W)	F.G. Howarth & D.J. Preston	4 Feb 2000	Wind-sheared shrubland	Resting on *Nicotiana*	W Sprecklesville
BL2002-221	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & R. Englund	26 Apr 2000	*Leucaena* shrubland.	-	Malaise trap site #1
BL2002-222	Sweep Net	(20° 54' 39" N,156° 25' 34"W)	G.A. Samuelson	27 Mar 2000	-	*Chenopodium*	East end of runway; *Chenopodium* & weeds
BL2002-223	Malaise Trap	(20° 54' 22" N,156°25' 56" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	27 Mar 2000	*Leucaena* shrubland	n/a	
BL2002-224	Sweep Net	(20° 54' 18" N,156° 25' 42" W)	G.A. Samuelson	31 Mar 2000	-	*Sida*	Near malaise trap #2, Sweeping near taxiway
BL2002-225	General	(20° 54' 38" N,156°25' 22"W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	29 Mar 2000	Strand shrubland	-	W Sprecklesville Beach
BL2002-226	Sweep Net	(20° 53'46" N,156°26' 37"W)	G.A. Samuelson & F.G. Howarth	3 Jun 2000	-	Spider lily flowers	In terminal area
BL2002-227	Gas Aspirator	(20° 53' 48.5" N,156° 26' 53" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, K. Martz & F. Starr	4 Jun 2000	Keawe forested area. Keawe woodland.	Keawe, *Sesuvium, Paspalum, Pluchea*	Behind T-shirt factory
BL2002-228	Sweep Net	(20° 53' 47" N,156°26' 27" W)	G.A. Samuelson	3 Jun 2000	-	Orchid tree	In terminal area
BL2002-229	General	(20° 53' 48" N,156° 26' 28" W)	D.J. Preston & J.E. Dockall	30 May 2000	-	grass	Terminal area
BL2002-230	Sweep Net	(20° 54' 39" N,156° 25' 34" W)	G.A. Samuelson	27 Mar 2000	-	*Dodonaea*	East end of runway
BL2002-231	Sweep Net	(20° 54' 18" N,156° 25' 42" W)	G.A. Samuelson	31 Mar 2000	-	*Abutilon*	Near Malaise Trap #2, Near taxiway

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-232	Gas Aspirator	(20° 54' 38" N,156° 25' 32"W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & R. Englund	26 Apr 2000	Native shrubland	*Chenopodium*	Spreckelsville
BL2002-232	Fogging	(20° 54' 39" N,156° 25' 34" W)	F.G. Howarth, D.J. Preston & G.A. Samuelson	29 Apr 2000	-	Chenopodium	East end of runway
BL2002-233	Malaise Trap	(20° 54' 22" N,156° 25'56" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Martz	29 Dec 1999-14 Jan 2000	-	-	Malaise Trap #1
BL2002-234	Fogging	(20° 54' 39" N,156° 25' 33" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & R.A. Englund	29 Apr 2000-	Dry Shrubland	*Chenopodium* sp.	W of bike path; Pyrethrum spray
BL2002-235	Gas Aspirator	(20° 54' 24" N,156° 26'00" W)	F.G. Howarth, D.J. Preston & R.A. Englund	10 Sep 1999	-	*Chenopodium*	Wetland #2; Site #12; sample #1
BL2002-236	General	(20° 54' 24" N,156° 26' 00" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Martz	28 Mar 2000	Wet land; *Sesuvium*, *Pluchea*, Keawe	-	Near bike path
BL2002-237	General	(20° 54' 35" N,156° 25' 38" W)	G.A. Samuelson & F.G. Howarth	2 Jun 2000	Bike path fence	mantid ootheca	
BL2002-238	Sifting Litter	(20° 53' 56" N,156° 27' 16" W)	G.A. Samuelson, F.G. Howarth, D.J. Preston & J.E. Dockall	2 Jun 2000	*Dodonaea* Litter	-	Kanaha Pond Reserve
BL2002-239	Malaise Trap	(20° 54' 16" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	3 Dec 1999	-	-	Malaise Trap #2
BL2002-240	Sweep Net	(20° 54' 39" N,156° 25' 34" W)	G.A. Samuelson & F. Starr	29 Mar 2000-	-	*Chenopodium*	Near bike path E end of runway
BL2002-241	Host Search	(20° 54' 29" N,156° 25' 52" W)	G.A. Samuelson	27 Mar 2000	Wet Spot #3.	Dry, dead *Leucaena* branches	
BL2002-242	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	18 Apr 2000	*Leucaena* Shrubland	-	Malaise Trap #2
BL2002-243	General	(20° 54' 47" N,156° 25' 33" W)	F.G. Howarth, R. Takumi, F. Starr & K. Martz	20 Jun 2001	Beach & strand.	-	West Sprecklesville
BL2002-244	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, A. Allison, R.E. Englund, K. Martz, F. Starr & J.E. Dockall	23 Mar 2000	*Leucaena* Shrubland	-	Malaise #2. Sometimes J.E. Dockall is mentioned as collector, and sometimes not Allison or Samuelson
BL2002-245	Sweep Net	(20° 53'47" N,156°26' 27"W)	F.G. Howarth & G.A. Samuelson	3 Jun 2000	-	Spider lily flowers	Terminal site
BL2002-246	Sweep Net	(20° 54' 11" N,156° 26’ 23" W)	F.G. Howarth & D.J. Preston	5 Aug 1999	Keawe Forest	Mixed shrubs, *Chenopodium*	Woodland near Kanaha Beach Park
BL2002-248	Sweep Net	(20° 54' 12" N,156° 26' 16" W)	G.A. Samuelson	29 Mar 2000	Near Wet Spot #1	*Hibiscus tiliaceus* etc.	
BL2002-250	Trunk Traps	(20° 54' 24 N,156° 26' 04" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999-10 Sep 1999	-	Keawe	Road off bike path; Site #6. 3 cup traps on Keawe
BL2002-251	Sweep Net	(20° 54' 17" N,156° 25' 40" W)	G.A. Samuelson	31 Mar 2000	-	*Abutilon*	Near taxiway; Near malaise trap #2

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-252	Gas Aspirator	(20° 54' 39" N,156° 25' 34" W)		28 Mar 2000	-	*Nicotiana glauca*	Bike path at E end of runway
BL2002-254A	Trunk Traps	(20° 54' 26" N,156° 26' 05" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Martz	4 Dec 1999	Dry shrubland (*Pluchea*)	-	
BL2002-255	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth & D.J. Preston	30 Nov 1999	Leucaena scrubland	-	Malaise trap #1; wrong date, probably 30 Nov 1999
BL2002-256	Lingren Funnels (Beetle Trap)	(20° 54' 30" N,156° 25' 50" W)	F.G. Howarth, D.J. Preston & G.A. Samuelson	31 Mar 2000	*Casuarina, Pluchea*	-	Near wetland 3; Bait Trap #2 (=BL0270 and =BL0271)
BL2002-257	Sweep Net	(20° 53' 35" N,156° 26' 38" W)	G.A. Samuelson	28 Mar 2000	Keawe woodland	-	E of A`alele St. near MV bulb & blacklight
BL2002-260	Gas Aspirator	(20°54' 11" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999	Drainage ditch pan	-	Wetland #; Site #9
BL2002-261	Gas Aspirator	(20° 54' 39" N,156° 25' 33" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999-10 Sep 1999	-	*Chenopodium*	East end of runway near bike path; Site #13.
BL2002-262	Malaise Trap	(20° 54'16" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	29 Dec 1999-14 Jan 2000	*Leucaena* shrubland	-	Malaise Trap #2
BL2002-263	Trunk Traps	(20° 54' 12" N,156° 26' 17" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999-10 Sep 1999	Keawe trees	-	Drainage canal; Site #10; 2 cup traps on Keawe trees, Wet spot #1
BL2002-265	Gas Aspirator	(20° 54' 01.5" N,156° 25' 42.5" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, K. Martz & F. Starr	28 Mar 2000	irrigated lawn & hedge	-	Near Crash fire station
BL2002-266	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston, K. Martz F. Starr &G.A.Samuelson,	24 Mar 2000	*Leucaena* shrubland	-	
BL2002-267	Host Search	(20° 54' 39" N,156° 25' 34" W)	F.G. Howarth & G.A. Samuelson	27 Mar 2000	-	*Scaevola taccada* (Naupaka)	W Specklesville
BL2002-268	Lingren Funnels (Beetle Trap)	(20° 54' 30" N,156° 25' 50" W)	F.G. Howarth, D.J. Preston & G.A. Samuelson	27 Mar 2000-31 Mar 2000	Near Wet Spot #3.	In hau overstory	Near MV site
BL2002-269	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	3 Dec 1999	*Leucaena* shrubland	-	
BL2002-275	Lingren Funnels (Beetle Trap)	(20° 54' 31" N,156° 25' 50" W)	G.A. Samuelson	29 Apr 2000-2 Jun 2000	In dense hau. *Leucaena* & *Schinus* overstory. Near Wet Spot #3.	-	
BL2002-277	Lingren Funnels (Beetle Trap)	(20° 54' 29" N,156° 25' 52" W)	G.A. Samuelson, F.G. Howarth & D.J. Preston	27 Mar 2000-31 Mar 2000	In forest Near Wetland #3.	On large *Causurina* trunk	Near wetland 3; Pinene attractant, (=BL0276)
BL2002-278	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	1 May 2000	*Leucaena* shrubland.	-	Malaise trap#1; 1 May is either start or end date

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-279	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	26 Apr 2000	*Leucaena* shrubland.	-	Malaise Trap #2
BL2002-281	Tulgren Funnel (Berlese Funnel)	(20°53' 56" N,156°27' 16" W)	G.A. Samuelson, F.G. Howarth & D.J. Preston	31 Mar 2000	-	*Dodonaea*	Near Kanaha Pond
BL2002-283	Host Search	(20° 54' 13" N,156° 26' 17" W)	G.A. Samuelson	29 Mar 2000	Near wetspot #1	Slime flux on keawe trunk	Attracted to slime flux on keawe trunk.
BL2002-284	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & R.A. Englund	30 Apr 2000	-	-	HDOA building; inside laboratory
BL2002-285	Sifting Litter	(20° 54' 42" N,156° 25' 31" W)	G.A. Samuelson, R. Takumi, K. Martz & F. Starr	29 Mar 2000	Near beach	*Tournefortia* leaf litter	East end of runway
BL2002-286	Sifting Litter	(20° 54' 12" N,156° 26'16" W)	G.A. Samuelson & D.J. Preston	27 Mar 2000	Wetland #1	Keawe leaf litter	
BL2002-287	General	(20° 53' 51" N,156° 26' 54" W)	G.A. Samuelson	5 Jun 2000	-	Decaying timber	Triangle area behind T-shirt factory
BL2007-288	Malaise Trap	(20° 54'16" N,156° 25' 42" W)	D.J. Preston, F.G. Howarth, & J.E. Dockall	16 Nov 1999	*Leucaena* shrubland	-	Near hele pad; Malaise Trap #2
BL2002-288A	General	(20° 54' 24" N,156° 26' 00" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Martz	28 Mar 2000	Wetland.	*Sesuvium, Pluchea*, Keawe	Near bike path
BL2002-289	Sweep Net	(20° 54' 34" N,156° 25' 40" W)	R. Takumi	29 Mar 2000	-	-	Spreckelsville
BL2002-290	Sweep Net	(20° 54' 16" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson, F. Starr & K. Martz	1 Mar 2000	-	-	
BL2002-291	Sweep Net	(20° 54' 23" N,156° 25' 54" W)	F.G. Howarth, G.A. Samuelson, J.E. Dockall, F. Starr & K. Martz	27 Mar 2000	-	-	Near Malaise Trap #1
BL2002-292	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz	30 Nov 1999	*Leucaena, Pluchea, Cenchrus, Asystasia* etc.	-	Near crash fire station; Malaise Trap #1
BL2002-293	Malaise Trap	(20° 54' 16" N,156° 25' 42" W)	F.G. Howarth & D.J. Preston	3 Dec 1999-16 Dec 1999	-	-	Malaise trap site #2
BL2002-294	Gas Aspirator	(20° 53' 57" N,156° 27' 14" W)	F.G. Howarth & D.J. Preston	28 Mar 2000	Alien weeds.	-	
BL2002-297	Ant Baits	(20° 53' 44" N,156° 26' 46" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	4 Oct 1999-8 Oct 1999	Ruderal	-	Corner with UPS; honey bait
BL2002-298	Ant Baits	(20° 53' 46" N,156° 26' 37" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	5 Oct 1999	Ruderal	-	Terminal Road; peanut butter
BL2002-299	Ant Baits	(20° 53' 44" N,156° 26' 46" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	4 Oct 1999-8 Oct 1999	Ruderal	-	At UPS in ditch; honey/peanut butter
BL2002-300	Ant Baits	(20° 53' 45" N,156° 26' 41" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	5 Oct 1999	Ruderal	-	UPS Rd at base of utility pole; peanut butter

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-302	Host Search	(20° 53' 52" N,156° 26' 23" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	3 Jun 2000	-	Spider lily flowers	Terminal
BL2002-303	Host Search	(20° 53' 45" N,156° 26' 38" W)	F.G. Howarth & D.J. Preston	4 Mar 2000	Ornamental	Oleander hedge	Terminal area
BL2002-305	Host Search	(20° 53' 52" N,156° 26' 23" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	3 Jun 2000	-	Orchid tree flowers	Terminal
BL2002-306	Fogging	(20° 53' 46.5" N,156° 27' 1.5" W)	F.G. Howarth, G.A. Samuelson & Raina Takumi	4 Jun 2000	-	*Pluchea*	
BL2002-307	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr	7 Mar 2000	-	-	Malaise Trap #2
BL2002-308	Gas Aspirator	(20° 53' 51" N,156° 26' 54" W)	F.G. Howarth & D.J. Preston	4 Jun 2000	-	Molasses grass	
BL2002-309	General	(20° 54' 06" N,156° 26' 35" W)	F.G. Howarth & D.J. Preston	4 Aug 1999	Keawe forest	-	Near Kanaha Beach Park; 5m
BL2002-310	Sweep Net	(20° 54' 42" N,156° 25' 31" W)	R. Takumi	29 Mar 2000	Native shrubs & *Scaevola*	-	East end of runway
BL2002-311	Sweep Net	(20° 54' 24" N,156° 25' 59" W)	D.J. Preston	28 Apr 2000	Wetland # 2	*Pluchea*	
BL2002-312	Sweep Net	(20° 53' 47" N,156° 26' 59.4" W)	D.J. Preston	1 Jun 2000	Keawe woodland	-	Behind T-shirt factory
BL2002-313	Yellow Pan Trap	(20° 53' 46" N,156° 27'00" W)	D.J. Preston	1 Jun 2000	Keawe woodland	-	Behind T-shirt factory
BL2002-314	General	(20° 53' 35" N,156° 26' 59" W)	D.J. Preston	27 Mar 2000	-	-	In window frame at HDOA office
BL2002-315	Sweep Net	(20° 53' 50" N,156°25' 52" W)	G.A. Samuelson	30 Apr 2000	Grass	-	Near control tower; sweeping grass
BL2002-316	General	(20° 54' 14" N,156° 26'17" W)	D.J. Preston	30 Apr 2000	Wetland #1	-	
BL2002-317	General	(20° 53' 59" N,156° 26' 39" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	7 Mar 2000	Grass and shrubs.	-	Car park waste site
BL2002-318	Sweep Net	(20° 54' 13' N,156° 26' 20" W)	F.G. Howarth & D.J. Preston	5 Aug 1999	Mixed shrubs.	-	>5m near Kanaha Beach Park
BL2002-319	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, K. Starr & F. Starr	5 Jun 2000-3 Jul 2000	-	-	Malaise Trap #2
BL2002-320	General	(20° 53' 47" N,156° 26' 59" W)	D.J. Preston & J.E. Dockall	31 May 2000	Under tires	-	Near old oil tank; area behind T-shirt factory
BL2002-322	Lingren Funnels (Beetle Trap)	(20° 54' 22" N,156° 25' 56" W)	G.A. Samuelson	31 Mar 2000-29 Apr 2000	In *Leucaena* stand	-	Pinene attractant; near Malaise trap site #1
BL2002-324	Sifting Litter	(20° 53'43" N,156° 27' 28" W)	F.G. Howarth, D.J. Preston, G.A Samuelson & J.E. Dockall	2 Dec 1999	-	*Dodonaea viscosa*	Kanaha Pond Reserve; sifting duff
BL2002-325	General	(20° 54' 12" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, G.A. Saumelson & R.A. Englund	27 Apr 2000	Grass	-	Near wetland #1
BL2002-326	General	(20° 54' 40" N,156° 25' 34" W)	F.G. Howarth	4 Oct 1999	-	-	Along bike path

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-327	General	(20° 54' 11" N,156° 26' 27" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	4 Oct 1999	Keawe forest.	-	Near Kanaha Beach
BL2002-328	General	(20° 54' 34" N,156° 25' 40" W)	F.G. Howarth	7 Oct 1999	Wetland	-	
BL2002-329	General	(20° 54' 12" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	10 Sep 1999	Wetland # 1	-	
BL2002-330	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston & F. Starr	29 Sep 2000-6 Nov 2000	-	-	Malaise Trap #1
BL2002-331	Host Search	(20° 54' 33" N,156° 25' 40" W)	F.G. Howarth & D.J. Preston	4 Feb 2000	-Wetspot #3	Resting on *Nicotiana*	W Specklesville
BL2002-332	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth, D.J. Preston, K. Martz & F. Starr	3 Dec 1999-16 Dec 1999	-	-	Malaise Trap #1
BL2002-333	Malaise Trap	(20° 54' 22" N,156° 25' 56" W)	F.G. Howarth et al.	16 Dec 1999-19 Dec 1999	-	-	Malaise Trap #1
BL2002-334	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth et al	5 Feb 2000-17 Feb 2000	-	-	Malaise Trap #2
BL2002-336	Bait Trap	(20°53' 36" N,156°26' 59" W)	F.G. Howarth	4 Jun 2000-5 Jun 2000	ornamentals and lawn	*Citrus* sp.	HDOA building, inside laboratory; methyl eugenol lure
BL2002-337	General	(20° 53' 46.7" N,156° 26' 59.4" W)	F.G. Howarth et al.	3 Jul 2000	Field	-	T-shirt field
BL2002-339	General	(20° 54' 26" N,156° 26' 05" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	7 Oct 1999	-	-	Plane crash site near compass
BL2002-340	Gas Aspirator	(20° 54' 13" N,156°26' 17" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	5 Oct 1999	Drainage ditch, no standing water	-	Wetland # 1
BL2002-342	Sweep Net	(20° 53' 57" N,156° 27' 14" W)	D.J. Preston	7 Mar 2000	-	-	Kanaha Reservoir
BL2002-343	General	(20° 53' 42" N,156° 27' 05" W)	D.J. Preston	3 Nov 1999	-	-	Kanaha Reservoir
BL2002-344	Sifting Litter	(20° 53' 56" N,156° 27' 16" W)	F.G. Howarth, D.J. Preston, G.A. Samuelson & R.A. Englund	28 Apr 2000	-	Aalii liter	Kanaha Pond Reserve
BL2002-345	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston & J.E. Dockall	4 Feb 2000	-	-	HDOA building, inside laboratory
BL2002-346	General	(20° 53' 45" N,156° 26' 40" W)	F.G. Howarth & D.J. Preston	5 Oct 1999	Ruderal and hedge. On ground and leaflitter.	-	UPS Junction
BL2002-348	Gas Aspirator	(20° 54' 24" N,156° 26' 00" W)	F.G. Howarth, D.J. Preston & R.A. Englund	8 Sep 1999	Wetland # 2 day time	*Sesuvium, Pluchea* etc.	
BL2002-349	General	(20° 53' 56" N,156° 27' 14" W)	D.J. Preston, F.G. Howarth & G.A. Samuelson	28 Apr 2000	Hedge, On web.	-	Kanaha Pond Reserve
BL2002-350	General	(20° 54' 26" N,156° 26' 05" W)	D.J. Preston & F. Starr	9 Sep 1999	*Leucaena* shrubland, on web	-	
BL2002-351	General	(20° 53' 54" N,156° 27' 23" W)	D.J. Preston & F.G. Howarth	2 Dec 1999	-	Keawe Pond Margin/on web	Kanaha Pond Reserve
BL2002-352	General	(20° 54'23" N,156° 25' 59" W)	F.G. Howarth	1 Feb 2000	Under stone in dry pond	-	AOA; Near Malaise Trap #1

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
BL2002-353	Tulgren Funnel (Berlese Funnel)	(20° 53' 50" N,156° 27' 29" W)	G.A. Samuelson	28 Mar 2000	Dry culms and debris on ground	-	Koloa Pond and channel
BL2002-354	General	(20° 54' 15"N,156° 26' 17"W)	F.G. Howarth & D.J. Preston	5 Oct 1999	Wet spot #1. On ground	-	
BL2002-355	Gas Aspirator	(20° 53' 54" N,156° 27' 24"W)	F.G. Howarth & D.J. Preston	6 Mar 2000	-	*Sporobolus, Sesuvium*, sedges	Kanaha Pond
BL2002-356	General	(20° 53' 51" N,156° 26' 24" W)	F.G. Howarth	1 Aug 1999-6 Aug 1999	-	-	Airport terminal men's room
BL2002-357	Malaise Trap	(20° 54' 18" N,156° 25' 42" W)	F.G. Howarth, D.J. Preston, K. Martz & F. Starr	3 Jul 2000-10 Aug 2000	-	-	Malaise Trap #2
BL2002-358	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth et al.	30 Mar 2000	In building	-	HDOA building, inside laboratory
BL2002-359	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth	5 Mar 2000	-	-	HDOA building, inside laboratory
BL2002-360	General	(20° 53' 35" N,156° 26' 59" W)	J.E. Dockall & D.J. Preston	1 Feb 2000	-	-	HDOA building, inside laboratory
BL2002-361	General	(20° 53' 50" N,156° 26'24" W)	R. Orr	21 May 2001	Men's room	-	Terminal building
KA2007-2	Gas Aspirator	(20° 54' 16" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Wetland dominated by *Bacopa*	*Bolboschoenus maritimus*	
KA2007-3	Host Search	(20° 53' 38" N,156° 26' 45" W)	F.G. Howarth, D.J. Preston, F. Starr, K Starr, H Laederich & R. TAKUMI	20 Jul 2006	-	*Cassia* sp. (yellow flowers)	A`alele St.
KA2007-4	Gas Aspirator	(20° 54' 16" N,156° 26' 16" W)		18 Jul 2006	Wetland dominated by *Bacopa*	*Pluchea* spp.	
KA2007-5	Gas Aspirator	(20° 53' 24" N,156° 26' 04" W)		20 Jul 2006	Koa haole dominated shrub	*Tridax procambens* (Coat buttons)	Haleakala Hwy near heliport
KA2007-6	Gas Aspirator	(20° 54' 26" N,156° 26' 10" W)		17 Jul 2006	Beach strand and keawe/mixed understory woodland	*Sporobolus virginicus* (Akiaki)	Some specimens possily mislabeled 20*54'01N; 156*27'46"W
KA2007-7	Gas Aspirator	(20° 53' 24" N,156° 26' 04" W)	F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr, K. Starr & H. Laederich	20 Jul 2006	Koa haole dominated shrub	*Abutilon grandifolium*	Haleakala Hwy near heliport
KA2007-8	Gas Aspirator	(20° 54' 16" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Wetland dominated by *Bacopa*	*Cyperus javanicus*	
KA2007-9	Gas Aspirator	(20° 53' 24" N,156° 26' 04" W)		20 Jul 2006	Koa haole dominated shrub	*Ipomoea* sp.	Haleakala Hwy near heliport
KA2007-11	General	(20° 54' 16" N,156° 26' 16" W)		18 Jul 2006	Wetland dominated by *Bacopa*	General	

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KA2007-13	Gas Aspirator	(20° 54' 07" N,156° 25' 41" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Koa haole dominated scrub	General: lawn	Rescue Fire Station
KA2007-14	Gas Aspirator	(20° 54' 07" N,156° 25' 41" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Koa haole dominated scrub	*Wedelia sphagneticola trilobata*	Rescue Fire Station
KA2007-16	Gas Aspirator	(20° 54' 07" N,156° 25' 41" W)		18 Jul 2006	Koa haole dominated scrub	*Cassia* x *nealii* (Shower tree)	
KA2007-17	Host Search	(20° 53' 35" N,156° 26' 59" W)		20 Jul 2006	Industrial, buildings	*Citrus* sp.	
KA2007-18	MV Bulb	(20° 54' 01" N,156° 27' 44" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	19 Jul 2006	Beach strand and keawe/mixed understory woodland	NA	Hobron wet spot (=KA0034 and =KA0294)
KA2007-19	Host Search	(20° 54' 31" N,156° 25' 47" W)		20 Jul 2006	Mixed shrubland and grasses	*Nicotiana*	
KA2007-20	Host Search	(20° 54' 16" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Wetland margin, irrigated lawn	Hibiscus hedge	
KA2007-22	Fogging	(20° 54' 23" N,156° 25' 59" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	*Leucaena* sp.mixed weeds	*Macroptilium atropurpureaum*	
KA2007-23	Fogging	(20° 54' 40" N,156° 25' 34" W)		20 Jul 2006	Wind-sheared dune vegetation	*Leucaena* sp. (Haole Koa)	
KA2007-24	Fogging	(20° 54' 16" N,156° 26' 16" W)		18 Jul 2006	Wetland dominated by *Bacopa*	*Schinus terebinthifolius*	
KA2007-26	Bait Trap	(20° 53' 28" N,156° 26' 37" W)		20 Jul 2006	Keawe/mixed understory woodland	Bait: banana and beer	Road off bike path
KA2007-29	Gas Aspirator	(20° 54' 26" N,156° 25' 54" W)		18 Jul 2006	Roadside	Weeds	Bike path
KA2007-30	Gas Aspirator	(20° 53' 36" N,156° 26' 59" W)		24 Jul 2006	Irrigated ornamental and lawns	*Erythrina* sp.	
KA2007-31	General	(20° 54' 39" N,156° 25' 34" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	20 Jul 2006	-	*Chenopodium oahuense*	East end of runway
KA2007-35	Gas Aspirator	(20° 54' 40" N,156° 25' 34" W)		20 Jul 2006	Wind-sheared dune vegetation	General	East end of runway
KA2007-36	Gas Aspirator	(20° 54' 20" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Wetland dominated by *Bacopa*	General: lawn, shrubs	Wetland 1
KA2007-37	Fogging	(20° 54' 16" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, H. Laederich, F. Starr & K. Starr	18 Jul 2006	Wetland dominated by *Bacopa*	*Thespesia populnea*	

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KA2007-38	Gas Aspirator	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	17 Jul 2006	Industrial, buildings	*Hibiscus rosa sinensis*	HDOA Insectary
KA2007-39	Fogging	(20° 53' 49" N,156° 26' 58" W)		17 Nov 2006	Keawe/mixed understory woodland	*Leucaena* sp. (haole koa)	
KA2007-40	Fogging	(20° 54' 16" N,156° 26' 16" W)		18 Jul 2006	Wetland dominated by *Bacopa*	*Bacopa monierri*	
KA2007-41	Gas Aspirator	(20° 54' 26" N,156° 26' 10" W)	F.G. Howarth, D.J. Preston, H. Laederich, F. Starr, & K. Starr	17 Jul 2006	Beach strand and keawe/mixed understory woodland	*Sesuvium portulacastrum* (Akulikuli)	Some specimens possibly mislabeled 20*54'01N; 156*27'46"W
KA2007-42	Gas Aspirator	(20° 54' 16" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, H. Laederich, F. Starr & K. Starr	18 Jul 2006	Wetland dominated by *Bacopa*	*Bacopa monnieri*	sample 1
KA2007-43	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, F. Starr & K. Starr	20 Jul 2006	-	-	HDOA Insectary
KA2007-44	General	(20° 54' 40" N,156° 25' 34" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & H. Laederich	20 Jul 2006	-	-	East end of runway
KA2007-45	Sweep Net	(20° 54' 01" N,156° 27' 42" W)		19 Jul 2006	Beach strand and keawe/mixed understory woodland	wrack	
KA2007-46	Sweep Net	(20° 54' 01" N,156° 27' 42" W)		19 Jul 2006	Beach strand and keawe/mixed understory woodland	*Scaevola* sp. (naupaka)	
KA2007-47	General	(20° 54' 02" N,156° 27' 42" W)	F.G. Howarth, F. Starr K. Starr, D.J. Preston & H. Laederich	19 Jul 2006	Rocky beach strand, littoral	Rock splash zone	Near Hobron Pt.
KA2007-48	Host Search	(20° 54' 01" N,156° 27' 42" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Starr	19 Jul 2006	Beach strand and keawe/mixed understory woodland	*Prosopis pallida* (keawe) trunks	
KA2007-56	Pitfall Trap	(20° 53' 53" N,156° 27' 09" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	21 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	-	Kanaha Pond
KA2007-57	MV Bulb	(20° 53' 53" N,156° 27' 09" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & A. Ghotaslou	21 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	NA	Kanaha Pond Reserve
KA2007-58	General	(20° 53' 53" N,156° 27' 09" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	21 Sep 2006	Wetland, mixed native/ keawe /mixed alien understory woodland	General – on ground	Kanaha Pond
KA2007-59	MV Bulb	(20° 54' 16" N,156° 26' 16" W)	D.J. Preston, F. Starr, K. Starr & H. Laederich	26 Jun 2006	Wetland dominated by *Bacopa*	NA	

Master Station List							
StationNum	**Method**	**Loc**	**Collectors**	**Coll. Date**	**Habitat**	**Host**	**Comments**
KA2007-60	MV Bulb	(20° 53' 49" N,156° 27' 23" W)	D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	19 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	NA	Kanaha Pond Reserve
KA2007-61	General	(20° 54' 23" N,156° 25' 54" W)		18 Sep 2006	keawe/mixed understory woodland	General	
KA2007-63	Sticky Trap	(20° 53' 54" N,156° 27' 43" W)		28 Aug 2006-18 Nov 2006	Beach strand and keawe/mixed understory woodland	*Prosopis pallida*, bait: fruit	
KA2007-64	Window Trap	(20° 54' 26" N,156° 25' 50" W)	F. Starr, K. Starr, F.G. Howarth, D.J. Preston, H. Laederich & A. Ghotaslou	18 Jul 2006-18 Sep 2006	Keawe/koa haole/mixed understory woodland	Window trap	
KA2007-65	Malaise Trap	(20° 54' 26" N,156° 25' 50" W)	F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich	18 Jul 2006-18 Sep 2006	Keawe/koa haole/mixed understory woodland	NA	
KA2007-66	Lingren Funnels (Beetle Trap)	(20° 54' 26" N,156° 25' 50" W)		18 Jul 2006-18 Sep 2006	Keawe/koa haole/mixed understory woodland	NA	
KA2007-67	Window Trap	(20° 54' 26" N,156° 25' 50" W)	F.G. Howarth, D.J. Preston, F. Starr, K Starr & H Laederich	18 Sep 2006-21 Oct 2006	Keawe/koa haole/mixed understory woodland	NA	Set below malaise trap panels
KA2007-84	Host Search	(20° 53' 35" N,156° 26' 59" W)		19 Jul 2006	Industrial, buildings	*Plumeria rubra*	
KA2007-85	Host Search	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	23 Jul 2006	Industrial, buildings	*Citrus* sp.	HDOA insectary
KA2007-86	Gas Aspirator	(20° 53' 53" N,156° 27' 39" W)		19 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Ipomoea pescaprae* subsp. *brasiliensis*	
KA2007-87	Gas Aspirator	(20° 53' 53" N,156° 27' 39" W)		19 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	General: *Leucaena* sp., *Sesuvium portulacastrum, Capparis sandwichiana*	
KA2007-88	Gas Aspirator	(20° 53' 56" N,156° 27' 17" W)		20 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Vitex rotundifolia* (Pohinahina), *Scaevola* sp. (Naupaka)	
KA2007-89	Gas Aspirator	(20° 53' 30" N,156° 26' 53" W)		20 Sep 2006	Ruderal, mixed ornamentals.	General: lawn	DLNR baseyard
KA2007-90	Gas Aspirator	(20° 53' 43" N,156° 27' 28" W)		20 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Sporobolus virginicus* (Akiaki)	

Master Station List							
StationNum	**Method**	**Loc**	**Collectors**	**Coll. Date**	**Habitat**	**Host**	**Comments**
KA2007-91	Gas Aspirator	(20° 53' 46" N,156° 27' 28" W)		19 Sep 2006	Wetland, mixed native/ keawe /mixed alien understory woodland	*Sporobolus virginicus* (Akiaki)	
KA2007-92	Gas Aspirator	(20° 53' 46" N,156° 27' 28" W)		19 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Pluchea* spp.	Kanaha Pond Reserve
KA2007-93	Gas Aspirator	(20° 53' 55" N,156° 27' 23" W)		20 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Dodonaea viscosa* (Aalii)	
KA2007-94	Gas Aspirator	(20° 53' 46" N,156° 27' 28" W)		19 Sep 2006	Wetland, mixed native/ keawe /mixed alien understory woodland	*Sesuvium portulacastrum* (Akulikuli)	Kanaha Pond Reserve
KA2007-95	Gas Aspirator	(20° 53' 56" N,156° 27' 18" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	20 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	*Dodonaea viscosa* (duff, leaf litter)	Kanaha Pond
KA2007-96	Gas Aspirator	(20° 53' 56" N,156° 27' 18" W)		20 Sep 2006	Wetland, mixed native/ keawe /mixed alien understory woodland	*Dodonaea viscosa* (foliage)	
KA2007-100	Gas Aspirator	(20° 53' 29" N,156° 27' 29" W)		20 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	General at pond edge	
KA2007-101	Gas Aspirator	(20° 53' 35" N,156° 26' 58" W)		20 Sep 2006	Irrigated ornamental plantings and lawns	General:lawn	
KA2007-102	Gas Aspirator	(20° 53' 46" N,156° 27' 28" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & A. Ghotaslou	19 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	*Cyperus laevigatus* (Makaloa)	Kanaha Pond
KA2007-103	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & A.Ghotaslou	22 Jul 2006	Irrigated ornamental plantings and lawns	General: night lights and ground	HDOA building
KA2007-104	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	23 Jul 2006	Irrigated ornamental plantings and lawns	General	HDOA grounds
KA2007-105	Sweep Net	(20° 53' 40" N,156° 27' 21" W)		19 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	-	Kanaha Pond Reserve

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KA2007-106	Sweep Net	(20° 53' 30" N,156° 26' 53" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	20 Sep 2006	Ruderal, mixed ornamentals.	*Wikstroemia monticola* (Akia)	DLNR baseyard
KA2007-107	Sweep Net	(20° 53' 46" N,156° 27' 28" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & A. Ghotaslou	19 Sep 2006	wetland, mixed native/ keawe/mixed alien understory woodland	-	Kanaha Pond
KA2007-108	General	(20° 53' 38" N,156° 27' 38" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & A. Ghotaslou	19 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	*Cyperus laevigatus* (Makaloa)	Kanaha Pond; in flight over *Cyperus laevigatus* (Makaloa)
KA2007-109	General	(20° 53' 38" N,156° 27' 38" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	19 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	General	Kanaha Pond Reserve
KA2007-110	General	(20° 53' 39" N,156° 27' 22" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & A. Ghotaslou	19 Sep 2006	Wetland, mixed native/ keawe/ alien understory woodland	*Cyperus laevigatus* (Makaloa)	Kanaha Pond
KA2007-111	General	(20° 53' 40" N,156° 27' 21" W)		19 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	General: on person	
KA2007-112	Host Search	(20° 53' 34" N,156° 27' 02" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Cascabela thevetia*	
KA2007-114	General	(20° 53' 34" N,156° 27' 02" W)	F.G. Howarth, D.J. Preston, M. Fukuda, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Irrigated ornamental plantings and lawns	General: building	HDOA building
KA2007-115	Sweep Net	(20° 53' 44" N,156° 27' 28" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	20 Sep 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	*Dodonaea viscosa* (Aalii)	Kanaha Pond Reserve
KA2007-116	Host Search	(20° 54' 40" N,156° 25' 34" W)		20 Jul 2006	Wind-sheared dune vegetation	*Ipomoea* sp. (flowers)	
KA2007-117	Sifting Soil and Leaf Litter	(20° 54' 07" N,156° 25' 41" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & H. Laederich	18 Jul 2006	Koa haole dominated scrub	Soil/litter below: *Wedelia* sp.	Fire Rescue Station
KA2007-118	Ant Baits	(20° 53' 28" N,156° 26' 37" W)	F.G. Howarth, H. Laederich, D.J. Perston, F. Starr & K. Starr	20 Jul 2006	Keawe/mixed understory woodland	Peanut butter	Road off bike path
KA2007-119	Host Search	(20° 53' 40" N,156° 27' 21" W)		19 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Sesuvium portulacastrum* (Akulikuli)	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KA2007-120	Host Search	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	22 Jul 2006	Industrial, buildings	*Erythrina sandwicensis* (Wiliwili)	HDOA Insectary
KA2007-121	Sifting Soil and Leaf Litter	(20° 54' 07" N,156° 25' 41" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & H. Laederich	18 Jul 2006	Koa haole dominated scrub	Soil/litter below: *Sphagneticola trilobata*	Fire Rescue Station
KA2007-122	General	(20° 53' 34" N,156° 27' 02" W)	F.G. Howarth, D.J. Preston. F. Starr, K. Starr & H. Laedrich	22 Jul 2006	Irrigated ornamental plantings and lawns	general	HDOA grounds
KA2007-123	Host Search	(20° 54' 16" N,156° 26' 16" W)		18 Jul 2006	Wetland, mixed native/ keawe /mixed alien understory woodland	*Ficus benjamina*	
KA2007-125	Gas Aspirator	(20° 54' 16" N,156° 26' 16" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Wetland dominated by *Bacopa*	*Bacopa monierri*	Kanaha Beach; sample 2
KA2007-126	Host Search	(20° 53' 34" N,156° 26' 59" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Hibiscus rosasinensis*	
KA2007-127	Host Search	(20° 53' 35" N,156° 27' 00" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Gossypium tomentosum* (Mao)	(=KA 0134)
KA2007-128	Host Search	(20° 53' 34" N,156° 27' 00" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Citrus* sp.	(=KA0130, KA 0131, KA 0135)
KA2007-129	Host Search	(20° 53' 34" N,156° 27' 00" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Chamaesyce hirta*	
KA2007-133	Host Search	(20° 53' 35" N,156° 26' 59" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Gossypium tomentosum* (Mao)	
KA2007-136	Host Search	(20° 53' 44" N,156° 26' 27" W)		22 Sep 2006	Industrial/mixed ornamentals	*Psidium* sp. (Guava)	
KA2007-137	Host Search	(20° 53' 33" N,156° 26' 49" W)		22 Sep 2006	Ruderal, mixed ornamentals.	*Hibiscus* sp.	
KA2007-138	Host Search	(20° 53' 33" N,156° 26' 49" W)		22 Sep 2006	Ruderal, mixed ornamentals.	Abutilon menziesii	
KA2007-139	Host Search	(20° 53' 33" N,156° 26' 49" W)		22 Sep 2006	Ruderal, mixed ornamentals.	*Chamaesyce* sp.	
KA2007-140	Host Search	(20° 53' 33" N,156° 26' 48" W)		22 Sep 2006	Ruderal, mixed ornamentals.	*Pouteria sandwicensis*	
KA2007-141	Host Search	(20° 53' 45" N,156° 26' 38" W)		22 Sep 2006	Industrial/mixed ornamentals	*Ipomoea indica*	
KA2007-145	Host Search	(20° 53' 48" N,156° 27' 24" W)		21 Sep 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Cynodon dactylon*	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KA2007-146	Host Search	(20° 53' 34" N,156° 27' 02" W)		21 Jul 2006	Industrial, buildings	*Citrus* sp.	
KA2007-147	Sticky Trap	(20° 53' 59" N,156° 25' 43" W)	F. Starr & K. Starr	28 Aug 2006-18 Nov 2006	Wind-sheared dune vegetation	*Leucaena leucocephala*, bait: fruit	ATC tower W side
KA2007-148	General	(20° 54' 26" N,156° 25' 50" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou	18 Sep 2006	Keawe/koa haole/mixed understory woodland	General: grass	Near malaise trap
KA2007-149	Sticky Trap	(20° 53' 35" N,156° 26' 59" W)	F. Starr & K. Starr	28 Aug 2006-18 Nov 2006	Irrigated ornamental plantings and lawns	*Citrus* sp., bait: fruit	HDOA station
KA2007-150	Host Search	(20° 53' 33" N,156° 26' 59" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Chrysalidocarpus lutescens* (Areca palm)	
KA2007-151	Host Search	(20° 53' 33" N,156° 26' 59" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Schefflera actinop*hylla	
KA2007-152	Host Search	(20° 53' 35" N,156° 26' 59" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Hibiscus clayi*	
KA2007-153	Host Search	(20° 53' 35" N,156° 26' 59" W)		21 Sep 2006	Irrigated ornamental plantings and lawns	*Hibiscus rosa sinensis*	
KA2007-154	Host Search	(20° 53' 35" N,156° 26' 59" W)		29 Sep 2006	Irrigated ornamental plantings and lawns	*Ophiopogon japonicus* (Mondo grass)	
KA2007-155	Sticky Trap	(20° 53' 59" N,156° 25' 43" W)		28 Aug 2006-18 Nov 2006	Wind-sheared dune vegetation	*Leucaena leucocephala*, bait: spam	
KA2007-157	Malaise Trap	(20° 54' 26" N,156° 25' 50" W)		18 Sep 2006-21 Oct 2006	Keawe/koa haole/mixed understory woodland	NA	
KA2007-158	Lingren Funnels (Beetle Trap)	(20° 54' 26" N,156° 25' 50" W)	F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich	18 Sep 2006-21 Oct 2006	Keawe/koa haole/mixed understory woodland	NA	
KA2007-159	Window Trap	(20° 54' 26" N,156° 25' 50" W)	F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich	21 Oct 2006-13 Nov 2006	Keawe/koa haole/mixed understory woodland	NA	
KA2007-168	MV Bulb	(20° 53' 48" N,156° 27' 22" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & H. Laederich	14 Nov 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	NA	Kanaha Pond Reserve
KA2007-169	MV Bulb	(20° 54' 26" N,156° 26' 01" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	16 Nov 2006	Keawe/ironwood/mixed understory woodland	NA	
KA2007-170	MV Bulb	(20° 53' 49" N,156° 26' 58" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	17 Nov 2006	Keawe/mixed understory woodland	NA	Behind T-shirt factory
KA2007-171	Malaise Trap	(20° 54' 26" N,156° 25' 50" W)	F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich	21 Oct 2006-13 Nov 2006	Keawe/koa haole/mixed understory woodland	NA	

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StationNum	**Method**	**Loc**	**Collectors**	**Coll. Date**	**Habitat**	**Host**	**Comments**
KA2007-172	Lingren Funnels (Beetle Trap)	(20° 54' 26" N,156° 25' 50" W)	F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich	21 Oct 2006-13 Nov 2006	Keawe/koa haole/mixed understory woodland	NA	
KA2007-192	Gas Aspirator	(20° 54' 28.5" N,156° 25'24.5" W)	F.G. Howarth, D.J. Preston, H. Laederich, F. Starr & K. Starr	20 Jul 2006	-	-	East end of runway
KA2007-210	Sifting Soil and Leaf Litter	(20° 54' 39" N,156° 25' 34" W)		14 Nov 2006	Wind-sheared dune vegetation	soil/litter below *Chenopodium oahuense*	
KA2007-211	Sifting Soil and Leaf Litter	(20° 54' 34" N,156° 25' 39" W)	F.G. Howarth & D.J. Preston	14 Nov 2006	Wind-sheared dune vegetation	Soil/litter below *Nicotiana glauca*	
KA2007-212	Sifting Soil and Leaf Litter	(20° 54' 46" N,156° 25' 36" W)		14 Nov 2006	Beach strand and wind-sheared dune vegetation	Soil/litter below wood chip pile	
KA2007-213	General	(20° 54' 28" N,156° 26' 05" W)	F.W. Howarth et al.	16 Nov 2006	Keawe/ironwood/mixed understory woodland	On web on ironwood, *Causurina*	Airplane crash site
KA2007-216	Sweep Net	(20° 53' 55" N,156° 26' 56" W)		16 Nov 2006	Keawe/mixed understory woodland	*Pluchea* sp.	
KA2007-217	Fogging	(20° 54' 30" N,156° 25' 51" W)		16 Nov 2006	*Bacopa* dominated wetland, keawe/mixed understory	*Pluchea* sp. (small leaf)	
KA2007-218	Sweep Net	(20° 54' 29" N,156° 25' 52" W)		16 Nov 2006	Bacopa dominated wetland, keawe/mixed understory	Over puddles	
KA2007-220	Gas Aspirator	(20° 53' 50" N,156° 27' 20" W)		14 Nov 2006	Keawe/mixed understory woodland	General	Kanaha Pond Reserve; coordinates approximate
KA2007-221	Gas Aspirator	(20° 53' 50" N,156° 26' 55" W)	F.G. Howarth, F. Starr, K. Starr, D.J. Preston & H. Laederich	17 Nov 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	*Atriplex* sp.	Triangle E of Kanaha Pond by canal =KA2007-223
KA2007-222	Gas Aspirator	(20° 53' 54" N,156° 26' 57" W)		17 Nov 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Pluchea* x *Fosbergii*	Near Kanaha Pond Res drainage canal
KA2007-224	Gas Aspirator	(20° 53' 50" N,156° 26' 54" W)		17 Nov 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Abutilon grandifolium*	
KA2007-225	Gas Aspirator	(20° 53' 50" N,156° 26' 55" W)		17 Nov 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	*Pluchea indica*	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KA2007-227	General	(20° 53' 50" N,156° 26' 54" W)		17 Nov 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	General: grasses	
KA2007-228	Gas Aspirator	(20° 54' 45" N,156° 25' 35" W)		14 Nov 2006	Wind-sheared dune vegetation, beach strand	Beach	
KA2007-229	Gas Aspirator	(20° 54' 39" N,156° 25' 34" W)		20 Jul 2006	Wind-sheared dune vegetation	*Chenopodium oahuense*	
KA2007-230	Host Search	(20° 53' 50" N,156° 26' 54" W)		17 Nov 2006	Wetland, mixed native/ keawe/mixed alien understory woodland	*Prosopis pallida* (Keawe)	
KA2007-231	Gas Aspirator	(20° 53' 11" N,156° 26' 52" W)		14 Nov 2006	Ruderal,old fallow field near canal	General	Old fallow field near canal
KA2007-232	Gas Aspirator	(20° 53' 40" N,156° 27' 20" W)		14 Nov 2006	Ruderal, keawe/mixed understory woodland	General	
KA2007-233	Gas Aspirator	(20° 54' 40" N,156° 25' 34" W)		20 Jul 2006	Wind-sheared dune vegetation	*Leucaena leucocephala*	
KA2007-242	Gas Aspirator	(20° 53' 02" N,156° 26' 42" W)		14 Nov 2006	Ruderal, roadside	General	
KA2007-245	Gas Aspirator	(20° 53' 30" N,156° 26' 51" W)		14 Nov 2006	Ruderal, mixed ornamentals	General	
KA2007-247	Gas Aspirator	(20° 54' 46" N,156° 25' 35" W)		14 Nov 2006	Wind-sheared dune vegetation, beach strand	*Cenchrus ciliaris* (buffel grass)	
KA2007-250	Gas Aspirator	(20° 54' 46" N,156° 25' 35" W)		14 Nov 2006	Wind-sheared dune vegetation, beach strand	*Tournefortia argentea*	
KA2007-251	Gas Aspirator	(20° 54' 46" N,156° 25' 35" W)		14 Nov 2006	Wind-sheared dune vegetation, beach strand	*Leucaena leucocephala*	
KA2007-252	Gas Aspirator	(20° 53' 50" N,156° 26' 54" W)		17 Jul 2006	Wetland, mixed native/ keawe/ mixed alien understory woodland	*Verbesina* sp.	
KA2007-256	Sticky Trap	(20° 53' 42" N,156° 26' 00" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Koa haole dominated scrub	*Prosopis pallida*, bait: fruit	
KA2007-258	Sticky Trap	(20° 53' 35" N,156° 26' 59" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Irrigated ornamental plantings and lawns	*Gossypium tom*entosum , bait: fruit	
KA2007-259	Sticky Trap	(20° 53' 35" N,156° 26' 59" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Irrigated ornamental plantings and lawns	*Plumeria rubra*, bait: fruit	Date recorded as "28 August 06 should be 28 Aug to 18 Nov.06.

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StationNum	**Method**	**Loc**	**Collectors**	**Coll. Date**	**Habitat**	**Host**	**Comments**
KA2007-261	Sticky Trap	(20° 53' 57" N,156° 27' 17" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Beach strand and keawe/mixed understory woodland	*Scaevola tacada*, bait: fruit	
KA2007-263	Sticky Trap	(20° 54' 05" N,156° 26' 40" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Beach strand and keawe/mixed understory woodland	*Schinus terebinthifolius*, bait: fruit	
KA2007-264	Sticky Trap	(20° 54' 17" N,156° 26' 17" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Wetland dominated by *Bacopa*	*Prosopis pallida*, bait: fruit	(= KA 0274)
KA2007-265	Sticky Trap	(20° 54' 21" N,156° 26' 17" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Beach strand and keawe/mixed understory woodland	*Pluchea* sp., bait: fruit	(= KA 0275)
KA2007-266	Sticky Trap	(20° 54' 02" N,156° 26' 36" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Keawe/mixed understory woodland	*Ricinus communis*, bait: fruit	(= KA 0276)
KA2007-267	Sticky Trap	(20° 54' 00" N,156° 26' 41" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Keawe/mixed understory woodland	*Leucaena leucocephala*, bait: fruit	Date recorded as "28 August 06". (= KA 0277)
KA2007-268	Sticky Trap	(20° 53' 53" N,156° 26' 46" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Keawe/mixed understory woodland	*Ricinus communis,* bait: fruit	(= KA 0278)
KA2007-269	Sticky Trap	(20° 53' 55" N,156° 26' 51" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Beach strand and keawe/mixed understory woodland	*Prosopis pallida*, bait: fruit	
KA2007-270	Sticky Trap	(20° 53' 37" N,156° 26' 46" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Ruderal, keawe/mixed understory woodland	*Leucaena leucocephala*, bait: fruit	
KA2007-271	Sticky Trap	(20° 53' 37" N,156° 26' 46" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Ruderal, keawe/mixed understory woodland	*Erythrina crista-galli*, bait: fruit	
KA2007-272	Sticky Trap	(20° 53' 46" N,156° 26' 39" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Ruderal, mixed ornamentals.	*Leucaena leucocephala*, bait: fruit	
KA2007-273	Sticky Trap	(20° 54' 06" N,156° 26' 41" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Beach strand and keawe/mixed understory woodland	*Schinus terebinthifolius*, bait: fruit	
KA2007-279	Sticky Trap	(20° 54' 23" N,156° 25' 58" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Ruderal, keawe/mixed understory woodland	AOA, in culvert to wetland 2	
KA2007-280	Sticky Trap	(20° 54' 24" N,156° 25' 35" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Ruderal, mixed ornamentals.	AOA, in *Leucaena leucocephala*, shrub land	
KA2007-285	Sticky Trap	(20° 53' 57" N,156° 27' 17" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Beach strand and keawe/mixed understory woodland	*Scaevola tacada* bait: spam	
KA2007-286	Sticky Trap	(20° 54' 01" N,156° 26' 51" W)	F. Starr, K. Starr & D.J. Preston	28 Aug 2006-18 Nov 2006	Beach strand and keawe/mixed understory woodland	*Pluchea* sp., bait: spam	

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StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KA2007-287	Fogging	(20° 54' 16" N,156° 26'16" N)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	18 Jul 2006	Wetland dominated by *Bacopa*	Hibiscus hedge	
KA2007-289	General	(20° 54' 20" N,156° 26' 07" W)	F.W. Howarth & D.J. Preston	13 Nov 2006	On Road.	Dead Toad.	AOA
KA2007-290	Gas Aspirator	(20° 54' 46" N,156° 25' 32" W)		14 Nov 2006	Wind-sheared dune vegetation, beach strand.	*Hibiscus tiliaceus*	Sprecklesville
KA2007-293	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich	19 Nov 2006	-	-	HDOA grounds
KA2007-297	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth	24 Jul 2006	Irrigated ornamental plantings and lawns,	-	HDOA grounds; on outside wall at night light
KA2007-300	General	(20° 54' 46" N,156° 25' 35" W)	F.G. Howarth, H. laederich, D.J. Preston, K. Starr & F. Starr	14 Nov 2006	Wind-sheared shrubland	*Asystasia*	Sprecklesville
KA2007-301	Gas Aspirator	(20° 54' 46" N,156° 25' 35" W)	F. Starr, K. Starr, D.J. Preston & F.G. Howarth	14 Nov 2006	Wind-sheared dune vegetation	*Vitex trifolia*	Sprecklesville
KA2007-302	General	(20° 53' 48" N,156° 27' 22" W)	F.G. Howarth & D.J. Preston	14 Nov 2006	Wetland, mixed native/keawe/mixed alien understory woodland	-	On webs near MV site
KM2003-1	Gas Aspirator	(20° 54' 26" N,156° 25' 50" W)	D.J. Preston & F.G. Howarth	26 Jun 2003	Keawe woodland	*Prosopis pallida, Chenopodium oahuense, Pluchea,* low weeds, grasses, etc.	
KM2003-2	Gas Aspirator	(20° 54' 33" N,156° 25' 40" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Starr	26 Jun 2003	Wet Spot #3.	*Heliotropium-Sesuvium* assoc.	Near East End of runway; bare ground and weeds
KM2003-3	Gas Aspirator	(20° 54' 38" N,156° 25' 36" W)		26 Jun 2003	Native shrub-land, day time	*Panicum maximum*	
KM2003-4	Gas Aspirator	(20° 54' 38.5" N,156° 25' 37" W)	F.G. Howarth et al.	26 Jun 2003	Native shrub-land, day time	*Leucana leucocephala*	
KM2003-5	Gas Aspirator	(20° 54' 39" N,156° 25' 33" W)		26 Jun 2003	Dry shrubland	*Chenopodium oahuense*	
KM2003-6	Gas Aspirator	(20° 54' 39" N,156° 25' 34" W)		26 Jun 2003	Native shrub-land, day time	*Chenopodium oahuense*	
KM2003-7	Gas Aspirator	(20° 53' 56" N,156° 27' 11" W)		25 Aug 2003	Kanaha Pond Reserve	*Pluchea odorata*	
KM2003-8	Gas Aspirator	(20° 53' 56" N,156° 27' 16" W)		25 Aug 2003	Kanaha Pond Reserve	*Dodonaea viscosa*	
KM2003-9	Gas Aspirator	(20° 53' 56" N,156° 27' 13" W)		25 Aug 2003	Kanaha Pond Reserve	*Chenopodium*	
KM2003-10	Gas Aspirator	(20° 53' 57" N,156° 27' 14" W)		25 Aug 2003	Kanaha Pond Reserve	*Myoporum*	

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KM2003-11	Gas Aspirator	(20° 53' 46" N,156° 27' 28" W)		27 Aug 2003	Kanaha Pond Reserve	*Sporobolus*	
KM2003-12	Gas Aspirator	(20° 54' 03" N,156° 25' 42" W)		27 Aug 2003	Grass nr. control tower	Short grass	Near control tower
KM2003-13	Gas Aspirator	(20° 54' 07" N,156° 25' 42" W)		27 Aug 2003	Industrial/ornamental	Planted Wiliwili	
KM2003-14	Gas Aspirator	(20° 54' 13" N,156° 26' 16" W)	F.G. Howarth, F. Starr, K. Starr, R. Englund, D.J. Preston & J.E. Dockall	28 Aug 2003	Wet spot # 1	Sedges and grass	Fence line near Wetland # 1
KM2003-15	Gas Aspirator	(20° 54' 23" N,156° 26' 11" W)		28 Aug 2003	Kanaha Beach wet spot nr. Ocean	Sedges and grass, salinity = 4 ppt	
KM2003-16	Gas Aspirator	(20° 54' 25" N,156° 26' 11" W)	F.G. Howarth & D.J. Preston	28 Aug 2003	Littoral	Seaweed, exposed beach sand and rocks	Coast east of Kanaha Beach
KM2003-17	Host Search	(20° 53' 36" N,156° 26' 38" W)		24 Jun 2003	Keawe woodland	*Ficus microcarpa*	
KM2003-18	Host Search	(20° 54' 17" N,156° 26' 09" W)		25 Jun 2003	Industrial, ruderal, AOA Test Burn Site	*Boerhavia*, roadside weeds	
KM2003-19	Host Search	(20° 54' 39" N,156° 25' 34" W)		26 Jun 2003	Native shrub-land, day time	*Chenopodium oahuense*	
KM2003-20	Host Search	(20° 54' 42" N,156° 25' 29" W)		26 Jun 2003	Native shrub-land, day time	*Vigna marina*	
KM2003-21	Host Search	(20° 54' 42" N,156° 25' 29" W)		26 Jun 2003	Native shrub-land, day time	*Scaevola tacada*	East end of runway
KM2003-22	Host Search	(20° 54' 42" N,156° 25' 29" W)		26 Jun 2003	Native shrub-land, day time	*Ipomoea indica*	
KM2003-23	Host Search	(20° 54' 23" N,156° 26' 16" W)	F.G. Howarth, J.E. Dockall, F. Starr & K. Starr	26 Jul 2003	Keawe woodland, grass	*Panicum maximum*	
KM2003-24	Host Search	(20° 53' 30" N,156° 27' 29" W)		24 Aug 2003	Kanaha Pond Reserve	*Pandanus*	
KM2003-25	Host Search	(20° 53' 44" N,156° 26' 46" W)	F.G. Howarth, K. Starr & F. Starr	24 Aug 2003	Ornamental planting	Ornamental Erythrina	
KM2003-26	Host Search	(20° 53' 45" N,156° 26' 46" W)		24 Aug 2003	Weedy shrubland	*Ricinus*	
KM2003-27	Host Search	(20° 53' 50" N,156° 27' 22" W)	F.G. Howarth, D.J. Preston, R.E. Englund & J.E. Dockall	26 Aug 2003	Kanaha Pond Reserve	Keawe	
KM2003-28	Host Search	(20° 53' 49" N,156° 27' 28" W)		27 Aug 2003	Kanaha Pond Reserve	Coconut	
KM2003-29	Host Search	(20° 53' 35" N,156° 26' 59" W)		28 Aug 2003	Ornamental, industrial	Ornamental bromeliad	
KM2003-30	Host Search	(20° 53' 32" N,156° 27' 01" W)		28 Aug 2003	Ornamental, industrial	Coconut	
KM2003-31	Host Search	(20° 53' 56" N,156° 26' 39" W)		28 Aug 2003	Ornamental, industrial	Oleander	

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KM2003-32	Bait Trap	(20° 53' 37" N,156° 26' 36" W)		28 Jun 2003-30 Aug 2003	Keawe woodland	Bleu cheese bait, Keawe, *Leucaena*, grass (*Cenchrus*)	Bait Trap #1
KM2003-33	Bait Trap	(20° 53' 36" N,156° 26' 36" W)		28 Jun 2003-25 Jul 2003	Keawe woodland	Bleu cheese bait, Keawe, *Leucaena*, grass (*Cenchrus*)	Bait Trap #2
KM2003-34	Bait Trap	(20° 53' 37" N,156° 26' 37" W)		28 Jun 2003-30 Aug 2003	Keawe woodland	Bleu cheese bait, Keawe, *Leucaena*, grass (*Cenchrus*)	Bait Trap #3
KM2003-35A	Malaise Trap	(20° 54' 26" N,156° 25' 50" W)	F. Starr, K. Starr, F.G. Howarth & D.J. Preston	25 Jun 2003-18 Jul 2003	Keawe woodland	*Prosopis pallida, Chenopodium oahuense, Pluchea*, low weeds, grasses, etc.	
KM2003-35B	Malaise Trap	(20° 54' 26" N,156° 25' 50" W)	F. Starr, K. Starr, F.G. Howarth & D.J. Preston	18 Jul 2003-24 Aug 2003	Keawe woodland,*Prosopis pallida,Chenopodium oahuense, Pluchea,* low weeds, grasses, etc.	-	AOA; Malaise site
KM2003-35C	Malaise Trap	(20° 54' 26" N,156° 25' 50" W)		24 Aug 2003-25 Sep 2003	Keawe woodland,*Prosopis pallida,Chenopodium oahuense, Pluchea,* low weeds, grasses, etc.	-	AOA; Malaise site
KM2003-36	MV Bulb	(20° 53' 37" N,156° 26' 39" W)	F.G. Howarth, K. Starr, F. Starr & D.J. Preston	24 Jun 2003	Keawe woodland	*Prosopis pallida, Pluchea*, low weeds, grasses	Near Aalele St.;
KM2003-37	MV Bulb	(20° 53' 56.5" N,156° 26' 52.5" W)	F.G. Howarth, D.J. Preston, K. Starr, F. Starr & J.E. Dockall	26 Jun 2003	Ruderal, wetland margin	Grass, ruderal, keawe	(=KM-0081)
KM2003-38	MV Bulb	(20° 54' 23" N,156° 26' 12" W)	F.G. Howarth, K. Starr & F. Starr	24 Jul 2003	Wetland 1, near beach	*Causurina*, sedges, grass	
KM2003-39	MV Bulb	(20° 53' 52" N,156° 26' 52" W)	F.G. Howarth, F. Starr & K. Starr	26 Jul 2003	Kanaha Pond Reserve, Keawe woodland	Keawe woodland, *Leucaena, Pluchea,* etc.	
KM2003-40	MV Bulb	(20° 53' 43" N,156° 27' 06" W)	F.G. Howarth, F. Starr, K. Starr & J.E. Dockall	23 Aug 2003	Kanaha Pond Reserve, Keawe woodland	*Keawe, Sporobolus, Pluchea, Sesuvium*	Kanaha Pond Reserve
KM2003-41	MV Bulb	(20° 53' 52" N,156° 27' 15" W)	F.G. Howarth, F. Starr, K. Starr, D.J. Preston, R.E. Englund & J.E. Dockall	25 Aug 2003	Kanaha Pond Reserve, Keawe woodland	Keawe/Grass	
KM2003-42	MV Bulb	(20° 53' 50" N,156° 27' 20" W)	F.G. Howarth, F. Starr, K. Starr, D.J. Preston, R.E. Englund & J.E. Dockall	26 Aug 2003	Kanaha Pond Reserve	Keawe/grass	Kanaha Pond
KM2003-43	Beating Sheet	(20° 54' 39" N,156° 25' 34" W)		26 Jun 2003	Native shrub-land, day time	*Chenopodium oahuense*	
KM2003-44	Beating Sheet	(20° 53' 56" N,156° 27' 15" W)		27 Jun 2003	Kanaha Pond Reserve, day time	*Chenopodium oahuense*	

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KM2003-45	Beating Sheet	(20° 54' 30" N,156° 25' 53" W)		24 Jul 2003	Nr wetspot 3, mixed ornamental forest	*Thespesia populnera*	
KM2003-46	General	(20° 53' 37" N,156° 26' 38" W)		24 Jun 2003	Keawe woodland	*Prosopis pallida, Pluchea*, low weeds, grasses	
KM2003-47	General	(20° 53' 37" N,156° 26' 39" W)		24 Jun 2003	Keawe woodland	*Prosopis pallida, Pluchea*, low weeds, grasses	
KM2003-48	General	(20° 54' 26" N,156° 25' 50" W)		25 Jun 2003	Keawe woodland	*Prosopis pallida, Chenopodium*	
KM2003-49	General	(20° 54' 26" N,156° 25' 51" W)	F.G. Howarth	25 Jun 2003	Ruderal	Bare ground	
KM2003-50	General	(20° 53' 56" N,156° 26' 52" W)	F.G. Howarth & D.J. Preston	26 Jun 2003	Keawe woodland	Keawe trunks at night	General KM-0050
KM2003-51	General	(20° 53' 35" N,156° 26' 59" W)		28 Jun 2003	Industrial	HDOA, building walls	
KM2003-52	General	(20° 53' 35" N,156° 27' 00" W)		28 Jun 2003	Industrial	Lights at HDOA	
KM2003-53	General	(20° 53' 39" N,156° 26' 40" W)	G.G. Howarth, F. Starr, K. Starr & J.E. Dockall	25 Jul 2003	Keawe woodland	In abandoned concrete bunker	A`alele dump area
KM2003-54	General	(20° 53' 44" N,156° 27' 00" W)	F.G. Howarth & J.E. Dockall	25 Jul 2003	Keawe forest	Open ground, ant hill	Triangle area behind t-shirt factory
KM2003-55	General	(20° 53' 52" N,156° 26' 52" W)		26 Jul 2003	Kanaha Pond Reserve, keawe woodland	Keawe woodland, *Leucaena*, *Pluchea*, etc.	
KM2003-56	General	(20° 54' 24" N,156° 25' 54" W)	F.G. Howarth, F. Starr & K. Starr	24 Aug 2003	Bare ground	Under stones, near wetspot	
KM2003-57	General	(20° 53' 37" N,156° 26' 38" W)		27 Aug 2003	Dump site	Green waste	
KM2003-58	General	(20° 53' 35" N,156° 27' 03" W)		28 Aug 2003	Ornamental	Red hibiscus	
KM2003-59	General	(20° 53' 36" N,156° 26' 59" W)		28 Aug 2003	Ornamental, industrial	Ornamental citrus, building walls	
KM2003-60	Sweep Net	(20° 53' 58" N,156° 26' 56" W)		25 Jul 2003	Ruderal, Kanaha Pond Reserve	*Atriplex* sp.	
KM2003-61	Sweep Net	(20° 53' 52" N,156° 26' 52" W)		26 Jul 2003	Kanaha Pond Reserve, keawe woodland	Keawe, *Panicum maximum*, *Chenopodium, Pluchea*	
KM2003-62	Sweep Net	(20° 53' 58" N,156° 26' 56" W)	F.G. Howarth, J.E. Dockall, F. Starr & K. Starr	26 Jul 2003	Ruderal, Kanaha Pond Reserve	*Atriplex* sp.	Kanaha Pond Reserve
KM2003-63	Sweep Net	(20° 54' 13" N,156° 26' 17" W)		24 Aug 2003	Wetland 1	*Chenopodium*	
KM2003-64	Sweep Net	(20° 54' 13" N,156° 26' 17" W)		24 Aug 2003	Wetland 1	Sedges	
KM2003-65	Sweep Net	(20° 53' 47" N,156° 27' 11" W)		26 Aug 2003	Kanaha Pond Reserve	Pond surface (*Batis*)	
KM2003-66	Sweep Net	(20° 53' 47" N,156° 27' 13" W)		26 Aug 2003	Kanaha Pond Reserve	Pond surface (*Batis*)	

Master Station List

StationNum	Method	Loc	Collectors	Coll. Date	Habitat	Host	Comments
KM2003-67	Sweep Net	(20° 53' 48" N,156° 27' 17" W)		26 Aug 2003	Kanaha Pond Reserve	Hypersaline sidepond (100 ppt salinity)	
KM2003-68	Sweep Net	(20° 54' 23" N,156° 26' 11" W)	F.G. Howarth, D.J. Preston & R.A. Englund	28 Aug 2003	Wetland 1, near beach	Wetland margin: sedges, grass	
KM2003-69	Sifting Litter	(20° 54' 24" N,156° 26' 12" W)	F.G. Howarth, F. Starr & K. Starr	24 Jul 2003	Wetland 1, near beach	*Causurina* litter	(= KM-0087)
KM2003-70	Fogging	(20° 54' 25" N,156° 26' 11" W)		24 Jul 2003	Beach strand	Blooming *Messerschmittea*	
KM2003-71	Fogging	(20° 54' 25" N,156° 26' 11" W)		24 Jul 2003	Beach strand	*Causurina*	
KM2003-72	Fogging	(20° 54' 30" N,156° 25' 53" W)	F.G. Howarth, F. Starr & K. Starr	24 Jul 2003	Near wetspot 3, mixed ornamental tree species	Date palm and Hau	
KM2003-73	Dip Net	(20° 53' 45" N,156° 27' 28" W)	D.J. Preston & J.E. Dockall	27 Jun 2003	Kanaha Pond Reserve,	Aquatic, in pool	
KM2003-74	Sweep Net	(20° 54' 25" N,156° 26' 12" W)	D.J. Preston & F.G. Howarth	24 Jul 2003	Wetspot #1 near beach.	-	
KM2003-75	Gas Aspirator	(20° 54' 37" N,156° 25' 28" W)	F.G. Howarth & D.J. Preston	26 Jun 2003	-	*Cynodon dactylon*	East end of runway; coordinates approximate
KM2003-77	General	(20° 53' 35" N,156° 26' 59" W)	F.G. Howarth, D.J. Preston, F. Starr, K. Starr & R.A. Englund	23 Aug 2003-30 Aug 2003	-	-	HDOA building
KM2003-78	General	(20° 53' 35" N,156° 26' 58" W)	F.G. Howarth, D.J. Preston, F. Starr & K. Starr	28 Jun 2003-29 Jun 2003	-	-	HDOA grounds
KM2003-79	Sifting Litter	20° 53' 37" N,156° 26' 39" W)	F.G. Howarth & D.J. Preston	24 Jun 2003	-	Leaf litter; Fabaceae	MV site
KM2003-80	Gas Aspirator	(20°54' 39" N,156°25' 34" W)	F.G. Howarth	25 Jun 2003	Native & alien shrubland	*Chenoppodium*	East end of runway
KM2003-82	Gas Aspirator	(20° 54' 26" N,156° 25' 50" W)	F.G. Howarth & D.J. Preston	26 Jun 2003	-	Pluchea	Malaise Trap site
KM2003-83	General	(20° 54' 26" N,156° 25' 50" W)	F.G. Howarth, F. Starr, K. Starr & J.E. Dockall	26 Jul 2003	Keawe woodland,*Prosopis pallida,Chenopodium oahuense, Pluchea*, low weeds, grasses, etc.	On keawe trunks	Malaise trap site
KM2003-84	Malaise Trap	(20° 54' 26" N,156° 25' 50" W)	F.G. Howarth, F. Starr & K. Starr	7 Jul 2003-18 Jul 2003	Keawe woodland; *Prosopis pallida,Chenopodium oahuense, Pluchea,* low weeds, grasses, etc.	-	
KM2003-85	General	(20°54' 25" N,156° 25' 58" W)	F.G. Howarth, F. Starr & K. Starr	24 Jul 2003	By water	-	Near wetspot #2
KM2003-86	General	(20° 53' 36" N,156° 27' 00" W)	F.G. Howarth & D.J. Preston	29 Jun 2003	Wetspot beneath air conditioner vent	-	HDOA grounds

Master Station List							
StationNum	**Method**	**Loc**	**Collectors**	**Coll. Date**	**Habitat**	**Host**	**Comments**
KM2003-88	Host Search	(20° 54' 26" N,156° 25' 54" W)	F.G. Howarth	24 Jun 2003	*Macroptileum atropurpureum*	-	
KM2003-90	General	(20° 53' 35" N,156° 27' 00" W)	F.G. Howarth, F. Starr, K. Starr & J.E. Dockall	25 Jul 2003	-	-	HDOA building, inside laboratory
KM2003-91	Host Search	(20° 54' 04" N,156° 26' 38" W)	D.J. Preston & F.G. Howarth	28 Aug 2003	Keawe forest	Keawe	
KM2003-92	Host Search	(20° 53' 52" N,156° 26' 20" W)	F.G. Howarth & D.J. Preston	23 Aug 2003	Indoor ornamental	Potted palm	Terminal building

Collection data originally presented in the following reports:

Howarth, F.G.& D.J. Preston. 2002. Kahului Airport Arthropod Baseline Survey, Final report submitted to E.K. Noda & Assoc., Inc. Honolulu. Hawaii Biological Survey. 91 p. Available on line at http://hbs.bishopmuseum.org/pdf/kahului-r.pdf

Howarth, F.G. & D.J. Preston. 2006. Monitoring for Arthropods (insects and relatives) occurring within the Kahului Airport environs, Maui, Hawaii. Final Report submitted to Edward K. Noda & Associates, Inc., 615 Piikoi Street, Suite 300, Honolulu, Hawaii 96814-3139, and the State of Hawaii, Department of Transportation, Airports Division. Hawaiian Biological Survey. 90 pp.

Howarth, F.G. & D.J. Preston. 2007. Monitoring for Arthropods (insects and relatives) occurring within the Kahului Airport environs, Maui, Hawaii, Phase II. Final Report submitted to Edward K. Noda & Associates, Inc., 615 Piikoi Street, Suite 300, Honolulu, Hawaii 96814, and the State of Hawaii, Department of Transportation, Airports Division. Hawaiian Biological Survey. 108 pp. Available on line at http://hbs.bishopmuseum.org/publications/pdf/kahului-II.pdf

APPENDIX II

COLLECTING METHODS: DESCRIPTIONS, SITE DATA TABLES, AND LOCATION MAPS

Gas Aspirator

Gas aspirator in operation
Photo by D.J. Preston, 2006

The principal method used was a gasoline-powered aspirator (vacuum pump), as this proved to be highly effective for sampling arthropods. The aspirator was worn as a backpack. We modified a commercially available model by fitting a 5-foot (1.5-m) long by 5-inch (12.7-cm) diameter PVC pipe, to the intake tube. The pipe opening was fitted with an internal sock of fine mesh screen netting, which was held in place with rubber bands. As the pipe was moved through and over vegetation and other suitable substrates, arthropods were vacuumed into the net along with debris. Each sample consisted of a five to ten minute run over the chosen substrate. Most samples included a range of plant species and associated substrates within the area chosen, usually between about 25 to 50 square feet (2.3 – 4.6 m^2). Often the vegetation could be sampled while walking along trails or roadways. Where host abundance or luxuriance was sufficient, samples from a single host plant species were collected. Approximately 200 aspirator samples were collected and processed. These are listed in **Table II-1**, and their locations shown in **Figures II-1** and **II-2**. Most were taken during daytime, but several samples were collected at night. After collection, each sample was secured inside its net bag with a rubber band, sealed in an individual plastic bag with a label giving data on location, substrate, date and circumstances of collection. Samples were stored in a refrigerator until they could be processed. Samples were treated with a fumigant, and the arthropods sorted from the debris while still fresh with the aid of a 10 to 20 power binocular microscope. In this way, most specimens were retrieved and preserved in excellent condition for later identification. However, the method was too labor intensive to allow processing more than a few samples a day. A few groups had to be collected by other methods. These included fragile species (notably moths and butterflies) that were too damaged by the aspirator; sessile insects (such as scales and mealybugs) and those living inside the substrate that were not captured; and larger insects that could climb out of the net and escape during vacuuming. However, a surprising diversity of small wasps and flies came through the process in fine condition. Overall, we collected over 250 species using this method.

The gas aspirator has several advantages over other collecting methods. Importantly, the collections are relatively unbiased; that is, everything within its range is captured to be sorted later with the aid of a microscope. Also the efficiency is high and complements other methods because the hose can be placed over and even shoved into vegetation, including spiny plants, where nets and other devices cannot be used. A major disadvantage is that the substrate and sample must be dry, as moisture clumps the sample and ruins the specimens.

Table II-1a. Collection sites sampled for arthropods by gas aspirator within the Kahului Airport Environs between 4 August 1999 and 4 June 2000. Map datum is Old Hawaiian = NAD 27

GAS ASPIRATOR				
04 August 1999 to 04 June 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0001	04-Aug-99	20º 54' 07" N	156º 26' 33" W	Keawe forest, keawe and under-story shrubs
BL0002	04-Aug-99	20º 54' 07" N	156º 26' 34" W	near Kanaha Beach Park, 5m elev., keawe forest, keawe and under-story shrubs

Table II-1a. continued

Gas Aspirator 04 August 1999 to 04 June 2000 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0003A	05-Aug-99	20º 54' 38" N	156º 25' 22" W	Strand shrubland, heliotrope, *Scaevola*, etc.
BL0004A	05-Aug-99	20º 54' 37" N -20º 54' 41" N	156º 25' 21" W-156º 25' 22" W	Papaula Point, beach and strand, rocky shore; *Schinus, Ricinus*, etc.
BL0005	05-Aug-99	20º 54' 17" N -20º 54' 20" N	156º 26' 09" W-156º 26' 12" W	Roadside, *Schinus, Pluchea*, etc., Gas Aspirator #4
BL0005A	05-Aug-99	20º 54' 18" N	156º 26' 12" W	Near Kanaha Beach Park, mixed shrub, *Schinus, Pluchea*, etc.,Gas Aspirator #3
BL0006B	5-Aug-99	20º 54' 24" N	156º 26' 05" W	Dry shrubland-*Pluchea, Waltheria*, grass, etc. 3 samples
BL0007	05-Aug-99	20º 54' 28" N	156º 26' 07" W	Strand, *Paspalum*? grass, strand shrubs
BL0008	06-Aug-99	20º 54' 47" N	156º 25' 33" W	Beach, rocky shoreline.
BL0006D	08-Sep-99	20º 54' 24" N	156º 26' 05" W	Dry shrubland, *Cenchrus*
BL0009	08-Sep-99	20º 54'17" N -20º 54'20" N	156º 26' 09" W-156º 26' 12" W	Roadside and keawe, *Schinus* (Christmas berry), Site #5
BL0009A	08-Sep-99	20º 53' 58" N	156º 26' 38" W	Roadside and keawe, keawe, *Pluchea*, *Abutilon*, etc.
BL0010A	08-Sep-99	20º 54' 26" N	156º 26' 05" W	Dry shrubland, *Pluchea*
BL0011B	08-Sep-99	20º 54' 28" N	156º 26' 08" W	"Cook's Beach", coast and flotsam
BL0012	08-Sep-99	20º 54' 24" N	156º 26' 00" W	Wetland # 2 at night, *Sesuvium, Pluchea*, etc.
BL0013	08-Sep-99	20º 54' 24" N	156º 25' 59" W	Wetland # 2 at night, *Sesuvium, Pluchea*, etc.
BL0260	08-Sep-99	20º 54' 11" N	156º 26' 16" W	Wetland # 1, drainage ditch pan, Site #9
BL0261	08-Sep-99	20º 54' 39" N	156º 25' 33" W	E end of runway near bike path, *Chenopodium*, Site #13
BL0348	08-Sep-99	20º 54' 24" N	156º 26' 00" W	Wetland # 2, day time, *Sesuvium, Pluchea* etc.
BL0014	09-Sep-99	20º 54' 12" N	156º 26' 16" W	Wetland # 1, day, sedges and grass
BL0014A	09-Sep-99	20º 54' 12" N	156º 26' 16" W	Wetland # 1, at night, sedges and grass
BL0015	09-Sep-99	20º 54' 09" N	156º 26' 23" W	*Leucaena* shrubland, *Leucaena* and grass (*Cenchrus*), C2
BL0016	09-Sep-99	20º 54' 03" N	156º 26' 35" W	Keawe forest and lawn boundary, keawe, *Leucaena*, grass, herbs
BL0017	09-Sep-99	20º 54' 03" N	156º 26' 36" W	Hedge at night, *Leucaena* and vines
BL0018	09-Sep-99	20º 54' 02" N	156º 26' 36" W	Lawn at night, legume ground cover, grass and herbs
BL0235	10-Sep-99	20º 54'24" N	156º 26'00" W	*Chenopodium*, Site #12; sample #1
BL0209	11-Sep-99	20º 54' 22" N	156º 25' 56" W	*Leucaena* shrubland, *Leucaena, Pluchea, Cenchrus, Asystasia*, etc., Gas aspirator #2 at Malaise #1 site
BL0121	04-Oct-99	20º 53' 22" N	156º 26' 41" W	Dry shrubland, *Nicotiana, Cenchrus ciliarus, Leucaena*, barren, mixed weeds; sample 1
BL0122	04-Oct-99	20º 53' 20" N	156º 26' 48" W	Ruderal, *Nicotiana, Cenchrus, Saccharum, Ricinus*, etc., sample 2
BL0021	05-Oct-99	20º 53' 45" N	156º 26' 38" W	Hedge, *Hisbiscus* and lawn, sample D3
BL0022A	05-Oct-99	20º 53' 46" N	156º 26' 37" W	Ornamental plantings, lilies, hedge
BL0022	05-Oct-99	20º 53' 46" N	156º 26' 37" W	Terminal Rd., ornamental plantings, cycads, palms, hedge
BL0066	05-Oct-99	20º 53' 45" N	156º 26' 40" W	Ornamentals, UPS Road & Main drive., road edge, *Bougainvillea*, Gas Aspirator #1
BL0123	05-Oct-99	20º 53' 58" N	156º 26' 53" W	Keawe woodland, *Chenopodium*

Table II-1a. continued

Gas Aspirator 04 August 1999 to 04 June 2000 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0340	05-Oct-99	20º 54'13" N	156º 26'17" W	Wetland #1, drainage ditch, no standing water
BL0124	06-Oct-99	20º 53' 45.5" N	156º 26' 41" W	Dry shrubland, *Leucaena*, *Ricinus*, *Cenchrus*, Australian saltbush, *Ipomoea*, *Pulchea*, *Boerhavia*, *Bidens*
BL0125	06-Oct-99	20º 53' 45" N	156º 26' 40.5" W	Dry shrubland, *Leucaena*, *Ricinus*, *Cenchrus*, Australian salt bush, *Ipomoea*, *Pulchea*, *Boerhavia*, *Bidens*
BL0126	06-Oct-99	20º 53' 45" N	156º 26' 40" W	Dry shrubland, *Leucaena*, *Ricinus*, *Cenchrus*, Australian salt bush, *Ipomoea*, *Pulchea*, *Boerhavia*, *Bidens*
BL0023	07-Oct-99	20º 54' 39" N	156º 25' 33" W	Dry shrubland, *Chenopodium*
BL0024	07-Oct-99	20º 54' 34" N	156º 25' 40" W	E end of runway, Wetland # 3, *Pluchea*, *Hibiscus*, etc.
BL0025	07-Oct-99	20º 53' 46" N	156º 27' 24" W	Kanaha Res., dried mud, sedges, *Sesuvium*
BL0026	07-Oct-99	20º 53' 49" N	156º 27' 12" W	Kanaha Pond Res., dried mud and sedges
BL0027A	07-Oct-99	20º 53' 51" N	156º 27' 21" W	Kanaha Pond Res., *Sporobolus*, night
BL0028A	02-Nov-99	20º 53' 34" N -20º 53' 37" N	156º 26' 56" W 156º 27' 02" W	Lawn and ornamental plantings, *Cyanodon*, *Wedalia*, *Gossipium*, *Erythrina*, *Bougainvillea*, juniper, weeds and low herbs, 6 samples
BL0029	02-Nov-99	20º 53' 41" N	156º 26' 50" W	Ornamental plantings, at night, *Verbesina* lawn.
BL0029A	02-Nov-99	20º 53' 34" N- 20º 53' 37" N	156º 26' 56" W 156º 27' 02" W	Lawn and ornamental plantings, *Cyanodon*, *Wedalia*, *Gossipium*, *Erythrina*, *Bougainvillea*, juniper, weeds, and low herbs, 6 samples E1.
BL0030	02-Nov-99	20º 53' 34" N	156º 27' 04" W	Ornamental plantings, at night, *Thevetia*, *Wedalia*, *Cynodon*
BL0031	02-Nov-99	20º 53' 33" N	156º 27' 05" W	Ornamental plantings, at night, *Bougainvillea*, *Wedalia*, *Cyanodon*
BL0032	02-Nov-99	20º 53' 34" N	156º 27' 06" W	Ornamental plantings, roadside near HDOA, at night, *Bougainvillea*, *Cyanodon*, weeds
BL0033	03-Nov-99	20º 53' 54" N	156º 27' 06" W	Kanaha Res., *Chenopodium*, *Pluchea*, *Sesuvium*, grass, keawe
BL0034	03-Nov-99	20º 53' 51" N	156º 27' 05" W	Kanaha Res., *Sesuvium*, *Sporobolus*, *Pluchea*
BL0035A	03-Nov-99	20º 53' 42" N	156º 27' 05" W	Kanaha Res., ruderal with keawe, *Sporobolus*, *Sesuvium*
BL0127	03-Nov-99	20º 53' 56" N	156º 27' 16" W	Kanaha Res. at night, a'ali'i, *Scaevola*
BL0036	04-Nov-99	20º 53' 41" N	156º 27' 12" W	Kanaha Res., *Chenopodium*
BL0037	04-Nov-99	20º 53' 44" N	156º 27' 10" W	Kanaha Res., pond margin: sedges and mud cracks
BL0038	04-Nov-99	20º 53' 47" N	156º 27' 21" W	Kanaha Res., Sporobolus virginicus
BL0039	04-Nov-99	20º 53' 45" N	156º 27' 29" W	Kanaha Res., *Sesbanea tomentosa*
BL0040	04-Nov-99	20º 53' 40" N	156º 27' 23" W	Kanaha Res., *Bolboschoenus* sedge
BL0041	04-Nov-99	20º 53' 56" N	156º 27' 15" W	Kanaha Res. at night, *Myoporum* (naio)
BL0042A	04-Nov-99	20º 53' 56" N	156º 27' 16" W	Kanaha Res. at night, *Dodonaea* (a`ali`i)
BL0043	04-Nov-99	20º 53' 56" N	156º 27' 23" W	Kanaha Pond,Kanaha Res. at night, *Sporobolus*
BL0044	04-Nov-99	20º 53' 56" N	156º 27' 19" W	Kanaha Res. at night, *Scaevola*
BL0045	01-Dec-99	20º 53' 55" N	156º 25' 45" W	Leucaena scrub, *Leucaena*, *Ricinus*, *Panicum*, *Botriochloa*, *Melinus*, *Cenchrus*, etc.
BL0046	01-Dec-99	20º 54' 00" N	156º 25' 41" W	Lawn, *Cyanodon* & mixed grasses, *Senna*, *Wedalia* & weeds

Table II-1a. continued

Gas Aspirator 04 August 1999 to 04 June 2000 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0047	01-Dec-99	20º 54' 01" N	156º 25' 40" W	Tower Rd., sugar cane & ruderal, sugar cane and ground
BL0048A	01-Dec-99	20º 54' 14" N	156º 25' 40" W	Tower Rd., Leucaena scrub; *Leucaena, Ricinus, Cenchrus, Waltheria*, etc.
BL0042B	02-Dec-99	20º 53' 56" N	156º 27' 16" W	Kanaha Pond Res. at night, *Dodonaea*
BL0045A	02-Dec-99	20º 53' 55" N	156º 25' 45" W	Tower Rd, Leucaena scrub; *Leucaena, Ricinus, Panicum, Botriochloa, Melinus, Cenchrus*, etc.
BL0049	02-Dec-99	20º 53' 28" N	156º 26' 10" W	Ruderal & ornamentals, *Leucaena, Hibiscus*, palms, ground
BL0050A	02-Dec-99	20º 53' 54" N	156º 27' 24" W	Kanaha Pond Res. at night, *Scaevola, Sporobulus*, Gas Aspirator 1
BL0051	02-Dec-99	20º 53' 56" N	156º 27' 22" W	Kanaha Pond Res. at night, *Dodonaea*, Gas Aspirator 2
BL0052	02-Dec-99	20º 53' 56" N	156º 27' 18" W	Kanaha Pond Res. at night, *Myoporum*, Gas Aspirator 3
BL0095	02-Feb-00	20º 53' 10.5" N	156º 27' 08.5" W	Fallow cane field w/ ruderal borders, *Waltheria*
BL0096	02-Feb-00	20º 53' 09.5" N	156º 27' 09.6" W	Fallow cane field w/ ruderal boarders, *Pluchea*
BL0097	02-Feb-00	20º 53' 08" N	156º 27' 11" W	Fallow cane field w/ ruderal boarders, *Sida fallax*
BL0098	02-Feb-00	20º 53' 07" N?	156º 25' 10" W	Fallow cane field w/ ruderal borders, *Sida fallax*
BL0099	02-Feb-00	20º 53' 09.5" N- 20º 53' 12" N	156º 27' 12" W 156º 27' 10" W	Fallow cane field w/ ruderal boarders, *Nicotiana, Bidens, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Sida Portulaca, Leucaena*, etc.
BL0215A	03-Feb-00	20º 54' 23" N	156º 25' 54" W	Mixed shrubs, *Atriplex semibacata* = Australian salt bush, Gas Aspirator G12
BL0215E	03-Feb-00	20º 54' 23" N	156º 25' 54" W	Mixed shrubs, *Marisum javanicus*, in understory of *Pulchea odorata, Leucaena, Pulchea indica, Pulchea* hybrid, etc.
BL0215C	03-Feb-00	20º 54' 23" N	156º 25' 54" W	Mixed shrub, *Sesuvium portulacastrum*, G11
BL0215D	03-Feb-00	20º 54' 23" N	156º 25' 54" W	Mixed shrubs, *Pulchea indica, Atriplex semibacata, Soudnus, Solanum americanum, Chenopodium murale*
BL0215B	03-Feb-00	20º 54' 23" N	156º 25' 54" W	Bare pond bottom, dry pond pan w/a few sedges
BL0054	04-Feb-00	20º 54' 47" N	156º 25' 34" W	Beach at night, algae and rocks at low tide
BL0055	02-Mar-00	20º 53' 56" N	156º 26' 52" W	Kanaha drainage culvert, water margin, mud & sedge edge
BL0055A	02-Mar-00	20º 53' 56" N	156º 26' 52" W	Kanaha drainage culvert, water margin, Sedge, H-6
BL0056	02-Mar-00	20º 53' 37" N	156º 26' 44" W	Leucaena thicket, mixed alien grasses, Leucaena
BL0057A	02-Mar-00	20º 53' 57" N	156º 26' 53" W	Keawe wood-land at night, *Chenopodium*
BL0058A	04-Mar-00	20º 54' 42" N	156º 25' 29" W	Native shrub-land at night, sedge & grasses, sample H37
BL0059A	04-Mar-00	20º 54' 42" N	156º 25' 31" W	Native shrub-land at night, *Scaevola*
BL0060A	04-Mar-00	20º 54' 39" N	156º 25' 34" W	Native shrub-land at night, *Chenopodium*
BL0061	05-Mar-00	20º 53' 32" N	156º 26' 37" W	Haleakala Hwy, keawe wood-land at night, *Prosopis pallida* (keawe)
BL0062	05-Mar-00	20º 53' 34" N	156º 26' 38" W	Keawe wood-land at night, mixed alien grasses, *Solanum americanum, Lycopersicon pimpinellifolium, Amaranthus* sp.
BL0063	05-Mar-00	20º 53' 39" N	156º 26' 42" W	Keawe wood-land at night, *Pulchea symphytifolia*
BL0042D	06-Mar-00	20º 53' 56" N	156º 27' 16" W	Native shrub-land, Kanaha Pond Res., *Vitex rotundifolia*

Table II-1a. continued

Gas Aspirator 04 August 1999 to 04 June 2000 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0042C	06-Mar-00	20º 53' 56" N	156º 27' 16" W	Kanaha Pond, native shrub-land, Kanaha Pond Res., *Dodonaea viscosa*
BL0050B	06-Mar-00	20º 53' 54" N	156º 27' 24" W	Dry shrubland, *Nicotiana*
BL0355	06-Mar-00	20º 53' 54" N	156º 27' 24"W	Kanaha Pond, *Sporobolus, Sesuvium*, sedges
BL0129A	28-Mar-00	20º 54' 43" N	156º 25' 30" W	Native beach strand, *Sporobolis*
BL0129	28-Mar-00	20º 54' 13" N	156º 26' 16" W	Wetland #1, sedges and grass
BL0130	28-Mar-00	20º 53' 55" N	156º 25' 45" W	*Leucaena* scrub, *Leucaena, Ricinus, Panicum, Botriochloa, Melinus, Cenchrus*, etc.
BL0252	28-Mar-00	20º 54' 39" N	156º 25' 34" W	Bike path at E end of runway. *Nicotiana glauca*
BL0265	28-Mar-00	20º 54' 01.5" N	156º 25' 42.5" W	Near crash fire station, irrigated lawn & hedge
BL0294	28-Mar-00	20º 53' 57" N	156º 27' 14" W	Alien weeds
BL0131	29-Mar-00	20º 54' 16" N	156º 26' 15" W	Gate 6, lawn, *Waltheria*, mixed grasses and weeds
BL0131A	29-Mar-00	20º 54' 45" N	156º 25' 33" W	Beach strand, *Scaevola, Sporobolis*, mixed grasses
BL0132	30-Mar-00	20º 53' 45" N	156º 26' 40" W	Industrial area/buildings, lawn, grassed, mixed weeds
BL0232	26-Apr-00	20º 54' 16" N	156º 25' 42"W	Spreckelsville, beach, *Chenopodium*
BL0133	27-Apr-00	20º 54' 12" N	156º 26' 16" W	Along bike path between plane crash and Gate 6.1, Wetland # 1 day time, sedges and grass
BL0134	29-Apr-00	20º 54' 26" N	156º 26' 05" W	Dry shrubland, *Casuarina*
BL0134A	29-Apr-00	20º 54' 40" N	156º 25' 20" W	Sprecklesville; beach, wind shear shrubs
BL0135	30-Apr-00	20º 54' 19" N	156º 26' 10" W	Roadside, *Schinus, Pluche*a, etc.
BL0136	01-May-00	20º 54' 22" N	156º 25' 56" W	Leucaena shrubland, *Leucaena, Pluchea, Cenchrus, Asystasia*, etc., vegetation around malaise trap #1
BL0137	30-May-00	20º 53' 46" N	156º 26' 40" W	Industrial area/buildings, *Bougainvillea*
BL0138	30-May-00	20º 53' 46.5" N	156º 27' 01.5" W	Keawe woodland, Keawe, *Pluchea*, low weeds, grasses
BL0139	30-May-00	20º 53' 45.5" N	156º 26' 41" W	Ornamentals; UPS Road & Main Drive, planted lawn
BL0140	30-May-00	20º 53' 40.5" N	156º 26' 45" W	Ornamentals; UPS Road & Main Drive, mixed weeds, castor bean, *Pluchea*, grasses
BL0141	30-May-00	20º 53' 42.5" N	156º 26' 38.5" W	*Leucaena* scrub mixed weeds, *Leucaena*, grass, *Asystasia*
BL0142	30-May-00	20º 53' 40" N	156º 26' 45" W	Ornamentals; UPS Road & Main Drive, road edge Bougainvillea
BL0143	30-May-00	20º 53' 46.5" N	156º 27' 01.5" W	Keawe woodland, ruderal, wetland margin, *Sesuvium*, keawe, *Pluchea*
BL0145	01-Jun-00	20º 53' 48.5" N	156º 26' 46.7" W	Industrial buildings, keawe, grasses, low weeds *Pluchea*
BL0146	02-Jun-00	20º 53' 50" N	156º 26' 53" W	*Leucaena*-keawe scrub, kou tree
BL0147	02-Jun-00	20º 53' 51" N	156º 26' 53" W	*Leucaena*-keawe scrub, roadside weeds
BL0148	02-Jun-00	20º 53' 52" N	156º 26' 56" W	*Leucaena* scrub mixed weeds, *Nicotiana*
BL0149	03-Jun-00	20º 53' 48" N	156º 26' 28" W	Terminal area, grass strip, ornamental pea, shower trees
BL0150	03-Jun-00	20º 53' 47" N	156º 26' 27" W	Terminal area, *Philodendron, Defenbachia, Spathodea, Anthurium*, grass, weeds
BL0227	04-Jun-00	20º 53' 48.5" N	156º 26' 53" W	Behind T-shirt factory, keawe forested area; keawe, *Sesuvium, Paspalum, Pluchea*
BL0308	04-Jun-00	20º 53' 51" N	156º 26' 54" W	Molasses grass

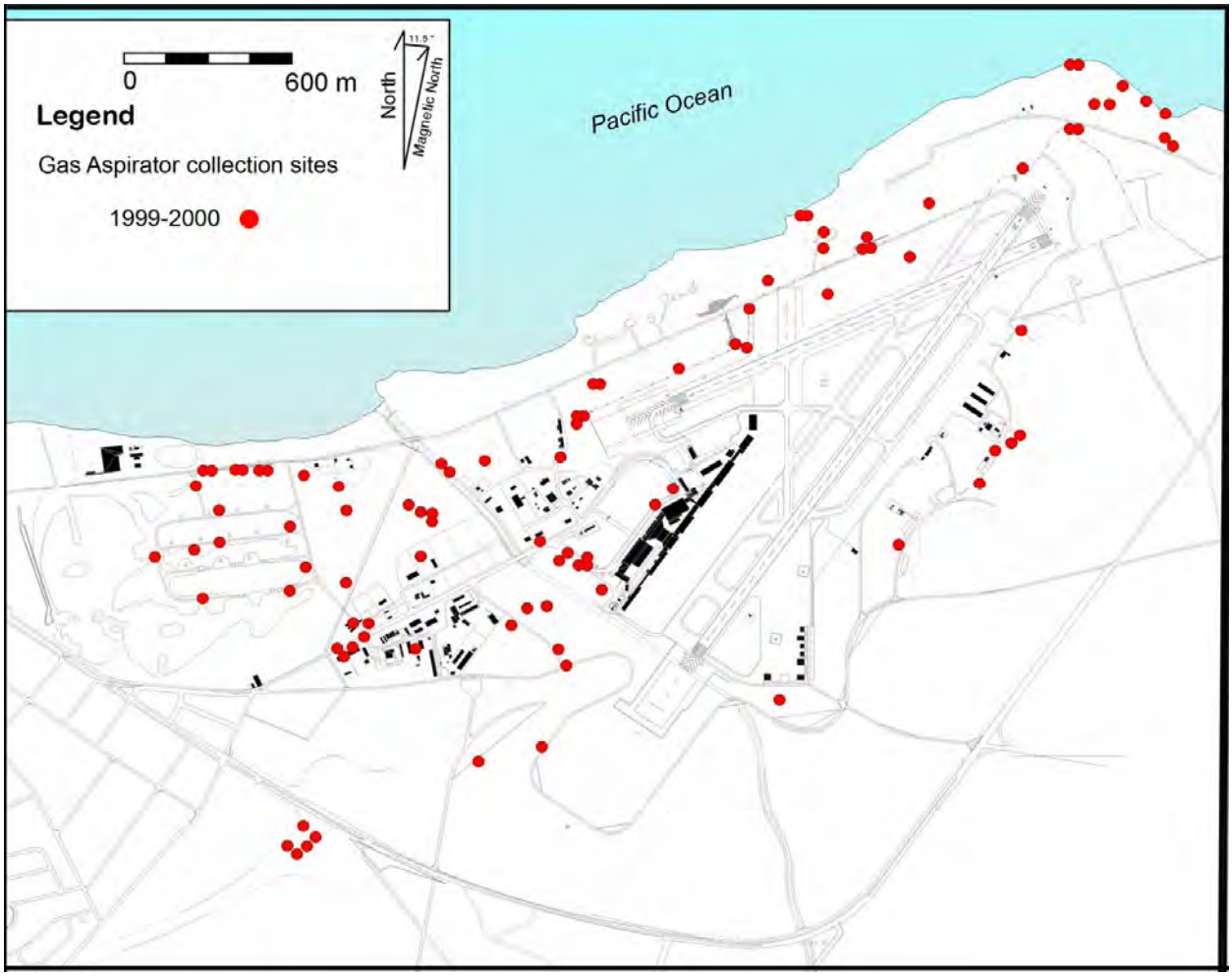


Figure II-1. Gas Aspirator collection sites during 1999-2000.

Table II-1b. Collection sites sampled for arthropods by gas aspirator within the Kahului Airport Environs between 25 June 2003 and 17 November 2006. Map datum is Old Hawaiian = NAD 27 **continued**

GAS ASPIRATOR				
25 June 2003 to 26 June 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0080	25-Jun-03	20º 54' 39" N	156º 25' 34" W	East end of runway, *Chenopodium*
KM0001	26-Jun-03	20º 54' 26" N	156º 25' 50" W	Keawe woodland, *Prosopis pallida*, *Chenopodium oahuense*, *Pluchea*, low weeds, grasses, etc.
KM0002	26-Jun-03	20º 54' 33" N	156º 25' 40.5" W	Wetland #3, bare ground, mixed weeds
KM0003	26-Jun-03	20º 54' 38" N	156º 25' 36" W	Native shrub-land, day time, *Panicum maximum*
KM0004	26-Jun-03	20º 54' 38.5" N	156º 25' 37" W	Native shrub-land, day time, *Leucana leucocephala*
KM0005	26-Jun-03	20º 54' 39" N	156º 25' 33" W	Dry shrubland, *Chenopodium oahuense*
KM0006	26-Jun-03	20º 54' 39" N	156º 25' 34" W	Native shrub-land, day time, *Chenopodium oahuense*
KM0075	26-Jun-03	20º 54' 37" N	156º 25' 28" W	East end of runway, *Cynodon dactylon*
KM0082	26-Jun-03	20º 54' 26" N	156º 25' 50" W	*Pluchea*, Malaise Trap site
KM0007	25-Aug-03	20º 53' 56" N	156º 27' 11" W	Kanaha Pond Reserve, *Pluchea odorata*
KM0008	25-Aug-03	20º 53' 56" N	156º 27' 16" W	Kanaha Pond Reserve, *Dodonaea viscosa*

Table II-1b. continued

Gas Aspirator 25 June 2003 to 26 June 2003. continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0009	25-Aug-03	20º 53' 56" N	156º 27' 13" W	Kanaha Pond Reserve, *Chenopodium*
KM0010	25-Aug-03	20º 53' 57" N	156º 27' 14" W	Kanaha Pond Reserve, *Myoporum*
KM0011	27-Aug-03	20º 53' 46" N	156º 27' 28" W	Kanaha Pond Reserve, *Sporobolus*
KM0012	27-Aug-03	20º 54' 03" N	156º 25' 42" W	Grass near control tower, short grass
KM0013	27-Aug-03	20º 54' 07" N	156º 25' 42" W	Industrial/ornamental, planted wiliwili
KM0014	28-Aug-03	20º 54' 13" N	156º 26' 16" W	Fence, Wet spot #1, sedges and grass
KM0015	28-Aug-03	20º 54' 23" N	156º 26' 11" W	Kanaha Beach wet spot near ocean, sedges and grass. Salinity = 4 ppt.
KM0016	28-Aug-03	20º 54' 25" N	156º 26' 11" W	Kanaha Beach, ocean rocks, seaweed and beach sand/rocks, littoral night
GAS ASPIRATOR				
09 September to 17 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA 0006	17-Jul-06	20º 54' 26" N	156º 26’ 10” W	Beach strand and keawe/mixed understory woodland, *Sporobolus virginicus* (Akiaki)
KA 0038	17-Jul-06	20º 53' 35" N	156º 26' 59" W	HDOA insectary, industrial, buildings; *Hibiscus rosa sinensis*
KA 0041	17-Jul-06	20 º 54’ 26 N	156* 26’ 10” W	Beach strand and keawe/mixed understory woodland; *Sesuvium portulacastrum* (akulikuli)
KA 0252	17-Jul-06	20º 53' 50" N	156º 26' 54" W	Wetland, mixed native/ keawe/mixed alien understory woodland, *Verbesina* sp.
KA 0002	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa, Bolboschoenus maritimus*
KA 0004	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa, Pluchea* spp.
KA 0008	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa, Cyperus javanicus*
KA 0042	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa, Bacopa monnieri*
KA 0013	18-Jul-06	20º 54' 07" N	156º 25' 41" W	Rescue Fire Station koa haole dominated scrub, general: lawn
KA 0014	18-Jul-06	20º 54' 07" N	156º 25' 41" W	Rescue firestation; koa haole dominated scrub, *Wedelia sphagneticola trilobata*
KA 0016	18-Jul-06	20º 54' 07" N	156º 25' 41" W	Koa haole dominated scrub, *Cassia xnealii* (shower tree)
KA 0029	18-Jul-06	20º 54' 26" N	156º 25' 54" W	Bike path, roadside weeds
KA 0036	18-Jul-06	20º 54' 20" N	156º 26' 16" W	Wetland dominated by *Bacopa* general: lawn, shrubs.
KA 0125	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Kanaha Beach wetland dominated by *Bacopa, Bacopa monierri*, sample 2
KA 0005	20-Jul-06	20º 53' 24" N	156º 26' 04" W	Haleakala Hwy near heliport; koa haole dominated shrub, *Tridax procambens* (coat buttons)
KA 0007	20-Jul-06	20º 53' 24" N	156º 26' 04" W	Haleakala Hwy near heliport; koa haole dominated shrub, *Abutilon grandifolium*
KA 0009	20-Jul-06	20º 53' 24" N	156º 26' 04" W	Haleakala Hwy near heliport; koa haole dominated shrub, *Ipomoea* sp.
KA 0035	20-Jul-06	20º 54' 40" N	156º 25' 34" W	Wind-sheared dune vegetation, general
KA 0192	20-Jul-06	20º 54' 28.5" N	156º 25'24.5" W	East end runway
KA 0229	20-Jul-06	20º 54' 39" N	156º 25' 34" W	Wind-sheared dune vegetation *Chenopodium oahuense*, night

Table II-1b. continued

Gas Aspirator: 09 September to 17 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA 0233	20-Jul-06	20º 54' 40" N	156º 25' 34" W	Wind-sheared dune vegetation, *Leucaena leucocephala*
KA 0030	24-Jul-06	20º 53' 36" N	156º 26' 59" W	Irrigated ornamental and lawns; *Erythrina* sp.
KA 0092	19-Sep-06	20º 53' 46" N	156º 27' 28" W	Wetland, mixed native/keawe/mixed alien understory woodland; *Pluchea* spp.
KA 0086	19-Sep-06	20º 53' 53" N	156º 27' 39" W	Wetland, mixed native/keawe/mixed alien understory woodland; *Ipomoea pescaprae* subsp. *brasiliensis*
KA 0087	19-Sep-06	20º 53' 53" N	156º 27' 39" W	Wetland, mixed native/keawe/mixed alien understory woodland, general; *Leucaena* sp., *Sesuvium portulacastrum, Capparis sandwichiana*
KA 0091	19-Sep-06	20º 53' 46" N	156º 27' 28" W	Wetland, mixed native/keawe/mixed alien understory woodland; *Sporobolus virginicus* (akiaki)
KA 0094	19-Sep-06	20º 53' 46" N	156º 27' 28" W	Wetland, mixed native/keawe/mixed alien understory woodland; *Sesuvium portulacastrum* (akulikuli).
KA 0102	19-Sep-06	20º 53' 46" N	156º 27' 28" W	Kanaha Pond wetland, mixed native/ keawe/mixed alien understory woodland; *Cyperus laevigatus* (makaloa).
KA 0088	20-Sep-06	20º 53' 56" N	156º 27' 17" W	Wetland, mixed native/keawe/mixed alien understory woodland; *Vitex rotundifolia* (pohinahina), *Scaevola* sp. (naupaka)
KA 0089	20-Sep-06	20º 53' 30" N	156º 26' 53" W	Ruderal, mixed ornamentals, general: lawn
KA 0090	20-Sep-06	20º 53' 43" N	156º 27' 28" W	Wetland, mixed native/keawe/mixed alien understory woodland; *Sporobolus virginicus* (akiaki)
KA 0093	20-Sep-06	20º 53' 55" N	156º 27' 23" W	Wetland, mixed native/keawe/mixed alien understory woodland; *Dodonaea viscosa* (aalii)
KA 0095	20-Sep-06	20º 53' 56" N	156º 27' 18" W	Kanaha Pond wetland, mixed native/ keawe/mixed alien understory woodland; *Dodonaea viscosa* (duff, leaf litter)
KA 0096	20-Sep-06	20º 53' 56" N	156º 27' 18" W	Wetland, mixed native/keawe/mixed alien understory woodland; *Dodonaea viscosa* (foliage)
KA 0100	20-Sep-06	20º 53' 29" N	156º 27' 29" W	Wetland, mixed native/keawe/mixed alien understory woodland; general at pond edge
KA 0101	20-Sep-06	20º 53' 35" N	156º 26' 58" W	Irrigated ornamental plantings and lawns; general:lawn
KA 0220	14-Nov-06	20º53’50”N	156º27’20”W	Wetland, mixed native/keawe/mixed alien understory woodland; general at pond edge
KA 0232	14 Nov 06	20º53’40”N	156º27’20”W	Wetland, ruderal keawe/mixed understory woodland
KA 0228	14-Nov-06	20º 54' 45" N	156º 25' 35" W	Wind-sheared dune vegetation, beach strand, beach
KA 0231	14-Nov-06	20º 53' 11" N	156º 26' 52" W	Ruderal, old fallow field near culvert/canal
KA 0242	14-Nov-06	20º 53' 02" N	156º 26' 42" W	Ruderal, roadside
KA 0245	14-Nov-06	20º 53' 30" N	156º 26' 51" W	Ruderal, mixed understory ornamentals general.
KA 0247	14-Nov-06	20º 54' 46" N	156º 25' 35" W	Wind-sheared dune vegetation, beach strand *Cenchrus ciliaris* (buffel grass)
KA 0250	14-Nov-06	20º 54' 46" N	156º 25' 35" W	Wind-sheared dune vegetation, beach strand; *Tournefortia argentea*, day
KA 0251	14-Nov-06	20º 54' 46" N	156º 25' 35" W	Wind-sheared dune vegetation, beach strand; *Leucaena leucocephala*
KA 0301	14-Nov-06	20º 54’ 46” N	156º 25' 35” W	Wind-sheared dune vegetation, *Vitex trifolia*
KA 0290	14-Nov-06	20º 54' 46" N	156º 25' 32" W	Wind-sheared dune vegetation, beach strand; *Hibiscus tiliaceus*

Table II-1b. continued

Gas Aspirator 09 September to 17 November 2006 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA 0221	17-Nov-06	20º 53' 50" N	156º 26' 55" W	Triangle E of Kanaha Pond by canal; wetland, mixed native/keawe/mixed alien understory woodland, *Atriplex* sp.
KA 0222	17-Nov-06	20º 53' 54" N	156º 26' 57" W	Triangle E of Kanaha Pond by canal; wetland, mixed native/keawe/mixed alien understory woodland, *Pluchea* x *Fosbergii*
KA 0224	17-Nov-06	20º 53' 50" N	156º 26' 54" W	Triangle E of Kanaha Pond by canal; wetland, mixed native/ keawe/mixed alien understory woodland, *Abutilon grandifolium*
KA 0225	17-Nov-06	20º 53' 50" N	156º 26' 55" W	Triangle E of Kanaha Pond by canal; wetland, mixed native/keawe/mixed alien understory woodland, *Pluchea indica*

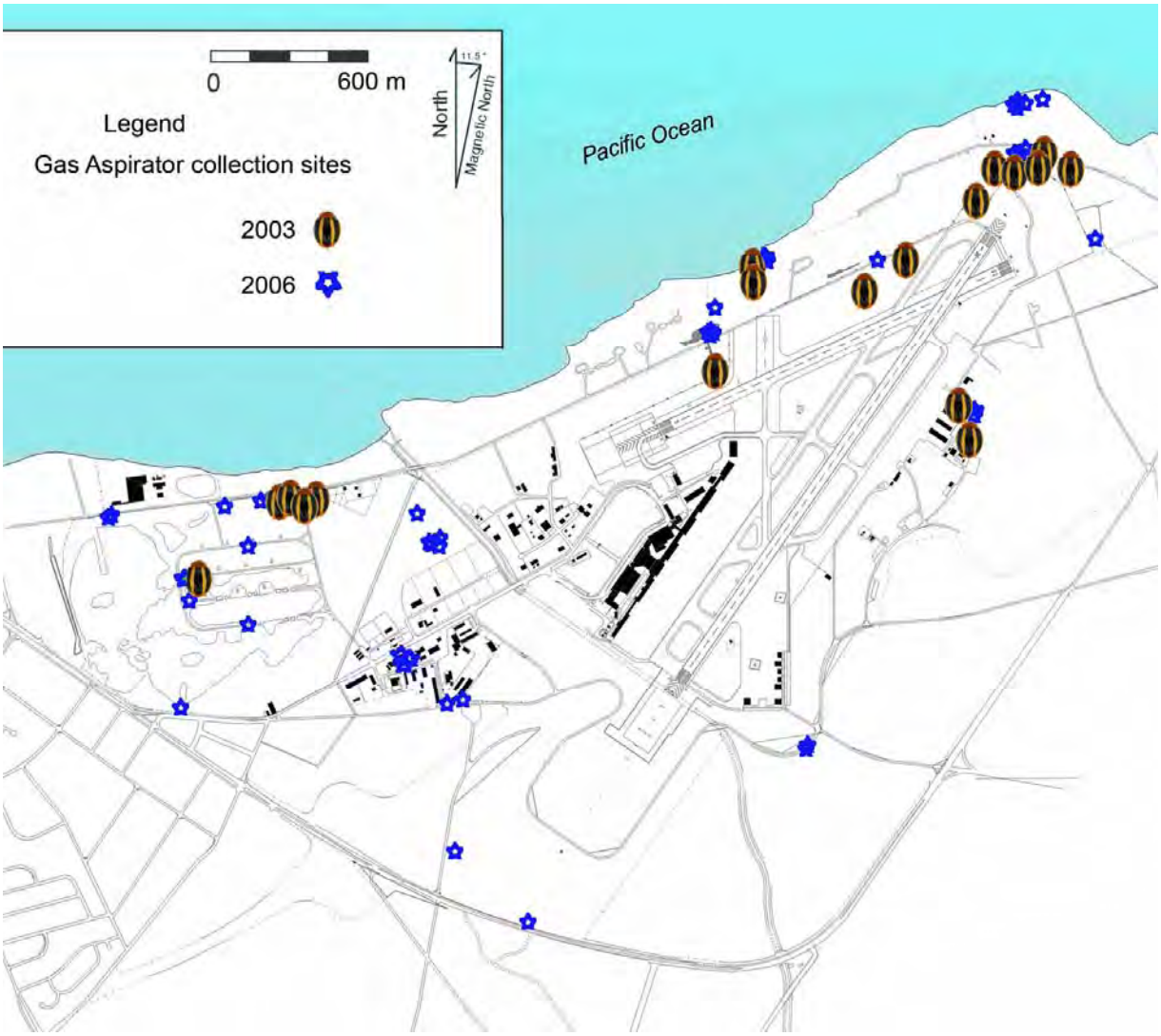


Figure II-2. Gas Aspirator collection sites during 2003 and 2006.

Malaise Traps

The malaise trap is an open-walled tent with baffles made of fine netting. It is hung between posts or trees. Dispersing insects that behaviorally try to go over obstacles (such as most wasps, flies and moths) become confused under the overhanging eaves of fine netting and enter a funnel of netting, which leads to the collecting canister. The traps used in the baseline survey measured about six feet high, eight feet long and five feet wide and had a collecting canister at only one end (**Figure** at right). The trap used in the 2003 and 2006 field seasons was larger measuring about eight feet high, 12 feet long and six feet wide and held a canister at each end. The traps were left in place and the specimens removed and the preservative replaced periodically usually between two and four weeks. We found that a mixture of approximately equal parts 90 % ethanol and propylene glycol worked well for preserving insects for a month or more. Propylene glycol is relatively safe environmentally and diluted the alcohol to safe nonflammable levels. Trap locations are listed in **Table II-2** and shown in **Figure II-3.**

Malaise Trap
Photo by D.J. Preston, 2006

Malaise traps are excellent passive traps for monitoring in a relatively unbiased manner the presence or activities of certain groups of insects. We collected more than 389 species in the Malaise traps during the surveys. An attempt was made to identify all species collected in one sample (KA-0171), an effort that yielded over 215 species. Placement of the trap is important and can affect the catch. It is best to place the trap across a natural flyway. Some insects (especially some beetles and wasps) habitually go down, when they encounter a barrier, and Malaise traps often miss these, but see the description of window trap.

Table II-2. . Collection sites sampled for arthropods by Malaise Traps within the Kahului Airport Environs between 25 June 2003 and 17 November 2006. Map datum is Old Hawaiian = NAD 27 …

MALAISE TRAPS				
04 October 1999 to 06 November 2000				
BL0076	04-Oct-99-08-Oct-99	20º 54' 25" N	156º 25' 58" W	Near bike path, Wetland # 2, palms, milo, keawe, "site 1"
BL0073	02-Nov-99-01-Jun-00	20º 54' 22" N	156º 25' 56" W	*Leucaena* shrubland; Leucaena, *Pluchea*, *Cenchrus*, *Asystasia*, etc.,
"Malaise trap # 1:" Each 2- 5 week sample was given a unique number; total 26 samples.				
BL0072	02-Nov-99-01-Feb-00	20º 54' 16" N	156º 25' 42" W	*Leucaena* shrubland, *Leucaena*, *Panicum*, *Cenchrus*, etc., Malaise trap #2
BL0077	01-Feb-00-2-Jun-00	20º 54' 18" N	156º 25' 42" W	*Leucaena* shrubland, *Leucaena*, *Panicum*, *Cenchrus*, etc., Malaise trap #2
"Malaise trap # 2:" Each 2- 5 week sample was given a unique number; total 16 samples.				
25 June 2003 to 25 September 2003				
KM0035	25-Jun-03-25-Sept-03	20º 54' 26" N	156º 25' 50" W	Keawe woodland; *Prosopis pallida*, *Chenopodium oahuense*, *Pluchea*, low weeds, grasses, etc.
4 samples correspond to pickup dates: KM0035; KM0035A, KM0084, KM0083				
18 July 2006 to 13 November 2006				
KA0065;	18-Jul-06 - 13-Nov-06	20º 54' 26" N	156º 25' 50" W	Keawe/koa haole/mixed understory woodland, 3 samples: KA0065; KA0157; KA0171
3 samples correspond to pickup dates: KA0065; KA0157; KA0171				

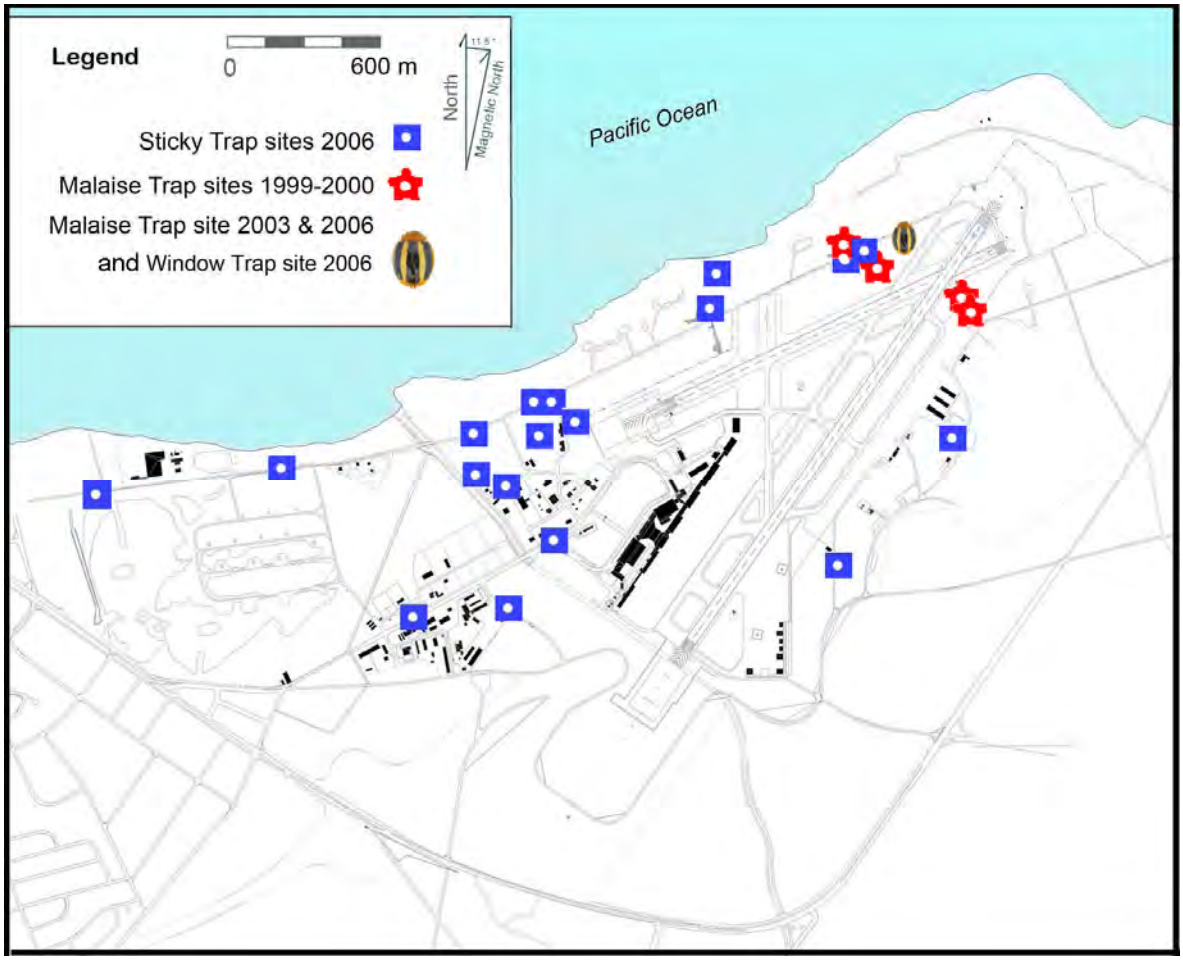


Figure II-3. Location of Malaise Trap, Window Trap, and Sticky Trap sites.

Window Trap

Window traps take advantage of the behavior of many dispersing arthropods that drop to the ground when they encounter an obstacle. Traditional designs use clear glass or plastic panels over trays containing a fluid preservative. In 2006, we placed white elongate pans directly beneath the panels of the Malaise trap. The pans were filled to about two inches (5 cm) deep with an ethanol-propylene glycol mixture. The fluid acts as preservative and is relatively non-toxic to most vertebrates, however, chicken wire mesh was placed over the trays to prevent larger debris from entering and also to prevent vertebrates from either drinking the fluid or stealing our catch.

Window Trap utilizing the panels of the Malaise trap
Photo by D.J. Preston, 2006

The samples are listed in **Table II-3,** and the location is shown in **Figure II-3.** We identified more than 75 species in the three window trap samples, and many were only collected by this method.

Table II-3. Collection sites sampled for arthropods by Window Traps within the Kahului Airport Environs between 18 July 2006 and 13 November 2006. Map datum is Old Hawaiian = NAD 27 …

WINDOW TRAP				
18 July 2006 to 13 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA0064	18-Jul-06-18-Sep-06	20º 54' 26" N	156º 25' 50" W	Keawe/koa haole/mixed understory woodland, Window trap set below Malaise trap panels
KA0067	18-Sep-06-21-Oct-06	20º 54' 26" N	156º 25' 50" W	Keawe/koa haole/mixed understory woodland, Window trap set below Malaise trap panels
KA0159	21-Oct-06-13-Nov-06	20º 54' 26" N	156º 25' 50" W	Keawe/koa haole/mixed understory woodland, Window trap set below Malaise trap panels

MV Bulb & Night Collecting

MV Bulb night collecting Photo by H.M. Laederich, 2006

Many insects are nocturnal and remain hidden during the day. This is especially true in drier lowland habitats, such as at Kahului Airport, because of the extreme desiccating environment during the daytime. We used headlamps for light and employed the same techniques at night as during the day. However, the main effort employed for night collecting was shining a 250-watt mercury vapor lamp **(MV-bulb)** on white bed-sheets strung across insect flyways (**Figure above**). On three nights in 2000, a 15-watt **black light** was also used and projected onto a separate white sheet. However, man power often dictated that only one light could be serviced per night. The lights were run for a three- to four-hour period on two or three nights each field trip. For both lights, representative samples of arthropods alighting on the sheets were collected. Fragile arthropods (such as moths, true bugs, and flies) were collected individually into separate vials to obtain quality specimens for identification. Smaller specimens were aspirated off the sheet and preserved several to a vial either dry or in alcohol. The method is labor intensive and

only one sample per night could be taken; however, the method allows many species to be sorted in the field, which decreases laboratory time and increases efficiency. The method is sensitive to location, especially the presence of competing extraneous lights; thus we could not sample large areas of the airport environs using this method. Each collecting session ran for three- to four-hours, and samples were taken on two or three nights during each field trip. This method is generally good for collecting night flying insects, and is one of the standard ways of surveying for moths. It is best done in a dark area and when no moon is in the sky, as the lights and moon glow compete with the light. The MV bulb was the most productive method used in the survey; 33 samples yielded more than 500 species. Out of the 139 species recorded from the combined MV/black light samples, 40 were not found in the samples that were collected with the MV bulb without the accompanying blacklight. The sample sites are listed in **Table II-4,** and the locations given in **Figure II-4.**

Table II-4. Collection sites sampled for arthropods by MV Bulb and Black Light within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian = NAD 27

MV BULB/BLACKLIGHT				
05 October 1999 to 04 June 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0078	05-Oct-99	20º 54' 13" N	156º 26' 17" W	Drainage ditch near Kanaha Beach near start of bike path.,Wetland # 1 at night, *Leucaena*, *Panicum*,sedges, keawe,sample D18.
BL0076A	06-Oct-99	20º 54' 25" N	156º 25' 58" W	Wetland # 2, palms, milo, keawe
BL0035	03-Nov-99	20º 53' 42" N	156º 27' 05" W	Kanaha Pond Reserve, ruderal with keawe, *Sporobolus*, *Sesuvium*.
BL0079	04-Nov-99	20º 53' 42" N	156º 27' 10" W	Kanaha Pond Res., wetland, open keawe woodland at pond margin.
BL0080	01-Dec-99	20º 54' 29" N	156º 25' 52" W	Wetland / keawe, *Sesuvium*, *Paspalum*, *Pluchea*, Sample F5
BL0081	02-Dec-99	20º 53' 54" N	156º 27' 23" W	Kanaha Pond Res., *Sporobolus*, keawe, pond margin.
BL0053	02-Feb-00	20º 54' 23" N	156º 25' 54" W	Wetland # 2 near Malaise site 1, *Leucaena*, wetland margin, *Sesuvium*, *Leucaena*, *Pluchea*,
BL0082	03-Feb-00	20º 53' 46" N	156º 27' 07" W	Kanaha Pond Res., keawe wood-land, ruderal, wetland margin, *Sesuvium*, keawe, *Pluchea*, ,
BL0057	02-Mar-00	20º 53' 57" N	156º 26' 53" W	Keawe wood-land, ruderal, wetland margin, keawe, *Pluchea*, *Chenopodium*, drainage canal margin off Kanaha Beach Rd.
BL0083	03-Mar-00	20º 53' 56" N	156º 27' 14" W	Kanaha Pond Res., keawe, *Sesuvium*, native shrubs.
BL0084	05-Mar-00	20º 53' 35" N	156º 26' 38" W	East of A‘alele St. & Haleakala Rd., keawe woodland, keawe, *Leucaena*, *Cenchrus*, etc.
BL0163	28-Mar-00	20º 53' 36" N	156º 26' 37" W	A‘alele dump area.,Keawe woodland, keawe, *Leucaena*, *Cenchrus*, etc.,15m; MV /black-light #1
BL0163A	29-Mar-00	20º 54' 29" N	156º 25' 51" W	Bike path, near wet spot 3, *Sesuvium*, keawe, *Pluchea*, MV /black-light #2
BL0164	26-Apr-00	20º 54' 07" N	156º 26' 28" W	Near north AOA fenceline, keawe woodland, keawe, *Cenchrus*, MV light #1
BL0165	27-Apr-00	20º 54' 04" N	156º 26' 40" W	Kanaha Beach Rd., keawe woodland, keawe, *Cenchrus*, *Asystacia*, MV light #2
BL0166	30-Apr-00	20º 54' 26" N	156º 26' 05" W	Crash site near bike path, keawe woodland, keawe, *Causurina*, mixed weeds, MV light #3
BL0167	31-May-00	20º 53' 36" N	156º 27' 05.2" W	Bunkers near south gate of Kanaha Pond Res., keawe woodland, wetland, MV site#1
BL0168	02-Jun-00	20º 53' 46.5" N	156º 27' 01.5" W	Between Kanaha drainage canal & T-shirt factory building, keawe woodland, keawe, *Pluchea*, low weeds, grasses, MV site #2.
BL0169	04-Jun-00	20º 53' 51" N	156º 26' 54" W	Between Kanaha drainage canal and T-shirt factory building, *Lucaena*-keawe scrub, mixed weeds, *Leucaena*-keawe, grasses, MV /black-light site #3.

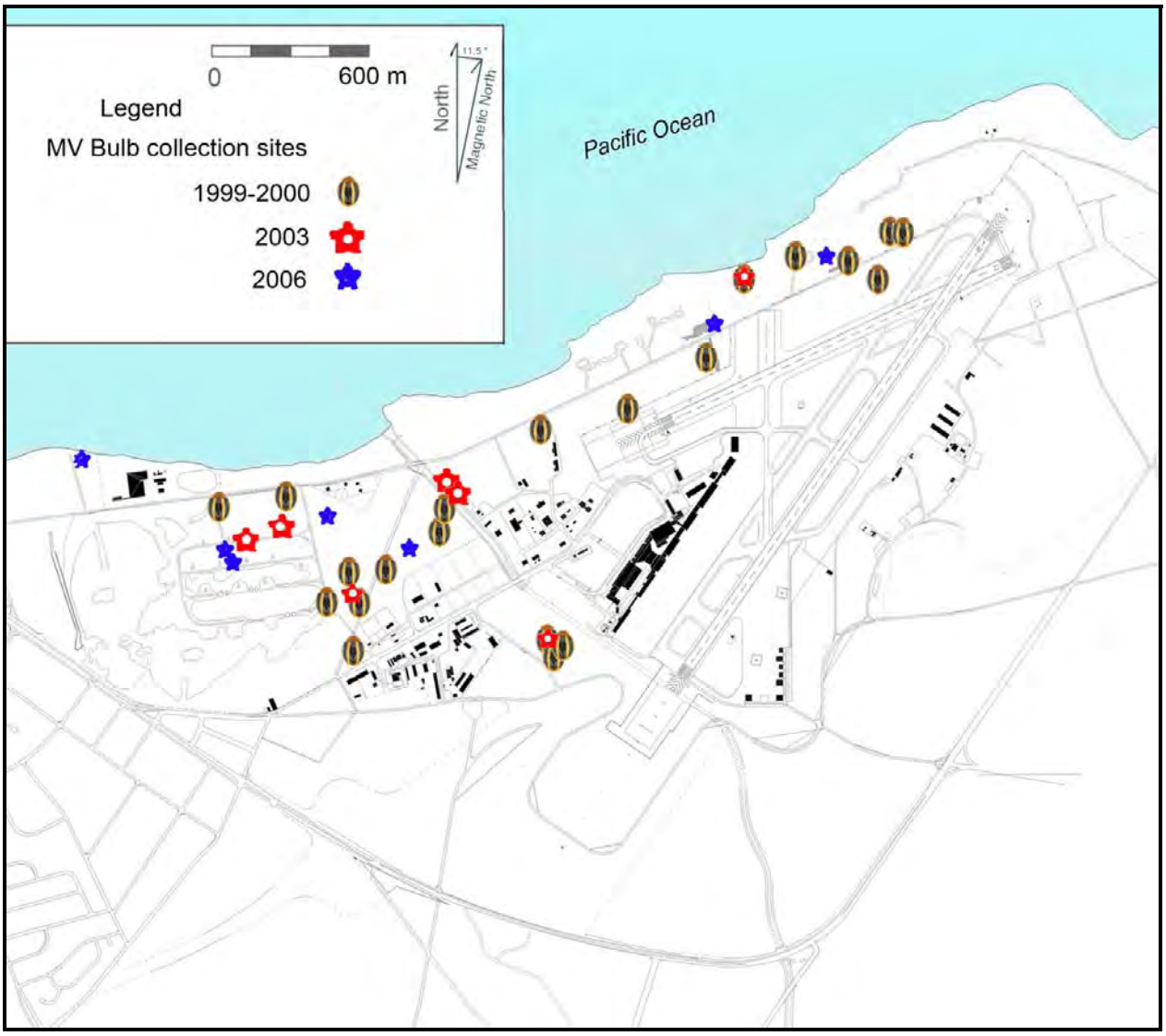


Figure II-4. Map of MV Bulb collecting sites.

Table II-4. continued

MV Bulb 24 June 2003 to 26 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0036	24-Jun-03	20º 53' 37" N	156º 26' 39" W	Near A‘alele St. in Keawe woodland, *Prosopis pallida, Pluchea*, low weeds, grasses
KM0037	26-Jun-03	20º 53' 56.5" N	156º 26' 52.5" W	Ruderal, wetland margin grass, ruderal, keawe.
KM0038	24-Jul-03	20º 54' 23" N	156º 26' 12" W	Wetland 1, near beach, *Causurina*, sedges, grass
KM0039	26-Jul-03	20º 53' 54" N	156º 26' 52" W	Near Drainage Canal, keawe woodland keawe woodland, *Leucaena*, *Pluchea*, etc.
KM0040	23-Aug-03	20º 53' 43" N	156º 27' 06" W	Kanaha Pond Reserve, keawe woodland, keawe, *Sporobolus*, *Pluchea*, *Sesuvium*
KM0041	25-Aug-03	20º 53' 52" N	156º 27' 15" W	Kanaha Pond Reserve, keawe woodland, grasses
KM0042	26-Aug-03	20º 53' 50" N	156º 27' 20" W	Kanaha Pond, Kanaha Pond Reserve, keawe, grass.

Table II-4. continued

MV BULB				
26 June 2006 to 16 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA0059	26-Jun-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa*
KA0018	19-Jul-06	20º 54' 01" N	156º 27' 43" W	Hobron wet spot. Beach strand and keawe/mixed understory woodland
KA0060	19-Sep-06	20º 53' 49" N	156º 27' 23" W	Kanaha Pond Res. Wetland, mixed native/ keawe/mixed alien understory woodland
KA0057	21-Sep-06	20º 53' 53" N	156º 27' 09" W	Kanaha Pond Res. Wetland, mixed native/ keawe/mixed alien understory woodland
KA0168	14-Nov-06	20º 53' 48" N	156º 27' 22" W	Kanaha Pond Res. Wetland, mixed native/ keawe/mixed alien understory woodland
KA0169	16-Nov-06	20º 54' 26" N	156º 26' 01" W	Keawe/ironwood/mixed understory woodland
KA0170	17-Nov-06	20º 53' 49" N	156º 26' 58" W	Behind T-shirt factory, keawe/mixed understory woodland

General Collecting

General collections were incidental or opportunistic captures made while walking between sites or in conjunction with other survey methods. Substrates and plant hosts were also visually inspected for insects whenever there was time although the latter have been listed under Host Search if the host or arthropod was the focus of the search. Captures were made with small hand-held aspirators, insect nets, by hand or directly into vials. About 100 samples yielded 125 species. Sample sites are listed in **Table II-5,** and the locations given in **Figure II-5.**

D.J. Preston using hand aspirator and K. Starr with sweep net

Photo by H.M. Laederich, 2006

Table II-5. General collection sites sampled for arthropods within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian = NAD 27

GENERAL				
01 August 1999 to 20 June 2001 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0356	1 Aug 99	20º 53' 51" N	156º 26' 24" N	In terminal building, men's room
BL0309	4-Aug-99	20º 54' 06" N	156º 26' 35" W	5m. Near Kanaha Beach park-keawe forest ,
BL0006C	8-Sep-99	20º 54' 24" N	156º 26' 05" W	Dry shrubland-*Pluchea*, *Waltheria*, grass, etc.
BL0010B	8-Sep-99	20º 54' 26" N	156º 26' 05" W	Kanaha Beach near crash site. Dry shrubland-*Pluchea*,
BL0350	9-Sep-99	20º 54' 26" N	156º 26' 05" W	*Leucaena* shrubland, on web.
BL0329	10-Sep-99	20º 54' 12" N	156º 26' 16" W	Wetland # 1,
BL0210	4-Oct-99	20º 53' 22" N	156º 26' 49" W	Ruderal-*Pluchea*.
BL0326	4-Oct-99	20º 54' 40" N	156º 25' 34" W	Along bike path.
BL0327	4-Oct-99	20º 54' 11" N	156º 26' 27" W	Near Kanaha Beach-keawe forest,
BL0346	5-Oct-99	20º 53' 45" N	156º 26' 40" W	UPS Junction. Ruderal and hedge. On ground and leaflitter.
BL0354	5-Oct-99	20º 54' 15"N	156º 26' 17"W	Wet spot #1. On ground.
BL0328	7-Oct-99	20º 54' 34" N	156º 25' 40" W	Wetland
BL0339	7-Oct-99	20º 54' 26" N	156º 26' 05" W	Plane crash site near compass
BL0343	3-Nov-99	20º 53' 42" N	156º 27' 05" W	Kanaha Pond Reserve,
BL0351	2-Dec-99	20º 53' 54" N	156º 27' 23" W	Kanaha Pond Res. Keawe pond margin/on web,
BL0218	1-Feb-00	20º 54' 24"N	156º 25' 54"W	*Leucaena* and weeds, *Pluchea*, etc. E of Malaise Trap #1
BL0352	1-Feb-00	20º 54' 23" N	156º 25' 59" W	Under stone in dry pond-Near Malaise Trap #1,
BL0360	1-Feb-00	20º 53' 35" N	156º 26' 59" W	HDOA lab, infesting cabinets
BL0345	4-Feb-00	20º 53' 35" N	156º 26' 59" W	HDOA Lab, in building,
BL0058	4-Mar-00	20º 54' 42" N	156º 25' 29" W	Native shrub-land at night-sedge & grasses, general
BL0059	4-Mar-00	20º 54' 42" N	156º 25' 31" W	Native shrub-land at night-*Scaevola*, general
BL0060	4-Mar-00 Date OK	20º 54' 39" N	156º 25' 34" W	Native shrub-land at night-*Nicotiana*, *Ipomea*, *Chenopodium*, roadway, etc., general
BL0216	5-Mar-00	20º 53' 36"N	156º26' 59"W	Ag station-flying near citrus tree. Clear, hot, sunny day, general
BL0359	5-Mar-00	20º 53' 35"N	156º26' 59"W	HDOA Ag station-in building, night
BL0317	7-Mar-00	20º 53' 59" N	156º 26' 39" W	Car park waste site. Grass and shrubs
BL0128	27-Mar-00	20º 54' 34" N	156º 25' 40" W	Wetland #3 under stones, Mixed alien grasses, *Pluchea*,
BL0314	27-Mar-00	20º 53' 35" N	156º 26' 59" W	In window frame at HDOA office,
BL0172	27-Mar-00	20º 54' 34" N	156º 25' 40" W	Ruderal bare ground @ wetspot #3,
BL0173	28-Mar-00	20º 54' 43" N	156º 25' 30" W	Ruderal-mixed weeds,
BL0236	28-Mar-00	20º 54' 24" N	156º 26' 00" W	Near bike path-wet land; *Sesuvium*, *Pluchea*, keawe
BL0288	28-Mar-00	20º 54' 24" N	156º 26' 00" W	Near bike path-wet land; *Sesuvium*, *Pluchea*, keawe
BL0174	29-Mar-00	20º 54' 43" N	156º 25' 32" W	Beach strand-*Scaevola*, *Sporobolis*, mixed grasses. Sample site #1, night
BL0225	29-Mar-00	20º 54' 38" N	156º25' 22"W	W Sprecklesville Beach. Strand shrubland

Table II-5. General. continued

General 01 August 1999 to 20 June 2001 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0358	30-Mar-00	20º 53' 35" N	156º 26' 59" W	HDOA building, inside laboratory, night
BL0325	27-Apr-00	20º 54' 12" N	156º 26' 16" W	Near wetland # 1, grass,
BL0349	28-Apr-00	20º 53' 56" N	156º 27' 14" W	Kanaha Pond Reserve-hedge, on web
BL0175	30-Apr-00	20º 54' 26" N	156º 26' 05" W	Dry shrubland, keawe-mixed weeds, koa haole, night
BL0284	30-Apr-00	20º 53' 35" N	156º 26' 59" W	HDOA building, inside laboratory, General
BL0316	30-Apr-00	20º 54' 14" N	156º 26'17" W	Wetland #1, day
BL0229	30-May-00	20º 53' 48" N	156º 26' 28" W	Terminal area-grass,
BL0176	31-May-00	20º 53' 46" N	156º 27' 00" W	Keawe woodland-keawe, mixed shrubs,
BL0320	31-May-00	20º 53' 47" N	156º 26' 59" W	Near old oil tank. Under tires
BL0211	1-Jun-00	20º 53' 49" N	156º 26' 56" W	Keawe wood-land daytime-keawe, mixed weeds,
BL0179	2-Jun-00	20º 53' 48" N	156º 25' 53" W	*Leucaena*-keawe scrub-roadside, mixed weeds,
BL0180	2-Jun-00	20º 53' 10" N	156º 27' 10" W	Ruderal-*Waltheria*, mixed weeds,
BL0237	2-Jun-00	20º 54' 35" N	156º 25' 38" W	Roadway, bike path fence,
BL0287	5-Jun-00	20º 53' 51" N	156º 26' 54" W	Triangle area behind T-shirt factory, decaying timber
BL0337	3-Jul-00	20º 53' 46.7" N	156º 26' 59.4" W	Triangle area behind T-shirt factory, field, day
BL0361	21-May-01	20º 53' 50" N	156º 26' 24" W	In terminal building, day
BL0243	20-Jun-01	20º 54' 47" N	156º 25' 33" W	West Sprecklesville-beach & strand,

General Collecting				
24 June 2003 to 23 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0046	24-Jun-03	20º 53' 37" N	156º 26' 38" W	Keawe woodland *Prosopis pallida, Pluchea*, low weeds, grasses
KM0047	24-Jun-03	20º 53' 37" N	156º 26' 39" W	Keawe woodland, *Prosopis pallida, Pluchea,* low weeds, grasses
KM0048	25-Jun-03	20º 54' 26" N	156º 25' 50" W	Keawe woodland, Prosopis pallida, Chenopodium
KM0049	25-Jun-03	20º 54' 26" N	156º 25' 51" W	Ruderal, Bare ground
KM0050	26-Jun-03	20º 53' 56" N	156º 26' 52" W	Keawe woodland, keawe trunks at night
KM0051	28-Jun-03	20º 53' 35" N	156º 26' 59" W	Industrial; HDOA, building walls
KM0052	28-Jun-03	20º 53' 35" N	156º 27' 00" W	Industrial, lights at HDOA
KM0078	28-Jun-03	20º 53' 35" N	156º 26' 58" W	HDOA grounds
KM0086	29-Jun-03	20º 53' 36" N	156º 27' 00" W	HDOA Grounds, wetspot
KM0085	24-Jul-03	20 º 54' 25" N	156º25' 58" W	Near wetspot #2, by water, day
KM0053	25-Jul-03	20º 53' 39" N	156º 26' 40" W	A alele Dump, keawe woodland, in abandoned concrete bunker
KM0054	25-Jul-03	20º 53' 44" N	156º 27' 00" W	Keawe forest, open ground, ant hill
KM0090	25 Jul-03	20º 53' 35" N	156º 27' 00" W	HDOA, in lab
KM0083	26 Jul.-03	20º 54' 26" N	156º 25' 50" W	@ malaise trap site; Keawe woodland, *Prosopis pallida, Chenopodium oahuense, Pluchea*, low weeds, grasses, etc.

Table II-5. General. continued

General 24 June 2003 to 23 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0055	26-Jul-03	20º 53' 52" N	156º 26' 52" W	Kanaha Pond Reserve, keawe woodland, *Leucaena*, *Pluchea*, etc.
KM0077	23-Aug-03	20º 53' 35" N	156º 26' 59" W	HDOA building.
KM0056	24-Aug-03	20º 54' 24" N	156º 25' 54" W	Bare ground, Under stones, near wetspot,
KM0057	27-Aug-03	20º 53' 37" N	156º 26' 38" W	Dump site, green waste,
KM0058	28-Aug-03	20º 53' 35" N	156º 27' 03" W	Ornamental, red hibiscus,
KM0059	28-Aug-03	20º 53' 36" N	156º 26' 59" W	Ornamental, industrial, ornamental citrus, building walls,

General Collecting				
18 July 2006 to 19 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA 0011	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa*,
KA 0114	18-Jul-06	20º 53' 34" N	156º 27' 02" W	HDOA building; irrigated ornamental plantings and lawns
KA 0047	19-Jul-06	20º 54' 02" N	156º 27' 42" W	Near Hobron Pt., rocky beach strand, littoral, rock splash zone
KA 0031	20-Jul-06	20º 54' 39" N	156º 25' 34" W	End of runway, *Chenopodium oahuense*, night
KA 0043	20-Jul-06	20° 53' 35" N	156° 26' 59" W	HDOA insectary, day
KA 0044	20-Jul-06	20º 54' 40" N	156º 25' 34" W	E end of runway
KA 0103	22-Jul-06	20º 53' 35" N	156º 26' 59" W	HDOA building, irrigated ornamental plantings and lawns, night lights and ground
KA 0122	22-Jul-06	20º 53' 34" N	156º 27' 02" W	HDOA: irrigated ornamental plantings and lawns, night
KA 0104	23-Jul-06	20º 53' 35" N	156º 26' 59" W	Irrigated ornamental plantings and lawns, night
KA 0297	24-Jul-06	20º 53' 35" N	156º 26' 59" W	Irrigated ornamental plantings and lawns, on wall near light, night
KA 0061	18-Sep-06	20º 54' 23" N	156º 25' 54" W	Keawe/mixed understory woodland
KA 0148	18-Sep-06	20º 54' 26" N	156º 25' 50" W	Keawe/koa haole/mixed understory woodland: grass
KA 0108	19-Sep-06	20º 53' 38" N	156º 27' 23" W	Wetland, mixed native/ keawe/mixed alien understory woodland, in flight over *Cyperus laevigatus* (makaloa), Kanaha Pond
KA 0109	19-Sep-06	20º 53' 38" N	156º 27' 23" W	Wetland; keawe woodland; mixed native alien understory,
KA 0110	19-Sep-06	20º 53' 39" N	156º 27' 22" W	Kanaha Pond Wetland; keawe woodland; mixed native alien understory, *Cyperus laevigatus* (makaloa),
KA 0111	19-Sep-06	20º 53' 40" N	156º 27' 21" W	Wetland, mixed native/ keawe/mixed alien understory woodland: on person
KA 0058	21-Sep-06	20º 53' 53" N	156º 27' 09" W	Kanaha Pond; wetland, mixed native/ keawe/mixed alien understory woodland– on ground
KA 0289	13-Nov-06	20º 54' 20" N	156º 26' 07" W	AOA: on road, dead toad, , day
KA 0300	14-Nov-06	20º 54' 46" N	156º 25' 35" W	Wind-sheared shrubland, Sprecklesville, *Asystasia*

Table II-5.

General 18 July 2006 to 19 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA 0302	14-Nov-06	20º 53' 48" N	156º 27' 22" W	Wetland, mixed native/keawe/mixed alien understory woodland, on webs near MV site,
KA 0213	16-Nov-06	20º 54' 28" N	156º 26' 05" W	Airplane crash site: keawe/ironwood/mixed understory woodland, on web on ironwood
KA 0227	17-Nov-06	20º 53' 50" N	156º 26' 54" W	Wetland, mixed native/ keawe/mixed alien understory woodland: grasses
KA 0293	19-Nov-06	20º 53' 35" N	156º 26' 59" W	HDOA

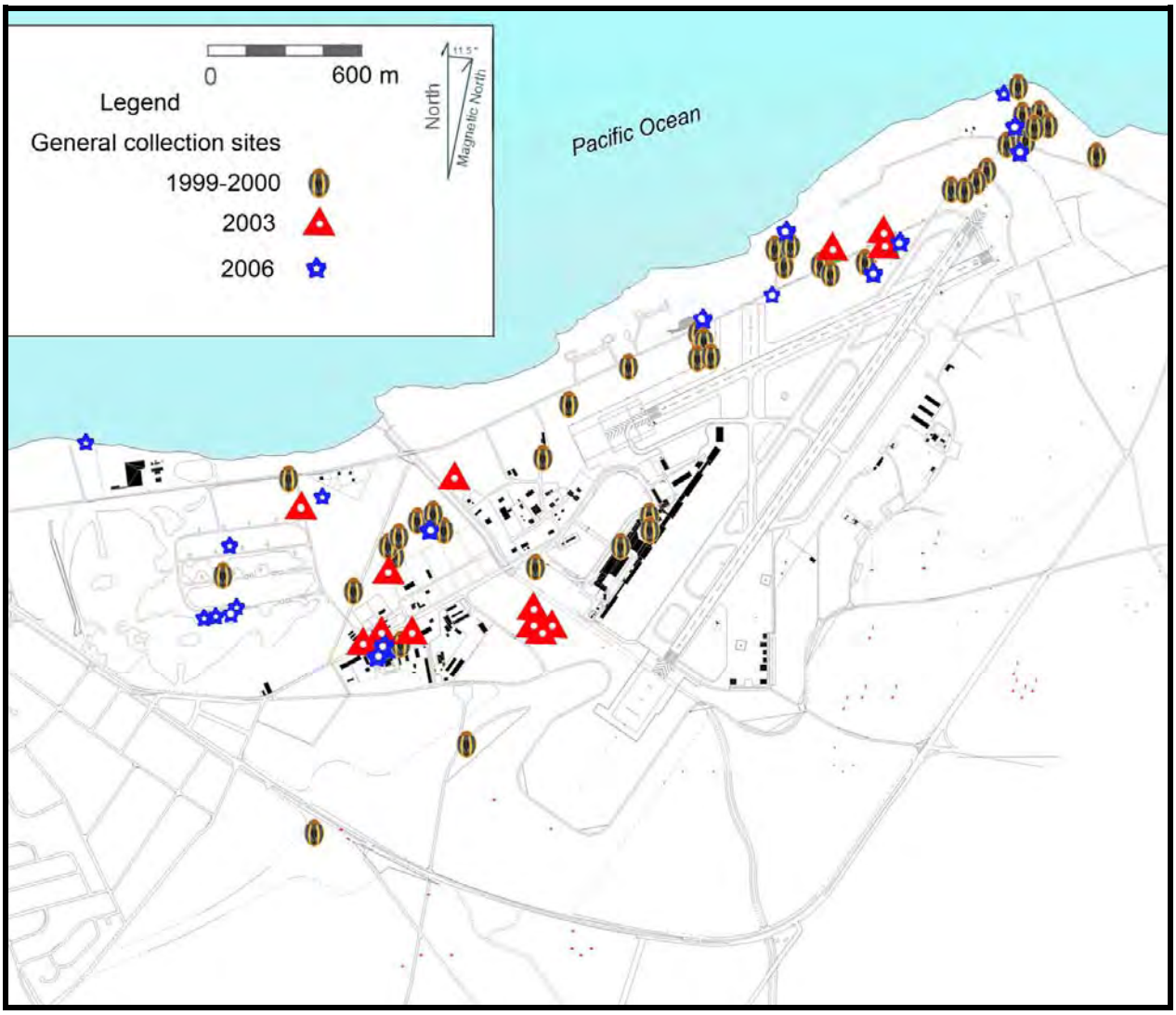


Figure II-5. Map showing locations of General collecting sites.

Sweep Net

F.G. Howarth & D.J. Preston using sweep nets to capture dragonflies. Photo by B. Evans, 2001

An **Insect Sweep Net** was used to capture actively flying specimens. Sweep Net samples were also taken by sweeping the net over host plants and substrates while walking along specific routes or along paths while walking between sites. Specific host plants were swept to obtain a sample of associated arthropods. Fifty samples were collected, which yielded 110 species. Sweep Net sample sites are listed in **Table II-6,** and the locations given in **Figure II-6.**

Table II-6. Collection sites sampled for arthropods by Sweep Net within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian = NAD 27

SWEEP NET				
5 August 2000 to 03 June 2000				
Collection Number	**Dates & # of spp**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0003	5-Aug-99	20º 54' 38" N	156º 25' 22" W	Near Papaula Point-Beach Strand shrubland-heliotrope, *Scaevola, Schinus*, etc.,
BL0004B	5-Aug-99	20º 54' 37" N- 20º 54' 41" N	156º 25' 21" W- 156º 25' 22" W	Beach and strand-Rocky shore and *Schinus, Ricinus*,etc., General sweep net
BL0246	05-Aug-99	20º 54’ 11” N	156º 26’ 23" W	Near Kanaha Beach Park, >5m elev, keawe woodland, mixed understory shrubs
BL0318	5-Aug-99	20º 54’ 13” N	156º 26’ 20” W	near Kanaha Beach Park, >5m elev. keawe woodland, mixed understory shrubs.
BL0011A	8-Sep-99	20º 54' 28" N	156º 26' 08" W	“Cook’s Beach”-Coast and flotsam,
BL0170	4-Feb-00	20º 54' 43" N	156º 25' 33" W	Beach strand *Scaevola*, mixed grasses.
BL0290	1-Mar-00	20º 54' 16" N	156º 25' 42" W	Malaise site #2; *Leucaena, Panicum, Cenchrus,* etc.
BL0055	2-Mar-00	20º 53' 56" N	156º 26' 52" W	Water margin, sedges. 2 samples
BL0120	6-Mar-00	20º 53' 53" N	156º 27' 08" W	Pond margin, Kanaha Pond Res., *Sesuvium*, sedges.
BL0120A	6-Mar-00	20º 53' 53" N	156º 27' 08" W	Pond margin, Kanaha Pond Res., *Chenopodium*, grasses.
BL0342	7-Mar-00	20º 53' 57" N	156º 27' 14" W	Kanaha Pond Reserve
BL0171	27-Mar-00	20º 53' 56" N	156º 27' 16" W	Kanaha Res., a`ali`I & *Scaevola*.

Table II-6. Continued

Sweep Net 5 August 2000 to 03 June 2000				
Collection Number	**Dates & # of spp**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0222	27-Mar-00	20º 54' 39" N	156º 25' 34"W	East end runway; *Chenopodium*, weeds
BL0230	27-Mar-00	20º 54' 39" N	156º 25' 34" W	East end runway; *Dodonaea*.
BL0291	27-Mar-00	20º 54' 23" N	156º 25' 54" W	Near Malaise Trap #1
BL0257	28-Mar-00	20º 53' 35" N	156º 26' 38" W	E of A'alele Rd near MV bulb & blacklight
BL0289	29-Mar-00	20º 54' 34" N	156º 25' 40" W	E end of runway, bike path, Spreckelsville
BL0310	29-Mar-00	20º 54' 42" N	156º 25' 31" W	E end of runway, native shrubs & *Scaevola*, day
BL0174	29-Mar-00	20º 54' 43" N	156º 25' 32" W	E end of runway, native shrubs & *Scaevola* night
BL0240	29-Mar-00	20º 54' 39" N	156º 25' 34" W	Near bike path E end of runway, *Chenopodium*
BL0248	29-Mar-00	20º 54' 12" N	156º 26' 16" W	Near Wet Spot #1, *Hibiscus tiliaceus* etc.
BL0224	31-Mar-00	20º 54' 18" N	156º 25' 42" W	Near malaise trap #2. Sweeping near taxiway, *Sida*
BL0231	31-Mar-00	20º 54' 18" N	156º 25' 42" W	Near Malaise Trap #2. Near taxiway, *Abutilon*
BL0251	31-Mar-00	20º 54' 17" N	156º 25' 40" W	Near taxiway. Near Malaise trap #2, *Abutilon*
BL0311	28-Apr-00	20º 54' 24" N	156º 25' 59" W	Wetland # 2, *Pluchea*
BL0315	30-Apr-00	20º 53'50"N	156º 25' 52" W	Near control tower, grass
BL0177	1-Jun-00	20º 53' 46"N	156º 26' 58.5"W	Keawe woodland; daytime; keawe, *Pulchea*, *Chenopodium*, grasses, mixed weeds.
BL0312	1-Jun-00	20° 53' 47" N	156° 26' 59.4"W	T-shirt factory, keawe woodland.
BL0181	3-Jun-00	20º 53' 43" N	156º 26' 31" W	Terminal; ornamentals, grass, shower tree, Ilima.
BL0228	3-Jun-00	20º 53' 47" N	156º26' 28" W	In terminal area, orchid tree
BL0245	3-Jun-00	20º 53' 47" N	156º26' 28" W	Terminal site, spider lily flowers
BL0226	3-Jun-00	20º 53' 46" N	156º 26' 37" W	Airport terminal area, spider lily flowers

Sweep net 18 July 2003 to 28 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0074	18-Jul-03	20º 54' 25" N	156º 26' 12" W	Wetspot #1 near beach.
KM0060	25-Jul-03	20º 53' 58" N	156º 26' 56" W	Ruderal, Kanaha Pond Reserve, *Atriplex* sp.
KM0061	26-Jul-03	20º 53' 52" N	156º 26' 52" W	Kanaha Pond Reserve, keawe woodland, keawe, *Panicum maximum*, *Chenopodium*, *Pluchea* @ night
KM0062	26-Jul-03	20º 53' 58" N	156º 26' 56" W	Kanaha Pond Reserve; ruderal, *Atriplex* sp. @ night
KM0063	24-Aug-03	20º 54' 13" N	156º 26' 17" W	Wetland 1, *Chenopodium*
KM0064	24-Aug-03	20º 54' 13" N	156º 26' 17" W	Wetland 1, Sedges
KM0065	26-Aug-03	20º 53' 47" N	156º 27' 11" W	Kanaha Pond Reserve, pond surface (*Batis*)
KM0066	26-Aug-03	20º 53' 47" N	156º 27' 13" W	Kanaha Pond Reserve, pond surface (*Batis*)
KM0067	26-Aug-03	20º 53' 48" N	156º 27' 17" W	Kanaha Pond Reserve, hypersaline sidepond (100 ppt salt)
KM0068	28-Aug-03	20º 54' 23" N	156º 26' 11" W	Wetland 1, near beach, wetland margin: sedges, grass@ night

Table II-6. Continued

Sweep Net 19 July 2006 to 16 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA0045	19-Jul-06	20º 54' 01" N	156º 27' 42" W	Beach strand and keawe woodland, mixed understory; sweeping wrack @ night
KA0046	19-Jul-06	20º 54' 01" N	156º 27' 42" W	Beach strand and keawe woodland, mixed understory, *Scaevola* sp. (naupaka) @ night
KA0105	19-Sep-06	20º 53' 40" N	156º 27' 21" W	Wetland; keawe woodland, mixed native/ alien understory.
KA0107	19-Sep-06	20º 53' 46" N	156º 27' 28" W	Wetland, keawe woodland; mixed native/ alien understory
KA0106	20-Sep-06	20º 53' 30" N	156º 26' 53" W	Ruderal, mixed ornamentals, *Wikstroemia monticola* (akia)
KA0115	20-Sep-06	20º 53' 44" N	156º 27' 28" W	Wetland, keawe woodland, mixed native/ alien understory; *Dodonaea viscosa* (a'ali'i) @ night
KA0216	16-Nov-06	20º 53' 55" N	156º 26' 56" W	Keawe/mixed understory woodland, *Pluchea* sp. day
KA0218	16-Nov-06	20º 54' 29" N	156º 25' 52" W	*Bacopa* dominated wetland, keawe/mixed understory, over puddles, day

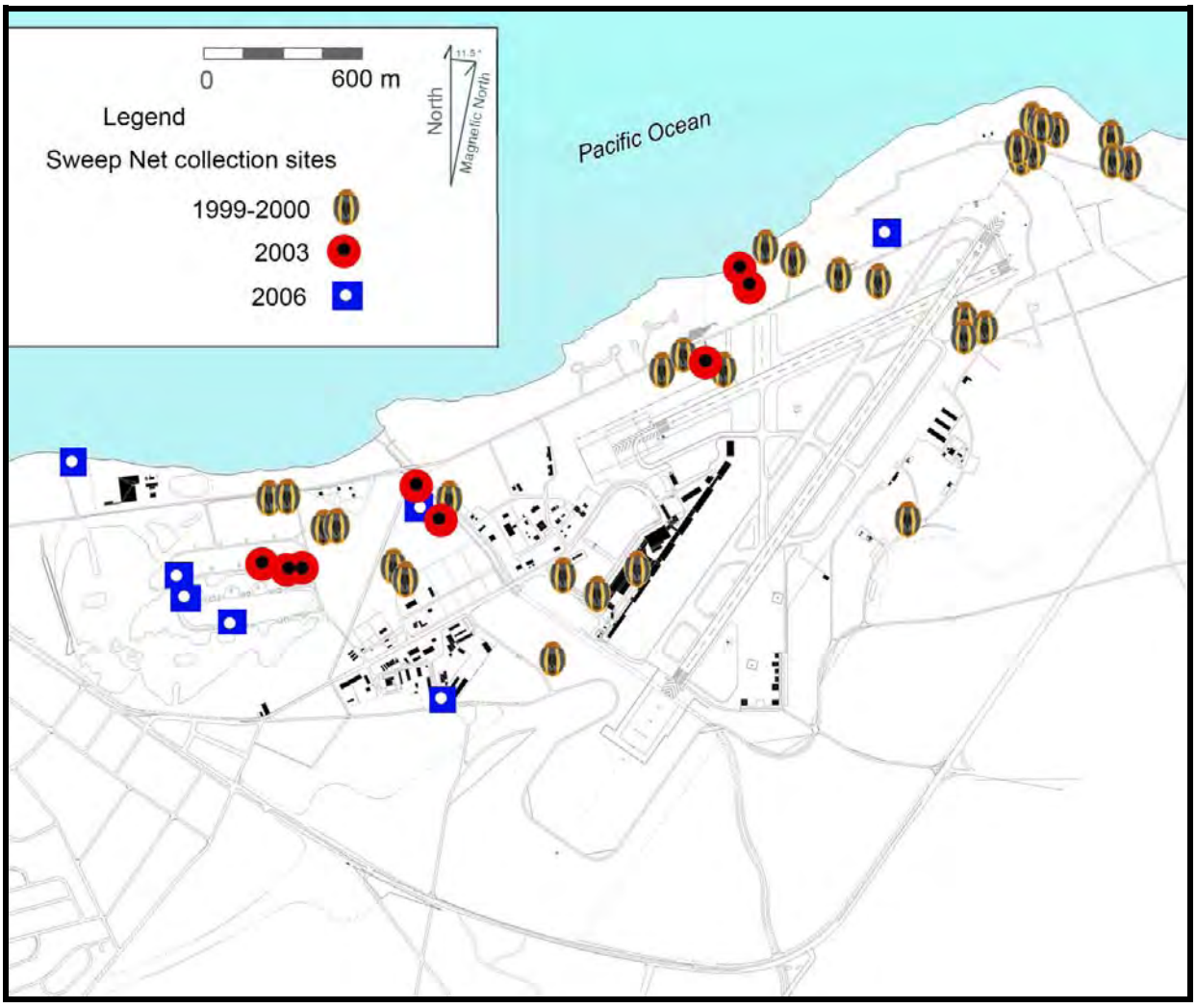


Figure II-6. Map showing locations of Sweep Net collecting sites.

Host Searching

Plant hosts were visually inspected, both opportunistically and purposefully, for host-specific arthropods especially if there was evidence of feeding damage. Plant samples showing insect damage (especially infested branches) were placed in screened cages (emergence traps) and the insects captured as they emerged over the course of several weeks. Captured larvae were also reared to adults, by placing them in cages and providing them with their appropriate food resources. Sixty-six samples yielded more that 50 species. Host searches are listed in **Table II-7**, and the locations are shown in **Figure II-7**.

Table II-7. Collection sites sampled for arthropods by **Host Search** within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian (=NAD 27).

HOST SEARCH				
05 August 1999 to 03 June 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0006A	05-Aug-99	20º 54' 29" N	156º 26' 05" W	"Cook's Beach", *Scaevola taccada*
BL0064	05-Aug-99	20º 54' 40" N	156º 25' 34" W	Dry shrubland, *Pluchea* flowers & *Chenopodium*
BL0011	08-Sep-99	20º 54' 28" N	156º 26' 08" W	Keawe forest, *Chenopodium*
BL0065	09-Sep-99	20º 54' 11" N	156º 26' 27" W	Keawe forest, *Chenopodium*
BL0019B	04-Oct-99	20º 53' 22" N	156º 26' 40" W	West end of runway; Ruderal-*Nicotiana, Cenchrus, Saccharum, Ricinus*, etc, ex *Nicotiana*
BL0020A	4-Oct-99	20º 53' 20" N	156º 26' 48" W	Ruderal-*Nicotiana, Cenchrus*, barren, ex *Nicotiana*
BL0027	07-Oct-99	20º 53' 51" N	156º 27' 21" W	Kanaha Res., *Sesuvium, Sporobolus, Pluchea*
BL0034	03-Nov-99	20º 53' 51" N	156º 27' 05" W	Native shrub-land at night, *Scaevola*
BL0219	04-Feb-00	20º 54'40"N	156º 25' 36"W	W Sprecklesville, wind-sheared shrubland, Resting on *Nicotiana*
BL0331	04-Feb-00	20º 54' 33" N	156º 25' 40" W	Wetspot 3, W Sprecklesville, Resting on *Nicotiana*
BL0303	4-Mar-00	20º 53' 45" N	156º 26' 38" W	Ornamental planting, ex oleander hedge.
BL0241	27-Mar-00	20º 54' 29" N	156º 25' 52" W	Near Wet Spot #3. ex dry, dead *Leucaena* branches,
BL0267	27-Mar-00	20º 54' 39" N	156º 25' 34" W	W Sprecklesville, *Scaevola taccada* (Naupaka)
BL0283	29-Mar-00	20º 54' 13" N	156º 26' 17" W	Near wetspot #1. Attracted to slime flux on keawe trunk,
BL0187	29-Apr-00 -	20º 54' 05" N	156º 26' 34" W	Keawe woodland; ex dead keawe branches in termite gallery
BL0178	1-Jun-00	20º 53' 47" N	156º 26' 59" W	Keawe wood-land –ex dead keawe branches, General, daytime
BL0302	3-Jun-00	20º 53' 52" N	156º 26' 23" W	In terminal area-spider lily flowers, night
BL0305	3-Jun-00	20º 53' 52" N	156º 26' 23" W	Terminal-orchid tree flowers, night
HOST SEARCH 24 June 2003 to 28 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0088	24 Jun 03	20º 54' 26" N	156º 25' 54" W	ex *Macroptileum atropurpureum*
KM0017	24Jun 03	20º 53' 36" N	156º 26' 38" W	ex *Ficus microcarpa*
KM0018	25Jun 03	20º 54' 17" N	156º 26' 09" W	*Boerhavia*, weeds
KM0020	26 Jun 03	20º 54' 42" N	156º 25' 29" W	*Vigna marina*
KM0019	26 Jun 03	20º 54' 39" N	156º 25' 34" W	*Chenopodium oahuense*
KM0021	26 Jun 03	20º 54' 42" N	156º 25' 29" W	*Scaevola taccada*

Table II-7. Continued.

Host Search 24 June 2003 to 28 August 2003 (continued)				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0022	26 Jun 03	20º 54' 42" N	156º 25' 29" W	ex *Ipomoea indica*
KM0023	26 Jul 03	20º 54' 23" N	156º 26' 16" W	*Panicum maximum*
KM0092	23 Aug 03	20º 53' 52" N	156º 26' 20" W	Potted palm
KM0024	24 Aug 03	20º 53' 30" N	156º 27' 29" W	*Pandanus*
KM0025	24 Aug 03	20º 53' 44" N	156º 26' 46" W	Ornamental wiliwili
KM0026	24 Aug 03	20º 53' 45" N	156º 26' 46" W	*Ricinus*
KM0027	26 Aug 03	20º 53' 50" N	156º 27' 22" W	Keawe
KM0028	27 Aug 03	20º 53' 49" N	156º 27' 28" W	Coconut
KM0029	28 Aug 03	20º 53' 35" N	156º 26' 59" W	Ornamental bromeliad
KM0030	28 Aug 03	20º 53' 32" N	156º 27' 01" W	Coconut
KM0031	28 Aug 03	20º 53' 56" N	156º 26' 39" W	Oleander
KM0091	28 Aug 03	20º 54' 04" N	156º 26' 38" W	Keawe
Host Search 18 July 2006 to 29 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA 0020	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland margin, irrigated lawn, hibiscus hedge, @NIGHT
KA 0123	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland, mixed native/ keawe/mixed alien understory woodland, ex *Ficus benjamina* trunks @NIGHT
KA 0048	19-Jul-06	20º 54' 01" N	156º 27' 42" W	Beach strand and keawe/mixed understory woodland, *Prosopis pallida* (keawe) trunks, @NIGHT
KA 0084	19-Jul-06	20º 53' 35" N	156º 26' 59" W	Industrial, buildings,*Plumeria rubra*, day
KA 0003	20-Jul-06	20º 53' 38" N	156º 26' 45" W	A`alele St., *Cassia* sp. (yellow flowers)
KA 0017	20-Jul-06	20º 53' 35" N	156º 26' 59" W	Industrial, buildings, *Citrus* sp., day
KA 0019	20-Jul-06	20º 54' 31" N	156º 25' 47" W	Mixed shrubland and grasses, *Nicotiana* @NIGHT
KA 0116	20-Jul-06	20º 54' 40" N	156º 25' 34" W	Wind-sheared dune vegetation, *Ipomoea* sp. (flowers), @NIGHT
KA 0146	21-Jul-06	20º 53' 34" N	156º 27' 02" W	Industrial, buildings, *Citrus* sp. day
KA 0120	22-Jul-06	20º 53' 35" N	156º 26' 59" W	Industrial, buildings, *Erythrina sandwicensis* (wiliwili), near HDOA insectary. day
KA 0085	23-Jul-06	20º 53' 35" N	156º 26' 59" W	Industrial, buildings, *Citrus* sp., HDOA insectary
KA 0119	19-Sep-06	20º 53' 40" N	156º 27' 21" W	Wetland, mixed native/ keawe/mixed alien understory woodland, *Sesuvium portulacastrum* (akulikuli),
KA 0112	21-Sep-06	20º 53' 34" N	156º 27' 02" W	Irrigated ornamental plantings and lawns, *Cascabela thevetia*, day
KA 0126	21-Sep-06	20º 53' 34" N	156º 26' 59" W	Irrigated ornamental plantings and lawns, *Hibiscus rosasinensis*, day (=KA 0153)
KA 0127	21-Sep-06	20º 53' 35" N	156º 27' 00" W	Irrigated ornamental plantings and lawns, *Gossypium tomentosum* (mao), day (=KA 0133)
KA 0128	21-Sep-06	20º 53' 34" N	156º 27' 00" W	Irrigated ornamental plantings and lawns, *Citrus* sp., day
KA 0129	21-Sep-06	20º 53' 34" N	156º 27' 00" W	Irrigated ornamental plantings and lawns, *Chamaesyce hirta*, day
KA 0145	21-Sep-06	20º 53' 48" N	156º 27' 24" W	Wetland, mixed native/ keawe/mixed alien understory woodland, *Cynodon dactylon*,

Table II-7. Continued.

Host Search 18 July 2006 to 17 November 2006 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA 0150	21-Sep-06	20º 53' 33" N	156º 26' 59" W	Irrigated ornamental plantings and lawns,*Chrysalidocarpus lutescens* (areca palm), day
KA 0151	21-Sep-06	20º 53' 33" N	156º 26' 59" W	Irrigated ornamental plantings and lawns, *Schefflera actinophylla*, day
KA 0152	21-Sep-06	20º 53' 35" N	156º 26' 59" W	Irrigated ornamental plantings and lawns, *Hibiscus clayi*, day
KA 0136	22-Sep-06	20º 53' 44" N	156º 26' 27" W	Industrial/mixed ornamentals, *Psidium* sp. (guava), day
KA 0137	22-Sep-06	20º 53' 33" N	156º 26' 49" W	Ruderal, mixed ornamentals, *Hibiscus* sp. day,
KA 0138	22-Sep-06	20º 53' 33" N	156º 26' 49" W	Ruderal, mixed ornamentals, *Abutilon menziesii*, day
KA 0139	22-Sep-06	20º 53' 33" N	156º 26' 49" W	Ruderal, mixed ornamentals.,*Chamaesyce* sp., day
KA 0140	22-Sep-06	20º 53' 33" N	156º 26' 48" W	Ruderal, mixed ornamentals, *Pouteria sandwicensis*, day
KA 0141	22-Sep-06	20º 53' 45" N	156º 26' 38" W	Industrial/mixed ornamentals, *Ipomoea indica*,
KA 0154	29-Sep-06	20º 53' 35" N	156º 26' 59" W	Irrigated ornamental plantings and lawns, *Ophiopogon japonicus* (mondo grass), day
KA 0133	14 Nov 06	20º 54' 39" N	156º 25' 34" W	Wind-sheared dune, *Nicotiana glauca*
KA 0230	17-Nov-06	20° 53' 50" N	156° 26' 54" W	Wetland, keawe woodland mixed native/ alien understory, *Prosopis pallida*

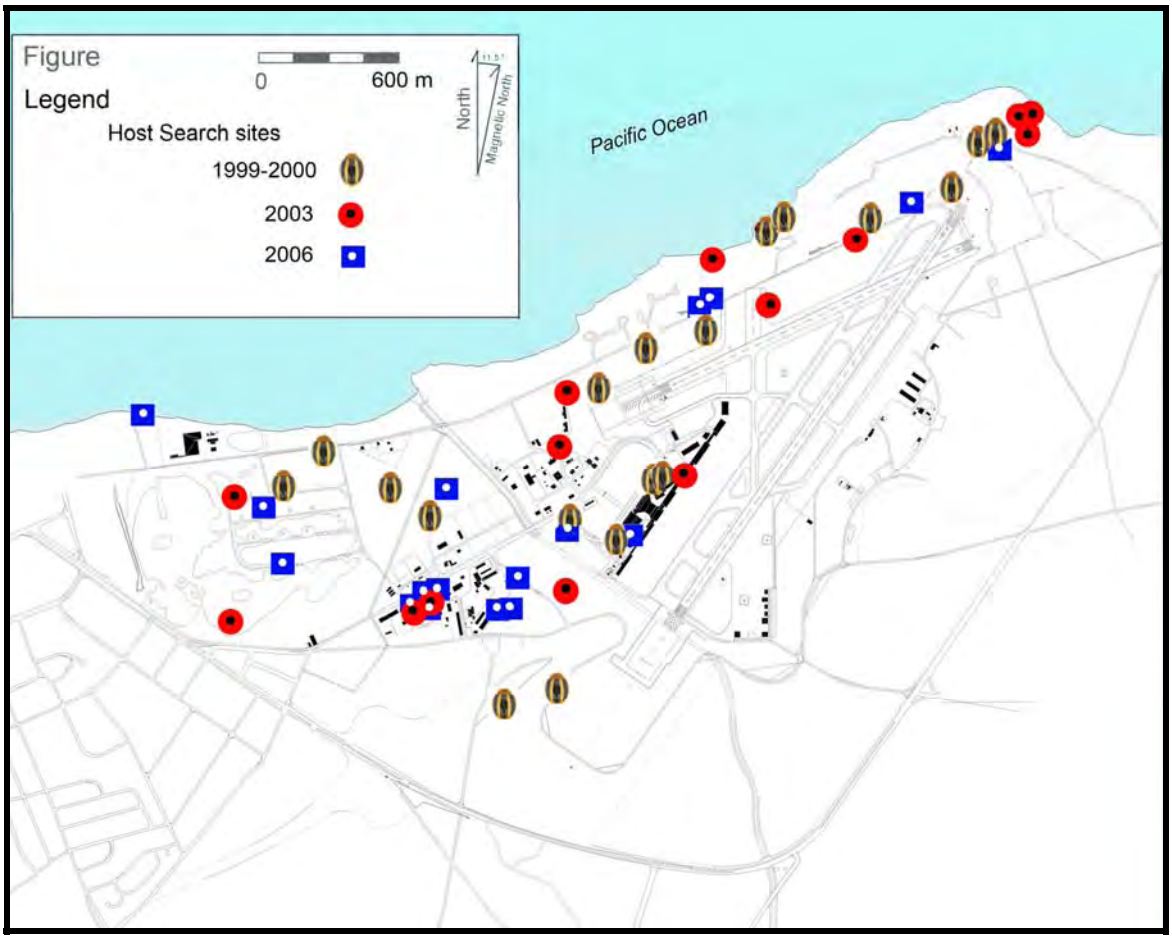


Figure II-7. Map showing location of Host Search collections.

Beating Sheet and Dip Net

Foliage was also sampled with a **beating sheet**, which is a 3-foot square (0.84 m^2) of muslin stretched tight on a wooden frame. The sheet was held directly below the foliage to be sampled, like an inverted umbrella, and the foliage vigorously shaken. Dislodged arthropods were collected from the sheet. The method is effective for beetles and true bugs that drop and play dead when disturbed. It is less effective for flies, wasps and other groups that fly or jump when disturbed. Sixteen beating sheet samples produced six records. Locations for beating sheet collections are list in **Table II-8** and shown in **Figure II-8.**

In addition, an aquatic Dip Net was used to collect one sample from a pool in Kanaha Pond Wildlife Reserve. This sample contained two species of aquatic true bugs. For efficiency, the location is included on **Figure II-8**.

Table II-8. Collection sites sampled for arthropods by beating sheet and dip net within the Kahului Airport Environs between 1 August 1999 and 23 August 2003. Map datum is Old Hawaiian = NAD 27

BEATING SHEET 01 August 1999 to 20 June 2001 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0108	3-Feb-00	20º 53' 43" N	156º 26' 46" W	Main roadside Terminal area, bougainvillea hedge
BL0109	3 Feb 00	20º 53' 48" N	156º 26' 28" N	Terminal area, ornamental plantings
BL0110	3-Feb-00	20º 53' 47" N	156º 26' 27" W	Terminal area ornamental planting.
BL0111	3-Feb-00	20º 53' 47" N	156º 26' 29" W	Terminal area ornamental planting.
BL0112	4-Feb-00	20º 53' 34" N	156º 26' 47" W	Terminal area ornamental planting, Next to *Mommordica charantia* on fence, next to large gravel pile,
BL0113	4-Feb-00	20º 53' 30" N	156º 26' 50" W	Industrial area/buildings, *Scaevola coriacea.*
BL0114	4-Feb-00	20º 53' 31" N	156º 26' 49" W	Industrial area/buildings *Osteomeles anthidydifolia.*
BL0115	4-Feb-00	20º 53' 32" N	156º 26' 49" W	Industrial area/buildings, *Bonamia menziesii*.
BL0116	4-Feb-00	20º 53' 33" N	156º 26' 50" W	Industrial area/buildings, *Abutilon menziesii*.
BL0117	4-Feb-00	20º 53' 41" N	156º 26' 31" W	Industrial area/buildings *Acacia confusa* (= Formosan koa) G33.
BL0118	4-Feb-00	20º 53' 39" N	156º 26' 46" W	Industrial area/buildings plant nursery; *Leucana leucocephala* & *Senna* sp. (= shower tree), # G-36.
BL0119	4-Feb-00	20º 53' 38" N	156º 26' 45" W	Industrial area/buildings, *Panicum maximum*.
BL0107B	3-Mar-00	20º 53' 35" N	156º 26' 45" W	Industrial area/buildings - Host Papaya
Beating Sheet 24 June 2003 to 23 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0043	26-Jun-03	20º 54' 39" N	156º 25' 34" W	Native shrub-land, day time *Chenopodium oahuense.*
KM0044	27-Jun-03	20º 53' 56" N	156º 27' 15" W	Kanaha Pond Reserve, day time *Chenopodium oahuense*, Beating Sheet
KM0045	24-Jul-03	20º 54' 30" N	156º 25' 53" W	Near wetspot 3, mixed ornamental forest *Thespesia populnera*, Beating Sheet
Dip Net 27 June 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0073	27-Jun-03	20º 53' 45" N	156º 27' 28" W	Kanaha Pond Reserve, aquatic, in pool.

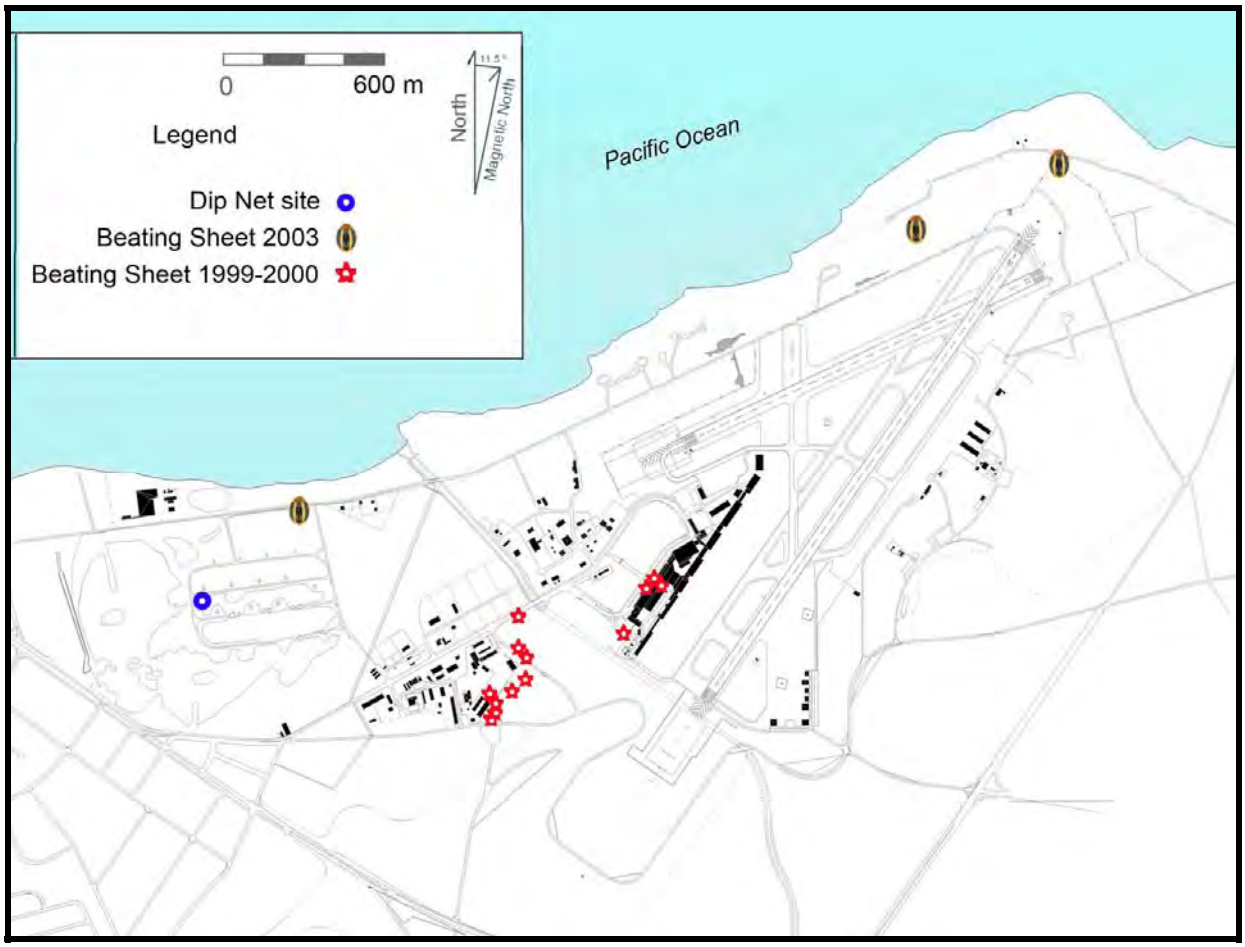


Figure II-8. Map showing location of Beating Sheet and Dip Net collections.

Fogging

The fogging method entailed spreading a white plastic sheet (a shower curtain) about 6-feet square (3.3 m^2) beneath the area to be sampled and spraying the area for 30 seconds with a biodegradable pyrethroid insecticide "flea fogger." The stunned arthropods were collected off the sheet as they fell. This method works well for sampling dense vegetation not suitable for the aspirator or sweep net such as plants with abundant loose, dry seed heads that would clog the sample. A further advantage is that pyrethroid compounds act as irritants to arthropods, and therefore many cryptic species, which otherwise might escape, are dislodged from hiding and drop to the sheet. The method provides a relatively unbiased sample of the species present that are vulnerable to the insecticide. More than 34 species, a few of which were collected only in fog samples, were recorded using this method. The thirty-four sample sites are listed in **Table II-9,** and the locations given in **Figure II-9.**

Fogging shrubs over white sheet
Photo by F. Starr, 2006

Table II-9- Fogging. Collection sites sampled for arthropods by fogging within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian = NAD 27

FOGGING				
Baseline Survey 29 April 2000 to 04 June 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0184	29-Apr-00	20º 54' 29.5" N	156º 25' 50.5" W	Open keawe woodland, keawe
BL0185	29-Apr-00	20º 54' 39" N	156º 25' 36" W	East end of runway native shrubland, *Chenopodium*
BL0186	29-Apr-00	20º 54' 04" N	156º 26' 35" W	Keawe woodland, keawe; @ night
BL0188	29-Apr-00	20º 54' 26" N	156º 26' 06" W	Keawe woodland, *Causurina*
BL0232	29-Apr-00	20º 54' 39" N	156º 25' 34" W	East end of runway, *Chenopodium*
BL0234	29-Apr-00	20º 54' 39" N	156º 25' 33" W	East end of bike path, dry shrubland, *Chenopodium* sp.
BL0189	30-May-00	20º 53' 44" N	156º 26' 40" W	Leucaena scrub, *Leucaena*, *Ipomea*. y
BL0190	31-May-00	20º 53' 45" N	156º 27' 02" W	Keawe woodland, keawe, *Pluchea*, low weeds, grasses.
BL0191	31-May-00	20º 53' 46.5" N	156º 27' 01.5" W	Keawe woodland, keawe, *Pluchea*, low weeds, grasses.
BL0192	31-May-00	20º 53' 50" N	156º 26' 52" W	Keawe woodland, keawe, *Pluchea*, low weeds, grasses.
BL0193	31-May-00	20º 53' 46" N	156º 27' 00" W	Keawe woodland, keawe, *Pluchea*, low weeds, grasses.
BL0194	01-Jun-00	20º 53' 48" N	156º 26' 58" W	Keawe woodland, keawe, *Pluchea*, low weeds, grasses.
BL0195	01-Jun-00	20º 53' 49" N	156º 26' 54" W	Keawe wood-land daytime, keawe, *Pluchea*, *Chenapodium*, grasses, mixed weeds.
BL0196	01-Jun-00	20º 53' 46" N	156º 26' 58" W	Keawe wood-land daytime, Keawe, Pluchea, Chenopodium, grasses, mixed weeds.
BL0197	01-Jun-00	20º 53' 45" N	156º 27' 02" W	Kanaha Pond drainage channel keawe wood-land, keawe, *Pluchea*, mixed weeds
BL0198	01-Jun-00	20º 53' 48" N	156º 27' 05" W	Keawe wood-land, keawe, *Pluchea*, mixed weeds.
BL0199	01-Jun-00	20º 53' 50" N	156º 27' 00" W	Behind t-shirt factory, Kanaha Pond, *Pluchea* & koa haole.
BL0200	01-Jun-00	20º 53' 46" N	156º 27' 02" W	Keawe wood-land, keawe, *Pluchea*, mixed weeds.
BL0201	01-Jun-00	20º 53' 52" N	156º 26' 57" W	Open keawe woodland, *Pluchea*, *Leucaena*; @ night.
BL0202	01-Jun-00	20º 53' 51" N	156º 26' 59" W	Open keawe woodland, *Pluchea*, *Leucaena*; @ night.
BL0203	02-Jun-00	20º 53' 56" N	156º 27' 16" W	Native shrubs, *Scaevola*.
BL0204	02-Jun-00	20º 54' 36" N	156º 25' 37" W	Mixed shrubland, *Chenopodium*
BL0306	04-Jun-00	20º 53’ 46" N	156º 27' 01-2" W	Keawe woodland, Keawe, *Pluchea*, low weeds, grasses. fogging *Pluchea*
Fogging				
First Monitoring Survey 24 June to 28 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0070	24-Jul-03	20º 54' 25" N	156º 26' 11" W	Beach strand, blooming *Messerschmittea*
KM0071	24-Jul-03	20º 54' 25" N	156º 26' 11" W	Beach strand, *Causurina*
KM0072	24-Jul-03	20º 54' 30" N	156º 25' 53" W	Near wetspot 3, mixed ornamental tree species, date palm and hau

Table II-9. continued

Fogging				
Second monitoring survey 18 July 2006 to 17 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA0037	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa*, *Thespesia populnea*; @ night
KA0022	18-Jul-06	20º 54' 23" N	156º 25' 59" W	*Leucaena* sp. mixed weeds, *Macroptilium atropurpureaum*; @ daytime
KA0024	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa*, *Schinus terebinthifolius;* @ night
KA0040	18-Jul-06	20º 54' 16" N	156º 26' 16" W	Wetland dominated by *Bacopa*, *Bacopa monierri* @ night
KA0287	18-Jul-06	20º 54' 16" N	156º 26'16" N	Wetland dominated by *Bacopa*, hibiscus hedge; @ night
KA0023	20-Jul-06	20º 54' 40" N	156º 25' 34" W	Wind-sheared dune vegetation, *Leucaena* sp. (haole koa); @ night
KA0217	16-Nov-06	20º 54' 30" N	156º 25' 51" W	*Bacopa* dominated wetland, keawe/mixed understory, *Pluchea* sp. (small leaf) @ daytime
KA0039	17-Nov-06	20º 53' 49" N	156º 26' 58" W	Keawe/mixed understory woodland, *Leucaena* sp. (haole koa); @ daytime

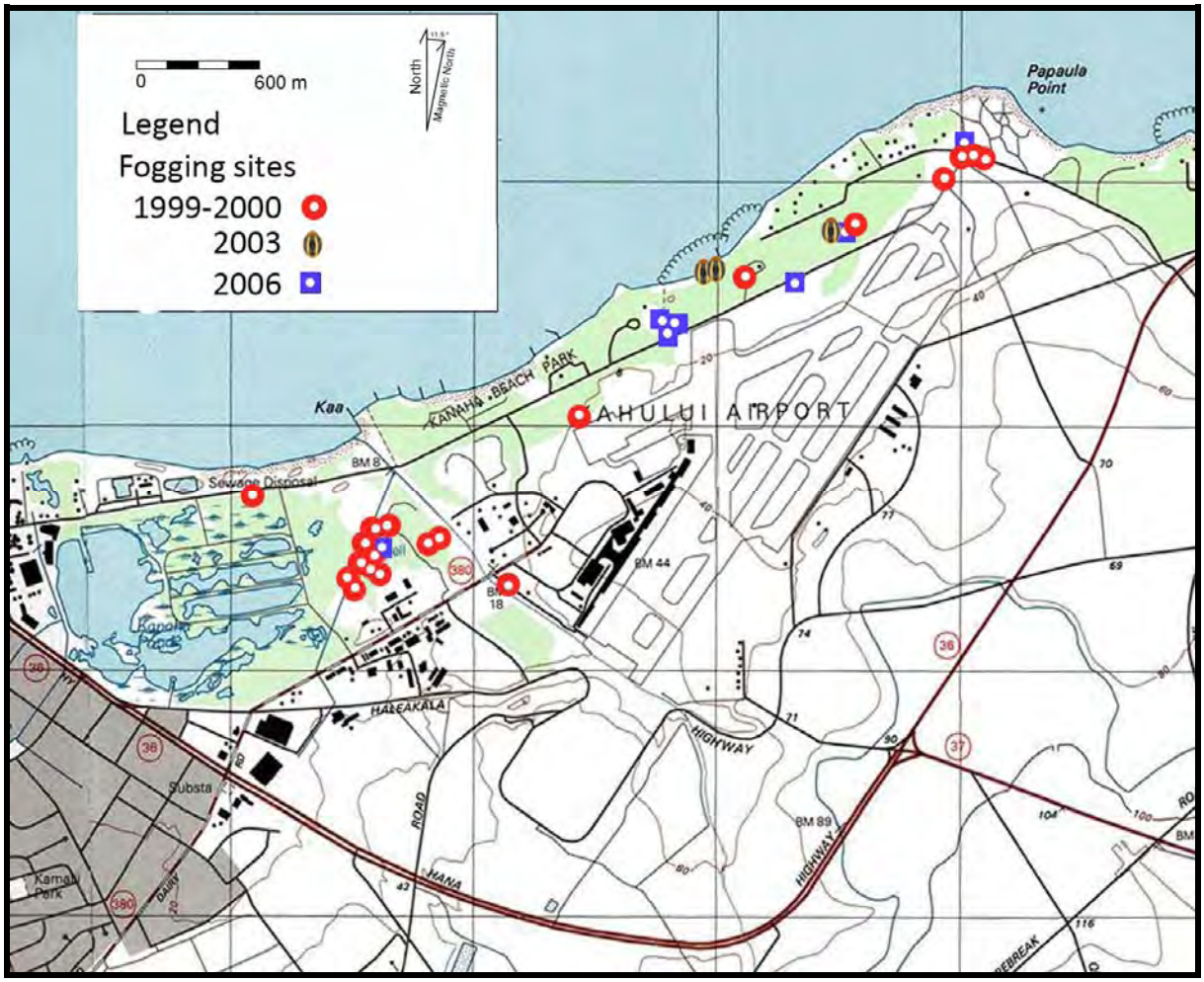


Figure II-9. Map showing locations of fogging collection sites.

Sticky Traps

Sticky traps are bright yellow cardboard sheets covered with non-drying sticky adhesive and are often baited with lures or organic material. Traps are placed in trees, shrubs, and various habitat types. The yellow color is very attractive to many foliage-feeding arthropods and their associated parasites and predators. The trap also collects many aerially-dispersing arthropods, especially, aphids, thrips, true flies, and wasps. The sticky traps are often constructed with cardboard or plastic roofs to protect them from heavy rain and falling branches. Traps are collected by covering the sticky surface with a clear plastic sheet or the card placed in a clear plastic bag for transport back to the laboratory for viewing and specimen removal. This is a very labor-intensive technique, especially if specimens need to be extracted from the glue for identification. Handling the sticky sheets can be messy and problematic. Also, the traps became fouled with dust, soot, seeds and other wind-borne debris, making species detection difficult. A few traps were lost to wind or to human or animal disturbance. Although specimens are not usually in pristine condition using this method, a high diversity of arthropods are captured and a sufficient percentage can be recovered for identification. The method is admirably suite for monitoring for the presence of known pest species. Over 50 species were captured on the 23 sticky traps set. Trap locations are listed in **Table II-10,** and their locations shown on **Figure II-10.**

Kim Starr holding a sticky trap
Photo by D.J. Preston, 2006

Sticky trap hanging in koa haole tree
Photo by F.G. Howarth, 2006

Table II-10. Collection sites sampled for arthropods by sticky traps within the Kahului Airport Environs between August 2006 and 18 November 2006. Map datum is Old Hawaiian = NAD 27

STICKY TRAPS				
28 August 2006 to 18 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA-0063	28 Aug 06-18 Nov 06	20° 53' 54" N,	156° 27' 43" W	Beach strand and keawe woodland, mixed understory, *Prosopis pallida*, bait: fruit
KA-0147	28 Aug 06-18 Nov 06	20° 53' 59" N,	156° 25' 43" W	ATC tower W side, wind-sheared dune vegetation *Leucaena leucocephala*, bait: fruit
KA-0149	28 Aug 06-18 Nov 06	20° 53' 35" N,	156° 26' 59" W	HDOA station, irrigated ornamental plantings and lawns, *Citrus* sp., bait: fruit
KA 0256	28-Aug-06-18-Nov-06	20º 53' 42" N	156º 26' 00" W	Koa haole dominated scrub, *Prosopis pallida*, bait: fruit

Table II-10. Continued

Sticky Traps 28 August 2006 to 18 November 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA 0258	28-Aug-06-18-Nov-06	20º 53' 35" N	156º 26' 59" W	Irrigated ornamental plantings and lawns, *Gossypium tomentosum*, bait: fruit
KA 0259	28-Aug-06-18 Nov- 06	20º 53' 35" N	156º 26' 59" W	Irrigated ornamental plantings and lawns *Plumeria rubra*, bait: fruit
KA 0261	28-Aug-06-18-Nov-06	20º 53' 57" N	156º 27' 17" W	Beach strand and keawe/mixed understory woodland, *Scaevola taccada*, bait: fruit
KA 0263	28-Aug-06-18-Nov-06	20º 54' 05" N	156º 26' 40" W	Beach strand and keawe/mixed *Schinus terebinthifolius*, bait: fruit understory woodland
KA 0264	28-Aug-06-18-Nov-06	20º 54' 17" N	156º 26' 17" W	Wetland dominated by *Bacopa, Prosopis pallida*, bait: fruit
KA 0265	28-Aug-06-18-Nov-06	20º 54' 21" N	156º 26' 17" W	Beach strand and keawe/mixed *Pluchea* sp., bait: fruit understory woodland
KA 0266	28-Aug-06-18-Nov-06	20º 54' 02" N	156º 26' 36" W	Keawe/mixed understory woodland, *Ricinus communis*, bait: fruit
KA 0267	28-Aug-06-18 Nov- 06	20º 54' 00" N	156º 26' 41" W	Keawe/mixed understory woodland *Leucaena leucocephala*, bait: fruit
KA 0268	28-Aug-06-18-Nov-06	20º 53' 53" N	156º 26' 46" W	Keawe/mixed understory woodland *Ricinus communis*, bait: fruit
KA 0269	28-Aug-06-18-Nov-06-	20º 53' 55" N	156º 26' 51" W	Beach strand and keawe/mixed understory woodland *Prosopis pallida*, bait: fruit
KA 0270	28-Aug-06-18-Nov-06-	20º 53' 37" N	156º 26' 46" W	Ruderal, keawe/mixed understory woodland *Leucaena leucocephala*, bait: fruit,
KA 0271	28-Aug-06-18-Nov-06-	20º 53' 37" N	156º 26' 46" W	Ruderal, keawe/mixed understory woodland Erythrina crista-galli, bait: fruit
KA 0272	28-Aug-06-18-Nov-06-	20º 53' 46" N	156º 26' 39" W	Ruderal, mixed ornamentals, *Leucaena leucocephala*, bait: fruit
KA 0273	28-Aug-06-18-Nov-06-	20º 54' 06" N	156º 26' 41" W	Beach strand and keawe/mixed *Schinus terebinthifolius*, bait: fruit understory woodland
KA 0285	28-Aug-06-18-Nov-06	20º 53' 57" N	156º 27' 17" W	Beach strand and keawe/mixed understory woodland *Scaevola tacada*, bait: Spam
KA 0286	28-Aug-06-18-Nov-06	20º 54' 01" N	156º 26' 51" W	Beach strand and keawe/mixed understory woodland, *Pluchea sp*., bait: Spam
KA-0279	28-Aug-06-18-Nov-06	20º 54' 23" N	156º 25' 58" W	AOA, in culvert to wetland 2
KA-0280	28-Aug-06-18-Nov-06	20º 54' 24" N	156º 25' 35" W	AOA, in *Leucaena leucocephala*, shrub land

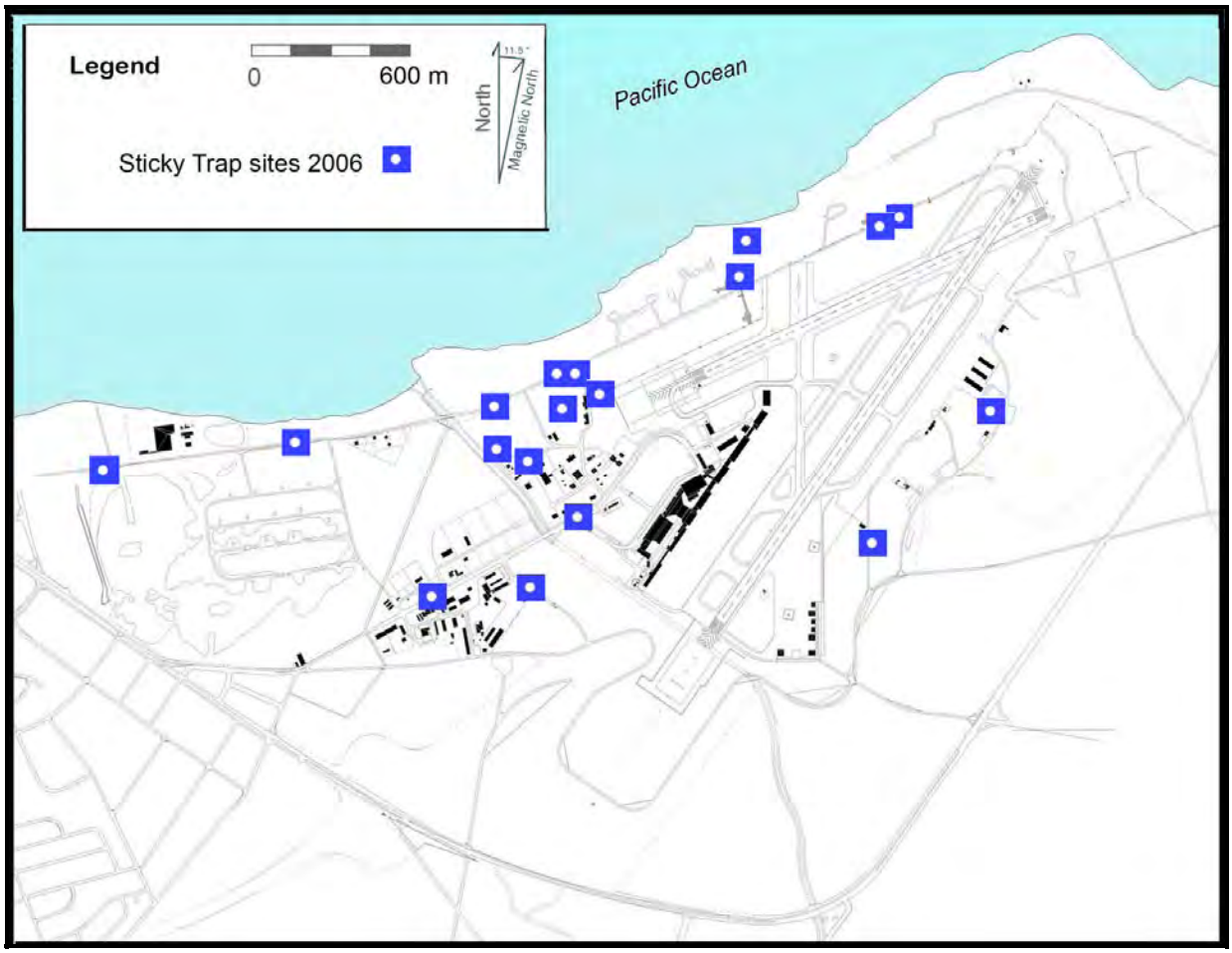


Figure II-10. Map showing locations of Sticky Trap collecting sites.

Ant Baits

Ant Bait station Photo by D.J. Preston, 2003

Since ants are considered especially problematic as invaders, several methods have been developed to survey for their presence. Ants are commonly inventoried by using small, rapidly deployed bait stations. Inexpensive wooden chopsticks work well. The bait is smeared on the chopstick, which is then left in suitable habitats for one to a few hours and retrieved. The chopsticks are placed in a sealed plastic bag for later sorting, or the ants separated in the field. During the baseline survey of 1999-2000, we set out ant bait stations along margins of vegetation and at other likely spots. We used three separate baits at most stations: peanut butter, honey, and canned fish-based cat food. The bait sticks were checked after one or more hours, and the ants present were collected. Peanut butter proved to be the most convenient to use and gave good results. Thirteen out of the total of 19 ant species found were detected using the bait stations. The gas aspirator also proved to be highly effective for collecting most species present. The 34 ant bait sites are listed in **Table II-11,** and their locations given in **Figure II-11.**

Table II-11. Collection sites sampled for arthropods by Ant Baits within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian = NAD 27

ANT BAITS				
04 October 1999 to 03 March 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0297	04-Oct-99	20º 53' 44" N	156º 26' 36" W	Corner with UPS; -ruderal - honey bait
BL0299	04-Oct-99	20º 53' 44" N	156º 26' 36" W	At UPS in ditch. -ruderal - honey/peanut butter
BL0069A	05-Oct-99	20º 53" 45' N	156º 26' 40" W	Ruderal and hedge, on ground and leaflitter 3 samples: voucher sample D20
BL0298	05-Oct-99	20º 53" 45' N	156º 26' 38" W	Terminal Road -ruderal - Peanut butter
BL0300	05-Oct-99	20º 53" 45' N	156º 26' 41" W	UPS Rd at base of utility pole. -Ruderal. - Peanut butter
BL0019A	06-Oct-99	20º 53' 22" N	156º 26' 40" W	Ruderal *Nicotiana*, *Cenchrus ciliarus*, barren
BL0020B	06-Oct-99	20º 53' 20" N	156º 26' 48" W	Ruderal *Nicotiana, Cenchrus, Saccharum, Ricinus*, etc
BL0072B	30-Nov-99-03-Dec-99	20º 54' 16" N	156º 25' 42" W	*Leucaena* shrubland, *Leucaena, Panicum, Cenchrus*, etc. near Malaise #2
BL0048B	01-Dec-99	20º 54' 14" N	156º 25' 40" W	*Leucaena* scrub, bare ground beneath *Leucaena*. Ant baits 1
BL0085	01-Dec-99	20º 54' 14" N	156º 25' 41" W	Roadside bare ground beneath *Leucaena*. Ant baits 2
BL0086	01-Dec-99	20º 54' 13" N	156º 25' 42" W	Tarmac & ruderal, wood pile. Ant baits 3
BL0087	01-Dec-99	20º 54' 12" N	156º 25' 42" W	Tarmac & ruderal, wood pile. Ant baits 4 & 5
BL0032A	02-Dec-99	20º 53' 34" N	156º 27' 06" W	Ornamental plantings Bougainvillea, *Cyanodon*, weeds
BL0088	02-Dec-99	20º 53' 36" N	156º 26' 59" W	Lawn and ornamental plantings Near HDOA office. Longitude approximate.
BL0089	02-Feb-00	20º 53' 09" N	156º 27' 06" W	Fallow cane field w/ ruderal borders; *Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc
BL0090	02-Feb-00	20º 53' 08" N	156º 27' 07" W	Fallow cane field w/ ruderal borders; *Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc
BL0091	02-Feb-00	20º 53' 07" N	156º 27' 08" W	Fallow cane field w/ ruderal borders; *Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc
BL0092	02-Feb-00	20º 53' 06" N	156º 27' 09" W	Fallow cane field w/ ruderal borders; *Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc
BL0093	02-Feb-00	20º 53' 05" N	156º 27' 10" W	Fallow cane field w/ ruderal borders; *Nicotiana, Cenchrus, Cyanodon Pluchea, Saccharum, Asystasia, Ricinus, Leucaena*, etc
BL0094	02-Feb-00	20º 53' 06" N	156º 27' 11" W	Fallow cane field w/ ruderal borders; *Nicotiana, Cenchrus, Cyanodon Pluchea ,Saccharum, Asystasia, Ricinus, Leucaena*, etc
BL0100	04-Feb-00	20º 53' 33" N	156º 26' 49" W	Industrial area/buildings; alien ornamentals in State Nursery misting house.
BL0101	04-Feb-00	20º 53' 34" N	156º 26' 50" W	Industrial area/buildings under *Gossypium tomentosum.*
BL0102	04-Feb-00	20º 53' 35" N	156º 26' 49" W	Industrial area/buildings; under citrus tree.
BL0103	04-Feb-00	20º 53' 35" N	156º 26' 48" W	Industrial area/buildings; next to pile of keawe wood/lumber.

Table II-11 continued

Ant Baits 04 October 1999 to 03 March 2000 continued				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0104A	03-Mar-00	20º 53' 36" N	156º 26' 44" W	Ground on perimeter of car lot next to airport nursery. Sample H20
BL0104B	03-Mar-00	20º 53' 36" N	156º 26' 44" W	Ground on perimeter of car lot next to airport nursery.
BL0105	03-Mar-00	20º 53' 35" N	156º 26' 42" W	Ground on perimeter of car lot next to airport nursery
BL0106	03-Mar-00	20º 53' 32" N	156º 26' 44" W	Ground on perimeter of car lot next to airport nursery
BL0107A	03-Mar-00	20º 53' 35" N	156º 26' 45" W	Ground near potted plants within airport nursery area.
Ant Baits continued				
20 July 2006				
KA0118	20-Jul-06	20º 54' 25" N	156º 26' 30" W	Road off bike path. Keawe/mixed understory woodland peanut butter

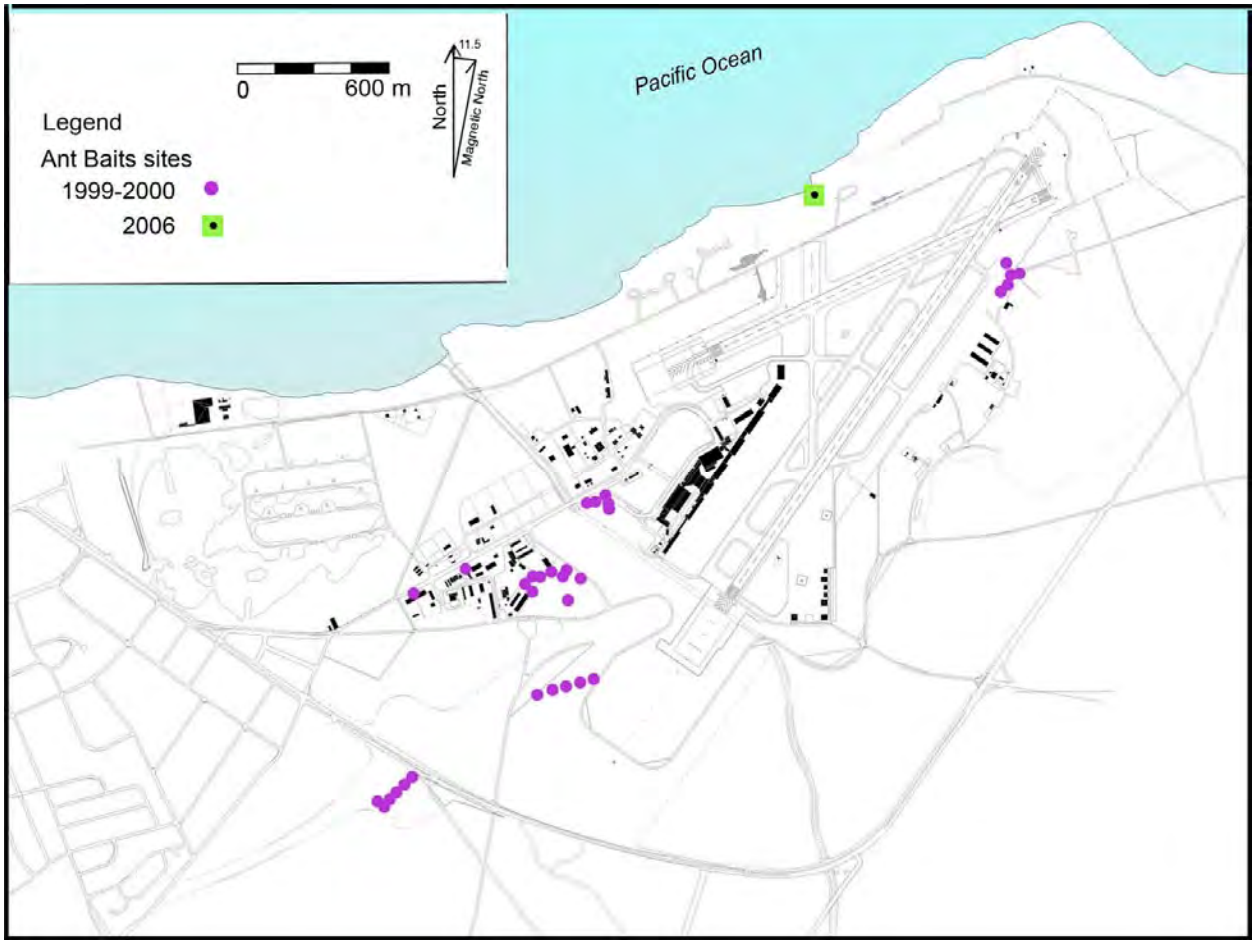


Figure II-11. Map showing location of Ant Bait sites.

Pan and trunk traps

These traps are small flat, yellow-colored pans or plastic cups partly filled way soapy water and either placed on the ground (pan traps) or pinned to tree trunks (trunk traps). Pan traps and trunk traps were set out and run for two days or longer. Arthropods attracted to the traps drowned and were collected. The color yellow is attractive to many diurnal insects possibly because

Yellow Pan and Trunk Traps Photos by DJ Preston

yellow mimics the color of diseased or weakened host plants. Pan traps with water are also attractive to many water-loving species. Trunk traps capture species migrating down the tree trunks. Since the traps needed to be set at the beginning of a fieldtrip and retrieved before leaving, their use was limited in the monitoring program. We set eight trunk traps and six yellow pan traps and recorded eight and nineteen species respectively. The traps are listed in **Table II-12,** and their locations shown on **Figure II-12.**

Table II-12a. Collection sites sampled for arthropods by trunk traps within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian = NAD 27.

TRUNK TRAPS = Cup Traps				
08 September 1999 to 05 October 1999				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0006E	08-Sep-99 10-Sep-99	20º 54' 26" N	156º 26' 06" W	Dry shrubland, on *Causarina*
BL0067	08-Sep-99-- 10 Sep-99	20º 54' 24" N	156º 26' 05" W	Dry shrubland, on klu
BL0250	08-Sep-99-- 10 Sep-99	20º 54' 24" N	156º 26' 04" W	Dry shrubland, on keawe
BL0263	08-Sep-99-- 10 Sep-99	20º 54' 12" N	156º 26' 17" W	Wet spot #1, Drainage canal, on keawe
BL0016A	09-Sep-99- 10-Sep-99	20º 54' 03" N	156º 26' 35" W	Keawe forest, on keawe
BL0068	09-Sep-99- 10-Sep-99	20º 54' 11" N	156º 26' 16" W	Wet spot #1, Drainage canal, keawe forest, on keawe
BL0069B	05-Oct-99- 07-Oct-99	20º 53" 45' N	156º 26' 40" W	*Leucaena* scrub, on *Leucaena* and *Erythrina*
BL0254A	4-Dec-99	20º 54' 26" N	156º 26' 05" W	Dry shrubland, *Pluchea*

Table II-12b. Collection sites sampled for arthropods by yellow pan traps within the Kahului Airport Environs between 1 August 1999 and 3 June 2000. Map datum is Old Hawaiian = NAD 27.

YELLOW PAN TRAPS				
September 1999 to June 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0009B	9-10 Sep 99	20^0 54'03"N	156^0 26'35"W	Keawe, *Leucaena* forest under keawe
BL0070	4-8 Oct 1999	20^0 54'25"N	156^0 25'58"W	Wetland # 2 Keawe forest/ ground: *Sesuvium*, grass, sand
BL0069C	5-7 Oct 1999	20^0 53"45'N	156^0 26'40"W	*Leucaena* scrub and hedge, Under *Leucaena* and *Hibiscus* hedge

Table II-12b. Continued.

YELLOW PAN TRAPS				
Yellow Pan Traps September 1999 to June 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0071	1-3 Dec 99	20^0 54'14"N	156^0 25'41"W	Roadside, Bare ground beneath *Leucaena*
BL0313	01-Jun to 03-Jun-00	20º 53' 46" N	156º 27' 00" W	Keawe woodland;
BL0151	01-Jun to 03-Jun-00	20º 53' 47" N	156º 27' 59" W	Keawe mixed understory; *Pluchea*, low weeds, grasses

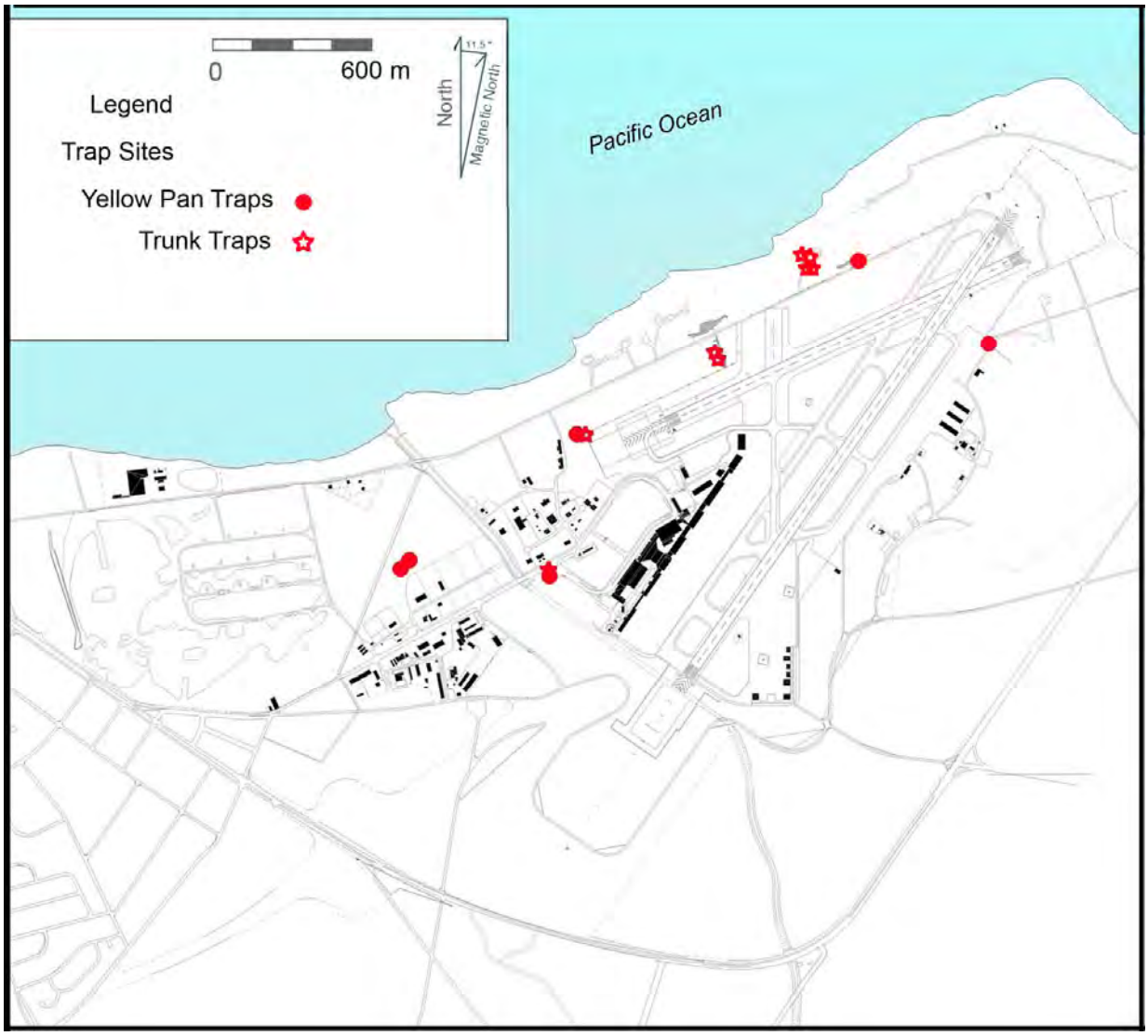


Figure II-12. Map showing location of Yellow Pan Trap and Trunk Trap sites.

Lingren funnels (Beetle trap)

Lingren Funnels
Photo by D.J. Preston, 2001

Each set of Lingren funnels consisted of eight plastic funnels about 10 inches (25 cm) in diameter fastened to nest about one inch (2.5 cm) apart. The bottom funnel emptied into a small jar with preservative (ethanol-propylene glycol mixture). The traps were hung next to tree trunks and left in place for a month or more. Insects attracted to tree trunks entered the gaps between the funnels and tumbled into the preservative. The traps are efficient for collecting wood-boring beetles and treehole breeders as well as arthropods that migrate from the leaf-litter to the canopy. Up to four traps were hung and serviced on each field trip for a total of 13 samples. Forty-four species, mostly beetles, were collected. Trap sites are listed in **Table II-13,** and their locations given in **Figure II-13.**

Table II-13. Collection sites sampled for arthropods by Lingren funnels (Beetle traps) within the Kahului Airport Environs between 31 March 2000 and 13 November 2006. Map datum is Old Hawaiian = NAD 27.

LINGREN FUNNELS (Beetle Trap)				
31 March 2000 to 02 June 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0208A	27-Mar-00-31-Mar-00	20º 54' 21(2)" N	156º 25' 56" W	*Leucaena, Cenchrus, Asystasia*, near Malaise trap site 1. Pinene attractant
BL0322	31-Mar-00-29-Apr-00	20º 54' 21(2)" N	156º 25' 56" W	*Leucaena, Cenchrus, Asystasia*, near Malaise trap site 1. Pinene attractant
BL0208	02 Jun 00-XI-00	20º 54' 21" N	156º 25' 56" W	*Leucaena, Cenchrus, Asystasia*, near Malaise trap
BL0268	27-Mar-00-31-Mar-00	20º 54' 30" N	156º 25' 50" W	Near MV site, near Wet Spot #3.,-In hau overstory; Bait trap #2.
BL0155	31-Mar-00-29-Apr-00	20º 54' 30" N	156º 25' 50" W	*Casurina/Pluchea*. Bait trap #2.
BL0256	31 Mar-00	20º 54' 30" N	156º 25' 50" W	*Casurina/Pluchea.* Bait trap #2
BL0277	27-Mar-00-31-Mar-00	20º 54' 29" N	156º 25' 52" W	In forest, on large *Causurina* trunk, Pinene attractant. Near wetland #3.
BL0159	31-Mar-00-29-Apr-00	20º 54' 30" N	156º 25' 51" W	Open Keawe woodland; wetspot # 3, keawe, *Schinus.*
BL0161	29-Apr-00-02-Jun-00	20º 54' 30" N	156º 25' 51" W	Open keawe woodland; wetspot # 3 keawe, *Schinus,*
BL0275	29-Apr-00-02-Jun-00	20º 54' 31" N	156º 25' 50" W	In dense hau. *Leucaena* and *Schinus* overstory. Near Wet Spot #3.
Lingren Funnels (Beetle trap) continued				
18 July 2006 to 13 November 2006				
KA0066	18-Jul-06-18-Sep-06	20º 54' 26" N	156º 25' 50" W	Keawe/koa haole/mixed understory woodland; near Malaise site
KA0158	18-Sep-06-21-Oct-06	20º 54' 26" N	156º 25' 50" W	Keawe/koa haole/mixed understory woodland
KA0172	21-Oct-06-13-Nov-06	20º 54' 26" N	156º 25' 50" W	Keawe/koa haole woodland /mixed understory

Bait traps

As the name implies, bait traps use attractants to entice animals to collect themselves. Attractants may be pheromone or kairomone lures to capture specifically targeted species or potential food or any smelly organic material to attract scavengers. We made bait traps from clear 2-liter soft drink bottles by cutting two 1-inch (2.54 cm) diameter holes on opposite sides about ½ way up from the bottom. About 100 ml of ethanol-propylene glycol mixture were added as a preservative, and bait (blue cheese, rotting mushrooms, or meat) was smeared or hung inside the holes above the preservative. The smelly bait attracted scavenging arthropods which fell into the preservative. Each trap was tied securely to a tree trunk and left in place for a few days or longer. One trap was baited with methyl eugenol to attract the oriental fruit fly. The 15 bait trap sites are listed in **Table II-14,** and their locations given in **Figure II-13.**

Bottle/Bait Trap
Photo by F.G. Howarth, 2007

Table II-14. Collection sites sampled for arthropods by bait trap within the Kahului Airport Environs between 30 November 1999 and 20 July 2006. Map datum is Old Hawaiian = NAD 27.

BAIT TRAPS				
30 November 1999 to 5 June 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0074	07-Mar-00-	20º 53' 35" N	156º 26' 37" W	Keawe woodland; keawe, *Leucaena*, *Cenchrus*, etc.
BL0075	07-Mar-00-	20º 53' 37" N	156º 26' 41" W	Keawe woodland; keawe, *Leucaena*, *Cenchrus*, etc.
BL0152	28-Mar-00-30-Apr-00	20º 54' 13" N	156º 26' 17" W	Keawe woodland on keawe near wetland # 1
BL0153	28-Mar-00-30-Apr-00	20º 54' 14" N	156º 26' 16" W	Keawe woodland on keawe near wetland # 1
BL0154	31-Mar-00-29-Apr-00	20º 54' 29" N	156º 25' 52" W	Near wetspot 3 keawe, *Pluchea*, low weeds, grasses
BL0156	29-Apr-00 -	20º 54' 26" N	156º 26' 07" W	Bike path, crash site; keawe woodland on *Causurina*
BL0157	29-Apr-00 -	20º 54' 27" N	156º 26' 05" W	Bike path, crash site; keawe woodland on *Causurina*
BL0160	31-Mar-00-29-Apr-00	20º 54' 31" N	156º 25' 50" W	Woodland, wetspot # 3; *Auricaria*, keawe
BL0162	29-Apr-00-02-Jun-00	20º 54' 31" N	156º 25' 50" W	Woodland, wetspot # 3; *Auricaria*, Keawe,
BL0158	30-Apr-00 -	20º 54' 12" N	156º 26' 17" W	Keawe woodland, *Schinus*, near wetland 1
BL0336	04-Jun-00-05-Jun-00	20º53'36" N	156º26'59" W	Ornamentals; citrus; methyl eugenol lure
Bait Trap 28 June 2003 to 30 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0032	28-Jun-03-30-Aug-03	20º 53' 37" N	156º 26' 36" W	Keawe woodland, bleu cheese bait, keawe, *Leucaena*, grass (*Cenchrus*), Bait Trap #1
KM0033	28-Jun-03-25-Jul-03	20º 53' 36" N	156º 26' 36" W	Keawe woodland, bleu cheese bait, keawe, *Leucaena*, grass (*Cenchrus*), Bait Trap #2

Table II-14. Continued.

Bait Trap 28 June 2003 to 30 August 2003				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KM0034	28-Jun-03-30-Aug-03	20º 53' 37" N	156º 26' 37" W	Keawe woodland Bleu cheese bait, Keawe, *Leucaena*, grass (*Cenchrus*), Bait Trap #3
Bait Trap 20 July 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
KA0026	20-Jul-06	20º 53' 28" N	156º 26' 37" W	Keawe woodland /mixed understory; Bait: banana and beer, bait trap

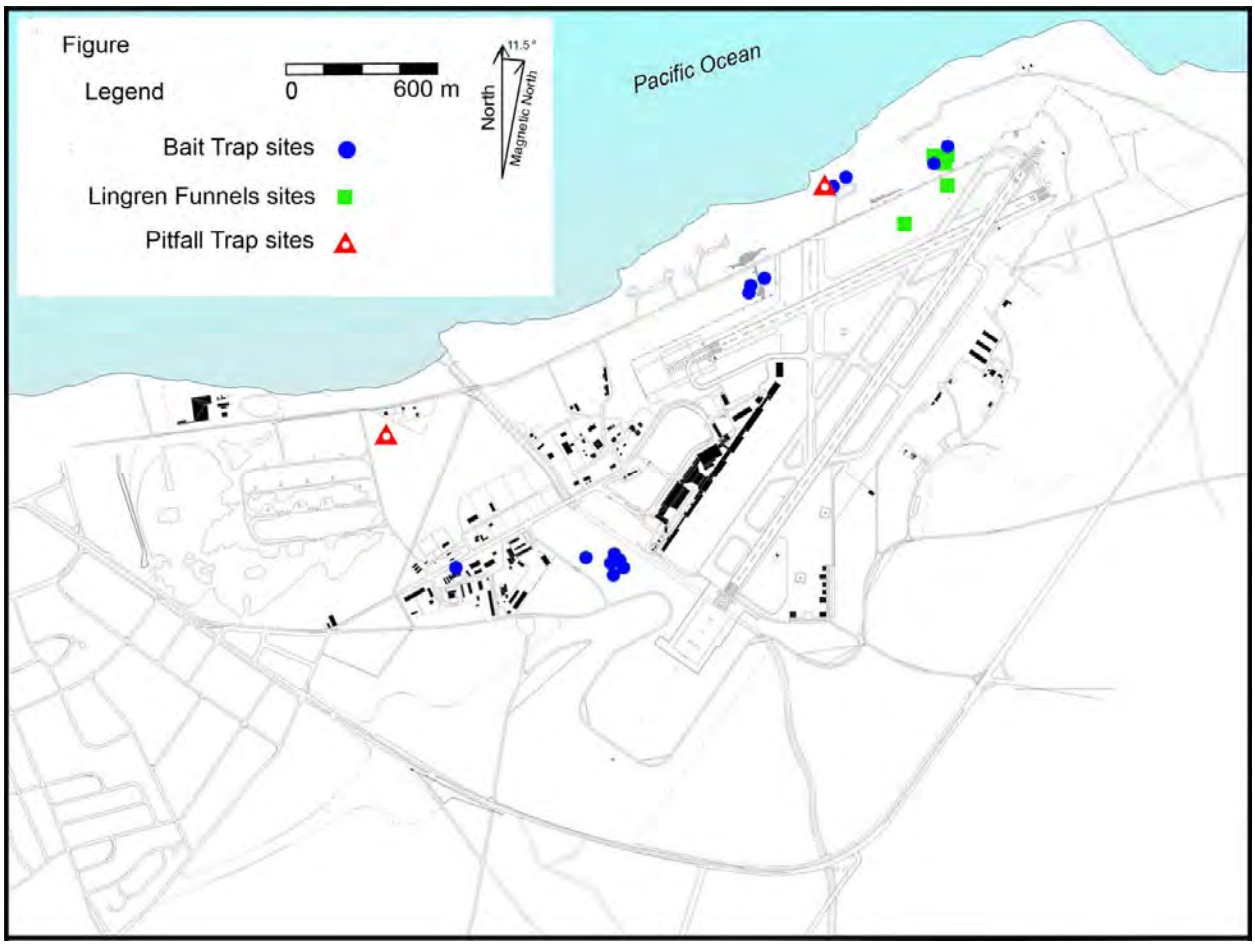


Figure II-13. Map showing location of Bait Trap, Pitfall Trap and Lingren Funnels sites.

Pitfall traps

Pitfall traps are usually partly buried on the ground with the lip flush with the surface. They may be baited to increase the catch and sensitivity of detecting rarer species, or they may be left unbaited. Dispersing ground-inhabiting arthropods accidentally cross the lip and tumble into the trap. We set only two traps, which captured 11 species. The traps are listed in **Table II-15,** and their locations shown on **Figure II-13.**

Table II-15. Collection sites sampled for arthropods by pitfall trap within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian = NAD 27

PITFALL TRAPS				
8-10 September 1999 and 21 September 2006				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0010	8-10 Sep 99	20º 54' 26" N	156º 26' 06" W	Road off bike path, 2 pitfalls set in wood chip pile
KA0056	21-Sep-06	20º 53' 53" N	156º 27' 09" W	Kanaha Pond, wetland, keawe woodland, mixed native/ alien understory; night

Tulgren funnel

Tulgren Funnel
Photo by D.J. Preston, 2001

Smaller leaf litter and soil arthropods are most efficiently collected with a Tulgren funnel, which is made with a large diameter funnel fitted with a jar containing a preservative at the bottom and a wire screen inside just below the rim. A sample of the substrate is placed on the screen, and the funnel loosely covered with a heat source (usually a low-wattage light bulb). An older model, known as a Berlese funnel, is similar but does not use a heat source. As the substrate dries out over a few days, the arthropods move down into the funnel to escape desiccation and are captured in the jar. Tulgren funnel samples were collected in conjunction with other methods and were processed in the lab. However, since the samples required time to dry, they had to be collected near the beginning of each fieldtrip. Five samples, which yielded 40 species (mostly mites), were processed during the baseline survey. Sample locations are listed in **Table II-16,** and their locations shown on **Figure II-14.**

Table II-16. Collection sites sampled for arthropods by Tulgren funnel extraction within the Kahului Airport Environs between 3 March August 2000 and 30 April 2000. Map datum is Old Hawaiian.=NAD 27

TULGREN FUNNEL EXTRACTION (BERLESE				
03 March 2000 to 30 April 2000				
BL0205	03-Mar-00	20º 53' 56" N	156º 27' 16" W	Kanaha Res. At night, aalii litter, Tulgren extraction #1
BL0353	28-Mar-00	20º 53’54" N	156º 27' 24" W	Koloa Pond and channel, -dry culms and debris on ground, -,
BL0206	31-Mar-00	20º 54' 16" N	156º 25' 42" W	*Leucaena* shrubland, *Leucaena*, *Panicum*, *Cenchrus*, etc., Tulgren extraction #2 at Malaise trap #2
BL0281	31-Mar-00	20º 53' 56" N	156º 27' 16" W	Near Kanaha Pond, *Dodonaea*,
BL0182	28-Apr-00-01-May-00	20º 54' 26" N	156º 26' 05" W	Dry shrubland, *Pluchea*, *Casuarina*, Tulgren extraction #3, old Bird nest in keawe

Sifting leaf litter and soil

Many larger leaf litter and soil arthropods can be effectively collected by throwing handfuls of litter or soil on to a white sheet and aspirating or hand collecting the animals as they try to escape. A plastic sheet, such as a shower curtain, works well since animals cannot easily escape on the slippery surface. Sifting the litter through a 1/4 or 1/2 inch wire screen separates the larger debris and concentrates the animals. We processed 15 samples and recorded 15 species. Sample locations are listed in **Table II-17,** and their locations shown on **Figure II-14.**

Table II-17. Collection sites sampled for arthropods by leaf litter and soil samples within the Kahului Airport Environs between 1 August 1999 and 18 November 2006. Map datum is Old Hawaiian = NAD 27

LEAF LITTER & SOIL SAMPLES				
Sifting leaf litter and soil 1999 - 2000				
Collection Number	**Dates**	**Latitude**	**Longitude**	**Habitat; Host(s); Notes**
BL0324	2 Dec-99	20º 53' 43" N	156º 27' 28" W	Kanaha Res. a'alii litter
BL0042E	03-Mar-00	20º 53' 56" N	156º 27' 16" W	Kanaha Res. at night, a'alii litter
BL0286	27-Mar-00	20º 54' 12" N	156º 26'16" W	Wetland #1. keawe leaf litter,
BL0183	29-Mar-00	20º 54' 42" N	156º 25' 31" W	Beach strand *Scaevola* leaf litter
BL0285	29-Mar-00	20º 54' 42" N	156º 25' 31" W	Beach strand *Tournefortia* leaf litter
BL0050	31-Mar-00	20º 53' 56" N	156º 27' 18" W	Kanaha Res. at night, a'alii litter
BL0344	28 Apr-00	20º 53' 56" N	156º 27' 16" W	Kanaha Res. at night, a'alii litter
BL0238	02 Jun-00	20º 53' 56" N	156º 27' 16" W	Kanaha Res. at night, a'alii litter
2003				
KM0069	24-Jul-03	20º 54' 24" N	156º 26' 12" W	Wetland #1, KM0087)
KM0079	24 Jun 03	20º 53’ 37" N	156º 26' 39" W	MV Bulb site ; Fabaceae litter
18 July 2006 to 14 November 2006				
KA0117	18-Jul-06	20º 54' 07" N	156º 25' 41" W	Fire Rescue Station, koa haole dominated scrub, soil/litter below: *Wedelia* sp. daytime
KA0121	18-Jul-06	20º 54' 07" N	156º 25' 41" W	Fire Rescue Station, koa haole dominated scrub soil/litter below: *Sphagneticola trilobata*, daytime
KA0212	14-Nov-06	20º 54' 46" N	156º 25' 36" W	Beach strand and wind-sheared dune vegetation, soil/litter below wood chip pile daytime
KA0210	14-Nov-06	20º 54' 39" N	156º 25' 34" W	Wind-sheared dune vegetation, soil/litter below: *Chenopodium oahuense.* daytime
KA0211	14-Nov-06	20º 54' 34" N	156º 25' 39" W	Wind-sheared dune vegetation, soil/litter below: *Nicotiana glauca* daytime

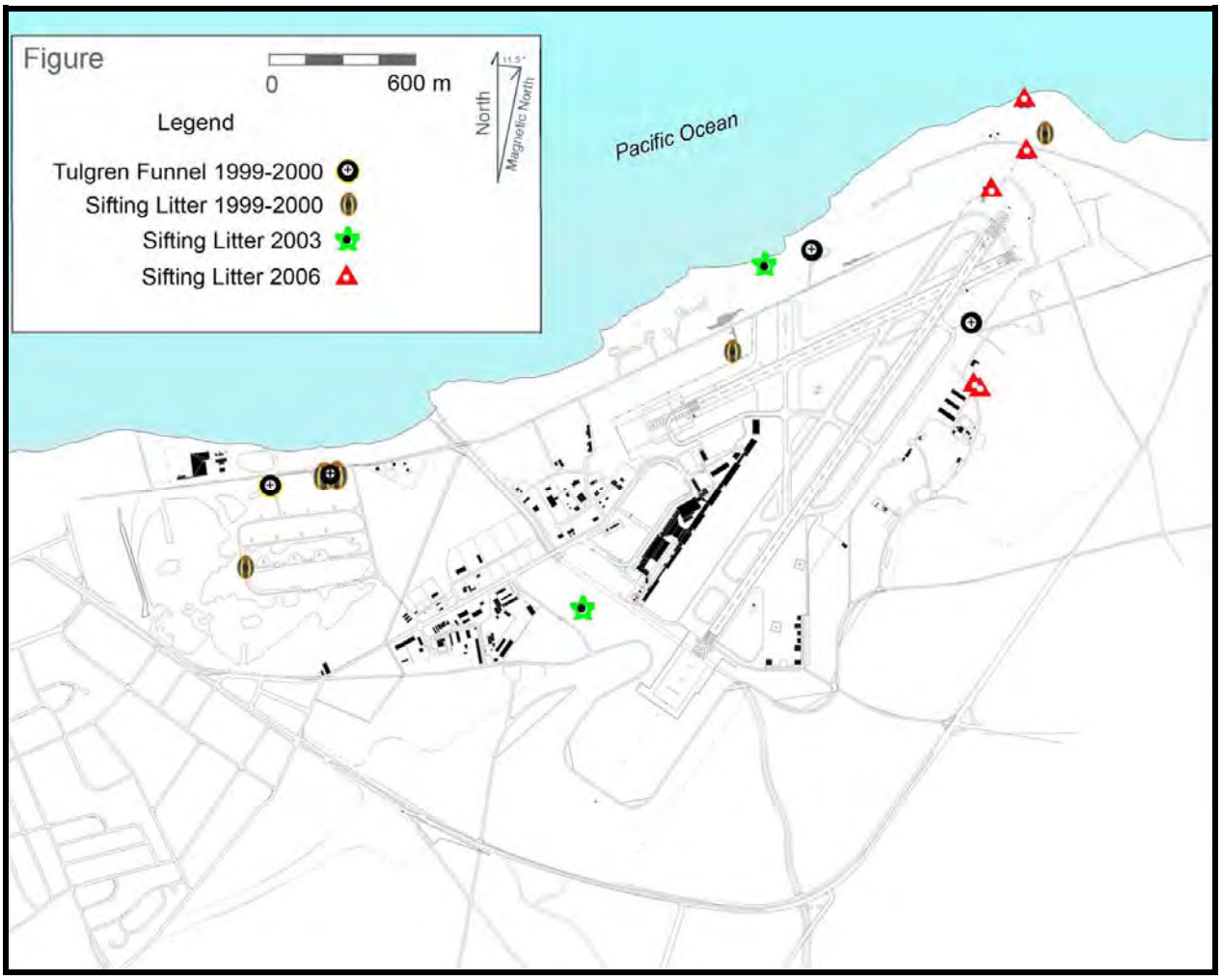


Figure II-14. Map showing location of collecting sites for the Tulgren Funnel and litter samples.

APPENDIX III

INSTRUCTIONS FOR USING THE KAHULUI DATABASE

Requirements:
Windows XP (or later)
MS Access 2003 (or later)
Monitor with minimum 1152x864 resolution

The only file necessary to run the database is Kahului.mdb. This file can be placed in any directory on the computer, and opened in MS Access 2003 (or later).

When opening the file in MS Access, the database should automatically open to the Main Form (**Figure III-1**).

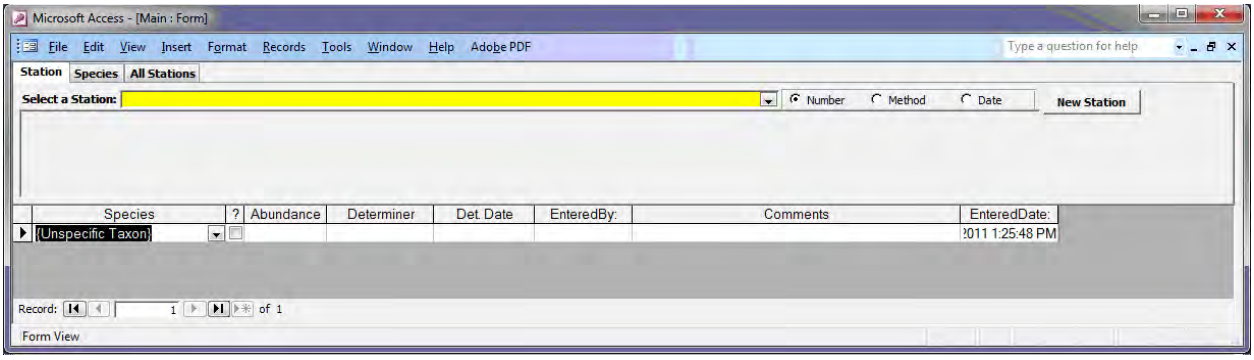


Figure III-1. Screen capture of Main Form window of Microsoft Access, "Kahului.mdb"

If this form does not open automatically, then depending on which version of Access is used, navigate to the "Forms" section in the MS Access Database Window and double-click on the "Main" form. The Database Window in MS Access 2003 is shown in **Figure III-2**. Different versions of MS Access use different ways to navigate and open individual forms.

Once the Main form is opened (**Figure III-1**), there are three tabs at the top of the page: "Station", "Species", and "All Stations". Each of these is described in detail below.

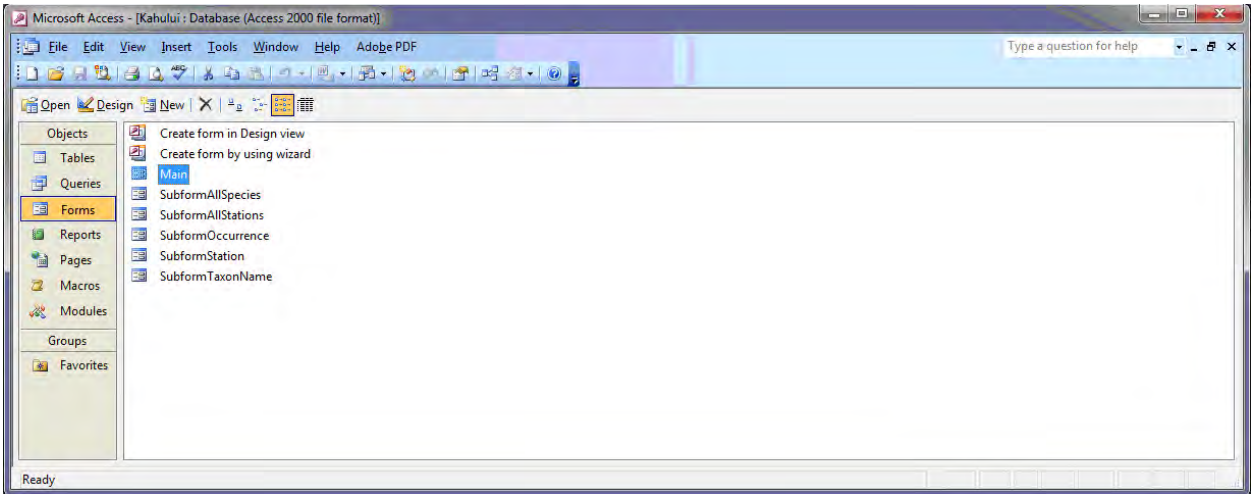


Figure III-2. Database Window, MS Access 2003.

Station Tab

The "Station" tab allows you to select an individual collection station, and see a list of all species found at that station. At the top of the form, there is a prompt to "Select a Station", and a yellow drop-down box ("drop-down boxes are indicated by the little button with a down-pointing black triangle in it, at the right side of the box). There are two ways to select a station: 1) Selecting it from the drop-down list; or 2) typing the station information in the box and allow it to auto-fill.

Selecting a Station from the Drop-Down List

There are two ways to display the Drop-down list (**Figure III-3**): 1) click the little button at the right side of the box using the mouse pointer, or clicking anywhere inside the yellow box and pressing [Alt]-[Down Arrow] on the keyboard (i.e., hold the "Alt" key down, and press the down-arrow key). In either case, you will see a listing of Stations appear below the yellow box (**Figure III-3**).

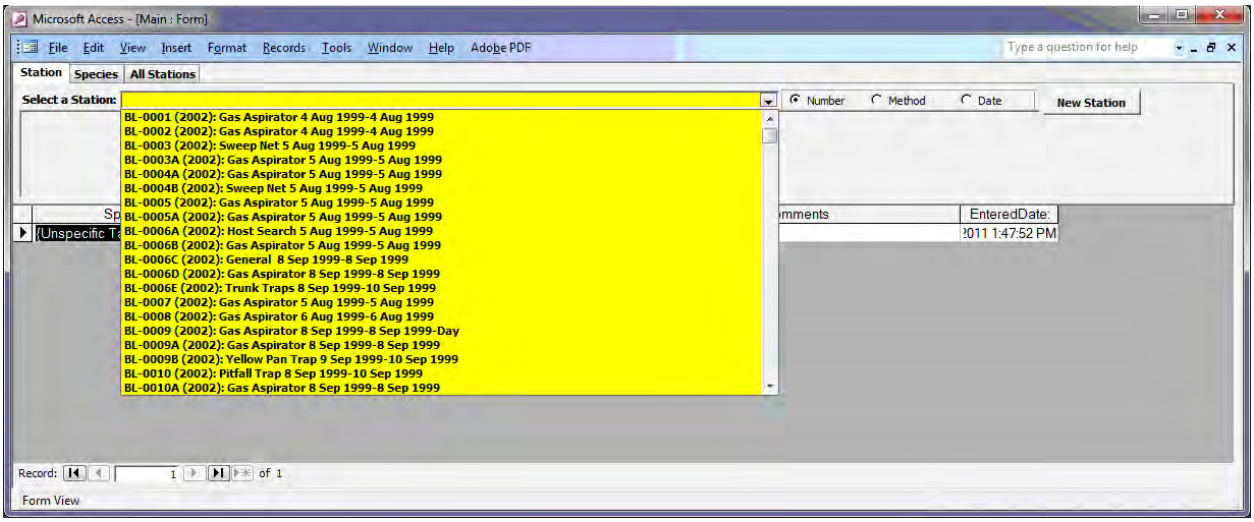


Figure III-3. Drop-Down list for selecting a Station by station number.

There is a scroll bar on the right side of the drop-down list that allows you to scroll down the list of Stations. Alternatively, you can repeatedly press or hold-down the "Down Arrow" key while the list is displayed, and the list will scroll down.

By default, the list is displayed first by Station Number, then method and date. However, to the right of the "Select a Station" drop-down list is an option to display the Stations alphabetically by Method (then Date and Station Number), or by Date (then by Method and Station Number). This option simply changes the sort-order of the items in the drop-down list. The Number tab is indicated by an arrow in **Figure 4,** and the Method and Date tabs are in line to the right.

Selecting a Station using Auto-Fill

If you click inside the yellow box and start typing, the value will auto-fill to the first matching record. For example, by typing "BL-0003", the full station label "BL-0003 (2002): Sweep Net 5 Aug 1999-5 Aug 1999" is displayed automatically (**Figure III-4**). This allows easy selection of a Station record by simply typing in the Station Number and pressing "Enter".

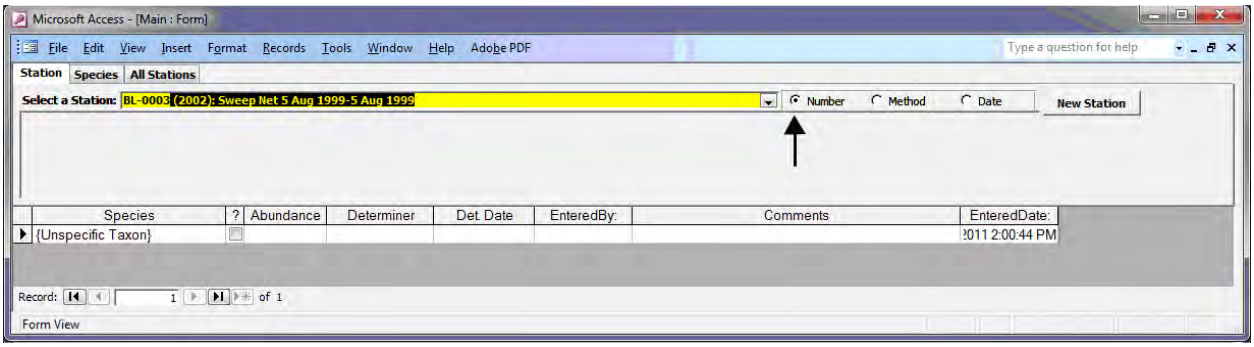


Figure III-4. Auto-Fill method for selecting a Station. Arrow points to Station Number tab.

Once a Station is selected (either by clicking it in the drop-down list with a Mouse, or highlighting it and pressing the "Enter" key, or through the Auto-fill method), the details of that Station are shown below the "Select a Station" box, and a list of species collected at that station appears in the lower part of the screen. An example is shown in **Figure III-5**.

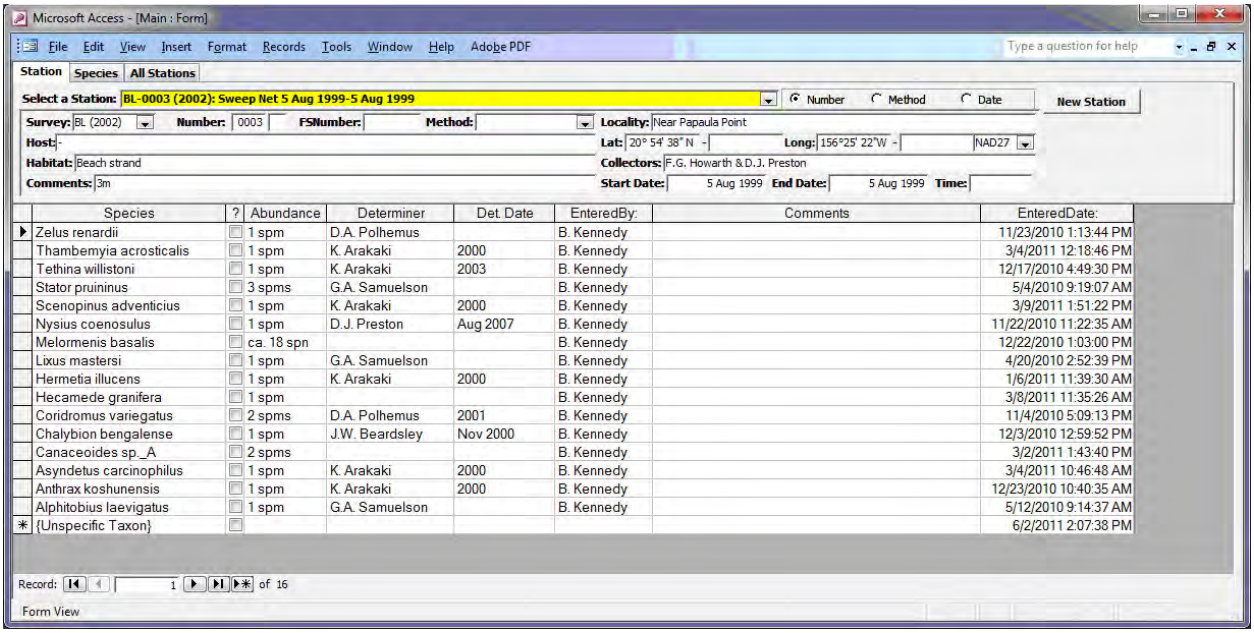


Figure III-5. Selected Station, showing Species List.

Species Tab

The "Species" tab works in very-much the same way as the "Station" tab, except in this case you select a particular species, and a list of stations where that species was collected is displayed.

The main difference is that the "Select a Species" box is green (instead of yellow), but otherwise it works the same way – allowing a selection of a species by either displaying a drop-down list of species names (**Figure III-6**), or auto-filling the "Select a Species" box as a species name is typed in.

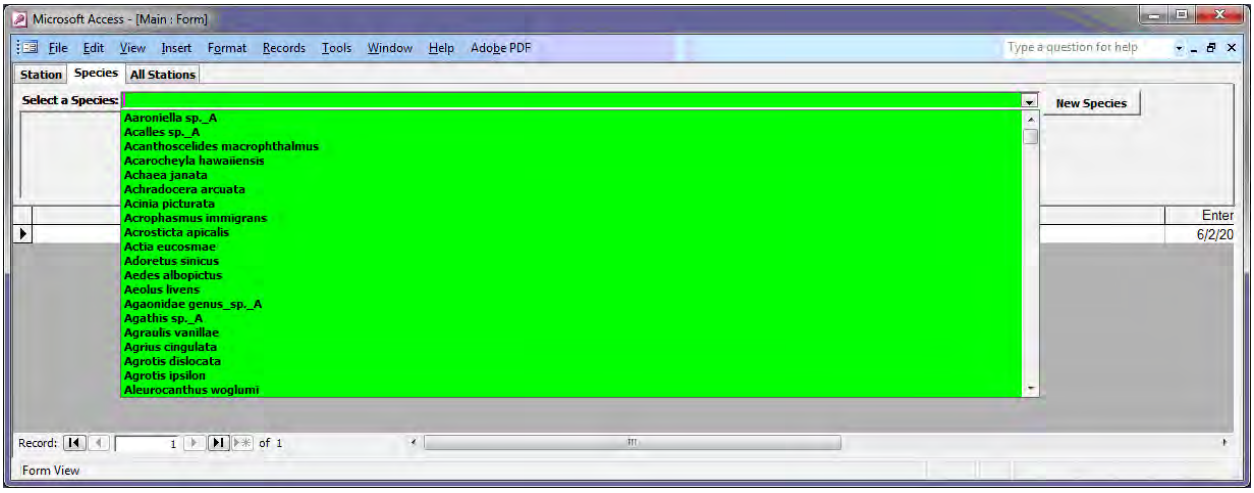


Figure III-6. Drop-Down list for selecting a species.

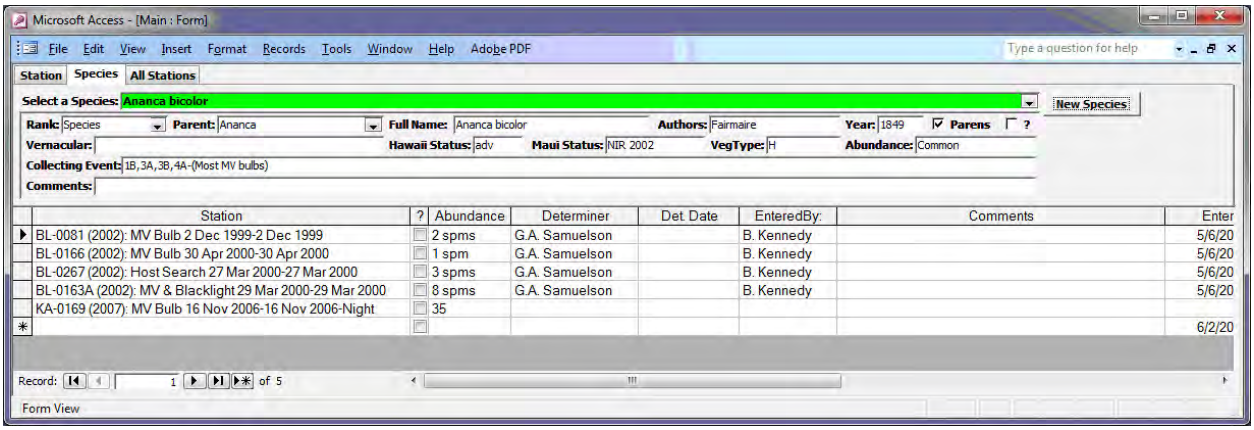


Figure III-7. Selected Species, showing Station List.

Once a species is selected, a list of Stations from which that species was collected is displayed (**Figure III-7**).

All Station Tab

The "All Stations" tab is simply a formatted listing of all the Stations in the database, with details listed in tabular form (**Figure III-8**).

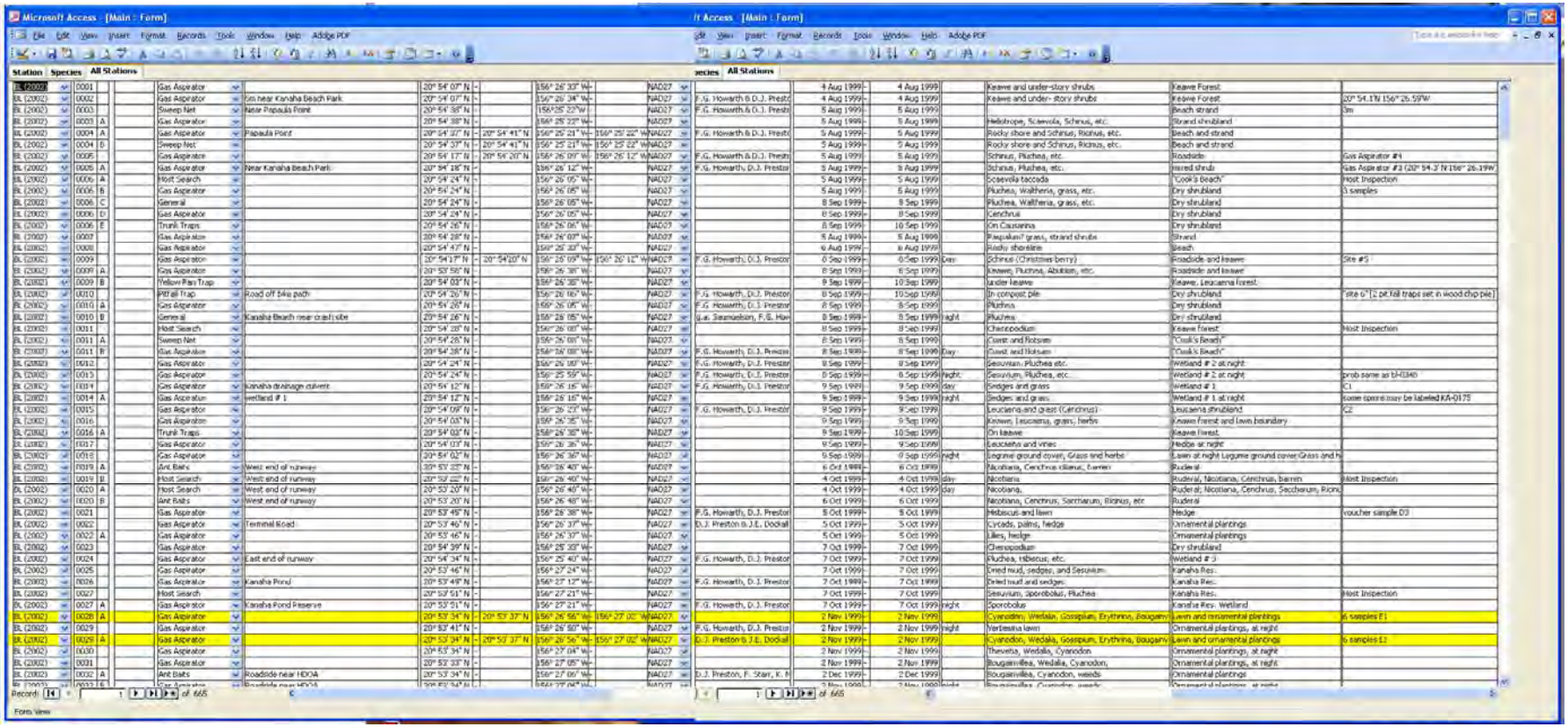


Figure III-8. Details of first 52 stations listed in numerical order under the "All Stations" tab.

APPENDIX IV

PHOTOGRAPHIC GALLERY OF ARTHROPODS OCCURRING WITHIN THE KAHULUI AIRPORT ENVIRONS

Introduction

One hundred seven photographs are presented that show the general habitus of 92 species found during the baseline and monitoring surveys. Nearly all the species depicted are new state or island records. A majority of the pictures (78) were created be Shepherd Myers using an Automontage® imaging system. The Automontage® system addresses the issues of depth of focus and field of view limitations normally faced when viewing small samples using a stereo dissecting or compound microscope. The Bishop Museum's auto-montage imaging station consists of two research grade microscopes: a stereo-dissecting microscope (Leica M165 C®) and a compound microscope (Leica DM2500®). Both microscopes are equipped with a programmable precision mechanical stage and a digital camera (Leica DFC420® 5MP). This setup is capable of capturing multiple, precisely aligned, images of a single specimen. Usually about 30 images are taken of each specimen, each at a prescribed focal length to capture the entire depth of the specimen in focus. The stack of images is edited with specific auto-montage software, which condenses the images into a single photograph using the pixels from the appropriate depth of field from the original set of images to ensure accurate focus. The resulting images have exceptional depth of field and excellent resolution and are therefore ideal as identification aids. The resulting 30 Mb tif files were edited and condensed to jpg files, and a scale bar added. Additional photographs were taken by FG Howarth using an Olympus Stylus® camera and by DJ Preston using a FinePix JX250®.

ARACHNIDA: ARANEAE (Spiders)

Oonopidae *Opopaea* sp A, female FGH photo

Oonopidae *Orchestina* species A, male

Oonopidae *Orchestina* species B, male

FGH photos

Pholcidae: *Smeringopus pallidus*, female DJPreston Photo

Uloboridae: *Zosis geniculata*, female FGH Photo

INSECTS

INSECTA: BLATTODEA (Cockroaches)

Blatellidae *Loboptera dimidiatipes* Automontage photo

INSECTA: COLEOPTERA (Beetles)

Aderidae *Xylophilus* sp A
Automontage photo

Aderidae *Xylophilus marquesanus*
Automontage photo

Anobiidae: *Ozognathus* sp A
Automontage photo

Anthicidae *Anthicus recens*
Automontage photo

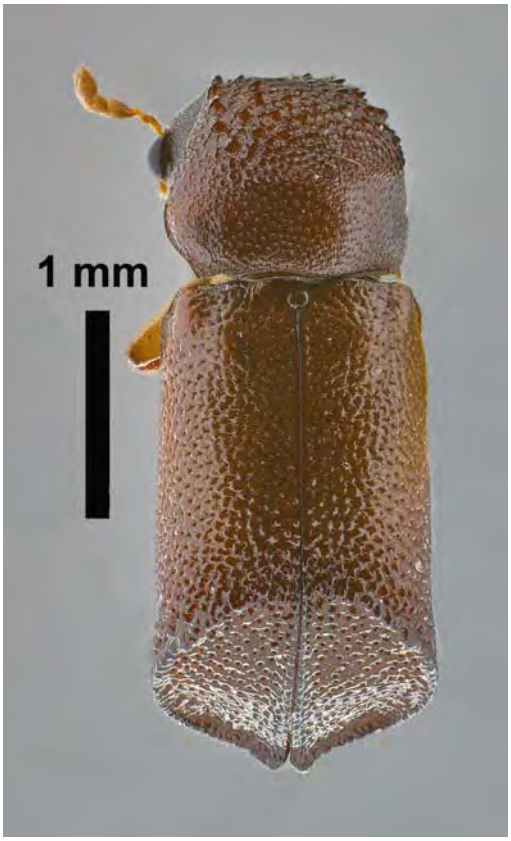
Anthicidae Anthicus recens, lateral view; Automontage photo

Anthicidae *Anthicus tobias*
Automontage photo

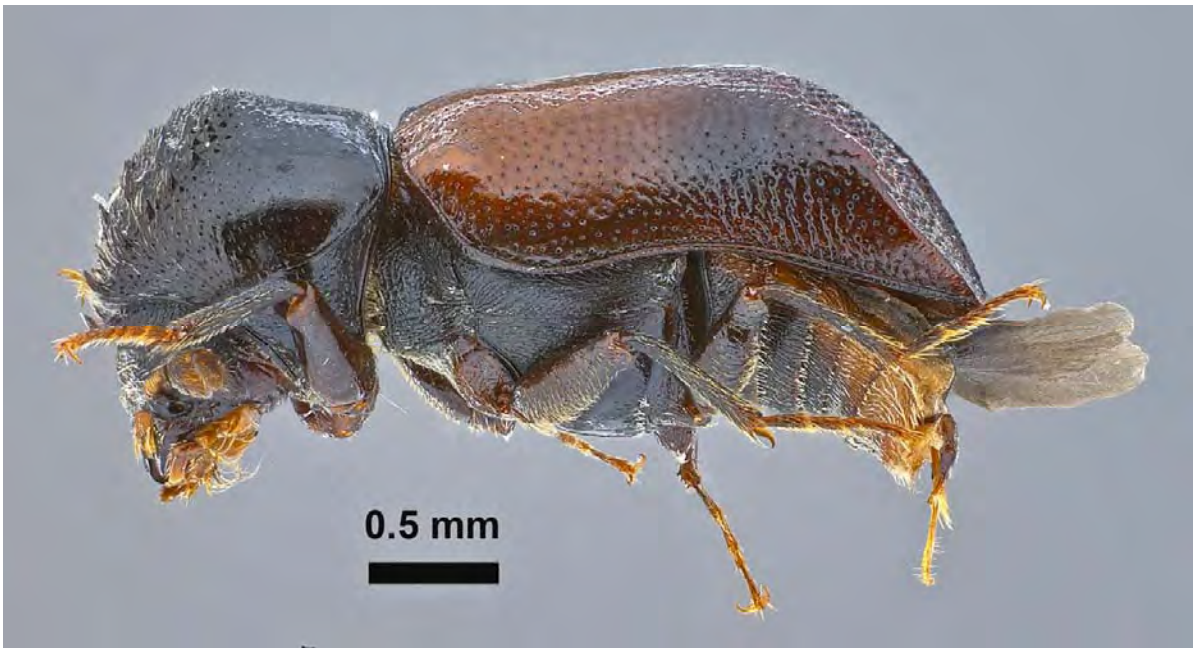
Anthicidae *Formicomus imperator*
Automontage photo

Anthicidae *Formicomus imperator*, lateral view; Automontage photo

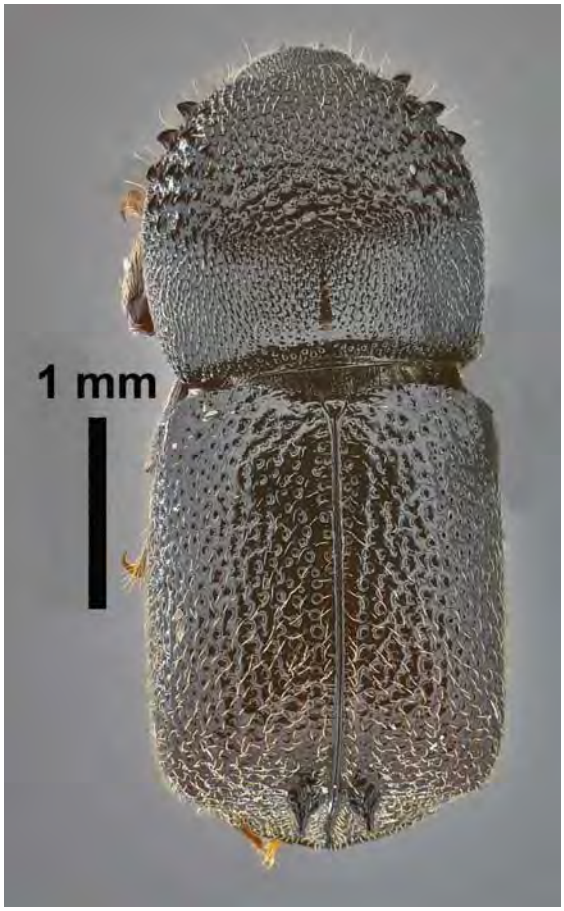
Anthribidae *Araecerus constans*
Automontage photo



Bostrichidae *Sinoxylon conigerum*
Automontage photo



Bostrichidae *Xylopsocus castanoptera;* Automontage photo



Bostrichidae *Xylopsocus capucinus*
Automontage photo

Buprestidae
Aphanisticus cochinchinae seminulum,
Automontage photo

Carabidae
Bembidion niloticum batesi
Automontage photo

Carabidae *Metacolpodes buchanani*
FGH photo

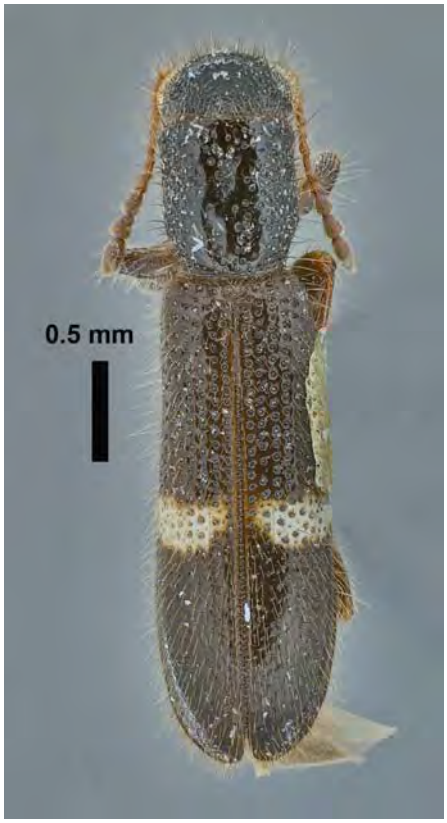
Carabidae *Notiobia purpurascens*
Automontage photo

Carabidae *Perigona nigriceps*
Automontage photo

Carabidae *Stenolophus* cf. *limbatus*
Automontage photo

Chrysomelidae *Acanthoscelides macrophthalmus*
Automontage photo

Chrysomelidae *Monoxia minuta*
Automontage photo



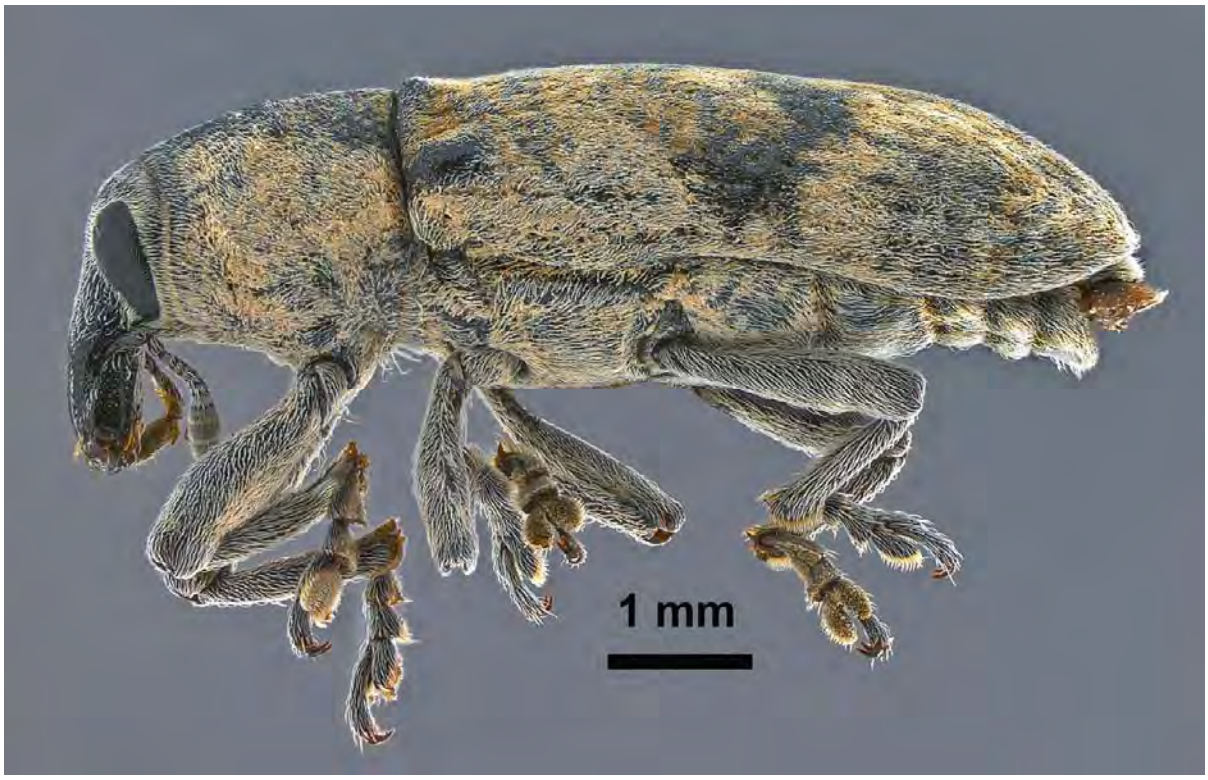
Cleridae *Tarsostenus univittatus*
Automontage photo

Coccinellidae *Brumoides suturalis*
Automontage photo

Curculionidae *Euplatypus parallelus*
Automontage photo

Curculionidae *Hypurus bertrandi*
Automontage photo

Curculionidae *Myllocerus* sp A
Automontage photo



Curculionidae *Lixus mastersi* Automontage photo

Curculionidae *Sphenophorus cariosus*, lateral view Automontage photo

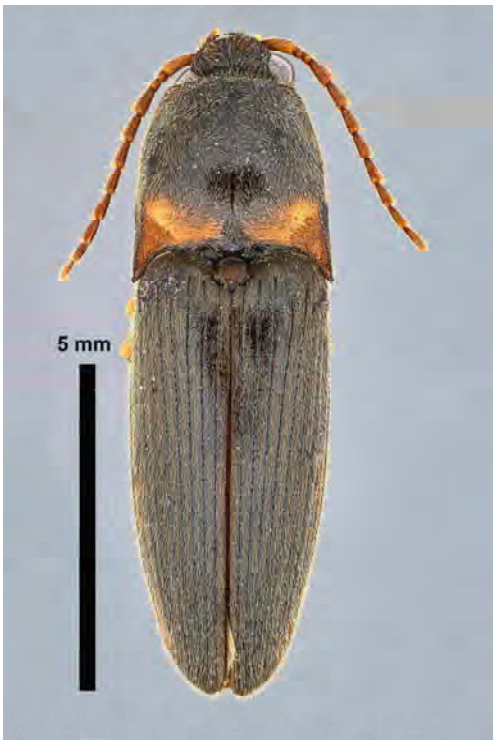
Curculionidae *Sphenophorus cariosus*, dorsal view; Automontage photo

Dermestidae *Attagenus undulatus*
Automontage photo

Elateridae *Aeolus livens*, lateral view Automontage photo

Elateridae *Aeolus livens*
Automontage photo

Elateridae *Cardiophorus stolatus*
Automontage photo



Elateridae *Conoderus pallip*es
Automontage photo

Elateridae *Melanotus punctosus*
Automontage photo

Erotylidae *Cryptophilus integer*
Automontage photo

Hydrophilidae *Cercyon fimbriatus*
Automontage photo

Laemophloeidae *Laemophloeus* sp A
Automontage photo

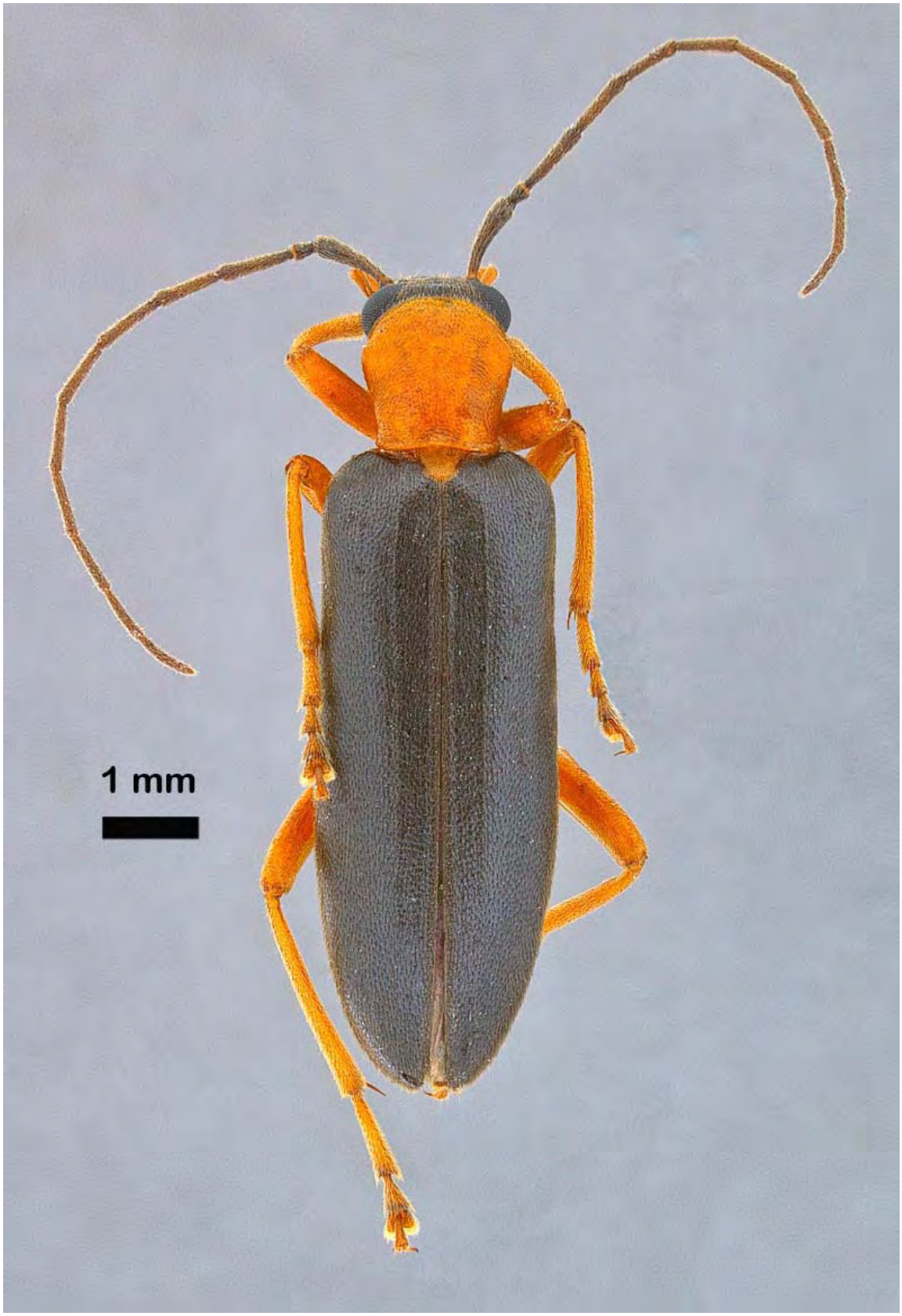
Nitidulidae *Carpophilus marginellus*
Automontage photo

Nitidulidae *Phenolia limbata tibialis*
FGH photo

Nitidulidae *Stelidota chontalensis*
Automontage photo

Rhipiphoridae *Rhipidius pectinicornis*
FGH photo

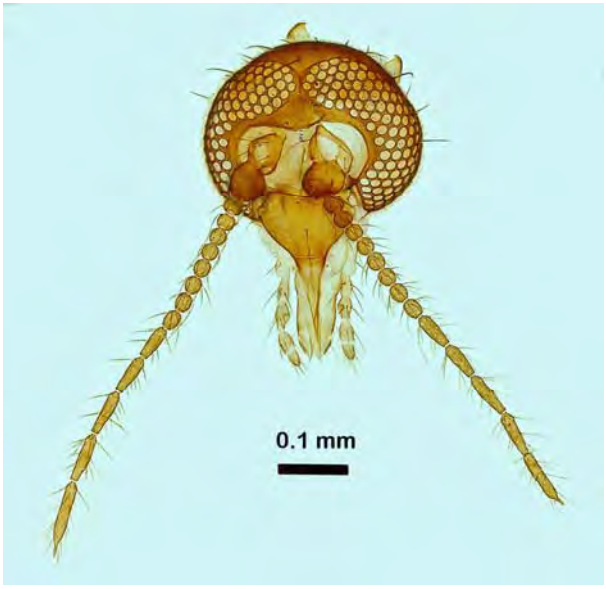
Tenebrionidae *Lepidocnemeplatia sericea*
FGH photo



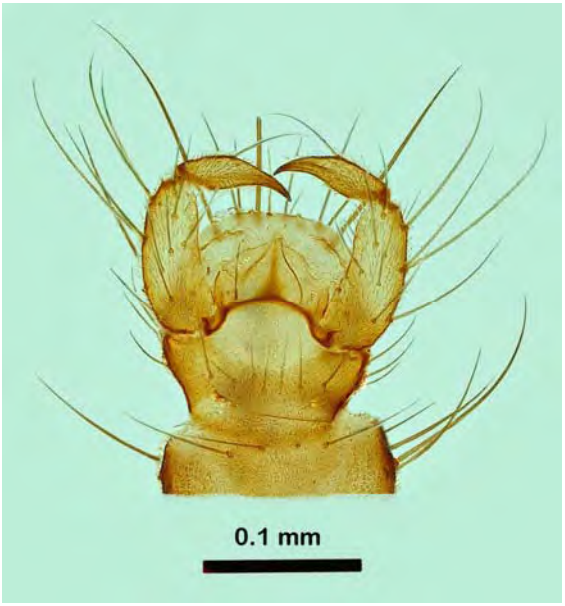
Oedemeridae *Ananca bicolor* Automontage photo

INSECTA: DIPTERA (Flies)

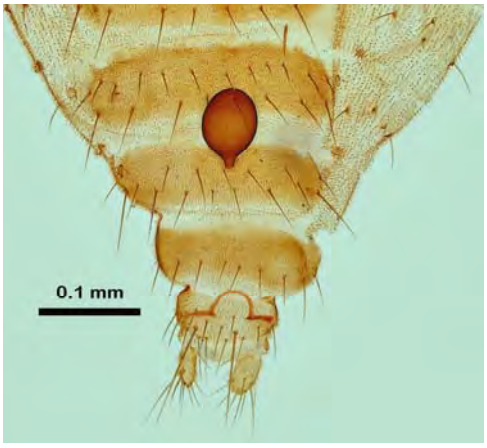
Ceratopogonidae (Biting midges)



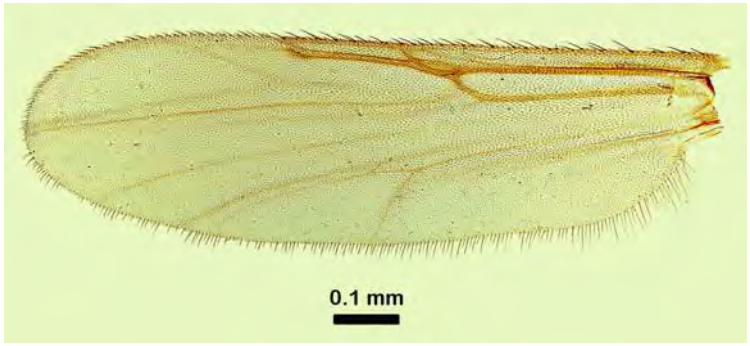
Atrichopogon levis, female head



Atrichopogon levis, female abdomen

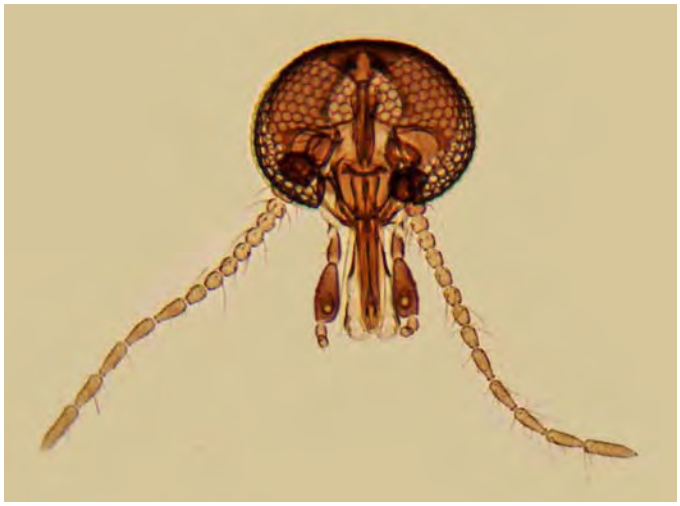


Atrichopogon levis. male genitalia

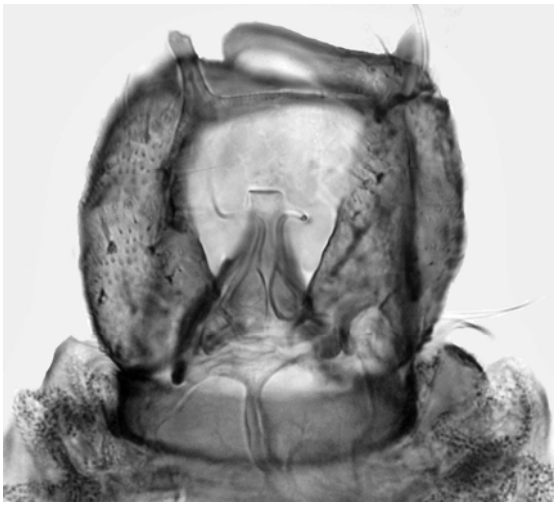


Atrichopogon levis, male wing

[Automontage photos]



Ceratopogonidae *Culicoides* cf. *jamaicensis*, female head



Culicoides cf. *jamaicensis*, male genitalia,

Culicoides cf. *jamaicensis*, female wing

FGH photos

Ceratopogonidae
Dasyhelea sp, female

FGH photo

Sarcophagidae *Sarcophaga africa* Automontage photo

INSECTA: HEMIPTERA: Heteroptera (True bugs)

Nabidae: *Stenonabis* sp A, lateral view Automontage photo

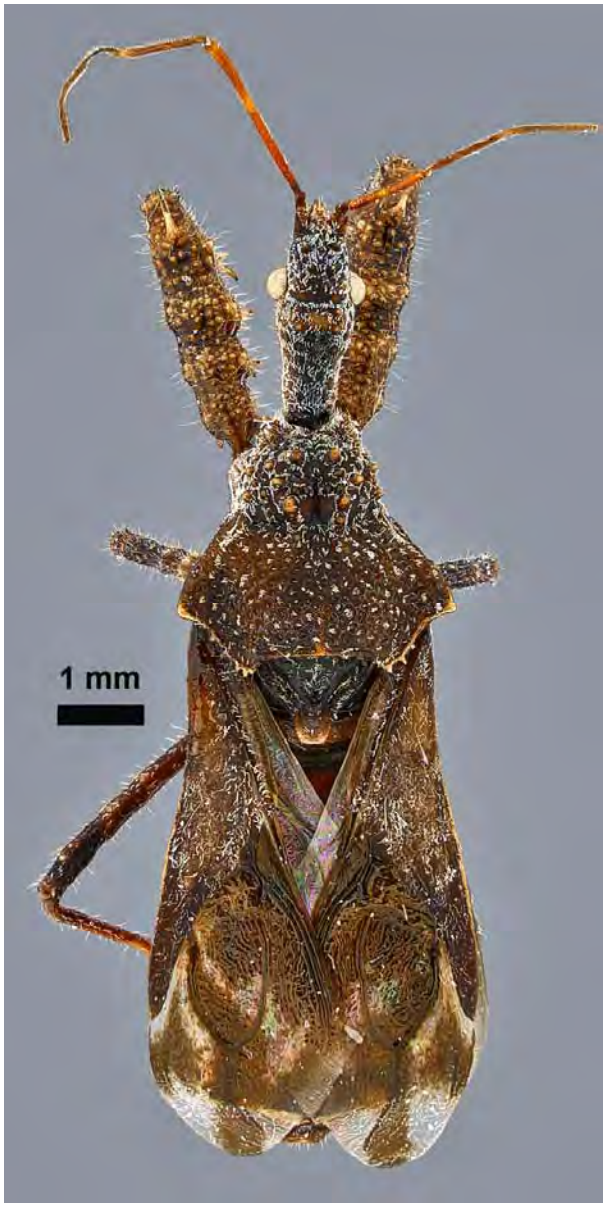
Pentatomidae *Eysarcoris ventralis*, dorsal view
Automontage photo

Pentatomidae *Piezodorus hyberni*, dorsal view
Automontage photo

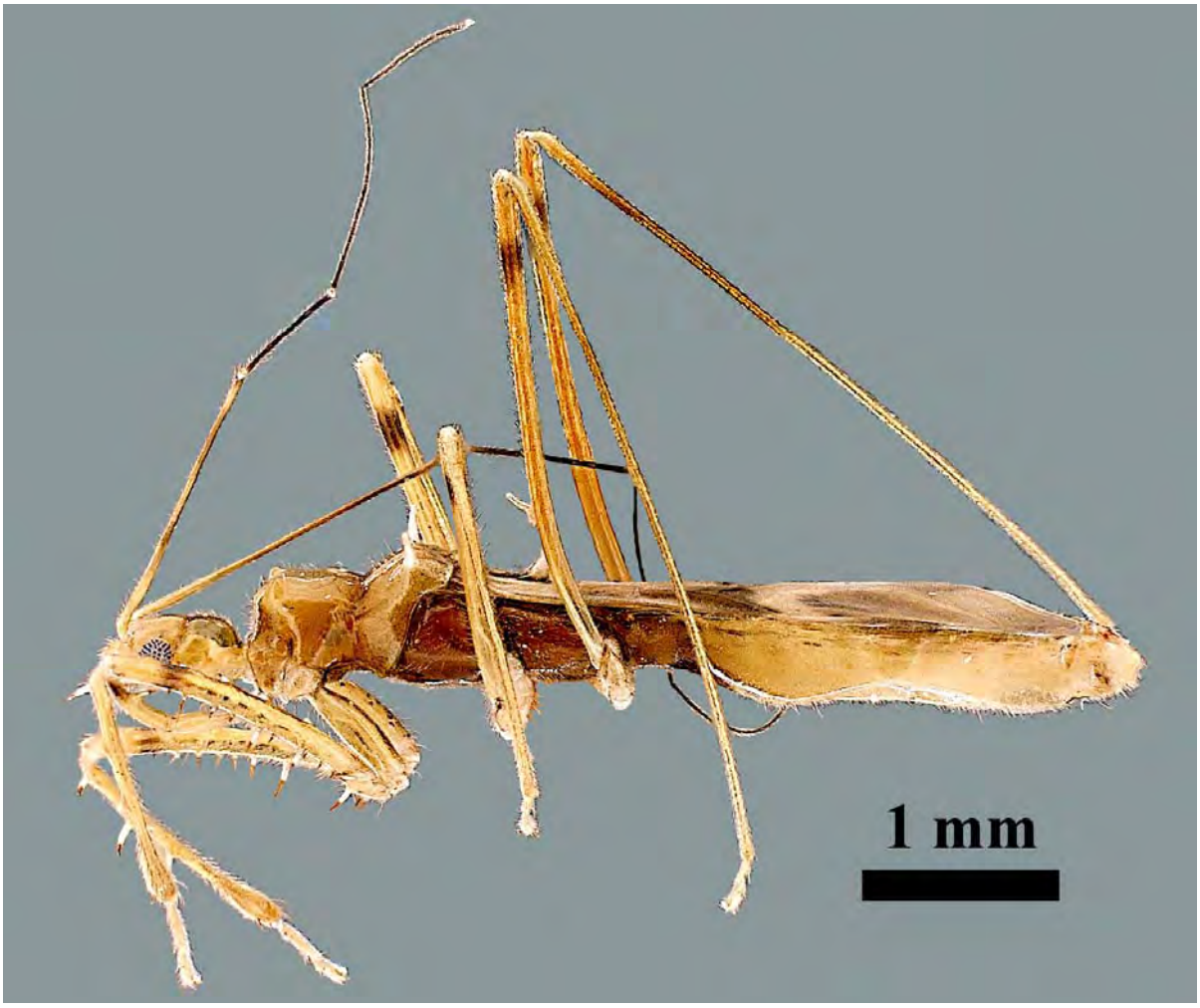
Pentatomidae
Piezodorus hyberni,
lateral view

Automontage photo

Reduviidae *Gallobelgicus saevus*, dorsal view
Automontage photo



Reduviidae *Sinea rileyi*, dorsal view
Automontage photo



Automontage photo

Reduviidae *Gallobelgicus saevus*, lateral view

Automontage photo

Rhopalidae *Niesthrea louisianica*, lateral view

Rhopalidae *Niesthrea louisianica*
Automontage photo

Saldidae *Micracanthia humilis*
Automontage photo

INSECTA: HEMIPTERA: Homoptera: (Scales, hoppers, aphids)

Cicadellidae *Scaphytopius loricatus*, lateral view Automontage photo

Cicadellidae *Scaphytopius loricatus*, dorsal view
Automontage photo

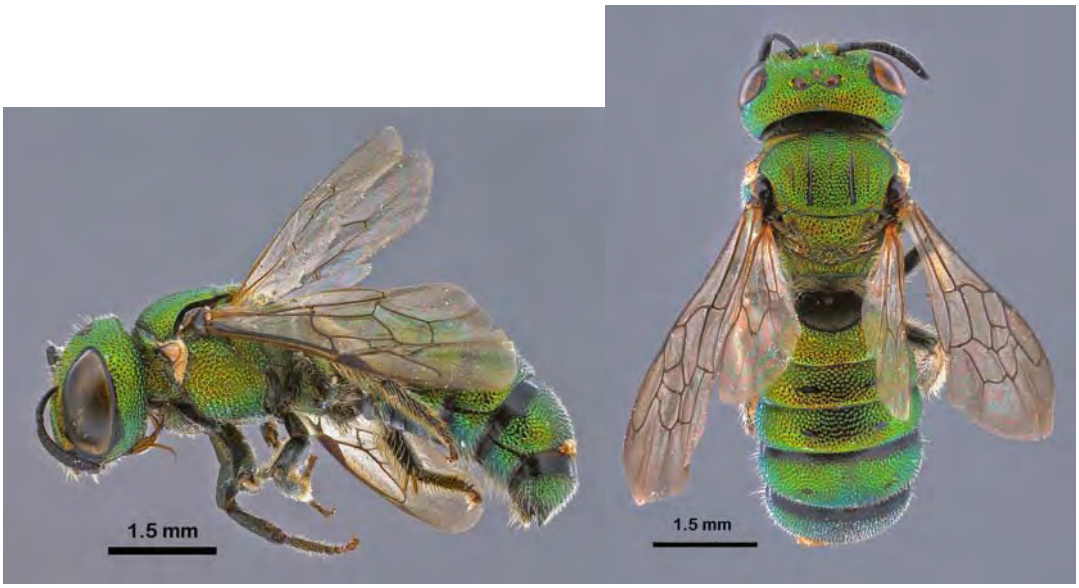
Cicadellidae *Spanbergiella quadripunctata*
Automontage photo

Derbidae *Cedusa* sp A

FGH photo

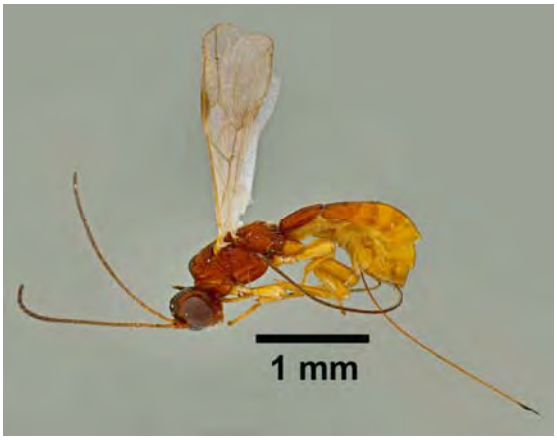
INSECTA: HYMENOPTERA (Wasps)

Anthophoridae *Ceratina arizonensis*, lateral view face Automontage photos



Anthophoridae *Ceratina smaragdula*, lateral view dorsal view Automontage photos

Bethylidae *Epyris extraneus*
Automontage photo



Braconidae *Acrophasmus immigrans*
Automontage photo

Braconidae *Agathis* sp A
Automontage photo

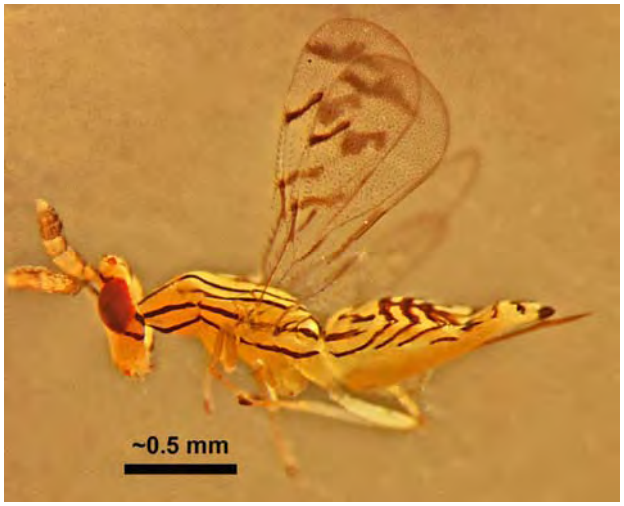
Braconidae *Apanteles* sp A
Automontage photo

Braconidae *Spathius prusias*
Automontage photo

Dryinidae Dryinidae genus sp A FGH photo

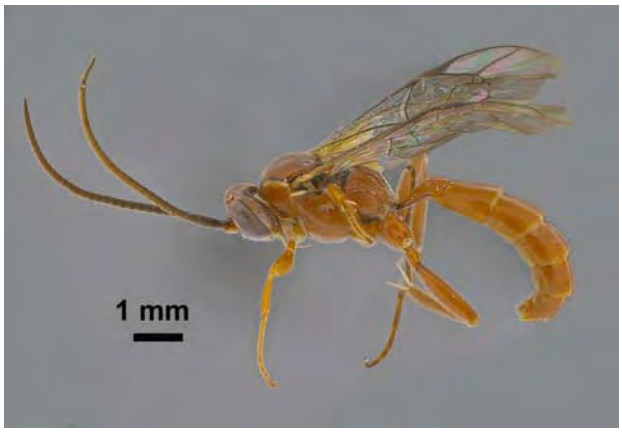
Encyrtidae genus sp A
FGH photo

Eucoilidae *Ganaspidium utilis* FGH photo



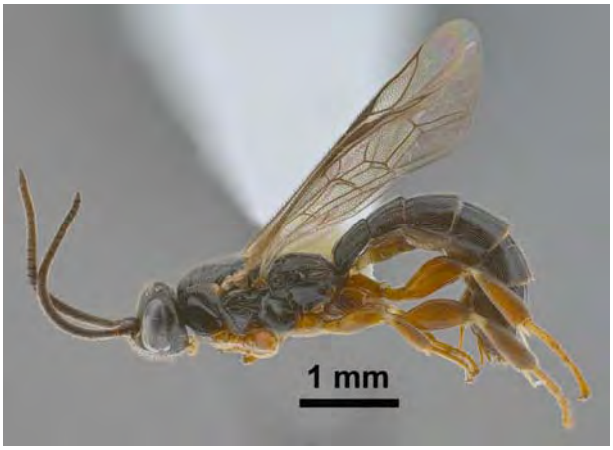
Eulophidae *Zagrammosoma* sp A poss. *multilineatum*,
FGH photo

Ichneumonidae *Anomalon californicum*
Automontage photo



Ichneumonidae *Barichneumon californicus*
Automontage photo

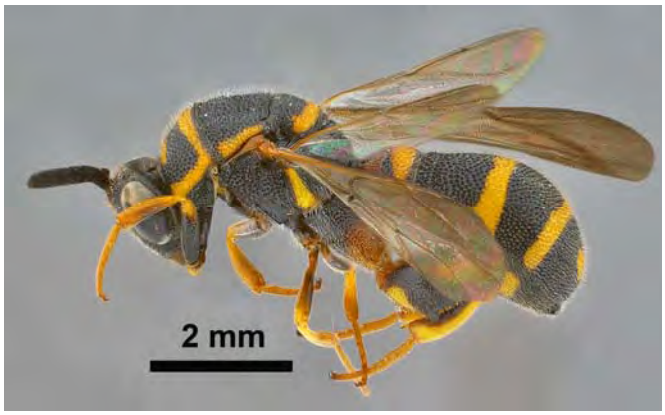
Ichneumonidae *Hypsicera* sp A
Automontage photo



Ichneumonidae Hypsicera sp B
Automontage photo

Ichneumonidae *Venturia* sp A
Automontage photo

Ichneumonidae Pimplinae genus sp A
Automontage photo



Leucospidae *Leucospis* sp A
Automontage photo

Pompilidae *Paracyphononyx pedestris*
Automontage photo

Pteromalidae
FGH photo

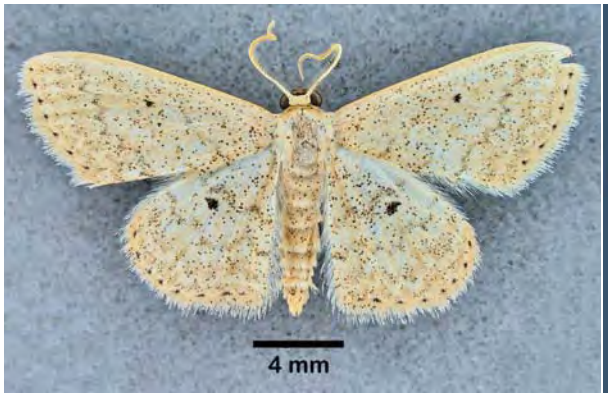
FGH photo

Vespidae *Polistes exclamans*, on nest

INSECTA: LEPIDOPTERA (Moths & butterflies)

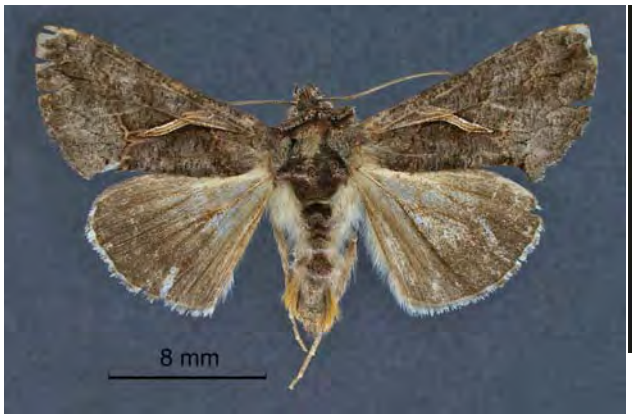
Choreutidae: Choreutis sp. A

Automontage photo



Geometridae: *Scopula* cf. *personata*
Automontage photo

Immidae: *Imma mylias*
Automontage photo



Noctuidae: *Ctenoplusia albostriata*
Automontage photo

Pyralidae: *Loryma* cf. *recusata*
FGH photo

INSECTA: PSOCOPTERA (Bark lice, psocids)

Archipsocidae: *Archipsocus* sp A
FGH photo

Caeciliidae: *Stenocaecilius analis*
FGH photo

Ectopsocidae: FGH photo
Ectopsocus cf. *richardsi*

Myopsocidae: *Myopsocus* sp A FGH photo

Philotarsidae: FGH photo
Aaroniella sp A

Philotarsidae: *Haplophalus* sp A FGH photo

CRUSTACEA:

AMPHIPODA: Talitridae: genus sp A
FGH photo

ISOPODA: Platyarthridae: *Trichorhina tomentosa*
FGH photo

APPENDIX V

COMPREHENSIVE LIST OF SPECIES OF TERRESTRIAL ARTHROPODS KNOWN TO OCCUR WITHIN THE KAHULUI AIRPORT ENVIRONS[1].

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
ARACHNIDA: ACARI (Mites**)**				
Acaridae				
Tyrophagus putrescentiae (Schrank 1781) mold mite	adv	2002		BL2002-281; BL2002-205; /Tulgren Funnel (Berlese).
Ameroseiidae				
Ameroseiidae genus sp. A	unk	NIR 2002		BL2002-205; /Tulgren Funnel (Berlese).
Anystidae				
Anystis sp. A	adv?	2002		BL2002-21, BL2002-206; /Gas Aspirator, Tulgren Funnel (Berlese).
Aphelacaridae				
Aphelacarus sp. A	unk	NIR 2002		BL2002-206; /Tulgren Funnel (Berlese).
Ascidae				
Asca duosetosa Fox 1946	adv	NIR 2002		BL2002-182, BL2002-205, BL2002-281; /Tulgren Funnel (Berlese).
Asca sp. A	adv?	NIR 2002		BL2002-182; /Tulgren Funnel (Berlese).
Bdellidae				
Bdella distincta (Baker & Balock 1944)	adv	NIR 2002		BL2002-205; /Tulgren Funnel (Berlese).
Bdellodes longirostris (Hermann 1804)	adv	NIR 2002		BL2002-262; /Malaise Trap.
Spinibdella sp. A	unk	NIR 2002		BL2002-58A, BL2002-206; /Gas Aspirator, Tulgren Funnel (Berlese).
Camerobiidae				
Neophyllobius sp. A	unk	NSR 2002		BL2002-182; /Tulgren Funnel (Berlese).
Cheyletidae				
Acarocheyla hawaiiensis (Baker 1949)	end?	2002		BL2002-136; /Gas Aspirator, Malaise Trap.
Hemicheyletia bakeri Ehara 1962	adv	NIR 2002		BL2002-12, BL2002-58A, BL2002-182, BL2002-205; /Gas Aspirator, Tulgren Funnel (Berlese).
Cunaxidae				
Cunaxa sp. nov. A	end?	2002		BL2002-58A, BL2002-206; /Gas Aspirator, Tulgren Funnel (Berlese).
Ereynetidae				
Ereynetidae genus sp. A	unk	NIR 2002		BL2002-206; /Tulgren Funnel (Berlese).
Erythraeidae				
Balaustium sp. nov. A	end?	2002		BL2002-131, BL2002-262; /Gas Aspirator, Malaise Trap.
Eupodidae				
Eupodes sp. nov. A	end	2002		BL2002-12, BL2002-21, BL2002-34, BL2002-58A; /Gas Aspirator
Fusacaridae				
Fusacaridae genus sp. A	adv?	NSR 2002		BL2002-12, BL2002-206; /Gas Aspirator, Tulgren Funnel (Berlese).

[1] = Names and arrangement follow Nishida (2002), except where updated.

[2] =**Biogeographic Status: end**=endemic to HIs, **ind**=indigenous to HIs, **adv**=adventive, **pur**=purposefully introduced, **unk**=Unknown,

[3] = **Status on Maui: NIR** = new island record, with year reported; **NSR** = new state record, with year reported; and **NTL =** new to list, with year first listed.

[4] = Incidence: .A subjective measure of commonness with the Kahului Airport environs.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
ARACHNIDA: ACARI (continued**)**				
Galumnatidae				
Pergalumna bryani (Jacot 1934)	adv	NSR 2002		BL2002-21, BL2002-206, BL2002-281; / Gas Aspirator, Tulgren Funnel (Berlese).
Laelapidae				
Hypoaspis sp. A	unk	2002		BL2002-76; /Malaise Trap.
Oribatulidae				
Lucoppia burrowsii (Michael 1890)	adv	2002		BL2002-5A, BL2002-12, BL2002-15, BL2002-50A, BL2002-131, BL2002-133, BL2002-136, BL2002-206, BL2002-215E; / Gas Aspirator, Tulgren Funnel (Berlese), Trunk Trap.
Zygoribatula sp. A	adv?	NIR 2002		BL2002-5A, BL2002-12, BL2002-34, BL2002-131, BL2002-133, BL2002-182 BL2002-206, BL2002-215E, BL2002-281, BL2002-348; /Gas Aspirator, Tulgren Funnel (Berlese).
Phthiracaridae				
Atropacarus (Atropacarus) striculus (Koch, 1834)	adv	2002		BL2002-281; /Tulgren Funnel (Berlese).
Phytoseiidae				
Amblyseius sp. A	unk	NTL 2011		BL2002-223; /Malaise Trap.
Phytoseiidae genus sp. A	unk	2002		BL2002-21, BL2002-174, BL2002-223; / Gas Aspirator, Malaise Trap, Sweep Net.
Pyemotidae				
Pyemotes tritici (LaGreze-Fossart & Montagne, 1851)	adv	2002		BL2002-182; /Tulgren Funnel (Berlese).
Scheloribatidae				
Scheloribates castlei Jacot 1934	end?	NIR 2002		BL2002-21; /Gas Aspirator.
Scheloribates muiri Jacot 1934	end	NIR 2002		BL2002-281; /Tulgren Funnel (Berlese).
Scheloribates sp. A	unk	NIR 2002		BL2002-21, BL2002-262; /Gas Aspirator, Malaise Trap.
Scheloribates sp. B	unk	NIR 2002		BL2002-133; /Gas Aspirator.
Scheloribates sp. C	unk	NIR 2002		BL2002-34, BL2002-182; /Gas Aspirator, Tulgren Funnel (Berlese).
Tarsonemidae				
Tarsonemus cf. sp. A	unk	2002		BL2002-58A; /Gas Aspirator.
Tenerifiidae				
Tenerifiidae genus sp. A	unk	2002		BL2002-206; /Tulgren Funnel (Berlese).
Tenuipalpidae				
Tenuipalpidae genus sp. A	unk	NTL 2011		BL2002-21; /Gas Aspirator.
Tetranychidae				
Tetranychidae genus sp. A	unk	2002		BL2002-21, BL2002-58A, BL2002-278; / Gas Aspirator, Malaise Trap.
Tydeidae				
Lorryia pandana Baker 1968	ind	NSR 2002		BL2002-12, BL2002-206; /Gas Aspirator, Tulgren Funnel (Berlese).
Pronematus sp. A	unk	NIR 2002		BL2002-205, BL2002-206; /Tulgren Funnel (Berlese).
Tydeus tutlei Baker 1965	adv	NIR 2002		BL2002-12, BL2002-206; /Gas Aspirator, Tulgren Funnel (Berlese).

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
ARACHNIDA: ARANEAE (Spiders**)**				
Araneidae				
Argiope appensa (Walckenaer 1841) yellow garden spider	adv	2002		BL2002-73K, BL2002-77C, BL2002-83, BL2002-243,KM2003-68,KA2007-65, KA2007-301; /Gas Aspirator, General, Malaise Trap, MV Bulb, Sweep Net.
Gasteracantha cranciformis (Linnaeus spinybacked spider	adv	NIR 2002	Scarce	BL2002-42A, KM2003-37; /Gas Aspirator, MV Bulb.
Gasteracantha mammosa C.L. Koch 1844 Asian spinybacked spider	adv	2002	Common	BL2002-349, BL2002-350, BL2002-351, KM2003-35A, KM2003-68, KA2007-85, KA2007-213; / General, Host Search, Malaise Trap, Sweep Net.
Neoscona theisi (Walkenaer 1841)	adv	NTL 2006	Uncommon	BL2002-38, BL2002-45, BL2002-53, BL2002-55C, BL2002-131, KM2003-36, KM2003-37, KA2007-44, KA2007-302; /Gas Aspirator, General, MV Bulb.
Clubionidae				
Cheiracanthium mordax L. Koch 1866 pale leaf spider	adv	2002	Uncommon	BL2002-5, BL2002-168, KM2003-56, KA2007-2, KA2007-8; /Gas Aspirator, General, MV Bulb.
Clubiona sp. A	adv	NSR? 2007		KM2003-35A, KM2003-38, KA2007-22, KA2007-65, KA2007-67, KA2007-158, KA2007-159, KA2007-171, KA2007-172; / Lingren Funnels (Beetle trap), Fogging, Malaise Trap, MV Bulb, Window Trap.
Desidae				
Paratheuma makai Berry & Beatty 1989	end	NIR 2007		KA2007-47; /General.
Gnaphosidae				
Scotophaeus blackwalli (Thorel 1871)	adv	NIR 2006	Local	BL2002-182, KM2003-35A; /Malaise Trap, Tulgren Funnel (Berlese).
Zelotes reformans Chamberlin 1924	adv	NIR 2002	Local	BL2002-352, BL2002-353, KM2003-49, KM2003-56, KM2003-69, KA2007-211; /General, Sifting Litter, Tulgren Funnel (Berlese).
Heteropodidae				
Heteropoda venatoria (Linnaeus 1767) cane spider	adv	2002	Common	KA2007-125; /Gas Aspirator.
Linyphiidae				
Erigone genus sp. A	adv?	NIR 2006	Local	BL2002-46; /Gas Aspirator.
Lycosidae				
Hogna sp. A [listed as '*Lycosa* sp A.' in earlier reports]	adv	NSR 2011		BL2002-354; /General .
Mysmenidae				
Mysmenella cf. sp. A	adv?	NIR? 2007	Scarce	KM2003-1, KA2007-48, KA2007-65, KA2007-67, KA2007-159; /Gas Aspirator, Host Search, Malaise Trap, Window Trap.
Nesticidae				
Eidmannella pallida (Emerton 1875)	adv	NIR 2011		KA2007-67; /Window Trap.
Ochyroceratidae				
Theotima radiata (Simon 1891)	adv	NTL 2006	Local	KM2003-35A, KA2007-64, KA2007-159;/ Malaise Trap, Window Trap.
Oecobiidae				
Oecobius navus Blackwell, 1859	adv	NIR 2011	Scarce	BL0029A / Gas Aspirator
Oonopidae				
Oonopidae genus sp. A	end?	NIR 2011		KM2003-69; /Sifting Litter.
Opopaea sp. A	end?	NIR 2006	Uncommon	BL2002-13, BL2002-182, KA2007-64, KA2007-67, KA2007-159; /Gas Aspirator, Tulgren Funnel (Berlese), Window Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
ARACHNIDA: ARANEAE (continued**)**				
Oonopidae (continued**)**				
Orchestina sp. A	unk	NIR 2007	Uncommon	KA2007-171; /Malaise Trap.
Orchestina sp. B	unk	NSR 2007	Uncommon	KA2007-171; /Malaise Trap.
Oxyopidae				
Oxyopes sp. A lynx spider [Kumashiro, et. al., 1990]	adv	2002	Common	BL2002-73H, BL2002-185, BL2002-215A, BL2002-308, BL2002-355,KM2003-4, KM2003-82, KA2007-6,KA2007-38,KA2007-42, KA2007-101,KA2007-125,KA2007-159, KA2007-192,KA2007-221,KA2007-300,KA2007-301;/ Fogging, Gas Aspirator, General, Malaise Trap, Window Trap.
Pholcidae				
Artema atlanta Walckenaer 1837	adv	NIR 2006	Local	KM2003-53; /General.
Smeringopus pallidus (Blackwall 1858)	adv	NTL 2006	Local	BL2002-343, KM2003-37, KA2007-60; /General, MV Bulb.
Salticidae				
Chrysilla versicolor (C.L. Koch 1846) [Listed in *Phintella*]	adv	NIR 2006		BL2002-22, KA2007-38; /Gas Aspirator.
Habronattus tarsalis (Banks 1904)	adv	NIR 2011		KA2007-13, KA2007-14; /Gas Aspirator
Hasarius adansoni (Audouin 1826)	adv	NTL 2006	Common	BL2002-30, BL2002-35, BL2002-165, BL2002-243, KA2007-67, KA2007-105, KA2007-122; /Gas Aspirator, General, MV Bulb, Sweep Net, Window Trap.
Menemerus bivitatus (Dufour 1831)	adv	NIR 2006	Common	BL2002-22, KM2003-78, KA2007-122, KA2007-149;/ Gas Aspirator, General, Sticky Trap.
Messua cf. *felix* (Peckham & Peckham 1901)	adv	NTL 2006		BL2002-5, BL2002-5A, BL2002-21, BL2002-73B, BL2002-118, BL2002-122, KM2003-68, KA2007-38, KA2007-221, KA2007-301; /Beating Sheet, Gas Aspirator, Malaise Trap, Sweep Net.
Scytodidae				
Scytodes cf. *fusca* Walckenaer 1837	adv	NTL 2006	Local	KM2003-50, KM2003-69, KA2007-67, KA2007-171;/ General, Malaise Trap, Sifting Litter, Window Trap.
Scytodes longipes Lucas 1845	adv	NTL 2011		KM2003-72, KA2007-67, KA2007-159; /Fogging, Window Trap.
Tetragnathidae				
Tetragnatha sp. A	adv?	2002	Local	BL2002-55A, BL2002-168, KM2003-74, KA2007-58, KA2007-170; /Gas Aspirator, General, MV Bulb, Sweep Net.
Theridiidae				
Argyrodes argentatus Cambridge 1880	adv	NIR 2006	Uncommon	BL2002-73H, KM2003-1, KM2003-74, KA2007-67, KA2007-159; /Gas Aspirator, Malaise Trap, Sweep Net, Window Trap.
Coleosoma adamsoni (Berland 1934)	adv	NIR 2011		KM2003-35A, KA2007-8, KA2007-58, KA2007-67, KA2007-171; /Gas Aspirator, General, Malaise Trap, Window Trap.
Coleosoma floridanum Banks 1900	adv	NIR 2002		BL2002-22, KA2007-13, KA2007-171;/ Gas Aspirator, Malaise Trap.
Steatoda erigoniformis (Cambridge 1872)	adv	NTL 2006	Local	BL2002-5A, KM2003-56; /Gas Aspirator, General.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
ARACHNIDA: ARANEAE (continued**)**				
Theridiidae (continued**)**				
Theridion melanostictum Cambridge 1876	adv	NIR 2002	Common	BL2002-38, BL2002-58A, BL2002-185, BL2002-215A, KM2003-1, KM2003-35A, KM2003-75, KA2007-6, KA2007-38, KA2007-42, KA2007-60, KA2007-67, KA2007-125, KA2007-149; /Fogging, Gas Aspirator, Malaise Trap, MV Bulb, Sticky Trap, Window Trap.
Uloboridae				
Zosis geniculata (Olivier 1789)	adv	NIR 2006	Local	KM2003-53; /General.
ARACHNIDA: PSEUDOSCORPIONIDA (False scorpions)				
Unplaced Family				
Pseudoscorpionida genus sp. A	unk	unk 2002	Local	BL2002-122, BL2002-182, KA2007-64, KA2007-67, KA2007-159, KA2007-211; /Gas Aspirator, Tulgren Funnel (Berlese), Window Trap.
ARACHNIDA: SCORPIONES (Scorpions**)**				
Buthidae				
Isometrus maculatus (DeGeer 1778) lesser brown scorpion	adv	2002	Common	BL2002-2, BL2002-174, BL2002-320; /Gas Aspirator, General, Sweep Net.
INSECTA: (Insects**)**				
BLATTODEA (Cockroaches**)**				
Blaberidae				
Diploptera punctata (Eschscholtz 1822) beetle cockroach	adv	2002	Scarce	BL2002-243; /General.
Pycnoscelus indicus (Fabricius 1775) Surinam cockroach	adv	2002	Common	BL2002-10, BL2002-73F, BL2002-76, BL2002-163A, BL2002-182, KM2003-38, KM2003-39, KA2007-67, KA2007-168, KA2007-169, KA2007-170; /Malaise Trap, MV & Blacklight, MV Bulb, Pitfall Trap, Tulgren Funnel (Berlese), Window Trap.
Blatellidae				
Balta sp. A [probably species reported by Kumashiro (1998)]	adv	2002	Scarce	BL2002-199, BL2002-243, BL2002-261, KM2003-38, KM2003-39, KM2003-78, KM2003-82, KM2003-83, KA2007-67, KA2007-148; /Fogging, Gas Aspirator, General, MV Bulb, Window Trap
Blatella lituricollis (Walker 1868) false German cockroach	adv	2002	Common	BL2002-18, KM2003-39, KM2003-41, KA2007-67, KA2007-101, KA2007-103, KA2007-148, KA2007-149, KA2007-170, KA2007-171; /Gas Aspirator, General, Malaise Trap, MV Bulb, Sticky Trap, Window Trap.
Loboptera dimidiatipes (Bolivar 1890)	adv	NTL 2007	Uncommon	BL2002-265, KA2007-57, KA2007-64, KA2007-101;/ Gas Aspirator, MV Bulb, Window Trap.
Symploce pallens (Stephens 1835)	adv	NIR 2002	Scarce	BL2002-55C, KA2007-265; /Gas Aspirator, Sticky Trap.
Blattidae				
Neostylopyga rhombifolia (Stoll 1813)	adv	NIR 2006	Scarce	KM2003-36; /MV Bulb.
Periplaneta americana (Linnaeus 1758) American cockroach	adv	2002	Common	BL2002-60, BL2002-340, KA2007-18, KA2007-170;/ Gas Aspirator, General, MV Bulb.
Periplaneta australasiae (Fabricius 1775)	adv	NTL 2006	Scarce	KM2003-42; /MV Bulb.
Platyzosteria soror (Brunner 1865)	adv	2002	Common	BL2002-60; /General.
Polyphagidae				
Euthyrrhapha pacifica (Coquebert 1804) Pacific cockroach	adv	2002	Common	BL2002-18, BL2002-73G, BL2002-73H, KA2007-67, KA2007-171; /Gas Aspirator, Malaise Trap, Window Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: COLEOPTERA (Beetles)				
Aderidae				
Xylophilus marquesanus Blair 1934	adv	NIR 2002	Common	BL2002-163, BL2002-165, BL2002-166, BL2002-227, BL2002-265; /Gas Aspirator, MV & Blacklight, MV Bulb.
Xylophilus cf. sp. A	adv	NSR 2011		BL2002-163A, KM2003-74; /MV & Blacklight, Sweep Net.
Anobiidae				
Ozognathus sp. A	adv	NIR 2002	Common	BL2002-169, BL2002-226, BL2002-227, BL2002-228, BL2002-230, BL2002-266; /Gas Aspirator, Malaise Trap, MV & Blacklight, Sweep Net.
Tricorynus sharpi (Pic 1912)	end	2002	Common	BL2002-9, BL2002-57, BL2002-73I, BL2002-83, BL2002-163, BL2002-166, BL2002-208A, BL2002-222, BL2002-223, BL2002-227, BL2002-230, BL2002-233, BL2002-239, BL2002-242, BL2002-244, BL2002-256, BL2002-257, BL2002-267, KM2003-39, KA2007-170; / Lingren Funnels (Beetle trap), Gas Aspirator, Host Search, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.
Anthicidae				
Anthicus recens Werner 1967	adv	NIR 2002	Common	BL2002-26, BL2002-57, BL2002-208A, KM2003-56;/ Lingren Funnels (Beetle trap), Gas Aspirator, General, MV Bulb.
Anthicus tobias Marseul 1879	adv	NIR 2006	Scarce	BL2002-84; /MV Bulb.
Formicomus imperator (LaFerte 1847)	adv	NIR 2006	Scarce	KM2003-2; /Gas Aspirator.
Anthribidae				
Araecerus constans Perkins 1900	end	NIR 2002	Local	BL2002-256, KA2007-171; / Lingren Funnels (Beetle trap), Malaise Trap.
Araecerus fasciculatus (DeGeer 1775) coffee bean weevil	adv	2002	Common	BL2002-163A, BL2002-208A, BL2002-228; / Lingren Funnels (Beetle trap), MV & Blacklight, Sweep Net.
Araecerus levipennis Jordan 1924 koa haole seed weevil	adv	2002	Common	BL2002-73F, BL2002-73H, BL2002-77C, BL2002-129, BL2002-163A, BL2002-221, BL2002-223, BL2002-224, BL2002-232, BL2002-233, BL2002-238, BL2002-239, BL2002-242, BL2002-246, BL2002-269, BL2002-178;/ Gas Aspirator, Malaise Trap, MV & Blacklight, Sifting Litter, Sweep Net.
Exillus lepidus Jordon 1922	adv	NTL 2007	Scarce	BL2002-73D; /Malaise Trap.
Bostrichidae				
Amphicerus cornutus (Pallas 1772) powderpost bostrichid	adv	2002	Common	BL2002-57, BL2002-76, BL2002-81, BL2002-83, BL2002-163, BL2002-163A, BL2002-233, BL2002-239, BL2002-269, BL2002-178; /Malaise Trap, MV & Blacklight, MV Bulb.
Dinoderus minutus (Fabricius 1775)	adv	NTL 2007	Scarce	BL2002-268; /Lingren Funnels (Beetle trap).
Sinoxylon conigerum Gerstaecker 1855	adv	2002	Uncommon	BL2002-73H, BL2002-239; /Malaise Trap.
Trogoxylon aequale (Wollaston 1867)	adv	NIR 2002	Local	BL2002-238; /Sifting Litter.
Xylopsocus capucinus (Fabricius 1781)	adv	NIR 2002	Scarce	BL2002-178; /Malaise Trap.
Xylopsocus castanoptera (Fairmaire 1850)	adv	NIR 2002	Local	BL2002-163A, BL2002-178; /Malaise Trap, MV & Blacklight.
Brentidae				
Cylas formicarius (Fabricius 1798) Sweet potato weevil	adv	2002	Common	BL2002-81, BL2002-83, BL2002-222, KA2007-95, KA2007-103, KA2007-115; /Gas Aspirator, General, MV Bulb, Sweep Net.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: COLEOPTERA (continued)				
Buprestidae				
Aphanisticus cochinchinae seminulum Obenberger 1929	adv	NSR 2002	Uncommon	BL2002-260, KM2003-75, KA2007-101; /Gas Aspirator.
Chrysobothris indica Castlenau & Gory 1837 flatheaded borer.	adv	2002	Local	BL2002-73D, BL2002-77C, BL2002-221, BL2002-239, BL2002-244, BL2002-262, BL2002-288;/ Malaise Trap.
Cantharidae				
Caccodes oceaniae (Bourgeois 1884)	adv	2002	Local	BL2002-9, BL2002-76; /Gas Aspirator, Malaise Trap.
Carabidae				
Bembidion niloticum batesi (Putzeys 1875)	adv?	NIR 2002	Common	BL2002-57, BL2002-169, KA2007-170;/ MV & Blacklight, MV Bulb.
Gnathaphanus upolensis (Csiki 1915)	adv	2002	Common	BL2002-163, KM2003-56, KA2007-18, KA2007-170; / General, MV & Blacklight, MV Bulb.
Metacolpodes buchanani (Hope 1831)	adv	2002	Common	BL2002-163A, BL2002-164; /MV & Blacklight, MV Bulb.
Notiobia purpurascens (Bates 1882) Listed as *Anisotarsus purpurascens*	adv	2002		BL2002-57, BL2002-83, BL2002-163A; / MV & Blacklight, MV Bulb.
Perigona nigriceps (Dejean 1831)	adv	NIR 2002	Local	BL2002-84, BL2002-163, BL2002-163A, BL2002-168, BL2002-169, KA2007-170;/ MV & Blacklight, MV Bulb.
Stenolophus cf. *limbalis* LeConte 1860	pur?	NIR 2002	Common	BL2002-73J, BL2002-163, BL2002-163A, KA2007-170; / Malaise Trap, MV & Blacklight, MV Bulb.
Cerambycidae				
Ceresium unicolor (Fabricius 1787)	adv	2002	Scarce	BL2002-81, KA2007-171; /Malaise Trap, MV Bulb.
Curtomerus flavus (Fabricius 1775)	adv	2002	Uncommon	BL2002-76; /Malaise Trap.
Placosternus crinicornis (Chevrolat 1860)	adv	2002	Common	BL2002-73E, KM2003-57, KA2007-171, BL2002-178;/ General, Malaise Trap.
Plagithmysus kahului Samuelson 2006 Hawaii longhorned beetle [species discovered during survey]	end	NTL 2007	Local	KM2003-62, KM2003-63, KA2007-31; /General, Sweep Net.
Sybra alternans (Wiedemann 1825)	adv	2002	Common	BL2002-73H, BL2002-73J, BL2002-77C, BL2002-150, BL2002-163A, BL2002-224, BL2002-231, BL2002-232, BL2002-233, BL2002-239, BL2002-240, BL2002-250, BL2002-251, BL2002-254A, KA2007-170, KA2007-171, BL2002-178, BL2002-184; /Fogging, Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net, Trunk Trap.
Chrysomelidae				
Acanthoscelides macrophthalmus	adv	NIR 2002	Common	BL2002-9, BL2002-57, BL2002-73I, BL2002-77C, BL2002-163, BL2002-163A, BL2002-165, BL2002-223, BL2002-230, BL2002-232, BL2002-233, BL2002-235, BL2002-242, BL2002-244, BL2002-246, BL2002-255, BL2002-256, KM2003-39, KA2007-171, BL2002-178;/ Lingren Funnels (Beetle trap), Fogging, Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.
Algarobius bottimeri Kingslover 1972 keawe bean weevil.	adv	2002	Common	BL2002-163, BL2002-166, BL2002-257, KA2007-171; / Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.
Carydon serratus (Oliver 1790) Tamarind seed weevil	adv	2002	Common	BL2002-163, BL2002-257, KA2007-171; /Malaise Trap, MV & Blacklight, Sweep Net.
Diachus auratus (Fabricius 1801) bronze leaf beetle	adv	2002	Common	BL2002-244, BL2002-245; /Malaise Trap, Sweep Net.
Lema trilineata White 1981	adv	2002	Scarce	BL2002-59; /General.
Megacerus leucospilus (Sharp 1885)	adv	2002	Scarce	BL2002-42C; /Gas Aspirator.
Mimosestes amicus (Horn 1873)	adv	2002	Common	BL2002-2, BL2002-9, BL2002-42C, BL2002-163, BL2002-166, BL2002-230, BL2002-244, BL2002-246, KA2007-170, KA2007-171; /Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: COLEOPTERA (continued)				
Chrysomelidae (continued**)**				
Mimosestes insularis Kingsolver & Johnson, 1978	adv	NIR 2002	Uncommon	BL2002-57, BL2002-83, BL2002-84, BL2002-163, BL2002-230, BL2002-244, BL2002-257, KA2007-170;/ Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.
Monoxia minuta Blake 1939	adv	NIR 2011		BL2002-184, KA2007-221; /Gas Aspirator, Malaise Trap.
Specularius impressithorax (Pic 1932)	adv	NTL 2006	Local	KM2003-25; /Host Search.
Stator pruininus (Horn 1873) pruinose bean weevil	adv	2002	Common	BL2002-2, BL2002-3, BL2002-9, BL2002-45A, BL2002-73G, BL2002-73I, BL2002-77C, BL2002-133, BL2002-163A, BL2002-221, BL2002-223, BL2002-232, BL2002-233, BL2002-235, BL2002-242, BL2002-244, BL2002-251, BL2002-260, BL2002-261, KM2003-39, BL2002-178; /Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.
Ciidae				
Cis species A	end?	2002		KA2007-120, KA2007-149; /Host Search, Sticky Trap.
Clambidae				
Clambus sp. A [not *C. pubescens* Redtenbacher.]	end?	NSR 2002	Local	BL2002-9, BL2002-178; /Gas Aspirator, Malaise Trap.
Cleridae				
Tarsostenus univittatus (Rossi 1792)	adv	NIR 2002	Uncommon	BL2002-167, BL2002-239; /Malaise Trap, MV Bulb.
Tillus notatus Klug 1840	adv	2002	Common	BL2002-73D, BL2002-223, BL2002-233, BL2002-239, BL2002-241, BL2002-242, BL2002-178; /Host Search, Malaise Trap.
Coccinellidae				
Brumoides suturalis (Fabricius 1798) three-striped lady beetle	adv	NIR 2002	Local	BL2002-73G, BL2002-238, KM2003-62; /Malaise Trap, Sifting Litter, Sweep Net.
Coccinella septempunctata Linnaeus 1758 sevenspotted lady beetle	pur	2002	Uncommon	BL2002-77C, BL2002-240; /Malaise Trap, Sweep Net.
Coelophora inaequalis (Fabricius 1775) Common Australian lady beetle	pur	2002	Common	BL2002-73H, BL2002-73J, BL2002-230, BL2002-233, BL2002-235, BL2002-236, BL2002-184; /Gas Aspirator, General, Malaise Trap, Sweep Net.
Cryptolaemus montrouzieri Mulsant 1853	pur	NTL 2006	Local	No Specimens recorded.
Curinus coeruleus (Mulsant 1850)	pur	2002	Common	BL2002-4A, BL2002-9, BL2002-73H, BL2002-73J, BL2002-129, BL2002-221, BL2002-223, BL2002-232, BL2002-233, BL2002-234, KA2007-265; /Fogging, Gas Aspirator, Malaise Trap, Sticky Trap.
Diomus debilis (Le Conte 1852)	pur	2002	Common	BL2002-26, BL2002-227, BL2002-178; /Gas Aspirator, Malaise Trap.
Diomus notesens (Blackburn 1889)	pur	-2002	Local	BL2002-129, BL2002-150, BL2002-229, KA2007-265;/ Gas Aspirator, General, Sticky Trap.
Diomus sp. A	pur?	NTL 2007	Scarce	KA2007-171, KA2007-265; /Malaise Trap, Sticky Trap.
Hyperaspis pantherina Fürsch 1975	pur	2002	Common	BL2002-231; /Sweep Net.
Nephaspis sp. A [near *N. bicolor*.]	pur?	NIR 2002		BL2002-228; /Sweep Net.
Nephus bilucernarius Mulsant 1850	pur	2002	Local	BL2002-9, BL2002-223, BL2002-224, BL2002-225, BL2002-226, BL2002-227, BL2002-230, BL2002-184;/ Gas Aspirator, General, Malaise Trap, Sweep Net.
Nephus roepkei (Fluiter 1938)	pur	2002	Local	BL2002-268; / Lingren Funnels (Beetle trap).
Olla v-nigrum (Mulsant 1866)	pur?	2002	Common	BL2002-73H, BL2002-73J, BL2002-77C, BL2002-84, BL2002-163, BL2002-163A, BL2002-221, BL2002-223, BL2002-224, KA2007-103, BL2002-184; /General, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: COLEOPTERA (continued)				
Coccinellidae (continued**)**				
Rodolia cardinalis (Mulsant 1853)	pur	2002	Local	BL2002-222; /Sweep Net.
Scymnus horni Gorham 1897	adv	NIR 2006	Local	BL2002-221, BL2002-231, KM2003-39; /Malaise Trap, MV Bulb, Sweep Net.
Sticholotis ruficeps Weise 1902	pur	2002	Common	BL2002-229, BL2002-243; /General.
Telsimia nitida Chapin 1926	pur	NIR 2002	Scarce	BL2002-305; /Host Search.
Corylophidae				
Anisomeristes basalis Sharp 1885	adv	NTL 2007	Local	BL2002-51; /Gas Aspirator.
Corylophidae genus sp. A [listed as *Sericoderus ?pubipennis.*] Possibly native.	unk	NSR? 2002		BL2002-84, BL2002-208A, BL2002-227, KM2003-74, BL2002-184; / Lingren Funnels (Beetle trap), Gas Aspirator, Malaise Trap, MV Bulb, Sweep Net.
Curculionidae [Including Scolytinae and Platypodinae]				
Acalles sp. A	end	2002	Scarce	BL2002-42A; /Gas Aspirator.
Euplatypus parallelus (Fabricius 1801) listed in *Platypus*	adv	NSR 2002	Uncommon	BL2002-83, BL2002-163, BL2002-167, BL2002-169; / MV & Blacklight, MV Bulb.
Hypothenemus eruditus (Westwood 1835)	adv	2002	Uncommon	BL2002-208A, BL2002-224, BL2002-268; / Lingren Funnels (Beetle trap), Sweep Net.
Hypothenemus cf. *birmanus* (Eichoff 1878) New name for *H. farinosus* Blandford 1896	adv	2002	Uncommon	BL2002-9, BL2002-208A, BL2002-256, BL2002-277; / Lingren Funnels (Beetle trap), Gas Aspirator.
Hypothenemus cf. *pubescens* Hopkins 1915	adv	2007	Scarce	BL2002-275; /Lingren Funnels (Beetle trap).
Hypothenemus cf. *seriatus* (Eichhoff 1871) Includes *H.* cf. *pulverulentus*(Eichhoff 1872)	adv	NIR 2002	Common	BL2002-239; BL2002-256; /Malaise Trap. Lingren Funnels (Beetle trap).
Hypothenemus sp. A	adv	2007	Common	BL2002-73H, BL2002-73I, BL2002-223, BL2002-233, BL2002-239, BL2002-242, BL2002-254A, BL2002-278, BL2002-178; /Malaise Trap, Trunk Trap.
Hypurus bertrandi (Perris 1852)	adv	2002	Local	BL2002-98, BL2002-133; /Gas Aspirator.
Listroderes difficilis Germain 1895	adv	NTL 2006	Scarce	BL2002-53; /MV Bulb.
Lixus mastersi Pascoe 1874	adv	NIR 2002	Common	BL2002-3, BL2002-235, KM2003-62; /Gas Aspirator, Sweep Net.
Myllocerus sp. A [Same as Beardsley & Kumashiro, et al., 1990?]	adv	NIR 2002	Common	BL2002-133, BL2002-163, KA2007-101, KA2007-103, KA2007-149, KA2007-170; /Gas Aspirator, General, MV & Blacklight, MV Bulb, Sticky Trap.
Pantomorus cervinus (Boheman, 1840) [new name for *Asynonychus godmanni* Crotch 1867] Fuller's rose beetle	adv	2002	Common	BL2002-2, BL2002-42C, BL2002-73J, BL2002-163A, BL2002-215A, BL2002-221, BL2002-224, BL2002-232, BL2002-235, BL2002-240, BL2002-248, KA2007-67, KA2007-170, KA2007-171; /Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net, Window Trap.
Sitophilus oryzae (Linnaeus 1763) the rice weevil	adv	2002		BL2002-73I, KA2007-67; /Malaise Trap, Window Trap.
Sphenophorus cariosus Olivier 1807	adv	NIR 2011		BL2002-241; /Host Search.
Sphenophorus venatus vestitus Chittenden 1904	adv	NTL 2007	Scarce	KA2007-61; /General.
Xyleborus affinis Eichhoff 1867	adv	2002	Scarce	BL2002-43, BL2002-208A; /Lingren Funnels (Beetle trap), Gas Aspirator.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: COLEOPTERA (continued)				
Dermestidae				
Attagenus fasciatus (Thunberg 1795)	adv	2002	Local	BL2002-268; / Lingren Funnels (Beetle trap).
Attagenus undulatus (Motschulsky 1858)	adv	NIR 2006	Scarce	BL2002-245; /Sweep Net.
Orphinus terminalis (Sharp 1885)	ind	2002	Common	BL2002-9, BL2002-73G, BL2002-73I, BL2002-221, BL2002-223, BL2002-239, KA2007-67; /Gas Aspirator, Malaise Trap, Window Trap.
Elateridae				
Aeolus livens (Le Conte 1853)	adv	NIR 2002	Common	BL2002-82, BL2002-163A; /MV & Blacklight, MV Bulb.
Cardiophorus stolatus Erichson 1840	adv	NIR 2002	Common	BL2002-35, BL2002-81, BL2002-163A, BL2002-166, BL2002-246, KA2007-101, KA2007-149, KA2007-170; /Gas Aspirator, MV & Blacklight, MV Bulb, Sticky Trap, Sweep Net.
Conoderus exsul (Sharp 1877)	adv	2002	Common	BL2002-73G, BL2002-73H, BL2002-166, BL2002-221, BL2002-223, BL2002-244, KA2007-170, KA2007-171, BL2002-178, BL2002-184; /Malaise Trap, MV Bulb.
Conoderus pallipes (Eschscholtz 1830)	adv	NIR 2002	Common	BL2002-76, BL2002-166, KA2007-170, KA2007-171; / Malaise Trap, MV Bulb.
Lacon modestus (Boisduval 1835)	adv	NIR 2002	Common	BL2002-163; /MV & Blacklight.
Melanotus punctosus (Walker 1858)	adv	NSR 2006	Common	BL2002-169, BL2002-279, KA2007-170, KA2007-171, BL2002-178; /Malaise Trap, MV & Blacklight, MV Bulb.
Melanoxanthus melanocephalus (Fabricius 1781)	adv	2002	Common	BL2002-169, BL2002-234, BL2002-277, BL2002-178;/ Lingren Funnels (Beetle trap), Fogging, Malaise Trap, MV & Blacklight.
Prodrasterius collaris (Candeze 1859)	adv	NIR 2007	Uncommon	KA2007-170, KA2007-171; /Malaise Trap, MV Bulb.
Simodactylus cinnamomeus (Boisduval 1835)	adv	2002	Common	BL2002-81, BL2002-163A, KA2007-170, KA2007-171; / Malaise Trap, MV & Blacklight, MV Bulb.
Endomychidae				
Eidoreus minutus Sharp 1885	end	NIR 2002	Scarce	BL2002-208A; / Lingren Funnels (Beetle trap).
Erotylidae				
Cryptophilus integer (Heer 1841)	adv	NIR 2002	Common	BL2002-57, BL2002-163, BL2002-208A, BL2002-265; / Lingren Funnels (Beetle trap), Gas Aspirator, MV & Blacklight,MV Bulb.
Hydrophilidae				
Cercyon fimbriatus Mannerheim 1852	adv	NSR 2002		BL2002-84, BL2002-243, KA2007-170; /General , MV Bulb.
Cercyon quisquilius (Linnaeus 1761)	pur	2002	Local	BL2002-163A, BL2002-239; /Malaise Trap, MV & Blacklight.
Enochrus sayi Gundersen 1977	adv	NIR 2002	Common	BL2002-35, BL2002-83,KA2007-170; /MV Bulb.
Tropisternus salsamentus Fall 1901	adv	2002	Local	KM2003-37, KM2003-38, KA2007-170; /MV Bulb.
Laemophloeidae				
Laemophloeus sp. A [not *L. minutus* Oliver.]	adv	NSR 2002	Local	BL2002-208A, BL2002-239, KM2003-77; / Lingren Funnels (Beetle trap), General, Malaise Trap.
Lathridiidae				
Cartodere cf. sp. A	adv	NIR/ NSR? 2006	Scarce	BL2002-281; /Tulgren Funnel (Berlese).
Corticaria cf. *longicollis* (Zeterstedt 1838)	adv?	NIR 2002	Local	BL2002-275, BL2002-277; / Lingren Funnels (Beetle trap).
Monotomidae				
Monotoma picipes Herbst 1793	adv	NTL 2011		BL2002-53; /MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: COLEOPTERA (continued)				
Mycetophagidae				
Litargus balteatus Le Conte 1856	adv?	2002	Local	BL2002-57, BL2002-163, BL2002-167, BL2002-277, KM2003-39; / Lingren Funnels (Beetle trap), MV & Blacklight, MV Bulb.
Litargus vestitus Sharp 1879	ind	2002	Uncommon	BL2002-166, BL2002-208A; /Lingren Funnels (Beetle trap), MV Bulb.
Typhaea stercorea (Linnaeus 1758)	adv	2002	Local	BL2002-155, BL2002-163, BL2002-244; / Lingren Funnels (Beetle trap), Malaise Trap, MV & Blacklight.
Nitidulidae				
Aethina concolor (Macleay 1872)	adv	NTL 2011	local	Reported from DLNR baseyard, Kahului, by Ewing & Cline, 2004
Carpophilus dimidiatus (Fabricius 1792)	adv	2002	Local	BL2002-256; / Lingren Funnels (Beetle trap).
Carpophilus hemipterus (Linnaeus 1758)	adv	2002	Common	BL2002-73H, BL2002-226; /Malaise Trap, Sweep Net.
Carpophilus humeralis (Fabricius 1798)	adv	2002	Common	BL2002-155, BL2002-239, BL2002-248, BL2002-250, BL2002-283, BL2002-284, KM2003-78, KA2007-171; / Lingren Funnels (Beetle trap), General, Host Search, Malaise Trap, Sweep Net, Trunk Trap.
Carpophilus marginellus Motschulsky 1858	adv	NIR 2002	Common	BL2002-83, BL2002-226, KA2007-171, BL2002-178; /Malaise Trap, MV Bulb, Sweep Net.
Carpophilus mutilatus Erichson 1843	adv	NIR 2006	Common	BL2002-228; /Sweep Net.
Conotelus mexicanus Murray 1864	adv	2002	Local	BL2002-226; /Sweep Net.
Eupraea (Haptoncus) luteolus Erichson 1843	adv	NIR 2002	Scarce	BL2002-57, BL2002-169, KA2007-170; /MV & Blacklight, MV Bulb.
Phenolia limbata tibialis (Boheman 1851)	adv	NIR 2002		BL2002-9B, BL2002-35, BL2002-53, BL2002-81, BL2002-82, BL2002-163A, BL2002-166, BL2002-265, KA2007-169, KA2007-170; /Gas Aspirator, MV & Blacklight, MV Bulb, Yellow Pan Trap.
Stelidota chontalensis Sharp 1890 [= S. sp. A of Beardsley et al, 1992].	adv	NIR 2006	Scarce	BL2002-83, BL2002-256; /Lingren Funnels (Beetle trap), MV Bulb.
Stelidota geminata (Say 1825) strawberry sap beetle	adv	NTL 2006	Scarce	BL2002-73G, BL2002-155, BL2002-163A, BL2002-169, BL2002-239, KA2007-170; / Lingren Funnels (Beetle trap), Malaise Trap, MV & Blacklight, MV Bulb. First recorded from Maui by Ewing & Cline 2004.
Oedemeridae				
Ananca bicolor (Fairmaire 1849)	adv	NIR 2002	Common	BL2002-81, BL2002-163A, BL2002-166, BL2002-267, KA2007-169; /Host Search, MV & Blacklight, MV Bulb.
Rhipiphoridae				
Rhipidius pectinicornis Thunberg 1806	adv	NIR 2007		KA2007-149, KA2007-171; /Malaise Trap, Sticky Trap.
Scarabaeidae				
Adoretus sinicus Burmeister 1855 Chinese rose beetle	adv	2002	Common	BL2002-9B, BL2002-18, BL2002-50, BL2002-53, BL2002-73J, BL2002-78, BL2002-81, BL2002-163, BL2002-163A, BL2002-233, BL2002-269, KA2007-95, KA2007-169, KA2007-170, KA2007-171, BL2002-178; Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb, / Sifting Litter, Yellow Pan Trap.
Ataenius cognatus (Le Conte 1859)	adv	2002	Common	BL2002-82, BL2002-84, KA2007-170; /MV Bulb.
Labarrus lividus (Olivier 1789) [Formerly known as *Aphodius lividus* (Oliver)].	adv	2002	Common	BL2002-57, BL2002-82, BL2002-83, BL2002-84, BL2002-163, BL2002-163A, BL2002-167, KA2007-170; / MV & Blacklight,MV Bulb.
Onthophagus catta (Fabricius 1787)	pur	NTL 2006	Uncommon	KM2003-37, KM2003-38; /MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: COLEOPTERA (continued)				
Scarabaeidae (continued)				
Protaetia fusca (Herbst 1790)	adv	NTL 2006	Scarce	BL2002-145; /Gas Aspirator.
Scirtidae				
Scirtes sp. A	adv	NIR 2002	Common	BL2002-163A; /MV & Blacklight. Beardsley & Mau, 1976.
Silvanidae				
Cryptamorpha desjardinsi (Guerin-Meneville, 1844)	adv	2002	Common	BL2002-57, BL2002-83, BL2002-163, BL2002-163A, BL2002-165, BL2002-166, BL2002-226, BL2002-265; /Gas Aspirator, MV & Blacklight, MV Bulb, Sweep Net.
Psammoechus insularis Sharp 1885	adv	NIR 2002	Scarce	BL2002-165; /MV Bulb.
Silvanoprus scuticollis (Walker 1859)	adv	NSR 2002	Scarce	BL2002-57, BL2002-163; /MV & Blacklight, MV Bulb.
Staphylinidae				
Anotylus sp. A	adv	NIR/NSR 2002	Uncommon	BL2002-163A, BL2002-169, BL2002-277, KA2007-169, KA2007-170, KA2007-171; / Lingren Funnels (Beetle trap), Malaise Trap, MV & Blacklight, MV Bulb.
Astenus sp. A	adv	NSR 2006	Scarce	KM2003-74; /Sweep Net.
Atheta sp. A	adv?	NTL 2007		KA2007-170, KA2007-171; /Malaise Trap, MV Bulb.
Carpelimus sp. A	adv?	NIR 2002	Common	BL2002-163A; /MV & Blacklight.
Carpelimus sp. B	adv?	NIR 2006	Scarce	BL2002-229, BL2002-277; /Lingren Funnels (Beetle trap), General.
Carpelimus sp. C	adv?	NIR 2006	Scarce	BL2002-277; / Lingren Funnels (Beetle trap),
Carpelimus sp. D	adv?	NSR? 2011		KA2007-170; /MV Bulb.
Coproporus sp. A [="*Tachinus* sp. (Williams, 1931)" in Nishida 2002].	adv	NIR 2002	Scarce	BL2002-163, KA2007-169, KA2007-170; /MV & Blacklight, MV Bulb.
Coproporus sp. B	adv	NTL 2007		KA2007-171; /Malaise Trap.
Hesperus sp. A	adv	NSR 2006	Scarce	BL2002-239; /Malaise Trap.
Lithocharis sp. A	adv	NIR 2002	Uncommon	BL2002-163A; /MV & Blacklight.
Oxytelinae genus sp. A	adv?	NSR? 2007	Scarce	KA2007-64; /Window Trap.
Philonthus discoideus (Gravenhorst 1802)	adv	2002	Scarce	BL2002-163A, KA2007-64, KA2007-169, KA2007-170;/ MV & Blacklight,MV Bulb,Window Trap.
Philonthus longicornis Stephens 1832	adv	2002	Scarce	BL2002-233; /Malaise Trap.
Philonthus rectangulus Sharp 1874	adv	NIR 2007	Scarce	KA2007-64; /Window Trap.
Philonthus sp. A	adv	NSR? 2007	Scarce	KA2007-169, KA2007-170; /MV Bulb.
Philonthus turbidus Erichson 1840	adv	2002	Common	BL2002-53, BL2002-73H, BL2002-73J, BL2002-163, BL2002-163A, BL2002-165, BL2002-239; /Malaise Trap, MV & Blacklight, MV Bulb.
Philothalpus analis (Erichson 1840)	pur	2002	Scarce	BL2002-262, KA2007-170; /Malaise Trap, MV Bulb.
Pselaphinae genus sp. A	adv	NSR 2011		BL2002-293; /Malaise Trap.
Rugilus sp. A	adv	NSR 2006	Scarce	BL2002-83, BL2002-163A, BL2002-165; /MV & Blacklight, MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: COLEOPTERA (continued)				
Staphylinidae (continued)				
Scopaeus sp. A	adv	NIR 2002	Scarce	BL2002-150, KM2003-74; /Gas Aspirator, Sweep Net.
Sunius sp. A	adv	NSR? 2007	Scarce	BL2002-163, KA2007-64; /MV & Blacklight, Window Trap.
Xantholinini genus sp. A	adv	NSR? 2007	Scarce	KA2007-170; /MV Bulb.
Tenebrionidae				
Alphitobius diaperinus (Panzer 1796)	adv	2002	Scarce	BL2002-163; /MV & Blacklight.
Alphitobius laevigatus (Fabricius 1781)	adv	NIR 2002	Scarce	BL2002-3, BL2002-10, BL2002-42A, KM2003-78; /Gas Aspirator, General, Pitfall Trap, Sweep Net.
Ammophorus insularis (Boheman 1858)	adv	2002	Common	BL2002-83, BL2002-84, BL2002-285; /MV Bulb, Sifting Litter.
Blapstinus dilatatus Le Conte 1851	adv	NIR 2002	Common	BL2002-286, BL2002-287; /General, Sifting Litter.
Blapstinus histricus Casey 1890	adv	NIR 2002	Scarce	BL2002-10, KM2003-39; /MV Bulb, Pitfall Trap.
Gnatocerus maxillosus (Fabricius 1801)	adv	NIR 2002	Scarce	BL2002-163A; /MV & Blacklight.
Gonocephalum adpressiforme Kaszab 1951	adv	2002	Scarce	BL2002-10; /Pitfall Trap.
Lepidocnemeplatia sericea (Horn 1870)	adv	NSR 2002	Unique	BL2002-165; /MV Bulb.
Lobometopon diremptus (Karsch 1881)	adv	2002	Common	BL2002-50, BL2002-76, BL2002-81, BL2002-82, BL2002-83, BL2002-166, BL2002-240, BL2002-267, BL2002-288A, KA2007-67, KA2007-95, KA2007-169, KA2007-170; /Gas Aspirator, General, Host Search, Malaise Trap, MV Bulb, Sifting Litter, Sweep Net, Window Trap
Lyphia sp. A [near *Lyphia angusta* (Lucas, 1846)]	adv	NIR/NSR 2002	Scarce	BL2002-165, BL2002-178; /Malaise Trap, MV Bulb.
Throscidae				
Trixagus extraneus Fisher 1942	adv	NIR 2002	Scarce	BL2002-163A; /MV & Blacklight.
Zopheridae				
Colobicus parilis Pascoe 1861	adv	NIR 2002	Scarce	BL2002-163A, BL2002-165; /MV & Blacklight, MV Bulb.
INSECTA: COLLEMBOLA (Springtails)				
Entomobryidae				
Entomobrya sp. A	adv?	NTL 2006	Local	Specimens not yet recorded.
Entomobryidae genus sp. A	unk	NTL 2007	Local	KA2007-121; /Tulgren Funnel (Berlese).
Entomobryoides sp. A	end	NTL 2006	Local	Specimens not yet recorded.
Lepidocyrtus immaculatus Folsum 1932	adv	NTL 2006	Common	Specimens not yet recorded.
Hypogastruridae				
Hypogastruridae genus sp. A	end?	NIR? 2002		Specimens not yet recorded.
Unplaced Family				
Collembola genus sp. A	unk	NTL, 2011		KA2007-149; /Sticky Trap.
INSECTA: DERMAPTERA (Earwigs)				
Carcinophoridae				
Euborellia annulipes (Lucas 1847)	adv	2002	Common	BL2002-83, BL2002-172, KA2007-43, KA2007-121; / General, MV Bulb, Tulgren Funnel (Berlese).

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DERMAPTERA (continued)				
Chelisochidae				
Chelisoches morio (Fabricius 1775)	adv	2002	Local	BL2002-180, BL2002-302, BL2002-358; /General, Host Search.
Labiduridae				
Labidura riparia (Pallas 1773)	adv	2002	Local	BL2002-35, BL2002-53, BL2002-76A, BL2002-79, BL2002-81, BL2002-163A; /MV & Blacklight, MV Bulb.
INSECTA: DIPTERA				
Agromyzidae				
Liriomyza sp. A	adv	2002		BL2002-42B; /Gas Aspirator.
Melanagromyza splendida Frick 1953	adv	2002	Local	BL2002-73I, BL2002-77C, KM2003-2, KM2003-37, KM2003-84, KA2007-171; /Gas Aspirator, Malaise Trap, MV Bulb.
Ophiomyia sp. A	adv	NTL,2011	Scarce	BL2002-5A; /Gas Aspirator,
Pseudonapomyza spicata (Malloch 1914)	adv	2002		BL2002-55A, BL2002-77C; /Gas Aspirator, Malaise Trap.
Anthomyidae				
Anthomyia vicarians Schiner 1868	adv	NTL 2006	Common	BL2002-73I, KM2003-42; /Malaise Trap, MV Bulb.
Anthomyzidae				
Amygdalops thomasseti Lamb 1914	adv	NTL 2011		KA2007-57; /MV Bulb.
Mumetopia nigrimana (Coquillett 1900)	adv	NTL 2011		BL2002-29, KA2007-42, KA2007-57, KA2007-125; / Gas Aspirator, MV Bulb.
Asilidae				
Leptopteromyia mexicanae Martin 1971	adv	NSR 2011		KA2007-157; /Malaise Trap.
Asteiidae				
Loewimyia orbiculata Hardy 1980	end	NIR 2002	Local	BL2002-42B, KA2007-171; /Gas Aspirator, Malaise Trap.
Bombyliidae				
Anthrax koshunensis Matsumura 1916	adv	2002	Local	BL2002-3, BL2002-73E, BL2002-73F, BL2002-337; / General, Malaise Trap, Sweep Net.
Calliphoridae				
Chrysomya megacephala (Fabricius 1774)	adv	2002	Scarce	BL2002-9, BL2002-76A, BL2002-78, BL2002-164, BL2002-165, BL2002-166, BL2002-243, BL2002-289, KM2003-36, KM2003-39, KM2003-40, KM2003-42, KA2007-170, KA2007-289; /Gas Aspirator, General, MV Bulb, Sweep Net.
Lucilia cuprina (Wiedemann 1830)	adv	NTL 2011		BL2002-29, KM2003-39; /Gas Aspirator, MV Bulb.
Rhinia apicalis (Wiedemann 1830)	adv	NTL 2011		BL2002-169, KA2007-169; /MV & Blacklight, MV Bulb.
Canacidae				
Canaceoides sp. A	end/ind	NTL 2006	Scarce	BL2002-3, BL2002-81, BL2002-82, KA2007-65; /Malaise Trap, MV Bulb, Sweep Net.
Dasyrhicnoessa fulva (Hendel 1913)	ind?	NTL 2011	Common	BL2002-55C, BL2002-81, BL2002-83, BL2002-163A, KM2003-2; /Gas Aspirator, MV & Blacklight, MV Bulb.
Dasyrhicnoessa vockerothi Hardy & Delfinado 1980	ind?	NIR 2011		BL2002-243; /General.
Pelomyia steyskali Hardy & Delfinado 1980	adv	NIR 2006		BL2002-243; /General.
Tethina willistoni (Melander 1913)	adv	NIR 2006		BL2002-3; /Sweep Net.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Cecidomyiidae				
Anarete johnsoni Felt 1906 Listed as genus sp B	adv	NTL 2011		BL2002-81, KA2007-169; KA2007-171/MV Bulb, Malaise trap.
Cecidomyiidae genus sp. A	unk	2002	Common	KA2007-171; /Malaise Trap.
Contarinia cf. *maculipennis* Felt 1933 Listed as genus sp. C	adv	NTL 2011		KM2003-35A, KA2007-169; KA2007-171/Malaise Trap, MV Bulb.
Lestremia leucophaea (Meigen 1818)	adv	NIR 2007	Local	KA2007-171; /Malaise Trap.
Lestremia sp. A	unk	NTL 2007	Local	KA2007-171; /Malaise Trap.
Ceratopogonidae				
Atrichopogon jacobsoni (Meijere 1907)	adv	2002	Common	BL2002-81, BL2002-163, BL2002-165, KM2003-37, KA2007-169, KA2007-170, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb.
Atrichopogon levis (Coquillett 1901) [Listed as *A* sp A in 2007]	adv	NSR 2011	Scarce	KA2007-42; /Gas Aspirator.
Culicoides cf. *jamaicensis* Edwards 1922 [Listed as sp nr. *C. jamaicensis* in 2007.]	adv	NSR 2007	Scarce	BL2002-73F; /Malaise Trap.
Dasyhelea excellentis Borkent 1996 [Considered endemic but now known from China]	adv	NIR, 2007		KA2007-171; /Malaise Trap.
Dasyhelea sp. C	end?	NSR 2007	Local	KA2007-57; /MV Bulb.
Dasyhelea sp. D	end?	NSR 2007	Uncommon	KA2007-171; /Malaise Trap.
Forcipomyia biannulata Ingram & Macfie 1924	adv	NSR 2007	Common	KA2007-157, KA2007-169, KA2007-170, KA2007-171; / Malaise Trap, MV Bulb.
Forcipomyia borbonica Clastrier 1959	adv	NIR 2011		BL2002-208A; /Beetle trap/Lingren .
Forcipomyia brevis (Johannsen 1927)	end	NIR 2006	Common	BL2002-81, KM2003-35A, KM2003-37, KM2003-41, KM2003-65, KA2007-171; /Malaise Trap, MV Bulb, Sweep Net.
Forcipomyia chrysolopha (Kieffer 1911)	adv	NSR 2007	Common	KA2007-169, KA2007-171, BL2002-184; /Malaise Trap, MV Bulb.
Forcipomyia hardyi Wirth & Howarth 1982	end	2002	Common	BL2002-73L, BL2002-81, KA2007-169, KA2007-171; / Malaise Trap, MV Bulb.
Forcipomyia cf. *quasiiingrami* Macfie 1939 .[or nr. *Forcipomyia quasiingrami* Macfie, 1939].	adv	NSR 2007	Common	KA2007-42, KA2007-65, KA2007-169, KA2007-171, KA2007-265; /Gas Aspirator, Malaise Trap, MV Bulb, Sticky Trap
Chironomidae				
Ablabesmyia sp. A Listed as geus sp A	adv	NSR 2011	Common	BL2002-168, KM2003-37, KM2003-39; /MV Bulb.
Chironomus hawaiiensis Grimshaw 1901	end?	2002	Common	BL2002-55C, BL2002-83, BL2002-131, BL2002-163, KM2003-37, KA2007-18, KA2007-170, KA2007-171; /Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb.
Chironomus sp. A [nr *Chironomus hawaiiensis* Grimshaw, 1901]	adv	NSR 2007	Local	BL2002-55C, BL2002-129, BL2002-131, BL2002-165, BL2002-168, KA2007-171; /Gas Aspirator, Malaise Trap,. MV Bulb.
Clunio vagans Stone & Wirth 1947	end	NIR 2002	Local	BL2002-54; /Gas Aspirator. [marine midge]
Corynoneura sp. A [matches Hardy's 1960 description]	adv	NIR 2011		KA2007-149; /Sticky Trap.
Cricotopus bicinctus (Meigen 1818)	adv	NIR 2006	Uncommon	BL2002-81, BL2002-83, BL2002-168, KA2007-170; /MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Chironomidae (continued)				
Orthocladius sp. A [Listed as *O. williamsi* in 2007]	end	NSR? 2011	Local	BL2002-78, BL2002-244, KA2007-169, KA2007-171; / Malaise Trap, MV Bulb.
Orthocladius sp. B	end	NSR? 2011		KA2007-42; /Gas Aspirator.
Polypedilum nubiferum (Skuse 1889)	adv	2002	Local	BL2002-55C, BL2002-81, BL2002-82, BL2002-83, BL2002-131, KM2003-36, KM2003-37, KA2007-103, KA2007-168, KA2007-170; /Gas Aspirator, General, MV Bulb.
Thalassomya setosipennis Wirth 1947	end	NTL 2007		BL2002-81, KA2007-40, KA2007-171; /Fogging, Malaise Trap, MV Bulb.
Chloropidae				
Cadrema pallida (Loew 1865)	adv	NTL 2006	Uncommon	BL2002-73K, BL2002-81, KM2003-38, KM2003-72, KA2007-149, KA2007-171, KA2007-265; /Fogging, Malaise Trap, MV Bulb, Sticky Trap.
Meromyza communis Fedoseeva 1971 [Listed as *M.* sp A in 2007]	adv	NTL 2011		BL2002-35, BL2002-81, KA2007-57, KA2007-101; / Gas Aspirator, MV Bulb.
Monochaetoscinella anonyma (Williston 1896)	adv	2002	Uncommon	BL2002-14A, BL2002-45, KA2007-42, KA2007-125; BL2002-29; /Gas Aspirator.
Rhodesiella sauteri (Duda 1930)	adv	2002		BL2002-73H, BL2002-77C; /Malaise Trap.
Rhodesiella scutellata (Meijere 1908)	adv	NTL 2007		KA2007-171; /Malaise Trap.
Semaranga dorsocentralis Becker 1911	adv	NIR 2006		BL2002-29A, KM2003-12; /Gas Aspirator.
Chyromyidae				
Aphaniosoma sp. A	end?	NSR? 2007	common	BL2002-26, BL2002-55A, BL2002-55C, BL2002-81, BL2002-167, KA2007-171, KA2007-192; /Gas Aspirator, Malaise Trap, MV Bulb.
Gymnochyromyia hawaiiensis Hardy 1980	end	NTL 2006		BL2002-73K, BL2002-79, BL2002-82, KM2003-82; /Gas Aspirator, Malaise Trap, MV Bulb.
Nannodastia horni Hendel 1930	adv	NIR 2007		BL2002-81, KA2007-171; /Malaise Trap, MV Bulb.
Cryptochetidae				
Cryptochetum iceryae (Williston 1888) cottony cushion scale fly	adv	NIR 2002	Local	BL2002-73F, KM2003-35A, KA2007-171; /Malaise Trap.
Culicidae				
Aedes albopictus (Skuse 1984) Asian tiger mosquito	adv	2002	Local	KM2003-36, KA2007-170; /MV Bulb.
Culex quinquefasciatus Say 1823	adv	2002	Common	BL2002-43, BL2002-73H, BL2002-80, BL2002-163, BL2002-165, KM2003-36, KM2003-37, KM2003-40, KA2007-168, KA2007-170, KA2007-171; /Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb.
Dolichopodidae				
Achradocera arcuata (van Duzee 1924)	adv	NIR 2006		BL2002-42B, BL2002-73K; /Gas Aspirator, Malaise Trap.
Amblypsilopus pallidicornis (Grimshaw 1910)	adv	NIR 2006	Scarce	BL2002-73B, BL2002-77A, KA2007-171, KA2007-265; / Malaise Trap, Sticky Trap.
Asyndetus carcinophilus Parent 1937	end	2002	Common	BL2002-3, BL2002-70, BL2002-73J, BL2002-76, BL2002-79, BL2002-81, KM2003-41, KM2003-42, KA2007-60; /Malaise Trap, MV Bulb, Sweep Net, Yellow Pan Trap.
Chrysosoma globiferum (Wiedemann 1830)	adv	NIR 2002	Common	BL2002-70, BL2002-73H, BL2002-73J, BL2002-333, KA2007-65, KA2007-171; /Malaise Trap, Yellow Pan Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Dolichopodidae (continued)				
Chrysotus longipalpus Aldrich 1896	adv	NTL 2007		KA2007-171; /Malaise Trap.
Condylostylus longicornis (Fabricius 1775)	adv	NIR 2007	Uncommon	BL2002-70, KA2007-65, KA2007-171, KA2007-265; / Malaise Trap, Sticky Trap, Yellow Pan Trap.
Dolichopus exsul Aldrich 1922	adv	2002	Common	BL2002-45A, BL2002-73E, BL2002-78, KM2003-35A; /Gas Aspirator, Malaise Trap, MV Bulb.
Thambemyia acrosticalis (Parent 1938)	end	2002	Common	BL2002-3, BL2002-243; /General, Sweep Net.
Drosophilidae				
Cacoxenus perspicax (Knab 1914)	adv	2002	Common	BL2002-42B, BL2002-72B, BL2002-73K, BL2002-239, BL2002-334, KM2003-35A, KA2007-149, KA2007-171; / Ant Baits, Gas Aspirator, Malaise Trap, Sticky Trap.
Chymomyza procnemis (Williston 1896)	adv	2002	Common	BL2002-73I, BL2002-73J, BL2002-73K, BL2002-81, BL2002227, KA2007-159, KA2007-171; /Gas Aspirator, Malaise Trap, MV Bulb, Window Trap.
Drosophila simulans Sturtevant 1919	adv	NTL 2007	Scarce	BL2002-73K, BL2002-83, KA2007-159, KA2007-171; / Malaise Trap, MV Bulb, Window Trap.
Drosophila suzukii (Matsumura 1931)	adv	NIR 2007	Scarce	BL2002-81, KA2007-67, KA2007-159, KA2007-171; / Malaise Trap, MV Bulb, Window Trap.
Empididae				
Chersodromia hawaiiensis Melander 1938	end	2002	Local	KM2003-16, KM2003-41, KA2007-168; /Gas Aspirator, MV Bulb.
Crossopalpus insularis (Melander 1952)	adv?	NIR 2006	Local	BL2002-76A; /MV Bulb.
Ephydridae				
Atissa oahuensis Cresson 1948	end	NIR 2002	Local	BL2002-260, KM2003-2; /Gas Aspirator.
Brachydeutera hebes Cresson 1926	adv	NTL 2007	Local	KA2007-159, KA2007-171; /Malaise Trap, Window Trap.
Brachydeutera sp. A	adv	NSR? 2007	Scarce	BL2002-73A, BL2002-78, BL2002-168, BL2002-169, BL2002-260, BL2002-261, KA2007-170; /Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb.
Ceropsilopa coquilletti Cresson 1922	adv	2002	Common	BL2002-27A, BL2002-78, BL2002-81, BL2002-82, BL2002-83, BL2002-163A, BL2002-215A, BL2002-246, KA2007-42; /Gas Aspirator, MV & Blacklight, MV Bulb, Sweep Net.
Clasiopella uncinata Hendel 1914	adv	NIR 2002	Scarce	KA2007-42; /Gas Aspirator.
Discomyza maculipennis (Weidemann 1824)	adv	NIR 2011		BL2002-70, KA2007-149; /Sticky Trap, Yellow Pan Trap.
Donaceus nigronotatus Cresson 1943	adv	2002	Common	BL2002-14, KA2007-171; /Gas Aspirator, Malaise Trap.
Ephydra gracilis Packard 1871	adv	NIR 2011		BL2002-53; /MV Bulb.
Ephydridae genus sp. A	adv	NTL 2007	Uncommon	KA2007-168, KA2007-170, KA2007-171; /Malaise Trap, MV Bulb.
Hecamede granifera (Thomson 1869)	adv	2002	Local	BL2002-3, BL2002-243, BL2002-260; /Gas Aspirator, General, Sweep Net.
Psilopa girschneri Von Roeder 1889	adv	2002		BL2002-42B, BL2002-81, BL2002-129; /Gas Aspirator, MV Bulb.
Scatella sexnotata (Cresson 1926)	ind	2002	Common	BL2002-14A, BL2002-35, BL2002-55A, BL2002-79, BL2002-82, BL2002-83, BL2002-261, KA2007-171; / Gas Aspirator, Malaise Trap, MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Ephydridae (continued)				
Scatella stagnalis (Fallen 1813)	adv	NIR 2002	Common	BL2002-28A, BL2002-42B, BL2002-48A, BL2002-129, BL2002-131, BL2002-260, KM2003-36, KM2003-37, KA2007-171; /Gas Aspirator, Malaise Trap, MV Bulb.
Heleomyzidae				
Spilochroa ornata (Johnson 1895)	adv	NIR 2002	Common	BL2002-73A, BL2002-73I, BL2002-166, KM2003-36, KM2003-37, KA2007-159, KA2007-170, KA2007-171; / Malaise Trap, MV Bulb, Window Trap.
Keroplatidae				
Tylparua hawaiiensis (Grimshaw 1901)	end	NTL 2007		KA2007-171; /Malaise Trap.
Lauxaniidae				
Poecilominettia sexseriata Hendel 1932	adv	2002	Common	BL2002-73H, KA2007-65, KA2007-67; / Malaise Trap, Window Trap.
Limoniidae				
Dicranomyia hawaiiensis Grimshaw 1901	end	2002	Scarce	BL2002-73B, KA2007-171, BL2002-183; /Malaise Trap.
Dicranomyia sp. A	adv	NSR 2002	Common	BL2002-21, BL2002-35, BL2002-78, BL2002-79, BL2002-82, KM2003-74; /Gas Aspirator, MV Bulb, Sweep Net.
Dicranomyia variabilis Grimshaw 1901	end	NTL 2006	Local	BL2002-42B, BL2002-53, BL2002-73L, BL2002-81, BL2002-82, BL2002-165, KM2003-74, KA2007-42; /Gas Aspirator, Malaise Trap, MV Bulb, Sweep Net.
Geranomyia advena (Alexander 1954)	end	NTL 2006	Scarce	BL2002-61, KM2003-84; /Gas Aspirator, Malaise Trap.
Libnotes perkinsi (Grimshaw 1901)	adv	NTL 2011		BL2002-29; /Gas Aspirator.
Styringomyia didyma Grimshaw 1901	adv	2002	Common	BL2002-53, BL2002-78, BL2002-79, BL2002-332, KM2003-36,KM2003-37, KA2007-169, KA2007-170, KA2007-171, BL2002-178, KA2007-265; /Malaise Trap, MV Bulb, Sticky Trap.
Trentepohlia australasiae Skuse 1890	adv	NIR 2006	Scarce	BL2002-356; /General.
Lonchaeidae				
Lamprolonchaea metatarsata (Kertesz	adv	2002	Scarce	BL2002-332, KA2007-149, KA2007-171; / Malaise Trap, Sticky Trap.
Lonchaea polita Say 1830 (Listed as *Lonchaea* sp A.)	adv	NTL 2011		KM2003-36, KA2007-18, KA2007-149, KA2007-171; / Malaise Trap, MV Bulb, Sticky Trap.
Lonchopteridae				
Lonchoptera furcata (Fallen 1823)	adv	2002	Scarce	BL2002-163A, KA2007-42; /Gas Aspirator, MV &Blacklight.
Micropezidae				
Taeniaptera angulata (Loew 1866)	adv	NIR 2002	Scarce	BL2002-357, KA2007-171; /Malaise Trap.
Milichiidae				
Desmometopa cf. *inaurata* Lamb 1914	adv	NTL 2007		BL2002-55C; /Gas Aspirator.
Desmometopa tarsalis Loew 1865	adv	NTL 2007		KA2007-149, KA2007-171; /Malaise Trap, Sticky Trap.
Milichia orientalis Malloch 1913	adv	NIR 2011	Scarce	KA2007-149; /Sticky Trap.
Milichiella lacteipennis (Loew 1865)	adv	NIR 2006	Scarce	BL2002-308, KA2007-159, KA2007-171; /Gas Aspirator, Malaise Trap, Window Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Muscidae				
Atherigona orientalis Schiner 1868	adv	2002	Common	BL2002-73E, BL2002-73H, BL2002-73I, BL2002-73L, BL2002-76, BL2002-78, BL2002-332, KA2007-149, KA2007-171, KA2007-289; BL2002-169; / General, Malaise Trap, MV Bulb, Sticky Trap.
Atherigona reversura Villeneuve 1936	adv	2002	Common	BL2002-42C, BL2002-73E, BL2002-73H, BL2002-73I, BL2002-73L, BL2002-78, BL2002-163, BL2002-165, KM2003-37, KA2007-171; /Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb.
Coenosiinae genus sp. A	adv	NSR 2002	Uncommon	BL2002-14A, BL2002-42B, BL2002-42C, BL2002-45, BL2002-72A, BL2002-73E, BL2002-73H, BL2002-73I, BL2002-73L, BL2002-82, BL2002-83, BL2002-131, BL2002-251, BL2002-265, BL2002-332, KM2003-2, BL2002-183; /Gas Aspirator, Malaise Trap, MV Bulb, Sweep Net.
Haematobia irritans (Linnaeus 1758) Horn fly	adv	NTL 2006		BL2002-73K, KA2007-171; /Malaise Trap.
Hydrotaea chalcogaster (Wiedemann 1824)	adv	NTL 2011		BL2002-169; /MV & Blacklight.
Lispe pectinipes Becker 1903	adv	NIR 2006		BL2002-183; /Malaise Trap.
Lispe sp. A	end?	NTL 2006		KM2003-37, KA2007-171, BL2002-183; /Malaise Trap, MV Bulb.
Musca domestica Linnaeus 1758 House fly	adv	NTL 2011		KM2003-37; /MV Bulb.
Stomoxys calcitrans (Linnaeus 1758) Stable fly	adv	2002	Common	BL2002-73E, BL2002-73H, BL2002-73J, BL2002-73K, BL2002-167, BL2002-169, BL2002-233, BL2002-332, BL2002-178; /Malaise Trap, MV & Blacklight, MV Bulb.
Synthesiomyia nudiseta (Van der Wulp 1883)	adv	2002	Scarce	BL2002-332; /Malaise Trap.
Mycetophilidae				
Leia sp. A	adv	NIR 2002	Scarce	BL2002-73J; /Malaise Trap.
Sciophila sp. A	adv	NSR 2006	Scarce	BL2002-73F, KA2007-171, BL2002-184; /Malaise Trap.
Periscelididae				
Stenomicra cf. *fascipennis* Malloch 1927	adv	NIR? 2011		KA2007-42; /Gas Aspirator.
Phoridae				
Chonocephalus sp. A	end?	2002	Common	BL2002-73F, KA2007-159, KA2007-171; / Malaise Trap, Window Trap.
Dohrniphora cornuta (Bigot 1857)	adv	NIR 2007		BL2002-35, KA2007-65, KA2007-67, KA2007-159, KA2007-171; /Malaise Trap, MV Bulb, Window Trap.
Megaselia cf. *brunnelpalpata* Beyer 1964	end?	NIR? 2011		BL2002-73I, KM2003-35A, KA2007-159, KA2007-172; / Lingren Funnels (Beetle trap), Malaise Trap, Window Trap.
Megaselia curtineura (Brues 1912)	adv	NTL 2011		KA2007-159; /Window Trap.
Megaselia scalaris (Loew 1866) coffin fly	adv	2002	Common	BL2002-73F, KA2007-104, KA2007-149, KA2007-159, KA2007-171; /General, Malaise Trap, Sticky Trap, Window Trap.
Megaselia setaria (Malloch 1912)	adv	NTL 2006		BL2002-10, BL2002-46, BL2002-69C, BL2002-73I, KA2007-159; /Gas Aspirator, Malaise Trap, Pitfall Trap, Window Trap, Yellow Pan Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Phoridae (Continued)				
Metopina ventralis Schmitz 1927	adv	NIR 2007		KA2007-159, KA2007-171; /Malaise Trap, Window Trap.
Puliciphora lucifera Dahl 1897	adv	NIR 2006	Scarce	BL2002-46; /Gas Aspirator.
Pipunculidae				
Pipunculidae genus sp. A	end?	NTL 2011		BL2002-73C; /Malaise Trap.
Psychodidae				
Clogmia albipunctata (Williston 1893)	adv	NTL 2006	Common	BL2002-73F, BL2002-82, KM2003-38, KM2003-74, KA2007-103, KA2007-149, KA2007-170, KA2007-171; /General, Malaise Trap, MV Bulb, Sticky Trap, Sweep Net.
Psychoda alternata Say 1824	adv	NTL 2006		BL2002-78, BL2002-81, KM2003-74, KA2007-171; /Malaise Trap, MV Bulb, Sweep Net.
Psychoda pseudalternata Williams 1946	adv	NIR 2007	Local	KA2007-171; /Malaise Trap.
Psychoda savaiiensis Edwards 1928	adv	NIR 2007		KA2007-171; /Malaise Trap.
Trichopsychoda insulicola (Quate 1954)	adv	NIR 2006	Local	KM2003-36, KM2003-38, KM2003-39, KA2007-171; / Malaise Trap, MV Bulb.
Sarcophagidae				
Helicobia morionella (Aldrich 1930)	adv	2002	Common	BL2002-42B, BL2002-70, BL2002-73E, BL2002-73K, BL2002-131, BL2002-169, BL2002-233, BL2002-325, BL2002-332, BL2002-334, KM2003-35A, KM2003-37, KA2007-42, KA2007-169, KA2007-171; /Gas Aspirator, General, Malaise Trap, MV & Blacklight, MV Bulb, Yellow Pan Trap.
Sarcophaga africa (Wiedemann 1824)	adv	NIR 2002	Local	BL2002-165, BL2002-221, KM2003-40, KA2007-169; / Malaise Trap, MV Bulb.
Sarcophaga albiceps Meigen 1826	adv	NTL 2011		BL2002-70; /Yellow Pan Trap.
Sarcophaga dux Thomson 1869	adv	2002	Common	BL2002-70, BL2002-332, KA2007-171; /Malaise Trap, Yellow Pan Trap.
Sarcophaga princeps Wiedemann 1830	adv	NIR 2011		BL2002-70; /Yellow Pan Trap.
Sarcophaga ruficornis (Fabricius 1794)	adv	NIR 2011		KA2007-18; /MV Bulb.
Tricharaea occidua (Fabricius 1794)	adv	NTL 2011		BL2002-73J, KA2007-42, KA2007-168, KA2007-171; / Gas Aspirator, Malaise Trap, MV Bulb.
Scatopsidae				
Colbodia fuscipes (Meigen 1830)	adv	2002	Scarce	KM2003-35A; /Malaise Trap.
Holoplagia guamensis (Johannsen 1946)	adv	NIR 2011		BL2002-73A; /Malaise Trap.
Psectrosciara brevicornis Johannsen 1946	adv	NTL 2011		KM2003-12; /Gas Aspirator.
Rhegmoclemina parvula Hardy 1956	adv	NTL 2007	Local	KA2007-171; /Malaise Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Scenopinidae				
Scenopinus adventicius Hardy 1960	adv	2002	Common	BL2002-3, BL2002-5A, BL2002-73E, BL2002-73H, BL2002-76, BL2002-78, BL2002-235, BL2002-243, BL2002-261, BL2002-332, KM2003-37, KM2003-78, KA2007-61, KA2007-67, KA2007-147, KA2007-159, KA2007-171, KA2007-172; / Lingren Funnels (Beetle trap), Gas Aspirator, General, Malaise Trap, MV Bulb, Sticky Trap, Sweep Net, Window Trap.
Scenopinus lucidus Becker 1902	adv	NIR 2011		BL2002-251; /Sweep Net.
Sciaridae				
Bradysia molokaiensis (Grimshaw 1901)	end	NTL 2007		KA2007-171; /Malaise Trap.
Bradysia sp. A [poss B. impatiens]	adv?	NTL 2011		KA2007-169; /MV Bulb.
Bradysia spatitergum (Hardy 1960)	adv	NTL 2007	Local	KA2007-169; /MV Bulb.
Bradysia tritici (Coquillet 1895)	adv	2002	Common	KA2007-169, KA2007-171; /Malaise Trap, MV Bulb.
Corynoptera latistylata (Hardy 1956)	adv	NIR? 2007		KA2007-171; /Malaise Trap.
Hyperplasion sp. A	adv	NSR 2007		KA2007-171; /Malaise Trap.
Plastosciara sp. A	end?	NTL 2006		BL2002-73I; /Malaise Trap.
Sepsidae				
Sepsis biflexuosa Strobl 1893	adv	2002	Common	BL2002-163; /MV & Blacklight.
Sepsis thoracica (Robineau-Desvoidy 1830)	adv	2002	Common	BL2002-42B, BL2002-55B, BL2002-78; /Gas Aspirator, MV Bulb, Sweep Net.
Sphaeroceridae				
Leptocera abdominiseta (Duda 1925)	adv	NTL 2006	Common	BL2002-12, BL2002-13, BL2002-14, KA2007-171, BL2002-178; /Gas Aspirator, Malaise Trap.
Leptocera fuscipennis (Haliday 1833)	adv	2002		BL2002-83; /MV Bulb.
Leptocera sp. A	adv	NTL 2007		KA2007-171; /Malaise Trap.
Poecilosomella punctipennis (Wiedemann, 1824)	adv	2002	Common	BL2002-178; /Malaise Trap.
Thoracochaeta brachystoma (Stenhammar, 1855)	adv	2002	Local	BL2002-83, BL2002-243, KA2007-171, BL2002-183; / General, Malaise Trap, MV Bulb.
Stratiomyidae				
Hermetia illucens (Linnaeus 1758)	adv	2002	Uncommon	BL2002-3, BL2002-199; /Fogging, Sweep Net.
Syrphidae				
Allograpta exotica (Wiedemann 1830)	adv	NTL 2006	Common	BL2002-73J, BL2002-73L, BL2002-184; /Malaise Trap.
Allograpta obliqua (Say 1823)	adv	2002	Common	BL2002-73J, BL2002-129, BL2002-233, KA2007-169, KA2007-171, BL2002-184; /Gas Aspirator, Malaise Trap, MV Bulb.
Copestylum tamaulipanum (Townsend 1898)	adv	NTL 2007		KA2007-171; /Malaise Trap.
Eristalinus aeneus (Scopoli 1763)	adv	2002	Common	BL2002-289, KM2003-37, KM2003-40, KM2003-41, KM2003-42, KA2007-18, KA2007-60, KA2007-168, KA2007-170; /MV Bulb, Sweep Net.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Syrphidae (continued)				
Eristalinus arvorum (Fabricius 1787)	adv	2002	Common	BL2002-73E, BL2002-73K, BL2002-76, BL2002-77C, BL2002-78, BL2002-81, BL2002-164, BL2002-233, KM2003-39, KM2003-40, KA2007-60, KA2007-169, BL2002-178; /Malaise Trap, MV Bulb.
Eumerus aurifrons (Wiedemann 1824)	adv	NIR 2002	Common	BL2002-69C, BL2002-73L; /Malaise Trap, Yellow Pan Trap.
Ornidia obesa (Fabricus 1775)	adv	2002	Common	BL2002-169, BL2002-317, BL2002-339, BL2002-178; / General, Malaise Trap, MV & Blacklight.
Simosyrphus grandicornis (Macquart 1942)	adv	2002	Common	BL2002-73E, BL2002-73J, BL2002-73K, BL2002-73L, BL2002-233, BL2002-239, BL2002-289, KM2003-36, KA2007-171, BL2002-184; /Malaise Trap, MV Bulb, Sweep Net.
Syritta orientalis Macquart 1842	adv	2002	Common	BL2002-9, BL2002-42B, BL2002-45, BL2002-73H, BL2002-76, BL2002-78, BL2002-134A, BL2002-166, BL2002-169, BL2002-233, BL2002-255, BL2002-265, BL2002-325, BL2002-184; /Gas Aspirator, General, Malaise Trap, MV & Blacklight, MV Bulb.
Toxomerus marginatus (Say 1823)	adv	2002	Common	BL2002-73J, BL2002-73L, BL2002-131, BL2002-251, BL2002-334; /Gas Aspirator, Malaise Trap, Sweep Net.
Tachinidae				
Actia eucosmae Bezzi 1926	adv	NIR 2002	Common	BL2002-45, BL2002-72A, BL2002-73E, BL2002-73H, BL2002-73L, BL2002-76, BL2002-233, BL2002-332, BL2002-333; /Gas Aspirator, Malaise Trap.
Archytas cyrphis Curran 1927	pur	2002	Common	BL2002-73F, BL2002-73H, BL2002-73K, BL2002-78, BL2002-233, BL2002-239, BL2002-310, KA2007-65; / Malaise Trap, MV Bulb, Sweep Net.
Chaetogaedia monticola (Bigot 1887)	pur	2002	Common	BL2002-73H, BL2002-73J, BL2002-233, BL2002-289, BL2002-307, BL2002-333, KA2007-169; /Malaise Trap, MV Bulb, Sweep Net.
Eucelatoria armigera (Coquillett 1889)	adv	2002	Common	BL2002-61, BL2002-73J, BL2002-73K, BL2002-76A, BL2002-78, BL2002-82, BL2002-83, BL2002-163, BL2002-165, BL2002-166, BL2002-167, BL2002-169, BL2002-233, BL2002-331, KM2003-37, KM2003-39, KM2003-42, KA2007-18, KA2007-60, KA2007-148, KA2007-168, KA2007-169, KA2007-170, KA2007-171; /Gas Aspirator, General Host Search, Malaise Trap, MV & Blacklight, MV Bulb.
Euvespivora decipiens (Walker 1859)	adv	NIR 2006		BL2002-307; /Malaise Trap.
Lespesia archippivora (Riley 1871)	pur	2002	Common	BL2002-73J, BL2002-164, BL2002-165, BL2002-167, BL2002-233, BL2002-334, KM2003-36, KM2003-37, KA2007-169, BL2002-184; /Malaise Trap, MV Bulb.
Ormia ochracea (Bigot 1888)	adv	NIR 2002	Scarce	BL2002-82, BL2002-163; /MV & Blacklight, MV Bulb.
Tachinidae genus sp. A [Close to *Euvespivora*?]	adv	NSR 2006		BL2002-73J; /Malaise Trap.
Trichopoda pilipes (Fabricius 1805)	pur	2002	Common	BL2002-73F, BL2002-73H, BL2002-73J, BL2002-78, BL2002-233, KA2007-170; /Malaise Trap, MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: DIPTERA (continued**)**				
Tephritidae				
Acinia picturata (Snow 1894)	pur	2002	Common	BL2002-55C, BL2002-73H, BL2002-73K, BL2002-73L, BL2002-78, BL2002-131, BL2002-163, BL2002-163A, BL2002-165, BL2002-169, BL2002-234, BL2002-246, BL2002-265, BL2002-307, BL2002-333, BL2002-334, KA2007-87, KA2007-171; /Fogging, Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.
Bactrocera cucurbitae (Coquillett 1899) Melon fly	adv	2002	Common	BL2002-334, KA2007-149; /Malaise Trap, Sticky Trap.
Bactrocera dorsalis (Hendel 1912) Oriental fruit fly	adv	2002	Local	BL2002-76, BL2002-336, KA2007-149, KA2007-171, KA2007-293; /Bait Trap, General, Malaise Trap, Sticky Trap.
Ensina sonchi (Linnaeus 1767)	adv	NIR 2006		BL2002-73H; /Malaise Trap.
Tetreuaresta obscuriventris (Loew 1873)	pur	2002	Common	BL2002-73E, BL2002-73H, BL2002-73I, BL2002-73L, BL2002-78, BL2002-265, BL2002-307; /Gas Aspirator, Malaise Trap, MV Bulb.
Tipulidae				
Tipulidae genus sp. A	adv	NSR 2007	Scarce	KA2007-42; /Gas Aspirator.
Ulidiidae				
Acrosticta apicalis (Williston 1896)	adv	2002		BL2002-73E, KA2007-171; /Malaise Trap.
Ceroxys latiusculus (Loew 1873)	adv	NIR 2002		BL2002-55B; /Sweep Net.
Euxesta anonnae (Fasbricius 1794)	adv	2002	Common	BL2002-42B, BL2002-45, BL2002-45A, BL2002-73E, BL2002-73H, BL2002-73K, BL2002-73L, BL2002-78, BL2002-265, KA2007-171, BL2002-178, BL2002-183; /Gas Aspirator, Malaise Trap, MV Bulb.
Notogramma cimiciforme Loew 1867	adv	NTL 2007		BL2002-42B, KA2007-159, KA2007-171; /Gas Aspirator, Malaise Trap, Window Trap.
Physiphora sp. A	adv	NTL 2007		KA2007-171; /Malaise Trap.
INSECTA: EMBIIDINA (Web spinners)				
Oligotomidae				
Oligotoma saundersii (Westwood 1837)	adv	2002	Common	BL2002-83, BL2002-163, BL2002-167, KM2003-36, KA2007-67, KA2007-170; /MV & Blacklight, MV Bulb, Window Trap.
INSECTA: HEMIPTERA: HETEROPTERA (True bugs)				
Alydidae				
Alydus pilosulus Herrich-Schaeffer 1848	adv	2002	Local	BL2002-18; /Gas Aspirator.
Anthocoridae				
Anthocoridae genus sp. A	adv?	NTL-2011		KA2007-149; /Sticky Trap.
Physopleurella mundula (White 1877)	adv	2002	Common	BL2002-62, BL2002-83, BL2002-84, KA2007-170; / Gas Aspirator, MV Bulb.
Corixidae				
Trichocorixa reticulata (Guerin-Meneville 1857)	adv	NTL 2011	Local	BL2002-174; /Sweep Net.
Cydnidae				
Cydnidae genus sp. A	adv	NSR 2002	Scarce	BL2002-53; /MV Bulb.
Geotomus pygmaeus (Dallas 1851)	adv	2002	Common	BL2002-82, BL2002-163, KM2003-37, KA2007-170; / MV & Blacklight, MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HEMIPTERA: HETEROPTERA (continued)				
Cydnidae (continued)				
Microporus shiromai Froeschner 1977	adv	NIR 2002	Local	BL2002-163; /MV & Blacklight.
Rhytidoporus indentatus Uhler 1877	adv	2002	Scarce	BL2002-163; /MV & Blacklight.
Lygaeidae				
Appolonius sp. A	adv	NIR 2002	Common	BL2002-188; /Fogging.
Botocudo marianensis (Usinger 1946)	adv	2002	Common	BL2002-84, BL2002-163; /MV & Blacklight, MV Bulb.
Clerada apicornis Signoret 1862	adv	NIR 2002	Local	BL2002-84, BL2002-344, KM2003-36; /MV Bulb, Sifting litter.
Geocoris punctipes (Say 1832)	adv	NIR 2006	Scarce	BL2002-215A, KM2003-62; /Gas Aspirator, Sweep Net.
Graptostethus manillensis (Stål 1859)	adv	2002	Common	KA2007-18; /MV Bulb.
Nysius coenosulus Stal 1859	end	NTL 2007		BL2002-3, BL2002-73H, BL2002-232, BL2002-234, BL2002-235, BL2002-255, KA2007-31; /Fogging, Gas Aspirator, General, Malaise Trap, Sweep Net.
Nysius sp. A	end	2002	Common	BL2002-62, KA2007-170, KA2007-171; /Gas Aspirator, Malaise Trap, MV Bulb.
Nysius sp. B	adv?	2002	Common	BL2002-14A, BL2002-163A, BL2002-265; /Gas Aspirator, MV & Blacklight.
Nysius terrestris Usinger 1942	end	NTL 2007		BL2002-43, BL2002-150, BL2002-166, BL2002-199, BL2002-227, BL2002-246, BL2002-255, BL2002-278, BL2002-288A; /Fogging, Gas Aspirator, General, Malaise Trap, MV Bulb, Sweep Net.
Pseudopachybrachius vinctus (Say 1832)	adv	2002	Common	BL2002-229, KA2007-103; /General.
Remaudiereana nigriceps (Dallas 1852)	adv	2002	Common	BL2002-57, BL2002-83, BL2002-163, BL2002-163A, BL2002-166, KA2007-42, KA2007-103; /Gas Aspirator, General, MV & Blacklight, MV Bulb.
Tempyra biguttula Stal 1874	adv	NIR 2002	Uncommon	BL2002-167; /MV Bulb.
Mesovelidae				
Mesovelia amoena Uhler 1894	adv	NTL 2007		KA2007-42; /Gas Aspirator. wetland
Mesovelia mulsanti White 1879	adv	2002		KM2003-73; /Dip Net. 1B, In pond
Miridae				
Coridromus variegatus (Montrouzier 1861)	adv	NIR 2002	Local	BL2002-3, BL2002-185, BL2002-235; /Fogging, Gas Aspirator, Sweep Net.
Cyrtorhinus cf. *fulvus* Knight 1935	pur	NTL 2006	Scarce	BL2002-57; /MV Bulb.
Engytatus modestus (Distant 1893)	adv	NTL 2006	Scarce	KM2003-39; /MV Bulb.
Opuna sp. A	end	NSR 2007	Local	KA2007-18; /MV Bulb.
Rhinacloa forticornis Reuter 1876	adv	2002	Common	BL2002-24, BL2002-84, BL2002-163, BL2002-166; /Gas Aspirator, MV & Blacklight, MV Bulb.
Spanagonicus albofasciatus (Reuter 1907)	adv	NTL 2006	Scarce	BL2002-51; /Gas Aspirator.
Stenotus binotatus (Fabricius 1794)	adv	NIR 2007	scarce	KA2007-168; /MV Bulb.
Stenotus sp. A	adv	NIR 2007	Uncommon	KA2007-170; /MV Bulb.
Taylorilygus apicalis (Fieber 1861)	adv	2002	Common	BL2002-163, BL2002-163A, BL2002-166, BL2002-168; /MV & Blacklight, MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HEMIPTERA: HETEROPTERA (continued)				
Miridae (continued)				
Trigonotylus tenuis (Reuter 1895)	adv	NIR 2002	Common	BL2002-24, BL2002-43, BL2002-57; /Gas Aspirator, MV Bulb.
Tytthus mundulus (Breddin 1896)	pur	2002	Common	BL2002-83, BL2002-84; /MV Bulb.
Nabidae				
Nabis capsiformis (Germar 1837)	adv	2002	Common	BL2002-150, BL2002-169, KM2003-38, KM2003-39, KA2007-42, KA2007-101, KA2007-125; /Gas Aspirator, MV & Blacklight, MV Bulb.
Stenonabis sp. A	adv	NSR 2011	Scarce	KA2007-18, KA2007-57; /MV Bulb.
Notonectidae				
Anisops kuroiwae Matsumura 1915	adv	2002	Local	KM2003-73, KA2007-170; /Dip Net, MV Bulb.
Pentatomidae				
Brochymena quadripustulata (Fabricius 1775)	adv	NIR 2002	Common	BL2002-42A, BL2002-52, KM2003-39, KM2003-83; /Gas Aspirator, General, MV Bulb.
Eysarcoris ventralis (Westwood 1837)	adv	NIR 2002	Common	BL2002-229, BL2002-289; /General, Sweep Net.
Nezara viridula (Linnaeus 1758)	adv	2002	Common	BL2002-129, BL2002-167; /Gas Aspirator, MV Bulb.
Oechalia cf *pacifica* (Stål 1859)	end	2002	Local	BL2002-169; /MV & Blacklight.
Piezodorus hyberni (Gmelin 1790) Listed as *P.* sp A	adv	NSR 2007		KA2007-7, KA2007-22; /Fogging, Gas Aspirator.
Plautia stali (Scott 1874)	adv	2002	Common	BL2002-53, BL2002-80, BL2002-83, KA2007-20, KA2007-168, KA2007-169; /Host Search, MV Bulb.
Thyanta custator accerra McAtee 1919	adv	NIR 2002	Common	BL2002-174; /Sweep Net.
Plataspidae				
Coptosoma xanthogramma (White 1842)	adv	2002	Uncommon	BL2002-5A, BL2002-305, KA2007-22; /Fogging, Gas Aspirator, Host Search.
Reduviidae				
Empicoris rubromaculatus (Blackburn 1889)	adv	2002	Scarce	KM2003-35A, KA2007-65, KA2007-67; /Malaise Trap, Window Trap.
Gallobelgicus saevus Bergroth 1913	adv	NIR 2002	Local	BL2002-84, KM2003-38; /MV Bulb.
Oncocephalus pacificus Kirkaldy 1908	adv	2002	Local	BL2002-57; /MV Bulb.
Ploiaria macrophthalma (Dohrn 1860)	adv	NIR 2011		BL2002-82; /MV Bulb.
Polididus armatissimus Stal 1859	adv	NTL 2011		KA2007-57, KA2007-103, KA2007-122; /General, MV Bulb.
Sinea rileyi Montandon 1893	adv	NSR 2002	Local	BL2002-73F, BL2002-129, BL2002-246, KA2007-42, KA2007-64, KA2007-101, KA2007-125, KA2007-170, KA2007-171/Gas Aspirator, Malaise Trap, MV Bulb, Sweep Net, Window Trap.
Zelus renardii Kolenati 1856	adv	2002	Common	BL2002-3, BL2002-9, BL2002-18, BL2002-73E, BL2002-73F, BL2002-73K, BL2002-289, BL2002-307, KA2007-168, KA2007-171; /Gas Aspirator, Malaise Trap, MV Bulb, Sweep Net.
Rhopalidae				
Liorhyssus hyalinus (Fabricius 1794)	adv	2002	Common	BL2002-169, BL2002-306; /Fogging, MV & Blacklight.
Niesthrea louisianica Sailer 1961	adv	NIR 2002	Common	BL2002-5A, BL2002-9, BL2002-131, BL2002-224, BL2002-257, BL2002-294; /Gas Aspirator, Sweep Net.
Saldidae				
Micracanthia humilis (Say 1832)	adv	NIR 2002	Local	BL2002-55C; /Gas Aspirator.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HEMIPTERA: HETEROPTERA (continued)				
Scutelleridae				
Coleotichus blackburniae White 1881 Koa bug	end	2002	Uncommon	BL2002-117; /Beating Sheet.
Tingidae				
Corythucha gossypii (Fabricius 1794)	adv	NTL 2006	Common	KM2003-25, KM2003-88; /Host Search.
Corythucha morrilli Osborn & Drake 1917	adv	NIR 2002	Common	BL2002-265, BL2002-308, KA2007-14, KA2007-171; /Gas Aspirator, Malaise Trap.
Leptodictya tabida (Herrich-Schaeffer 1840)	adv	2002	Common	BL2002-21, BL2002-45, BL2002-129, BL2002-294, KA2007-171, BL2002-184; /Gas Aspirator, Malaise Trap.
INSECTA: HEMIPTERA: HOMOPTERA (Hoppers, scales and relatives)				
Aleyrodidae				
Aleurocanthus woglumi Ashby 1915 citrus blackfly	adv	NTL 2007	Local	KA2007-17, KA2007-149; /Host Search, Sticky Trap.
Aleurodicus dispersus Russell 1965	adv	2002	Common	BL2002-81; /MV Bulb.
Aleurodicus dugesii Cockerell 1896	adv	NTL 2007	common	KA2007-65, KA2007-84; /Host Search, Malaise Trap.
Aleurothrixus floccosus (Maskell 1896)	adv	NTL 2011		KA2007-146; /Host Search.
Aphididae				
Cerataphis orchidearum (Westwood 1879)	adv	NTL-2011	Common	KA2007-150; /Host Search.
Sipha flava (Forbes 1884)	adv	NTL 2006	Local	KM2003-23; /Host Search.
Cercopidae				
Clastoptera xanthocephala Germar 1839	adv	2002	Common	BL2002-73F, BL2002-73L, BL2002-129, BL2002-131, BL2002-150, BL2002-163, BL2002-163A, BL2002-278, KM2003-37, KM2003-80, KM2003-82, KA2007-149, KA2007-192; /Gas Aspirator, Malaise Trap, MV & Blacklight, MV Bulb, Sticky Trap.
Cicadellidae				
Balclutha incisa hospes (Kirkaldy 1910)	adv	2002	Common	BL2002-83; /MV Bulb.
Balclutha cf. *rubrostriata* (Melichar 1903)	adv	NIR 2002		BL2002-14A, BL2002-62; /Gas Aspirator.
Balclutha sp. A	end?	2002	Local	BL2002-57, BL2002-165; /MV Bulb.
Carneocephala sagittifera (Uhler 1895)	adv	2002	Common	BL2002-57, BL2002-129, BL2002-150, BL2002-229, BL2002-260, BL2002-294; /Gas Aspirator, General, MV Bulb.
Circulifer tenellus (Baker 1896)	adv	2002	Common	BL2002-26; /Gas Aspirator.
Draeculacephala minerva Ball 1927	adv	2002	Common	BL2002-57, BL2002-227, BL2002-260, KA2007-42, KA2007-125; /Gas Aspirator, MV Bulb.
Empoasca solana DeLong 1931	adv	2002	Common	BL2002-62, BL2002-83, KA2007-168, KA2007-170; /Gas Aspirator, MV Bulb.
Graminella sonora (Ball 1900)	adv	NIR 2002	Common	BL2002-14A, BL2002-57, BL2002-265; /Gas Aspirator, MV Bulb.
Gyponana germari (Stal 1864)	adv	NIR 2002	Common	BL2002-2, BL2002-42C, BL2002-51, BL2002-62, BL2002-73H, BL2002-83, BL2002-150, BL2002-163A, BL2002-165, BL2002-199, BL2002-225, BL2002-230, BL2002-232, BL2002-234, BL2002-235, BL2002-246, BL2002-289, KA2007-169, KA2007-171; /Fogging, Gas Aspirator, General, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HEMIPTERA: HOMOPTERA (continued)				
Cicadellidae (continued)				
Penestragania robusta (Uhler 1877)	adv	2002	Common	BL2002-62, BL2002-163A, BL2002-165, BL2002-166, BL2002-167, KA2007-169; /Gas Aspirator, MV & Blacklight, MV Bulb.
Scaphytopius loricatus (Van Duzee 1894)	adv	NIR 2002	Local	BL2002-246, BL2002-306; /Fogging, Sweep Net.
Sophonia orientalis (Matsumura 1912) 2-spotted leafhopper	adv	2002	Common	BL2002-51; /Gas Aspirator. host *Dodonaea viscosa*.
Spanbergiella quadripunctata Lawson 1932	adv	NIR 2002	Common	BL2002-76, BL2002-227, BL2002-240, BL2002-260, KA2007-170; /Gas Aspirator, Malaise Trap, MV Bulb, Sweep Net.
Coccidae				
Ceroplastes cirripediformis Comstock 1881 Barnacle scale	adv	2002	Scarce	BL2002-2; /Gas Aspirator.
Coccus cf. *hesperidum* Linnaeus 1758	adv	NTL 2011		KA2007-84, KA2007-151; /Host Search.
Coccus viridis (Green 1889)	adv	NTL 2006		KA2007-17; /Host Search.
Pulvinaria urbicola Cockerell 1893 Urbicola soft scale	adv	NIR 2002	Local	BL2002-20A; /Host Search.
Conchaspididae				
Conchapis angraeci (Cockerell 1896)	adv	NIR 2006	Local	KM2003-29; /Host Search.
Delphacidae				
Emoloana sporobolicola (Kirkaldy 1910)	end	2002	Local	BL2002-38, BL2002-43, KA2007-6; /Gas Aspirator.
Opiconsiva paludum (Kirkaldy 1910)	adv	NIR 2011		BL2002-81, KA2007-168; /MV Bulb.
Perkinsiella saccharicida Kirkaldy 1903 sugarcane planthopper	adv	2002	Common	BL2002-83, BL2002-84, BL2002-166, KA2007-170, KA2007-171; /Malaise Trap, MV Bulb.
Sardia rostrata pluto (Kirkaldy 1906)	adv	NIR 2002	Common	BL2002-14A, BL2002-35, BL2002-57, BL2002-62, BL2002-83, BL2002-84, BL2002-150, BL2002-163A, BL2002-165, BL2002-167, BL2002-240, KA2007-168, KA2007-170; /Gas Aspirator, MV & Blacklight, MV Bulb, Sweep Net.
Sogatella sp. A	adv	2002	Local	BL2002-260; /Gas Aspirator.
Derbidae				
Cedusa sp. A	adv	NIR 2007		KA2007-171; /Malaise Trap.
Diaspididae				
Aspidiotus destructor Signoret 1869 Coconut scale	adv	NTL 2006	Common	KM2003-30; /Host Search.
Diaspididae genus sp. A [possibly *Fiorinia* sp]	adv	NTL 2011		KA2007-149; /Sticky Trap..
Ischnaspis longirostris (Signoret 1882) Black thread scale	adv	NTL 2006	Common	KM2003-91; /Host Search.
Lepidosaphes beckii (Newman 1869)	adv	NTL 2011		KA2007-17; /Host Search.
Pseudaulacaspis cockerelli (Colley 1897) Oleander scale	adv	2002	Common	KM2003-31; /Host Search.
Flatidae				
Melormenis basalis (Walker 1851)	adv	2002	Common	BL2002-3, BL2002-5A, BL2002-45, BL2002-129, BL2002-163A, BL2002-230, BL2002-234, BL2002-309, KM2003-35B, KM2003-82, KA2007-8, KA2007-37, KA2007-38, KA2007-39, KA2007-40, KA2007-60, KA2007-67, KA2007-169, KA2007-171; /Fogging, Gas Aspirator, General, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net, Window Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HEMIPTERA: HOMOPTERA (continued)				
Halimococcidae				
Thysanococcus pandani Stickney 1934	adv	NTL 2006	Local	KM2003-24; /Host Search.
Margarodidae				
Icerya purchasi Maskell 1878 cottony cushion scale	adv	2002	Common	BL2002-19B; /Host Search.
Membracidae				
Spissistilus festinus (Say 1830)	adv	2002	Common	BL2002-5A, BL2002-42B, BL2002-51, BL2002-122, BL2002-131; /Gas Aspirator.
Vanduzeea segmentata (Fowler 1895)	adv	2002	Common	BL2002-61, BL2002-73E, BL2002-134A, BL2002-163A, BL2002-167, BL2002-169, BL2002-197, BL2002-246, BL2002-289, BL2002-294, BL2002-309, KA2007-106, KA2007-170, BL2002-184; /Fogging, Gas Aspirator, General, Malaise Trap, MV & Blacklight, MV Bulb, Sweep Net.
Pseudococcidae				
Maconellicoccus hirsutus (Green 1908) Pink hibiscus mealybug	adv	NTL 2006	Common	BL2002-21, KA2007-152; /Gas Aspirator, Host Search.
Nipaecoccus nipae (Maskell 1893)	adv	NTL 2006	Common	KM2003-92; /Host Search.
Saccharicoccus sacchari (Cockerell 1895) Pink sugarcane mealybug	adv	2002	Common	BL2002-180; /General.
Psyllidae				
Heteropsylla cubana Crawford 1914	adv	2002	Common	BL2002-45, BL2002-165; /Gas Aspirator, MV Bulb.
Tropiduchidae				
Kallitaxila granulata (Stal 1870)	adv	NIR 2006	Common	KM2003-80, KM2003-82, KM2003-84, KA2007-116, KA2007-149, KA2007-169, KA2007-171, KA2007-192; /Gas Aspirator, Host Search, Malaise Trap, MV Bulb, Sticky Trap.
INSECTA: HYMENOPTERA (Wasps, ants, bees)				
Agaonidae				
Agaonidae genus sp. A	adv	NTL 2007	Uncommon	KA2007-171; /Malaise Trap.
Eupristina verticillata Waterston	pur	NIR 2002	Local	KA2007-171, BL2002-178; /Malaise Trap.
Josephiella sp. A	adv	NIR 2002	Uncommon	KA2007-171, BL2002-183; /Malaise Trap.
Anthophoridae				
Ceratina (Pithitis) smaragdula (Fabricius 1787	adv	NIR 2007	Scarce	KA2007-64, KA2007-159; /Window Trap.
Ceratina arizonensis Cockerell 1898	adv	NIR 2002	Uncommon	BL2002-289, KA2007-171; /Malaise Trap, Sweep Net.
Xylocopa sonorina Smith 1874	adv	2002	Common	BL2002-73E, BL2002-73F, BL2002-73H, BL2002-73K, BL2002-290, BL2002-291, KM2003-35B, KA2007-171; /Malaise Trap, Sweep Net.
Aphelinidae				
Aphelinidae genus sp. A	adv	NTL 2011		KA2007-149; /Sticky Trap.
Aphytis cf. *hispanicus* Mercet 1912	adv	NIR 2007	Scarce	BL2002-73I; /Malaise Trap.
Encarsia sp. A	adv/pur?	2002	Uncommon	BL2002-77C, BL2002-292; /Malaise Trap.

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INSECTA: HYMENOPTERA: (continued)				
Aphidiidae				
Aphidius gifuensis Ashmead 1906	adv	NIR 2002		BL2002-73G; /Malaise Trap.
Lysiphlebus testaceipes (Cresson 1880)	pur	2002	Common	BL2002-73I, BL2002-221, BL2002-292, BL2002-293, BL2002-178; /Malaise Trap.
Apidae				
Apis mellifera Linnaeus 1758 Honey bee	pur	2002	Common	BL2002-73E, BL2002-73F, KM2003-35B, KA2007-170, KA2007-171, BL2002-288; / Malaise Trap, MV Bulb.
Bethylidae				
Epyris extraneus Birdwell 1917	adv	NTL 2006	Scarce	BL2002-151, BL2002-294, BL2002-346; /Gas Aspirator, General, Yellow Pan Trap.
Epyris sp. A	adv	NIR 2002	Scarce	BL2002-292, KA2007-101, KA2007-149, KA2007-171, BL2002-178, KA2007-265; /Gas Aspirator, Malaise Trap, Sticky Trap.
Goniozus cf. *columbianus* Ashmead 1893	adv	NSR 2002		BL2002-178; /Malaise Trap.
Goniozus emigratus Rower 1917	adv	NIR 2007	Common	BL2002-178; /Malaise Trap.
Braconidae				
Acrophasmus immigrans (Beardsley 1961)	adv	NIR 2002		BL2002-77C, BL2002-184; /Malaise Trap.
Agathis sp. A	adv	NIR 2002	Common	BL2002-73I, BL2002-77C, BL2002-221, BL2002-293, BL2002-178; /Malaise Trap.
Apanteles opacus (Ashmead 1905)	adv	NIR 2002	Common	BL2002-77C; /Malaise Trap.
Apanteles sp. A [nr. *Apanteles carpatus*]	adv	NSR 2007	Scarce	BL2002-82, BL2002-178; /Malaise Trap, MV Bulb
Ascogaster sp. A	adv?	NSR 2002	Scarce	BL2002-78; /MV Bulb.
Braconidae genus sp. A	adv/pur?	NTL 2007	Scarce	BL2002-179; /Malaise Trap.
Braconidae genus sp. B [unidentified genus species B]	adv/pur?	NTL 2007	Local	KA2007-171; /Malaise Trap.
Braconidae genus sp. C [unidentified genus nr. *Opius*.]	adv/pur?	NTL 2007	Scarce	BL2002-178; /Malaise Trap.
Braconidae genus sp. D [unidentified genus nr *Rhacontus*]	adv/pur?	NTL 2007	Scarce	BL2002-178; /Malaise Trap..
Braconidae genus sp. E [unidentified genus nr. *Orgilus*]	adv/pur?	NTL 2007	Scarce	BL2002-178; /Malaise Trap.
Cotesia sp. A	pur?	NTL 2007	Scarce	BL2002-169, KA2007-171; /Malaise Trap, MV & Blacklight.
Glyptapanteles militaris (Walsh 1861)	pur	2002	Common	BL2002-77C; /Malaise Trap.
Glyptapanteles sp. A	adv	NSR 2002	Common	BL2002-77C, BL2002-178, BL2002-184; /Malaise Trap.
Glyptocolastes texanus Ashmead 1900	adv	NIR 2002		BL2002-73I, BL2002-178; /Malaise Trap.
Heterospilus prosopidis Viereck 1910	pur	2002	Common	BL2002-61, BL2002-73A, BL2002-73F, BL2002-77B, BL2002-77C, BL2002-131, BL2002-169, BL2002-293, BL2002-309, KA2007-171, BL2002-178, BL2002-183; /Gas Aspirator, General, Malaise Trap, MV & Blacklight.
Heterospilus sp. A	adv	NIR 2002		BL2002-77C, BL2002-178; /Malaise Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HYMENOPTERA: (continued)				
Braconidae (continued)				
Parallorhogas pallidiceps (Perkins 1910)	adv	2002		BL2002-73I, BL2002-184; /Malaise Trap.
Phanerotoma sp. A	adv	NIR 2002		BL2002-73G, BL2002-73I; /Malaise Trap.
Phanerotoma sp. B	adv	NIR 2002		BL2002-73I; /Malaise Trap.
Spathius prusias Nixon 1943	adv	NIR 2002	Common	BL2002-73I, BL2002-77C, BL2002-163A, BL2002-199, BL2002-292, BL2002-178; /Fogging, Malaise Trap, MV & Blacklight.
Stenocorse bruchivora (Crawford 1910)	pur	2002	Common	BL2002-73H, BL2002-73I, BL2002-77B, BL2002-77C, BL2002-221, BL2002-292, BL2002-293, BL2002-178, BL2002-184; /Malaise Trap.
Urosigalphus bruchi Crawford 1907	pur	2002	Common	BL2002-9, BL2002-73B, BL2002-76, BL2002-77C, KA2007-171, BL2002-178; /Gas Aspirator, Malaise Trap.
Chalcididae				
Brachymeria discreta Gahan 1942	adv	NIR 2007	Scarce	BL2002-167; /MV Bulb.
Brachymeria obscurata (Walker 1874)	pur	2002	Common	BL2002-73A, BL2002-289, BL2002-178; /Malaise Trap, Sweep Net.
Brachymeria podagrica (Fabricius 1787)	adv	NIR 2002		BL2002-73A, BL2002-178; /Malaise Trap.
Dirhinus sp. A	adv/pur?	NIR/ NSR 2007	Uncommon	BL2002-76, BL2002-151, KA2007-65, KA2007-67, KA2007-171; /Malaise Trap, Window Trap, Yellow Pan Trap.
Invreia sp. A [*Invreia* sp. near *philippiensis* Masi, 1929]	adv	NIR 2002		KA2007-67, BL2002-178; /Malaise Trap, Window Trap.
Chrysididae				
Trichrysis cf *luzonica* (Mocsary 1889)	adv	NTL 2007	Scarce	BL2002-73E, BL2002-233; /Malaise Trap.
Diapriidae				
Diapriidae genus sp. A	unk	NSR 2002		BL2002-178, BL2002-183; /Malaise Trap. "unreported."
Trichopria drosophilae (Perkins 1910)	end	NIR 2002		BL2002-178; /Malaise Trap.
Dryinidae				
Anteon coriaceus (Perkins 1905)	adv	NIR 2002		BL2002-178; /Malaise Trap.
Dryinidae genus sp. A	pur?	NTL 2011		KA2007-36; /Gas Aspirator.
Elasmidae				
Elasmus sp A	adv	NSR? 2011		BL2002-79; /MV Bulb.
Elasmus sp B	adv	NSR? 2011		BL2002-79, KA2007-168; /MV Bulb.
Encyrtidae				
Encyrtidae genus sp. A	adv?	2002	Uncommon	BL2002-73B, BL2002-73G, BL2002-73I, BL2002-221, BL2002-184; /Malaise Trap.
Eucoilidae				
Eucoila impatiens (Say 1836)	pur	NTL 2007	Scarce	KA2007-171; /Malaise Trap.
Ganaspidium utilis Beardsley 1988	pur	2002		BL2002-178; /Malaise Trap.

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INSECTA: HYMENOPTERA: (continued)				
Eulophidae				
Euplectrus sp. A	adv?	NSR? 2002	Local	No Specimens recorded. Identified by JWBeardsley, but specimens not located after his death..
Horismenus sp. A	adv	NSR 2002	Common	KA2007-171, BL2002-178; /Malaise Trap.
Quadrastichus erythrinae Kim 2004	adv	NTL 2007	Common	KA2007-14, KA2007-120, KA2007-149, KA2007-265; /Gas Aspirator, Host Search, Sticky Trap.
Tetrastichinae genus sp. A	adv	NSR? 2007	Scarce	BL2002-237; /General. reared ex mantid ootheca.
Zagrammosoma sp. A [possibly *multilineatum*(Ashmead, 1888)]	adv	NSR 2007	Scarce	KA2007-65; /Malaise Trap.
Eupelmidae				
Brasema cushmani (Crawford 1908)	pur	2002	Common	BL2002-26, BL2002-55C, BL2002-73H, BL2002-199, BL2002-292, BL2002-178, KA2007-265; /Fogging, Gas Aspirator, Malaise Trap, Sticky Trap.
Eupelmidae genus sp. A [unidentified = *Anastatus?* sp]	adv	NSR? 2011		BL2002-306, KA2007-101; /Fogging, Gas Aspirator.
Eupelmus swezeyi (Crawford 1915)	adv	NIR 2002	Common	BL2002-26, BL2002-178; /Gas Aspirator, Malaise Trap.
Eurytomidae				
Eurytoma sp. A	adv?	NSR 2002	Local	BL2002-5A, BL2002-73A, BL2002-73C, BL2002-73H, BL2002-131, BL2002-292, BL2002-178; / Gas Aspirator, Malaise Trap. "unreported" -JWB
Evaniidae				
Evania appendigaster Linnaeus 1758	adv	NIR 2002	Common	BL2002-73C, KA2007-171, BL2002-178, BL2002-184; / Malaise Trap.
Szepligetella sericea (Cameron 1883)	adv	NIR 2007	Scarce	BL2002-73A, BL2002-73B, KA2007-171; /Malaise Trap.
Formicidae				
Anoplolepis gracilipes (F. Smith 1857)	adv	2002	Common	BL2002-61, KA2007-265; /Gas Aspirator, Sticky Trap.
Camponotus variegatus (F. Smith 1858) [This sp is part of a complex group; its name may change when the group is revised]	adv	2002	Common	BL2002-10, BL2002-73J, BL2002-81, BL2002-263, KA2007-67, KA2007-171; /Malaise Trap, MV Bulb, Pitfall Trap, Trunk Trap, Window Trap.
Cardiocondyla emeryi Forel 1881	adv	NTL 2011		BL2002-10A, BL2002-13, BL2002-21, BL2002-69A, BL2002-88, BL2002-104A, KM2003-35A, KA2007-43, KA2007-67, KA2007-118, KA2007-149; /Ant Baits, Gas Aspirator, General, Malaise Trap, Sticky Trap, Window Trap.
Cardiocondyla cf. *kagutsuchi* Terayama, 1999	adv	NTL 2011		BL2002-26; /Gas Aspirator.
Cardiocondyla minutior Forel 1899 [This sp was formerly known in Hawai'i as *C. nuda* (Mayr. 1866)]	adv	NTL 2011		KA2007-118; /Ant Baits.
Hypoponera punctatissima (Roger 1859)	adv	NTL 2011		BL2002-76; /Malaise Trap.
Leptogenys falcigera Roger 1861	adv	NTL 2011		KM2003-50; /General.
Monomorium floricola (Jerdon 1851)	adv	NTL 2011		BL2002-11B, BL2002-32A, BL2002-88, KM2003-35A, KA2007-118; /Ant Baits, Gas Aspirator, Malaise Trap.
Monomorium pharaonis (Linnaeus 1758)	adv	NTL 2011		BL2002-10, BL2002-10A, BL2002-21, BL2002-87, BL2002-88, BL2002-94, BL2002-122, BL2002-299, KA2007-43; /Ant Baits, Gas Aspirator, General, Pitfall Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HYMENOPTERA: (continued)				
Formicidae (continued)				
Ochetellus glaber (Mayr 1862)	adv	2002		BL2002-5A, BL2002-11B, BL2002-21, BL2002-26, BL2002-48B, BL2002-87, BL2002-88, BL2002-104A, BL2002-118, BL2002-122, BL2002-185, BL2002-215C, KM2003-35A, KA2007-14, KA2007-65, KA2007-67, KA2007-158, KA2007-172; /Ant Baits, Beating Sheet, Lingren Funnels (Beetle trap), Fogging, Gas Aspirator, Malaise Trap, Window Trap.
Paratrechina bourbonica Forel 1886	adv	2002		BL2002-361; /General .
Paratrechina longicornis (Latreille 1802)	adv	2002	Common	BL2002-10 ,BL2002-10A, BL2002-21, BL2002-32A, BL2002-48B, BL2002-69A, BL2002-87, BL2002-88, BL2002-89, BL2002-122, KM2003-35A, KM2003-54, KA2007-118, KA2007-171; /Ant Baits, Gas Aspirator, General, Malaise Trap, Pitfall Trap.
Paratrechina vaga (Forel 1901)	adv	NTL 2011		KA2007-42; /Gas Aspirator.
Pheidole megacephala (Fabricius 1793)	adv	2002	Common	BL2002-13, BL2002-26, BL2002-76, BL2002-82, BL2002-83, BL2002-88, BL2002-104A, BL2002-106, BL2002-107A, BL2002-300, BL2002-324, KA2007-6, KA2007-8, KA2007-18, KA2007-36, KA2007-37, KA2007-39, KA2007-42, KA2007-43, KA2007-57, KA2007-67, KA2007-95, KA2007-101, KA2007-104, KA2007-1; /Ant Baits, Lingren Funnels (Beetle trap), Fogging, Gas Aspirator, General, Malaise Trap, MV Bulb, Sifting Litter, Sticky Trap, Window Trap.
Plagiolepis alluaudi Emery 1894	adv	2002	Common	BL2002-10A, BL2002-82, BL2002-88, KM2003-35A, KA2007-67, KA2007-121, KA2007-158; /Ant Baits, Lingren Funnels (Beetle trap), Gas Aspirator, Malaise Trap, MV Bulb, Tulgren Funnel (Berlese, Window Trap.
Solenopsis geminata (Fabricius 1804)	adv	2002	Common	BL2002-5A, BL2002-32A, BL2002-48B, BL2002-69A, BL2002-87, BL2002-88, BL2002-172, BL2002-297, KA2007-118, KA2007-158; /Ant Baits, Lingren Funnels (Beetle trap), Gas Aspirator, General.
Tapinoma melanocephalum (Fabricius 1793)	adv	2002	Common	BL2002-5A, BL2002-32A, KA2007-18; /Ant Baits, Gas Aspirator, MV Bulb.
Technomyrmex difficilis Forel 1892 [Formerly *T. albepes*]	adv	2002		BL2002-21, BL2002-68, BL2002-88, BL2002-185, KM2003-35A, KA2007-67, KA2007-158, KA2007-172; / Ant Baits, Lingren Funnels (Beetle trap), Fogging, Gas Aspirator, Malaise Trap, Trunk Trap, Window Trap.
Tetramorium simillimum (F. Smith 1851)	adv	NTL 2011		BL2002-10, BL2002-10A, BL2002-21, BL2002-43, BL2002-69A, BL2002-87, BL2002-88, BL2002-297, BL2002- 298, KM2003-79, KA2007-43, KA2007-67, / KA2007-118, KA2007-121; /Ant Baits, Gas Aspirator, General, Pitfall Trap, Sifting Litter, Tungren Funnel (Berlese), Window Trap.
Halictidae				
Dialictus sp. A [near *Dialictus navadensis* (Crawford, 1907)]	adv	2002	Common	BL2002-73A, BL2002-73B, BL2002-73C, BL2002-73I, BL2002-169, BL2002-233, BL2002-292, BL2002-293, KA2007-64, KA2007-171, BL2002-178; /Malaise Trap, MV & Blacklight, Window Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HYMENOPTERA: (continued)				
Ichneumonidae				
Anomalon californicum (Cresson 1879)	adv	NIR 2002	Common	BL2002-73B, BL2002-73C, BL2002-73F, BL2002-77C, BL2002-151, BL2002-233, BL2002-292, KA2007-65, BL2002-178, BL2002-184; /Malaise Trap, Yellow Pan Trap.
Barichneumon californicus Heinrich 1971	adv	NIR 2002	Common	BL2002-73H, BL2002-151, BL2002-163, BL2002-221, BL2002-233, KA2007-67, KA2007-171, BL2002-178, BL2002-184; /Malaise Trap, MV & Blacklight, Window Trap, Yellow Pan Trap.
Casinaria infesta (Cresson 1872)	adv	2002		BL2002-73A, BL2002-73H, BL2002-77C, BL2002-233; / Malaise Trap.
Cremastini genus sp. A	adv/pur?	NSR 2006		BL2002-73G, BL2002-73H, BL2002-73I, BL2002-221; / Malaise Trap.
Diplazon laetatorius (Fabricius 1781)	adv	2002	Common	BL2002-73F, BL2002-73H, KA2007-171, BL2002-184; / Malaise Trap.
Echthromorpha agrestoria fuscator (Fabricius 1793)	end	2002	Common	BL2002-73H, BL2002-77C, BL2002-233; /Malaise Trap.
Gelis sp. A [species near(?) *Gelis albipalpus* (Thomson, 1884)]	adv	NIR 2002		BL2002-73I, BL2002-77C, BL2002-184; /Malaise Trap.
Hypsicera sp. A [not *H. femoralis*(Fourcroy)]	adv	NSR 2002		BL2002-73H, BL2002-73I, BL2002-221, KA2007-65, BL2002-178, BL2002-184; /Malaise Trap
Hypsicera sp. B [different from sp A]	adv	NSR 2002		BL2002-73H; /Malaise Trap.
Pimpla punicipes Cresson 1873	adv	2002	Common	BL2002-73H, BL2002-233; /Malaise Trap.
Pimplinae genus sp. A [not *Pimpla punicipes*]	adv	NSR 2006	Scarce	BL2002-76; /Malaise Trap.
Pristomerus hawaiiensis Perkins 1910	end?	2002	Common	KA2007-65, BL2002-184; /Malaise Trap.
Trathala flavoorbitalis (Cameron 1907)	adv	2002		No Specimens recorded. Identified by JWBeardsley, but specimens not located after his untimely death.
Venturia sp. A [not *canescens* (Gravenhorst1829)]	adv	NIR 2002		BL2002-178; /Malaise Trap.
Leucospidae				
Leucospis sp. A [not *Leucospis affinis* Say, 1824]	adv	NSR 2007	Scarce	BL2002-42B, KA2007-109; /Gas Aspirator, General.
Megachilidae				
Chalicodoma umbripennis (F. Smith 1853)	adv	2002		BL2002-77C; /Malaise Trap.
Megachile timberlakei Cockerell 1920	adv	2002	Local	BL2002-73B, BL2002-73C, BL2002-76, BL2002-246, KA2007-65, BL2002-178; /Malaise Trap, Sweep Net.
Mymaridae				
Gonatocerus californicus Girault 1911	adv	2002		BL2002-73I, BL2002-77C, BL2002-221, BL2002-184; / Malaise Trap.
Gonatocerus dolichocerus Ashmead 1887	adv	2002		BL2002-73I, BL2002-77C; /Malaise Trap.
Gonatocerus sp. A	adv	NSR 2002		BL2002-73I, BL2002-77C, BL2002-184; /Malaise Trap.
Polynema sp. A	unk	NIR? 2011		BL2002-293; /Malaise Trap.
Stephanodes reduvioli (Perkins 1905)	adv	2002		BL2002-77C; /Malaise Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HYMENOPTERA: (continued)				
Platygasteridae				
Platygasteridae genus sp. A	adv?	NIR 2011		BL2002-73G; /Malaise Trap.
Platygasteridae genus sp. B	unk	NIR 2011		BL2002-45A; /Gas Aspirator.
Pompilidae				
Anoplius toluca (Cameron 1893)	adv	2002		BL2002-53, BL2002-73B; /Malaise Trap, MV Bulb.
Paracyphononyx pedestris (F. Smith 1855)	adv	NIR 2002		BL2002-73B, BL2002-73G, BL2002-262; /Malaise Trap.
Pteromalidae				
Anisopteromalus cf. sp. A	adv	NTL 2011		BL2002-178; /Malaise Trap.
Callocleonymus swezeyi (Yoshimoto & Ishii, 1965)	adv	NSR 2006	Scarce	BL2002-178; /Malaise Trap.
Lariophagus texanus Crawford 1910	pur	2002	Common	BL2002-178; /Malaise Trap.
Pachyneuron sp. A [possibly *Pachyneuron aphidis*(Bouché)]	adv	NSR 2002		BL2002-178; /Malaise Trap.
Scelionidae				
Baeus sp. A	adv?	NSR 2007	Scarce	KA2007-149, KA2007-171; /Malaise Trap, Sticky Trap.
Telenomus sp. A	unk	NIR? 2011		BL2002-292, BL2002-178; /Malaise Trap.
Telenomus vulcanus Perkins 1910	end?	NIR 2002	Common	BL2002-77C, BL2002-178, BL2002-184; /Malaise Trap.
Scoliidae				
Campsomeris marginella modesta. (F. Smith, 1855)	pur	2002	Common	BL2002-73B, BL2002-73C, BL2002-73I, BL2002-262, BL2002-293, KA2007-171, BL2002-183; /Malaise Trap.
Sphecidae				
Ampulex compressa (Fabricius 1781)	pur	2002	Common	BL2002-263, KA2007-43, KA2007-171; /General, Malaise Trap, Trunk Trap.
Chalybion bengalense (Dahlbom 1845)	adv	NIR 2002		BL2002-3, BL2002-73B; /Malaise Trap, Sweep Net.
Dolichurus stantoni (Ashmead 1904)	pur	2002	Common	BL2002-77C, BL2002-151, BL2002-199, KA2007-65; / Fogging, Malaise Trap, Yellow Pan Trap.
Dryudella immigrans (Williams 1946)	adv	NIR 2002	Common	BL2002-73B, BL2002-73C, BL2002-73I, BL2002-215A, BL2002-221, BL2002-178; /Gas Aspirator, Malaise Trap.
Ectemnius mandibularis (F. Smith 1879)	end	2002	Common	BL2002-73F, BL2002-77A, BL2002-310, BL2002-311, BL2002-312; /Malaise Trap, Sweep Net.
Ectemnius molokaiensis (Perkins 1899)	end	2002	Local	BL2002-73G, BL2002-293; /Malaise Trap.
Isodontia mexicana (Sausure 1867)	adv	NIR 2002	Common	BL2002-246, BL2002-178; /Malaise Trap, Sweep Net.
Nitela sp. A	adv	NIR 2002		BL2002-263; /Trunk Trap.
Pison hospes F. Smith 1879	adv	NTL 2007	Common	BL2002-151, BL2002-233, BL2002-178, KA2007-265;/ Malaise Trap, Sticky Trap, Yellow Pan Trap.
Pison iridipenne Smith 1879	adv	NTL 2006	Common	BL2002-73C, BL2002-163A; /Malaise Trap, MV & Blacklight.
Polemistis luzonensis (Rohwer 1919)	adv	NIR 2002	Scarce	BL2002-184; /Malaise Trap.
Rhopalum sp. A	adv	NIR 2002		BL2002-77C; /Malaise Trap.
Sceliphron caementarium (Drury 1770)	adv	2002		BL2002-310, BL2002-314; /General, Sweep Net.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: HYMENOPTERA: (continued)				
Sphecidae (continued)				
Sceliphron madraspatanum (Fabricius, 1791)	adv	NIR 2002		BL2002-262, BL2002-293; /Malaise Trap.
Sphecidae genus sp. A	adv	NSR 2007	Scarce	KA2007-171; /Malaise Trap.
Tachysphex morosus (F. Smith 1859)	adv	NIR 2002	Common	BL2002-73H, BL2002-77C, BL2002-233, BL2002-289, BL2002-310; /Malaise Trap, Sweep Net. Beardsley's original labels "prob. Beardsley's *T. bituberculata* Cameron", which is now *T. morosus*.
Trypoxylon bicolor F. Smith 1856	adv	2002	Common	BL2002-73B, BL2002-73C, BL2002-73H, BL2002-233, KA2007-171, BL2002-178; /Malaise Trap.
Trypoxylon philippinensis Ashmead 1904	adv	2002		BL2002-73G, BL2002-283, BL2002-310, KA2007-171; / Host Search, Malaise Trap, Sweep Net.
Torymidae				
Megastigmus transvaalensis (Hussey, 1956)	adv	NIR 2002		BL2002-73A, BL2002-83, BL2002-163, BL2002-165, BL2002-166, KM2003-36, KM2003-37, KA2007-18, KA2007-168, KA2007-171, BL2002-178; /Malaise Trap, MV & Blacklight, MV Bulb.
Podagrion mantis Ashmead 1886	adv	NIR 2002		BL2002-77C, BL2002-292, BL2002-293, KA2007-65, KA2007-171, BL2002-178; /Malaise Trap.
Trichogrammatidae				
Trichogrammatidae genus sp. A	adv?	NTL 2011		BL2002-221, BL2002-233; /Malaise Trap.
Vespidae				
Delta campaniforme esuriens (Saussure, 1852)	adv	NIR 2002	Common	BL2002-5A, BL2002-73F, BL2002-73H, BL2002-246, BL2002-315, KM2003-85; /Gas Aspirator, General, Malaise Trap, Sweep Net.
Delta curvatum (Saussure 1854)	adv	2002	Uncommon	BL2002-316, BL2002-317; /General .
Delta pyriforme philippinense (Bequaert, 1928)	adv	NIR 2002	Uncommon	No specimens.collected. Visual record by DJ Preston.
Pachodynerus nasidens (Latreille 1832)	adv	2002	Common	BL2002-5A, BL2002-73A, BL2002-73B, BL2002-73H, BL2002-82, BL2002-224, BL2002-289, BL2002-178; /Gas Aspirator, Malaise Trap, MV Bulb, Sweep Net.
Polistes aurifer Saussure 1853	adv	2002	Common	BL2002-73A, BL2002-73F, BL2002-73K, BL2002-223, BL2002-233, KA2007-109, BL2002-178; /General, Malaise Trap.
Polistes exclamans Viereck 1906	adv	NIR 2002	Common	BL2002-169, BL2002-318, KA2007-114, KA2007-171;/ General, Malaise Trap, MV & Blacklight, Sweep Net.
Vespula pensylvanica (Saussure 1857) Western yellow jacket	adv	2002	Transient	BL2002-262, BL2002-319; /Malaise Trap.
INSECTA: ISOPTERA (Termites)				
Kalotermitidae				
Cryptotermes brevis (Walker 1853) drywood termite	adv	2002	Common	BL2002-73E, BL2002-76A, KM2003-36, KM2003-38, KA2007-159, KA2007-168, KA2007-171, KA2007-265; / Malaise Trap, MV Bulb, Sticky Trap, Window Trap.
Incisitermes immigrans (Snyder 1922)	adv	NTL 2006	Common	BL2002-73K, BL2002-166, BL2002-187, KM2003-40, KM2003-41, KA2007-18, KA2007-67; /Host Search, Malaise Trap, MV Bulb, Window Trap.
Rhinotermitidae				
Coptotermes formosanus Shiraki 1909 Formosan termite	adv	2002	Common	BL2002-360; /General. infesting cabinets and walls of HDOA insectary.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: LEPIDOPTERA (Moths & butterflies)				
Choreutidae				
Choreutis sp. A (Listed in 2007 as unknown family)	adv	NSR 2011		KA2007-20; /Host Search.
Cosmopterigidae				
Anatrachyntis incertulella (Walker 1864) the Pandanus flower mo th	adv	2002	Scarce	BL2002-83, BL2002-163A, KA2007-169; /MV & Blacklight, MV Bulb.
Asymphorodes dimorpha (Busck 1914)	adv	2002	Common	BL2002-169, KA2007-18; /MV & Blacklight, MV Bulb.
Asymphorodes triaula (Meyrick 1935)	adv	NIR 2002		BL2002-168, BL2002-169, KA2007-18; /MV & Blacklight, MV Bulb.
Hyposmocoma sp. A	end	2002	Common	BL2002-53, BL2002-82, KA2007-59, KA2007-168, KA2007-169, KA2007-170, KA2007-171; /Malaise Trap, MV Bulb.
Hyposmocoma sp. B	end	2002	Uncommon	BL2002-168, BL2002-169; /MV & Blacklight, MV Bulb.
Hyposmocoma sp. C	end	2002	Common	BL2002-81, BL2002-163A; /MV & Blacklight, MV Bulb.
Hyposmocoma sp. D	end	2002	Common	BL2002-164, BL2002-165, BL2002-166, KA2007-169, KA2007-170, KA2007-171; /Malaise Trap, MV Bulb.
Hyposmocoma sp. E	end	2002	Scarce	BL2002-166; /MV Bulb.
Hyposmocoma sp. F	end	2002	Scarce	BL2002-53; /MV Bulb.
Ithome concolorella (Chambers 1875) Keawe flower moth	adv	2002	Common	BL2002-165, BL2002-167, KA2007-171; /Malaise Trap, MV Bulb.
Pyroderces badia (Hodges 1962)	adv	NIR 2002	Scarce	BL2002-53, BL2002-163A, KA2007-169; /MV & Blacklight, MV Bulb.
Pyroderces rileyi (Walsingham 1882) the pink cornworm	adv	2002	Uncommon	BL2002-53, BL2002-82, BL2002-168, KA2007-168, KA2007-169; /MV Bulb.
Crambidae				
Euchromius ocelleus (Haworth 1811)	adv	NIR 2002	Uncommon	BL2002-53, BL2002-82; /MV Bulb.
Eudonia sp. A	end	2002	Scarce	BL2002-53; /MV Bulb.
Hellula undalis (Fabricius 1781)	adv	2002	Common	BL2002-83; /MV Bulb.
Herpetogramma licarsisalis (Walker 1859) grass webworm	adv	2002	Common	BL2002-53, BL2002-83, BL2002-163A, KM2003-37, KA2007-18, KA2007-57, KA2007-59, KA2007-60, KA2007-168, KA2007-169, KA2007-170, KA2007-171; / Malaise Trap, MV & Blacklight, MV Bulb.
Mestolobes minuscula (Butler 1881)	end	NTL 2007	Common	BL2002-83, BL2002-163A, KM2003-41, KM2003-42, KA2007-18, KA2007-57, KA2007-168, KA2007-169, KA2007-170, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb.
Nomophila noctuella (Denis & Schiffermueller, 1775)	adv	2002	Uncommon	BL2002-83; /MV Bulb.
Omiodes blackburni (Butler 1877)	end	NTL 2006	Local	KM2003-28; /Host Search.
Omiodes demaratalis (Walker 1859)	end	NTL 2006	Scarce	KM2003-41; /MV Bulb.
Omiodes localis (Butler 1879)	end	2002	Uncommon	BL2002-83, KM2003-37, KA2007-169; /MV Bulb.
Omphisa anastomosalis (Guenee 1854)	adv	2002	Uncommon	BL2002-83; /MV Bulb.
Orthomecyna exigua (Butler 1879)	end	2002	Common	BL2002-35, BL2002-57, BL2002-76A, BL2002-83, BL2002-163A, BL2002-166, KM2003-41, KA2007-57, KA2007-59, KA2007-60, KA2007-168, KA2007-169, KA2007-170; /MV & Blacklight, MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: LEPIDOPTERA: (continued)				
Crambidae (continued)				
Spoladea recurvalis (Fabricius 1775) beet webworm	adv	2002	Common	BL2002-35, BL2002-82, BL2002-83, KM2003-37, KM2003-41, KA2007-18, KA2007-57, KA2007-168, KA2007-170; /MV Bulb.
Synclita obliteralis (Walker 1859)	adv	NIR 2002	Uncommon	BL2002-53, BL2002-82, KM2003-37, KM2003-40, KA2007-18, KA2007-168, KA2007-169; /MV Bulb.
Tamsica floricolens (Butler 1883)	end	NIR 2002	Common	BL2002-35, BL2002-57, BL2002-76A, BL2002-81, BL2002-83, BL2002-163A, BL2002-167, KM2003-37, KM2003-41, KM2003-42, KA2007-18, KA2007-57, KA2007-59, KA2007-60, KA2007-168, KA2007-169, KA2007-170, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb.
Udea litorea (Butler 1883)	end	NIR 2002	Local	BL2002-57, KM2003-38, KA2007-169; /MV Bulb.
Gelechiidae				
Autosticha pelodes (Meyrick 1883)	adv	NIR 2002	Uncommon	BL2002-82, BL2002-165, KA2007-170; /MV Bulb.
Dichomeris acuminata (Staudinger 1876)	adv	NIR 2002	Locally	BL2002-84, BL2002-163, BL2002-164; /MV & Blacklight, MV Bulb.
Dichomeris aenigmatica (Clarke 1962) the sourbush moth	pur	2002	Scarce	BL2002-306; /Fogging.
Gelechiidae genus sp. A [near *Autosticha*]	adv	NSR 2002	Uncommon	BL2002-84, KM2003-37, KA2007-57, KA2007-60; /MV Bulb.
Keiferia lycopersicella (Walsingham 1928) the tomato pinworm	adv	2002	Scarce	BL2002-168; /MV Bulb.
Pectinophora gossypiella (Saunders 1843) [prob. Pectinophora gossypiella (Saunders, 1843)] pink bollworm	adv	2002	Scarce	BL2002-163A, KA2007-169; /MV & Blacklight, MV Bulb.
Phthorimaea operculella (Zeller 1873) the potato tuberworm	adv	2002	Scarce	BL2002-167; /MV Bulb.
Stoeberhinus testaceus Butler 1881	adv	2002	Common	BL2002-81, BL2002-163A, KM2003-38, KM2003-41, KA2007-18, KA2007-169, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb.
Geometridae				
Anacamptodes fragilaria (Grossbeck 1909) Koa haole moth	adv	2002	Common	BL2002-57, BL2002-84, BL2002-163A, BL2002-164, BL2002-165, BL2002-166, BL2002-167, BL2002-168, KM2003-36, KM2003-40, KM2003-42, KA2007-18, - KA2007-57, KA2007-169, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb.
Cyclophora nanaria (Walker 1861)	adv	2002	Common	BL2002-57, BL2002-84, BL2002-163A, BL2002-165, KM2003-35B, KM2003-38, KM2003-41, KA2007-170, KA2007-171 /Malaise Trap, MV & Blacklight, MV Bulb.
Disclisioprocta stellata (Guenee 1857) Bouganvillea looper	adv	2002	Common	BL2002-108B; /Beating Sheet.
Macaria abydata Guenee 1857 Koa haole looper	adv	2002	Common	BL2002-76A, BL2002-81, BL2002-164, KM2003-35B, KA2007-18, KA2007-57, KA2007-60, KA2007-67, KA2007-168, KA2007-169, KA2007-171; /Malaise Trap, MV Bulb, Window Trap.
Scopula cf. *personata* (Prout 1913)	adv	NIR 2002	Common	BL2002-57, BL2002-82, BL2002-83, BL2002-163, KM2003-38;/MV & Blacklight, MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: LEPIDOPTERA: (continued)				
Hesperiidae				
Hylephila phyleus (Drury 1770) firey skipper	adv	2002	Common	BL2002-84, BL2002-120A, KA2007-148; /General, MV Bulb, Sweep Net. Numerous visuals of adults in grassy areas.
Immidae				
Imma mylias Meyrick 1906	adv	NIR 2007	Scarce	BL2002-35; /MV Bulb.
Lycaenidae				
Brephidium exilis (Boisduval 1852)	adv	NIR 2002	Common	BL2002-33, BL2002-145; /Gas Aspirator.
Lampides boeticus (Linnaeus 1767) Bean butterfly	adv	2002	Common	BL2002-6C; /General.
Lyonetidae				
Bedellia orchilella Walsingham 1907 Sweet potato leafminer.	adv	2002	Scarce	KA2007-169, KA2007-170; /MV Bulb.
Noctuidae				
Achaea janata (Linnaeus 1758) Croton moth	adv	2002	Common	BL2002-57, BL2002-83, BL2002-163A; /MV & Blacklight, MV Bulb.
Agrotis cf. *dislocata* (Walker 1856)	end	2002		BL2002-84; /MV Bulb.
Agrotis ipsilon (Hufnagel 1767) Greasy cutworm	adv	2002	Common	BL2002-57, BL2002-84, BL2002-163A; /MV & Blacklight, MV Bulb.
Amyna natalis (Walker 1858)	adv	NIR 2002	Common	KM2003-36; /MV Bulb.
Anomis flava (Fabricius 1775)	adv	NIR 2006	Scarce	KA2007-18, KA2007-20, KA2007-59; /Host Search, MV Bulb.
Ascalapha odorata (Linnaeus 1758) Black witch	adv	2002	Uncommon	BL2002-83, BL2002-166; /MV Bulb.
Athetis thoracica (Moore 1884)	adv	2002	Common	BL2002-53, BL2002-57, BL2002-82, BL2002-164, BL2002-165, BL2002-166, KM2003-39, KA2007-57, KA2007-169; /MV Bulb.
Chrysodeixis eriosoma (Doubleday 1843)	adv	2002	Common	BL2002-53, BL2002-57, BL2002-78,BL2002-84; /MV Bulb.
Condica dolorosa (Walker 1865)	adv	NIR 2006	Scarce	KM2003-84; /Malaise Trap.
Condica illecta (Walker 1865)	adv	2002	Uncommon	BL2002-83; /MV Bulb.
Ctenoplusia cf. *albostriata* Bremer & Gray, 1853	adv	NSR 2002	Scarce	BL2002-57; /MV Bulb.
Elaphria nucicolora (Guenee 1852)	adv	2002	Common	BL2002-53, BL2002-57, BL2002-83, BL2002-84, BL2002-163A, BL2002-166, BL2002-167, BL2002-168, BL2002-169, KM2003-36, KM2003-38, KM2003-39, KA2007-18, KA2007-169; /MV & Blacklight, MV Bulb.
Eublemma accedens (Felder & Rogenhofer, 1874)	adv	NIR 2002	Common	BL2002-57, BL2002-81, BL2002-83, BL2002-84, BL2002-163A, KM2003-38, KM2003-40, KA2007-18, KA2007-59, KA2007-170; /MV & Blacklight, MV Bulb.
Hypena laceratalis Walker 1858 Lantana looper	pur	2002	Common	BL2002-84, BL2002-163A, BL2002-166, KA2007-170; /MV & Blacklight, MV Bulb.
Hypocala deflorata (Fabricius 1793)	adv	NTL 2007	Scarce	KA2007-59; /MV Bulb.
Leucania loreyimima Rungs 1953	adv	NIR 2002	Uncommon	BL2002-83; /MV Bulb.
Leucania cf. *scottii* Butler 1886	adv	NIR 2002	Uncommon	BL2002-82; /MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: LEPIDOPTERA: (continued)				
Noctuidae (continued)				
Leucania cf. *striata* Leech 1900	adv	2002	Uncommon	BL2002-83; /MV Bulb.
Lycophotia porphyrea (Denis & Schiffermueller, 1775) black cutworm	adv	2002	Uncommon	BL2002-60; /General.
Melipotis indomita (Walker 1857)	adv	2002	Common	BL2002-53, BL2002-76A, BL2002-83, BL2002-163A, BL2002-165, BL2002-166, BL2002-167, BL2002-169, KM2003-35B, KM2003-36, KM2003-39, KM2003-42, KA2007-18, KA2007-57, KA2007-60, KA2007-169, KA2007-170, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb.
Polydesma boarmoides Guenee 1852	adv	2002	Scarce	BL2002-167, KM2003-40, KA2007-297; /General, MV Bulb.
Pseudaletia unipuncta (Haworth 1809)	adv	2002	Common	BL2002-82, KA2007-168; /MV Bulb.
Schrankia altivolans (Butler 1880)	end	2002	Local	BL2002-82, BL2002-167; /MV Bulb.
Simplicia caeneusalis (Walker 1858)	adv	2002	Common	BL2002-53, BL2002-57, BL2002-82, BL2002-163A, BL2002-165, KM2003-38, KA2007-168; /MV & Blacklight, MV Bulb.
Spodoptera mauritia (Boisduval 1833)	adv	2002	Scarce	BL2002-83, KM2003-37; /MV Bulb.
Trichoplusia ni (Huebner 1802) Cabbage looper	adv	2002	Uncommon	BL2002-83; /MV Bulb.
Nymphalidae				
Agraulis vanillae (Linnaeus 1758) Gulf fritillary	adv	2002	Uncommon	No specimens collected; visual records.
Danaus plexippus (Linnaeus 1758) Monarch	adv	2002	Common	No specimens collected; visual records.
Vanessa cardui (Linnaeus 1758) *Painted lady*	adv	2002	Common	BL2002-218; /General .
Oecophoridae				
Ethmia nigroapicella (Saalmueller 1880) Kou moth	adv	2002	Uncommon	BL2002-82, KM2003-40, KA2007-57, KA2007-103; /General, MV Bulb.
Thyrocopa epicapna (Meyrick 1883)	end	2002	Local	BL2002-163A, BL2002-164, BL2002-169; / MV & Blacklight, MV Bulb.
Olethreutidae				
Crocidosema cf. *blackburni* (Butler 1910)	end?	2002	Scarce	BL2002-53, BL2002-83; /MV Bulb.
Crocidosema lantana Busck 1910	pur	2002	Uncommon	BL2002-83, BL2002-84, KA2007-168, KA2007-169, KA2007-170; /MV Bulb.
Crocidosema leprara (Walsingham 1907)	end	NIR 2002		BL2002-53, BL2002-81, BL2002-82, BL2002-163A, BL2002-169, KA2007-169, KA2007-170; /MV & Blacklight, MV Bulb.
Cryptophlebia illepida (Butler 1882)	end?	2002	Common	BL2002-53, BL2002-83, KA2007-18, KA2007-60, KA2007-168, KA2007-169, KA2007-170; /MV Bulb.
Cryptophlebia ombrodelta (Lower 1898)	adv	2002	Common	BL2002-163A, BL2002-164, BL2002-165, BL2002-168, BL2002-169, KA2007-169, KA2007-170; /MV & Blacklight, MV Bulb.
Papilionidae				
Papilio xuthus (Linnaeus 1767) Citrus swallowtail	adv	2002	Common	BL2002-216; /General .
Pieridae				
Pieris rapae (Linnaeus 1758) Cabbage white	adv	2002	Common	BL2002-216; /General .

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: LEPIDOPTERA: (continued)				
Plutellidae				
Plutella xylostella (Linnaeus 1758) Diamond-back moth	adv	2002	Scarce	BL2002-53, BL2002-57; /MV Bulb.
Psychidae				
Brachycyttarus griseus De Joannis 1929	adv	NIR 2002	Common	KM2003-51, KM2003-86, KA2007-123; /General, Host Search.
Pterophoridae				
Lioptilodes cf. *parvus* (Walsingham 1880)	adv	NIR 2011		KA2007-169; /MV Bulb.
Megalorhipida leucodactylus (Fabricius, 1794)	adv	NTL 2011		KM2003-36; /MV Bulb.
Stenoptiloides sp. A	adv	2002	Uncommon	BL2002-82, BL2002-84, KM2003-40, KA2007-18, KA2007-125; /Gas Aspirator, MV Bulb.
Pyralidae				
Ectomyelois ceratoniae (Zeller 1839)	adv	NIR 2011		KA2007-169, KA2007-170; /MV Bulb.
Elasmopalpus lignosellus (Zeller 1848)	adv	2002	Scarce	BL2002-57, KA2007-169; /MV Bulb.
Ephestiodes gilvescentella Ragonot 1887	adv	2002	Common	BL2002-35, BL2002-53, BL2002-57, BL2002-76A, BL2002-81, BL2002-82, BL2002-83, BL2002-163, BL2002-164, BL2002-165, BL2002-166, BL2002-167, BL2002-168, BL2002-169, KM2003-36, KM2003-37, KM2003-38, KM2003-39, KM2003-40, KM2003-41, KM2003-42, KA2007-18, KA2007-57, KA2007-59,/ Malaise Trap, MV & Blacklight, MV Bulb. Most MV sites.
Galleria mellonela (Linnaeus 1758) Greater wax moth	adv	NTL 2007	Scarce	KA2007-57; /MV Bulb.
Loryma cf. *recusata* (Walker 1863) [Listed in 2007 as unknown Crambidae]	adv	NSR 2011	Scarce	BL2002-166, KA2007-60; /MV Bulb.
Sphingidae				
Agrius cingulata (Fabricius 1775) Sweet potato hornworm	adv	2002	Uncommon	KA2007-169; /MV Bulb.
Deilephila nerii (Linnaeus 1758) Oleander hawk moth	adv	2002	Local	BL2002-303; /Host Search.
Hippotion boerhaviae Fabricius 1775 [Mis identified as *H rosetta*]	adv	NIR 2002	Common	BL2002-45A, BL2002-53, BL2002-219, KA2007-19; /Gas Aspirator, Host Search, MV Bulb.
Hyles lineata (Fabricius 1775) White-lined sphinx	adv?	2002	Scarce	BL2002-219; /Host Search.
Manduca blackburni (Butler 1880) Blackburn's sphinx (U.S. Federally listed endangered species).	end	2002	.	BL2002-331, KA2007-133, KA2007-170; /Host Search, MV Bulb. Many sight records on tree tobacco. No specimens collected
Tineidae				
Dryadaula terpsichorella (Busck 1910)	adv	2002	Common	BL2002-53, BL2002-163A, BL2002-166,KA2007-121, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb, Tulgren Funnel (Berlese).
Erechthias minuscula (Walsingham 1907)	adv	2002	Common	BL2002-53, BL2002-57, BL2002-82, BL2002-163A, BL2002-166, BL2002-168, KM2003-38, KM2003-39, KM2003-42, KA2007-18, KA2007-169, KA2007-170, KA2007-171;/Malaise Trap, MV & Blacklight, MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: LEPIDOPTERA: (continued)				
Tineidae (continued)				
Erechthias simulans (Butler 1882)	adv	NIR 2002	Uncommon	BL2002-53, BL2002-83, BL2002-84, BL2002-163, BL2002-166, KM2003-37, KM2003-39, KM2003-41, KA2007-169, KA2007-170; /MV & Blacklight, MV Bulb.
Monopis meliorella (Walker 1863)	adv	NIR 2002	Scarce	BL2002-84, KM2003-37; /MV Bulb.
Opogona aurisquamosa (Butler 1881)	adv	2002	Uncommon	BL2002-166; /MV Bulb.
Opogona omoscopa (Meyrick 1893)	adv	2002	Local	BL2002-83, BL2002-84, BL2002-163, BL2002-163A, KM2003-36, KA2007-18, KA2007-168; /MV & Blacklight, MV Bulb.
Phereoeca allutella (Rebel 1892)	adv	2002	Uncommon	BL2002-358, KM2003-53; /General.
Tineidae genus sp. A	adv	NSR 2006	Common	BL2002-81, BL2002-166, KA2007-169, KA2007-170; /MV Bulb.
Trichophaga mormopis Meyrick 1935	adv	2002	Uncommon	BL2002-83; /MV Bulb.
Tortricidae				
Amorbia imigratella Busck 1910	adv	NTL 2007	Scarce	KA2007-57; /MV Bulb.
Bactra venosana (Zeller 1847)	pur	2002	Common	BL2002-53, BL2002-57, BL2002-76A, BL2002-81, BL2002-163A, BL2002-167, KM2003-38, KM2003-39, KA2007-18, KA2007-170, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb.
Episimus utilis Zimmerman 1978	pur	2002	Scarce	BL2002-53; /MV Bulb.
Lorita scarificata (Meyrick 1917)	adv	NIR 2002	Common	BL2002-35, BL2002-57, BL2002-81, BL2002-83, BL2002-84, BL2002-163, BL2002-163A, BL2002-164, BL2002-165, BL2002-166, BL2002-167, BL2002-168, BL2002-169, KM2003-36, KM2003-37, KM2003-41, KM2003-42, KA2007-18, KA2007-57, KA2007-168, KA2007-169, KA2007-170, KA2007-171; /Malaise Trap, MV & Blacklight, MV Bulb.
Platynota stultana Walsingham 1884	adv	NIR 2002	Common	BL2002-35, BL2002-53, BL2002-57, BL2002-81, BL2002-82, BL2002-83, BL2002-84, BL2002-163, BL2002-165, BL2002-166, BL2002-167, BL2002-168, BL2002-169, KM2003-36, KM2003-39, KM2003-41, KA2007-57, KA2007-59, KA2007-169, KA2007-170; /MV & Blacklight, MV Bulb.
INSECTA: MANTODEA (Mantids)				
Mantidae				
Hierodula patellifera (Serville 1839)	adv	2002	Common	BL2002-215C, KM2003-36, KM2003-40; /Gas Aspirator, MV Bulb.
Tenodera australasiae (Leach 1815)	adv	2002	Common	BL2002-60, BL2002-73E, BL2002-235, BL2002-237, KM2003-39, KA2007-169, KA2007-171; /Gas Aspirator, General, Malaise Trap, MV Bulb.
INSECTA: NEUROPTERA (Lacewings)				
Chrysopidae				
Chrysoperla comanche (Banks 1938)	adv	2002	Common	BL2002-61, BL2002-78, BL2002-81, BL2002-82, BL2002-83, BL2002-84, BL2002-165, BL2002-166, BL2002-168, KM2003-36, KM2003-42, KM2003-82, KA2007-18, KA2007-60, KA2007-104, KA2007-148, KA2007-265; /Gas Aspirator, General, MV Bulb, Sticky Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: NEUROPTERA: (continued)				
Coniopterygidae				
Coniocompsa zimmermani Kimmins 1953	adv	2002	Scarce	BL2002-21, BL2002-26, BL2002-30, KA2007-65, KA2007-265; /Gas Aspirator, Malaise Trap, Sticky Trap.
Hemerobiidae				
Micromus timidus Hagen 1853	pur	2002	Local	BL2002-169, KA2007-65; /Malaise Trap, MV & Blacklight.
Sympherobius barberi (Banks 1903)	pur	2002	Uncommon	BL2002-223, KM2003-35A, KM2003-36, KM2003-37, KM2003-39; /Malaise Trap, MV Bulb.
INSECTA: ODONATA (Dragonflies & damselflies)				
Aeshnidae				
Anax junius (Drury 1770) Green darner	ind	2002	Common	No Specimens recorded. Numerous visual sightings, one spm with HDOA on Maui.
Coenagrionidae				
Ischnura ramburii (Selys-Longchamps, 1850)	adv	2002	Common	BL2002-55A, BL2002-55B, BL2002-260, BL2002-312, KM2003-39, KA2007-102, KA2007-105, KA2007-107, KA2007-108, KA2007-110; /Gas Aspirator, General, MV Bulb, Sweep Net.
Libellulidae				
Orthemis ferruginea (Fabricius 1775)	adv	2002	Common	BL2002-342; /Sweep Net.
Pantala flavescens (Fabricius 1798) Globe skimmer	ind	2002	Common	BL2002-343; /General.
INSECTA: ORTHOPTERA (Grasshoppers, crickets & katydids)				
Acrididae				
Oedaleus abruptus (Thunberg 1815)	adv	2002	Common	BL2002-166, BL2002-325, BL2002-326; /General, MV Bulb.
Schistocerca nitens (Thunberg 1815)	adv	2002	Common	BL2002-57, BL2002-60, BL2002-327, KA2007-101, KA2007-2; /Gas Aspirator, General, MV Bulb.
Gryllidae				
Cycloptiloides americanus (Saussure 1870)	adv	NIR 2011		BL2002-346; /General.
Gryllus bimaculatus DeGeer 1773	adv	2002	Scarce	BL2002-57, BL2002-174; /MV Bulb, Sweep Net.
Modicogryllus siamensis Chopard 1961	adv	2002	Common	BL2002-53, BL2002-81, BL2002-163A, BL2002-164, KM2003-40, KA2007-42, KA2007-57, KA2007-125, KA2007-168, KA2007-170; KA2007-2; /Gas Aspirator, MV & Blacklight, MV Bulb.
Trigonidomorpha sjostedti Chopard 1926	adv	2002	Scarce	BL2002-45, KM2003-39, KM2003-74, KA2007-2, KA2007-42, KA2007-168, KA2007-169; / Gas Aspirator, MV Bulb, Sweep Net.
Pyrgomorphidae				
Atractomorpha sinensis Bolivar 1905	adv	2002	Common	BL2002-129, BL2002-163A, BL2002-328, BL2002-329, KM2003-21, KA2007-2, KA2007-42, KA2007-148; / Gas Aspirator, General, Host Search, MV & Blacklight.
Tetrigidae				
Paratettix mexicanus (Saussure 1861)	adv	NIR 2006	Scarce	BL2002-129, KM2003-74, KA2007-42; /Gas Aspirator,Sweep Net.
Tettigoniidae				
Conocephalus saltator (Saussure 1859)	adv	NTL 2006	Uncommon	BL2002-84, KM2003-40, KM2003-68, KA2007-104, KA2007-2, KA2007-171, KA2007-192; /Gas Aspirator, General, Malaise Trap, MV Bulb, Sweep Net.
Elimaea punctifera (Walker 1869)	adv	NIR 2002	Common	BL2002-77C, BL2002-330, KA2007-65, KA2007-171; /Malaise Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: ORTHOPTERA (continued)				
Tettigoniidae (continued)				
Euconocephalus nasutus (Thunberg 1815)	adv	2002	Common	BL2002-60, BL2002-326, BL2002-331, KM2003-39, BL2002-288; /General, Host Search, Malaise Trap, MV Bulb.
Phaneroptera furcifera Stal 1874	adv	NIR 2007		KM2003-39, KA2007-169; /MV Bulb.
INSECTA: PSOCOPTERA (Bark lice, psocids)				
Archipsocidae				
Archipsocus sp. A	adv	NSR 2006	Local	KM2003-27, KA2007-67, KA2007-158, KA2007-159; /Lingren Funnels (Beetle trap), Host Search, Window Trap.
Caeciliidae				
Stenocaecilius analis (Banks 1931)	adv	NTL 2011		BL2002-73K, KA2007-159, KA2007-168; /Malaise Trap, MV Bulb, Window Trap.
Stenocaecilius casarum (Badonnel 1931)	adv	NTL 2011		BL2002-45, BL2002-72A, BL2002-79, BL2002-81, KA2007-103, KA2007-159, KA2007-172; / Lingren Funnels (Beetle trap), Gas Aspirator, General, Malaise Trap, MV Bulb, Window Trap.
Ectopsocidae				
Ectopsocus perkinsi Banks 1931	adv	NIR 2011		BL2002-215A; /Gas Aspirator.
Ectopsocus cf. *richardsi* (Perlman 1929)	adv	NTL 2011		BL2002-5A; /Gas Aspirator.
Ectopsocus spilotus Thornton & Wong, 1968	adv	NIR 2011		BL2002-5A, BL2002-21, BL2002-45A, BL2002-53, BL2002-73K, KA2007-38, KA2007-67, KA2007-159; / Gas Aspirator, Malaise Trap, MV Bulb, Window Trap.
Elipsocidae				
Kilauella sp. A	end	NTL 2011		BL2002-53, BL2002-55C, BL2002-72A, BL2002-73K, BL2002-215A, KA2007-159; /Gas Aspirator, Malaise Trap, MV Bulb, Window Trap.
Hemipsocidae				
Hemipsocus roseus (Hagen 1859)	adv	NTL 2006		BL2002-81, KM2003-39; /MV Bulb.
Lachesillidae				
Lachesilla pedicularia (Linnaeus 1758)	adv	NIR 2011		BL2002-73K, BL2002-81, BL2002-83, KA2007-67, KA2007-159, KA2007-168; /Malaise Trap, MV Bulb, Window Trap.
Lepidopsocidae				
Echmepteryx madagascariensis (Kolbe, 1885)	adv	NTL 2011		KA2007-159; /Window Trap.
Lepidopsocus maculatus Thornton, Lee & Chui, 1972	adv	NTL 2007	Local	KM2003-35A, KA2007-48, KA2007-67, KA2007-158, KA2007-159; / Lingren Funnels (Beetle trap), Host Search, Malaise Trap, Window Trap.
Lepidopsocus marmoratus Banks 1931	adv	NTL 2011		KA2007-67, KA2007-158, KA2007-159; / Lingren Funnels (Beetle trap), Window Trap.
Liposcelidae				
Liposcelis cf. *divinatorius* (Mueller 1776) Book louse	adv	NIR 2002	Common	BL2002-21, KM2003-82, KA2007-67, KA2007-158, KA2007-159, KA2007-171; / Lingren Funnels (Beetle trap), Gas Aspirator, Malaise Trap, Window Trap.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
INSECTA: PSOCOPTERA (continued)				
Myopsocidae				
Myopsocus sp. A [Listed in2007 report as *Ptycta* sp A]	adv	NSR 2011		KA2007-18, KA2007-37, KA2007-48, KA2007-171; / Fogging, Host Search, Malaise Trap, MV Bulb.
Pachytroctidae				
Tapinella formosana Enderlein 1908	adv	NTL 2011		KA2007-159; /Window Trap.
Peripsocidae				
Peripsocus cf. *nitens* Thornton & Wong, 1968	ind?	NTL 2011		BL2002-79, BL2002-81, BL2002-83, KA2007-18; /MV Bulb.
Philotarsidae				
Aaroniella sp. A	adv	NSR 2011		KM2003-37, KA2007-18, KA2007-57, KA2007-159; /MV Bulb, Window Trap.
Haplophalus sp. A	adv	NSR 2011		BL2002-83, BL2002-118, KA2007-18, KA2007-65, KA2007-159; /Beating Sheet, Malaise Trap, MV Bulb, Window Trap.
Pseudocaeciliidae				
Pseudocaecilius criniger (Perkins 1899)	adv	NTL 2011		BL2002-79, BL2002-81, KA2007-168; /MV Bulb.
Psocidae				
Ptycta sp. B	end	NTL 2011		BL2002-99, KA2007-48; /Gas Aspirator, Host Search.
Ptycta sp. C	end	NTL 2011		BL2002-45A, BL2002-72A; /Gas Aspirator, Malaise Trap.
INSECTA: SIPHONAPTERA (Fleas)				
Pulicidae				
Ctenocephalides felis (Bouche 1835) Cat flea	adv	2002	Scarce	BL2002-358; /General.
INSECTA: STREPSIPTERA (Twisted-winged parasites)				
Stylopidae				
Xenos auriferi Pierce 1911	adv	2002	Common	BL2002-73E; /Malaise Trap.
INSECTA: THYSANOPTERA (Thrips)				
Phlaeothripidae				
Gynaikothrips ficorum (Marchal 1908)	adv	NTL 2006	Uncommon	Specimens not yet recorded.
Thripidae				
Heliothrips heamorrhoidalis (Bouche 1833)	adv	2002	Common	BL2002-182, BL2002-188, BL2002-208A; / Lingren Funnels (Beetle trap), Fogging, Tulgren Funnel (Berlese).
INSECTA: THYSANURA (Silverfish)				
Lepismatidae				
Ctenolepisma longicaudatum Escherich, 1905	adv	NIR 2002	Common	BL2002-345, BL2002-359; /General.
INSECTA: TRICHOPTERA (Caddisflies)				
Hydropsychidae				
Cheumatopsyche pettiti (Banks 1908)	adv	2002	Common	BL2002-81, BL2002-82, BL2002-168, KM2003-37, KA2007-18, KA2007-169, KA2007-170; /MV Bulb.
Hydroptilidae				
Oxyethira maya Denning 1947	adv	2002	Uncommon	BL2002-35, KM2003-36, KM2003-38, KM2003-39; /MV Bulb.

ARTHROPOD FAUNA NAME	Status[2] in Hawai'i	Status[3] on Maui	Incidence[4]	Collection Station Numbers / Methods
CRUSTACEA: AMPHIPODA (Sandhoppers)				
Talitridae				
Talitridae genus sp. A	end/ind	2002	Local	BL2002-128, KA2007-56; /General, Pitfall Trap.
CRUSTACEA: ISOPODA (Pillbugs & sowbugs)				
Armadillididae				
Armadillidium vulgare (Latreille 1804)	adv	NIR 2006	Uncommon	KM2003-86, KM2003-90, KA2007-101, KA2007-103, KA2007-104, KA2007-121; /Gas Aspirator, General, Tulgren Funnel (Berlese).
Ligiidae				
Ligia hawaiensis Dana 1853	end	NTL 2007	Uncommon	KA2007-47; /General .
Philosciidae				
Littorophiloscia culebrae (Moore 1901)	adv	NIR 2011		KA2007-47; /General.
Platyarthridae				
Niambia sp. A	adv?	NIR 2011		KA2007-67; /Window Trap. Recorded from Oahu by Taiti & Ferrara, 1991.
Trichorhina tomentosa (Budd-Lund 1885)	adv	NTL 2011		KA2007-121; /Tulgren Funnel (Berlese).
Porcellionidae				
Porcellio laevis Latreille 1804	adv	2002	Common	BL2002-30, BL2002-60, BL2002-320, KM2003-54, KA2007-64, KA2007-67, KA2007-103, KA2007-121, KA2007-122, KA2007-159; /Gas Aspirator, General, Tulgren Funnel (Berlese), Window Trap.
Porcellionides pruinosus (Brandt 1833)	adv	NTL 2006	Common	BL2002-30, BL2002-324, KM2003-54, KM2003-86, KA2007-14, KA2007-56, KA2007-58, KA2007-64, KA2007-101; /Gas Aspirator, General, Pitfall Trap, Sifting Litter, Window Trap.
Scyphacidae				
Alloniscus oahuensis Budde-Lund 1879	adv	2002	Local	BL2002-70, BL2002-172; /General, Yellow Pan Trap.
CHILOPODA: GEOPHILOMORPHA (Soil Centipedes)				
Mecistocephalidae				
Mecistocephalus cf. *spissus* Wood 1862	adv	NTL 2007	Scarce	KA2007-117; / Tulgren Funnel (Berlese).
CHILOPODA: SCOLOPENDROMORPHA (Giant Centipedes)				
Scolopendridae				
Scolopendra subspinipes Leach 1815 Giant centipede	adv	2002	Common	BL2002-10B; /General.
DIPLOPODA: POLYDESMIDA (Flat-backed millipedes)				
Paradoxosomatidae				
Oxidus gracilis (C.L. Koch 1847) Garden millipede	adv	NTL 2006	Scarce	BL2002-107B; /Beating Sheet.
DIPLOPODA: POLYXENIDA (Bristletail millipedes)				
Polyxenidae				
Polyxenus sp. A	end?	NSR? 2006	Local	KM2003-69, KM2003-74; /Sifting Litter, Sweep Net.

[1] = Names and arrangement follow Nishida (2002), except where updated.
[2] = **Biogeographic Status: end**=endemic to HIs, **ind**=indigenous to HIs, **adv**=adventive, **pur**=purposefully introduced, **unk**=Unknown,
[3] = **Status on Maui: NIR** = new island record, with year reported; **NSR** = new state record, with year reported; and **NTL =** new to list, with year first listed.
[4] = Incidence: .A subjective measure of commonness with the Kahului Airport environs.

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APPENDIX VI

ADDITIONS AND DELETIONS MADE TO THE COMPREHENSIVE LIST OF SPECIES OF TERRESTRIAL ARTHROPODS KNOWN FROM THE KAHULUI AIRPORT ENVIRONS.

TAXA	Species	Action	
ARACHNIDA: Acari:			
Erythraeidae	Erythraeidae Genus sp A	deleted	unk[1]
Tyroglyphidae	Tyroglyphidae Genus sp A	deleted	unk
Phytoseiidae	*Amblyseius* sp_A		unk
Tenuipalpidae	Tenuipalpidae genus_sp_A		unk
Uropodina: Family?	Family? Genus sp.A	deleted	unk
ARACHNIDA: Araneae			
Dysderidae	*Dysdera crocata* C.L. Koch 1838	deleted	adv
Lycosidae	*Hogna* sp. A [Name and status revised – *Lycosa* sp A end?]	**NSR**[2]	adv
Lycosidae	– *Lycosa* sp A [Name and status revised *Hogna* sp. A]	**NSR**[2]	end?
Nesticidae	*Eidmannella pallida* (Emerton 1875)	**NIR**	adv
Oecobiidae	*Oecobius navus* Blackwell, 1859	**NIR**	adv
Oonopidae	Oonopidae genus sp A	**NIR**	end?
Salticidae	*Habronattus tarsalis* (Banks 1904)	**NIR**	adv
Scytodidae	*Scytodes longipes* Lucas 1845		adv
Theridiidae	*Coleosoma adamsoni* (Berland 1934)	**NIR**	adv
INSECTA: Coleoptera			
Aderidae	*Xylophilus* cf. sp. A	**NSR**	adv
Anobiidae	*Tricorynus herbarium* (Gorham 1883)	deleted	adv
Carabidae	*Gnathaphanus picipes* (Csiki 1915)	deleted	adv
Chrysomelidae	*Monoxia minuta* Blake 1939	**NIR**	adv
Coccinellidae	*Delphastus pusillus* (LeConte 1852)	deleted	pur
	Hippodamia convergens Guerin-Meneville 1844	deleted	pur
Corylophidae	Corylophidae genus sp. A [Name revised - *Sericoderus ?pubipennis*]		unk
	Sericoderus ?pubipennis [Name revised - Corylophidae genus sp. A]	deleted	end?
Curculionidae	*Crossotarsus externedentatus* (Fairmaire 1850)	deleted	adv
	Hypothenemus cf. *pulverulentus* (Eichhoff 1872)	deleted	adv
	Pantomorus cervinis [Name revised - *Asynonychus godmanni*]		adv
	Sphenophorus cariosus Olivier 1807	**NIR**	adv
Monotomidae	*Monotoma picipes* Herbst 1793		adv
Nitidulidae	*Aethina concolor* (Macleay, 1872) [Recorded by Ewing & Cline 2004]		adv
Staphylinidae	*Carpelimus* sp. D	**NSR**	adv
	Philonthonus nr *discoides*	deleted	adv
	Pselaphinae genus sp A	**NSR**	adv
	Sunius sp B	deleted	adv
INSECTA: Collembola	Family Genus sp. A		unk
INSECTA: Diptera			
Agromyzidae	*Ophiomyia* sp A NTL 2011		adv
Anthomyzidae	*Amygdalops thomasseti* Lamb 1914		adv
	Mumetopia nigrimana (Coquillett 1900)		adv

[1] Biogeographic status: end = endemic (found naturally only in HI); ind = indigenous (occurring naturally in HI and elsewhere); adv = adventive (inadvertently introduced into HI); pur = purposefully introduced; unk = of unknown origin.

[2] Historic status: NSR = New state record; NIR = New island record on Maui.

Appendix VI. (continued)

TAXA	Species	Action	
INSECTA: Diptera (continued)			
Asilidae	*Leptopteromyia mexicanae* Martin 1971	**NSR**	adv
Calliphoridae	*Lucilia cuprina* (Wiedemann 1830)		adv
	Rhinia apicalis (Wiedemann 1830)		adv
Canacidae	*Dasyrhicnoessa fulva* (Hendel 1913) [Name revised - D. sp. A]		ind?
	Dasyrhicnoessa vockerothi Hardy & Delfinado 1980 [Name revised - *D.* sp B]	**NIR**	ind?
Cecidomyiidae	*Anarete johnsoni* Felt 1906 [Name revised - genus sp. B]		adv
	Contarinia cf. *maculipennis* Felt 1933 [Name revised - genus sp. C]		adv
Ceratopogonidae	*Atrichopogon levis* (Coquillett 1901) [Name revised - *A.* sp. A]	**NSR**	adv
	Forcipomyia borbonica Clastrier 1959	**NIR**	adv
Chironomidae	*Ablabesmyia* sp A [Name revised - genus sp. A]	**NSR**	adv
	Corynoneura sp A	**NIR**	adv
	Orthocladius sp A [Name revised - *O. williamsi*]	**NSR?**	end
	Orthocladius sp B	**NSR?**	end
Chloropidae	*Coniscinella formosa* (Becker 1911)	deleted	adv
	Meromyza communis Fedoseeva 1971 [Name revised - *M.* sp A]		adv
Ephydridae	*Discomyza maculipennis* (Weidemann 1824)	**NIR**	adv
	Ephydra gracilis Packard 1871	**NIR**	adv
Limoniidae	*Libnotes perkinsi* (Grimshaw 1901)		adv
Lonchaeidae	*Lonchaea polita* Say 1830 [Name revised – *L.* sp A]		adv
Milichiidae	*Milichia orientalis* Malloch 1913	**NIR**	adv
Muscidae	*Hydrotaea chalcogaster* (Wiedemann 1824)		adv
	Musca domestica Linnaeus 1758		adv
Periscelididae	*Stenomicra* cf. *fascipennis* Malloch 1927	**NIR?**	adv
Phoridae	*Megaselia* cf. *brunnelpalpata* Beyer 1964	**NIR?**	end
	Megaselia curtineura (Brues 1912)		adv
	Megaselia furcatalis Beyer 1964	deleted	end
Pipunculidae	Pipunculidae genus sp. A		end
Platystomatidae	*Scholastes bimaculatus* (Hendel 1914)	deleted	adv
Sarcophagidae	*Sarcophaga albiceps* Meigen 1826		adv
	Sarcophaga princeps Wiedemann 1830	**NIR**	adv
	Sarcophaga ruficornis (Fabricius 1794)	**NIR**	adv
	Tricharaea occidua (Fabricius 1794)		adv
Scatopsidae	*Holoplagia guamensis* (Johannsen 1946)	**NIR**	adv
	Psectrosciara brevicornis Johannsen 1946		adv
	Scatopse sp. A	deleted	adv
Scenopinidae	*Scenopinus lucidus* Becker 1902	**NIR**	adv
	Scenopinus sp A	deleted	adv
Sciaridae	*Bradysia* sp A		adv
INSECTA: Hemiptera: Heteroptera			
Anthocoridae	Anthocoridae genus sp A		adv
Corixidae	*Trichocorixa reticulata* (Guerin-Meneville 1857)		adv
Nabidae	*Stenonabis* sp A [Name revised - *Nabis* sp. A]	**NSR**	adv
Pentatomidae	*Piezodorus hybneri* [Name revised - *P.* sp A]	**NIR**	adv
Reduviidae	*Ploiaria macrophthalma* (Dohrn 1860)	**NIR**	adv
	Polididus armatissimus Stal 1859		adv
INSECTA: Hemiptera: Homoptera			
Aleyrodidae	*Aleurothrixus floccosus* (Maskell 1896)		adv
Aphidae	*Cerataphis orchidearum* (Westwood 1879) **[**Name revised - *Aphis* sp. A]		adv

Appendix VI. (continued)

TAXA	Species	Action	
INSECTA: Hemiptera: Homoptera (continued**)**			
Cicadellidae	6 unidentified species	deleted	unk
Coccidae	*Coccus* cf. *hesperidum* Linnaeus 1758		adv
Delphacidae	*Opiconsiva paludum* (Kirkaldy 1910)	**NIR**	adv
Diaspididae	Diaspididae genus sp A (poss. *Fiorinia* sp)		adv
	Lepidosaphes beckii (Newman 1869)		adv
Pseudococcidae:	*Palmicultor palmarum* (Ehrhorn 1916)	deleted	adv
INSECTA: Hymenoptera			
Aphelinidae	Aphelinidae genus sp A		adv
Bethylidae	un-identified genus sp A	deleted	adv
Dryinidae	Dryinidae genus sp A		pur?
Elasmidae	*Elasmus* sp	**NSR?**	adv
	Elasmus sp B	**NSR?**	adv
Eupelmidae	Eupelmidae genus sp A (*Anastatus* sp?)	**NSR?**	adv
Formicidae	*Cardiocondyla emeryi* Forel 1881		adv
	Cardiocondyla cf. *kagutsuchi* Terayama 1999		adv
	Cardiocondyla minutior Forel 1899		adv
	Hypoponera punctatissima (Roger 1859)		adv
	Leptogenys falcigera Roger 1861		adv
	Monomorium floricola (Jerdon 1851)		adv
	Monomorium pharaonis (Linnaeus 1758)		adv
	Paratrechina vaga (Forel 1901)		adv
	Tetramorium simillimum (F. Smith 1851)		adv
Mymaridae	*Polynema* sp. A	**NIR**	unk
Platygasteridae	Platygasteridae genus sp A	**NIR?**	adv
Platygasteridae	Platygasteridae genus sp B	**NIR?**	unk
Pteromalidae	*Anisopteromalus* cf. sp A		adv
Sceleonidae	*Telenomus* sp A	**NIR?**	unk
Sphecidae	*Tachysphex* sp A	deleted	adv
Trichogrammatidae	Trichogrammatidae genus sp A		adv
Vespidae	*Polistes olivaceus* (DeGeer 1773)	deleted	adv
INSECTA: Lepidoptera			
Choreutidae	*Choreutis* sp A [Name revised - unknown Lepidoptera: genus sp A]	**NSR**	adv
Crambidae	*Mestolobes* sp A	deleted	end
Noctuidae	*Schrankia altivolans* (Butler 1880) [Name revised - *S.* sp A]		end
Oecophoridae	*Thyrocopa epicapna* (Meyrick 1883) [Name revised - *T.* spp A & B]		end
	Thyrocopa sp B	deleted	end
Pterophoridae	*Lioptilodes* cf. *parvus* (Walsingham 1880)	**NIR**	adv
	Megalorhipida leucodactylus (Fabricius 1793)		adv
Pyralidae	*Ectomyelois ceratoniae* (Zeller 1839)	**NIR**	adv
Pyralidae	*Loryma* cf. *recusata* [Name revised - unknown Crambidae: genus sp A**]**	**NSR**	adv
INSECTA: Orthoptera			
Gryllidae	*Cycloptiloides americanus* (Saussure 1870)	**NIR**	adv

Appendix VI. (continued)

TAXA	Species	Action	
INSECTA: Psocoptera			
Caeciliidae	*Stenocaecilius analis* (Banks 1931)		adv
	Stenocaecilius casarum (Badonnel 1931)		adv
Ectopsocidae	*Ectopsocus perkinsi* Banks 1931	**NIR**	adv
	Ectopsocus cf. *richardsi* (Perlman 1929)		adv
	Ectopsocus spilotus Thornton & Wong 1968	**NIR**	adv
Elipsocidae	*Kilauella* sp A **[**Name revised - *Palistreptus inconstans* (Perkins)]		end
Lachesillidae	*Lachesilla pedicularia* (Linnaeus 1758)	**NIR**	adv
Lepidopsocidae	*Echmepteryx madagascariensis* (Kolbe 1885)		adv
	Lepidopsocus marmoratus Banks 1931 **[**Name revised - *L.* sp. A]		adv
Myopsocidae	*Myopsocus* sp A [Name revised - *Ptycta* sp A]		adv
Pachytroctidae	*Tapinella formosana* Enderlein 1908		adv
Peripsocidae	*Peripsocus* cf. *nitens* Thornton & Wong 1968		ind?
Philotarsidae	*Aaroniella* sp A	**NSR**	adv
	Haplophalus sp A	**NSR**	adv
Pseudocaeciliidae	*Pseudocaecilius criniger* (Perkins 1899)		adv
Psocidae	*Ptycta* sp A [Name revised - *Myopsocus* sp A]	deleted	end
Psocidae	*Ptycta* sp B		end
	Ptycta sp C		end
CRUSTACEA: Isopoda			
Philosciidae	*Littorophiloscia culebrae* (Moore 1901)	**NIR**	adv
Platyarthridae	*Niambia* sp A	**NIR**	adv
	Trichorhina tomentosa (Budd-Lund 1885)		adv

[1] Biogeographic status: end = endemic (found naturally only in HI); ind = indigenous (occurring naturally in HI and elsewhere); adv = adventive (inadvertently introduced into HI); pur = purposefully introduced; unk = of unknown origin.

[2] Historic status: NSR = New state record; NIR = New island record on Maui.

APPENDIX VII

NEW ISLAND RECORDS AND NEW STATE RECORDS OF ARTHROPOD SPECIES COLLECTED WITHIN THE KAHULUI AIRPORT ENVIRONS

In this annotated list, we present distribution records for 49 species of arthropods that were collected during the survey of terrestrial arthropods occurring within the Kahului Airport environs and that are herein newly recorded from Maui. This list supplements the list of new records given in Howarth & Preston (2007), and nine new records are based on revised names from the 2007 list. Of the 49 species, 43 are alien; three are native; and three are of unknown biogeographic status. Thirty-three species are new island records and 16 are new to the state. Nishida (2002) was the principal source used to determine the known island distribution of each species. Two species are pests of stored products (*Ectomyelois ceratoniae* and *Lachesilla pedicularia*) and probably have been on Maui for many years. The aquatic midge (*Ablabesmyia* species A) is a potential nuisance pest. The billbug (*Sphenophorus cariosus*) and metalmark moth (*Choreutis* sp. A) are potential plant pests; and the wolf spider (*Hogna* sp A) and nabid bug (*Stenonabis* species A) are generalist predators and potentially invasive in natural areas. The effects on the environment of the other species are unknown. Unless otherwise noted, identifications were made by FG Howarth. Vouchers specimens are deposited in the Hawaii Biological Survey at Bishop Museum with a duplicate set deposited in the insect collection of the Hawaii Dept of Agriculture.

ARACHNIDA: Araneae: Lycosidae

Hogna species A **New state record**

This species was first listed from Kahului in 2002 as *Lycosa* sp A and provisionally considered native; however, the form of the male pedipalp matches extra-limital species of *Hogna* rather than the native Hawaiian *Lycosa* wolf spiders. *Hogna* is the largest genus of wolf spiders with a nearly world-wide distribution. The Maui specimen may be *H. crispipes* (L. Koch, 1877), which is widespread in Australia and many Pacific islands (Framenau et al. 2006).

Material examined: **MAUI:** Kahului Airport, Wet spot #1, 20° 54' 15"N, 156° 26' 17"W, 5 Oct 1999, on bare ground at night, *FG. Howarth & DJ. Preston BL2002-354* (1 male).

Araneae: Nesticidae

Eidmannella pallida (Emerton 1875) **New island record**

Nesticids are small spiders resembling some Theridiidae. *Eidmenella pallida* builds flimsy cobwebs in leaf litter, under stones and in caves. It is locally common in Hawai‘i but rarely collected. It is widespread in North America and has been widely distributed by humans. It probably has been on Maui for many years.

Eidmannella pallida female,
A - ventral view
B – epigynum, ventral view
Photos by FGH

Material examined: **MAUI:** Kahului Airport, keawe-koa haole woodland, 20° 54' 26" N, 156° 25' 50" W, 18 Sep 2006-21 Oct 2006, window trap, *F.G. Howarth, D.J. Preston, F. & K Starr, & H Laederich KA2007-67* (1 male)

Araneae: Oecobiidae

Oecobius navus Blackwell 1859 **New island record**

This minute spider builds sheet webs in buildings and other cryptic habitats. It is easily transported by commerce and is nearly cosmopolitan. In Hawai‘i, it is also known from O‘ahu, Lana‘i, and Hawai‘i islands, but probably occurs on all the inhabited islands.

Material examined: **MAUI:** Kahului Airport, lawn and ornamental plantings, 20° 53' 34" N, 156° 26' 56" W, 2 Nov 1999, gas aspirator, D.J. Preston & J.E. Dockall, BL0029A (1 female).

Araneae: Oonopidae

Oonopidae genus species A **New island record**

Although unidentified, this species is different from the three species of oonopids (six-eyed jumping spiders) previously recorded from Maui. This species is considered native.

Material examined: **MAUI:** Kahului Airport, Wetland # 1, 20° 54' 25"N, 156° 26' 12"W, 24 Jul 2003 sifting *Causurina* litter, *F.G. Howarth, F. & K. Starr KM2003-69* (1 imm). Kanaha Pond, wetland, 20° 53' 53" N, 156° 27' 09" W, 21 Sep 2006, on ground, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou KA2007-58,* (1 female).

Araneae: Salticidae

Habronattus tarsalis (Banks 1904) **New island record**

This jumping spider is widely distributed in the tropics; its dispersal aided by human transport. It is surprising that it has not previously been reported from Maui.

Habronattus tarsalis, male
Right male pedipalp, ventral view

Photos by FGH

Material examined: **MAUI:** Kahului Airport, lawn near Rescue Fire Station, 20° 54' 07" N, 156° 25' 41" W, 18 Jul 2006, gas aspirator, *F.G. Howarth, D.J. Preston, F. & K. Starr & H. Laederich KA2007-13*. (2 males, 6 imm). Same except: gas aspirator, *Wedelia sphagneticola trilobata, KA2007-14*. (1 male, 1 female).

Araneae: Theridiidae

Coleosoma adamsoni (Berland 1934) **New island record**

This non-native cobweb spider was previously recorded from Kauaʻi, Hawaiʻi and Midway.

Material examined: **MAUI:** Kahului Airport, Keawe woodland, 20° 54' 26" N, 156° 25' 50" W, 25 Jun 2003-18 Jul 2003, Malaise trap, *F. & K. Starr, F.G. Howarth & D.J. Preston KM2003-35A.* (1 male, 1 female). Wetland # 1, *Cyperus javanicus* 20° 54' 16" N, 156° 26' 16" W, 18 Jul 2006, gas aspirator, *D.J. Preston, F. & K. Starr & F.G. Howarth KA2007-8* (1 male). Kanaha Pond, wetland, 20° 53' 53" N, 156° 27' 09" W, 21 Sep 2006, on ground, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & A. Ghotaslou KA2007-58,* (1 female). keawe-koa haole woodland, 20° 54' 26" N, 156° 25' 50" W, 18 Sep -21 Oct 2006, window trap, *F.G. Howarth, D.J. Preston, F. & K Starr, & H Laederich KA2007-67* (1 female). Keawe /koa haole woodland, 20° 54' 26" N, 156° 25' 50" W, 21 Oct -13 Nov 2006, Malaise trap, *F. & K. Starr, F.G. Howarth, D.J. Preston & H. Laederich KA2007-171*, (1 male).

INSECTA: Coleoptera: Aderidae

Xylophilus cf. sp. A **New state record**

Adults of many ant-like leaf beetles rest on the undersides of leaves, whereas the larvae live in rotting wood. This species is distinct from *X. marquesanus*, the only other aderid species recorded from Hawaiʻi. Both species occur in the study area and are compared in the figures below. Determination was made by GA Samuelson.

Material examined: **MAUI:** Kahului Airport, Wetland # 2 near Bike path, 20° 54' 29" N, 156° 25' 52" W, 29 Mar 2000, MV & Blacklight, *F.G. Howarth, D.J. Preston, G.A. Samuelson, K. Martz & F. Starr BL2002-163A* (1 spm). Wetspot #1 near beach, 20° 54' 26" N,156° 26' 12" W, 24 Jul 2003, Sweep Net, *D.J. Preston & F.G. Howarth KM2003-74* (1 spm).

Xylophilus cf. sp. A

Xylophilus marquesanus

Monoxia minuta

Automontage photos by S. Myers

Coleoptera: Chrysomelidae

Monoxia minuta Blake 1939 **New island record**

This leaf beetle is known from desert shrub lands in Baja California and first recorded on O‘ahu in 1962 from an adult reared from a larva on *Atriplex semibaccata* (Beardsley 1962). The larvae are leaf miners on *Atriplex* (Chenopodiaceae). The adult is figured above. This is the first report of the species spreading beyond O‘ahu. Species identification was made by DJ Preston.

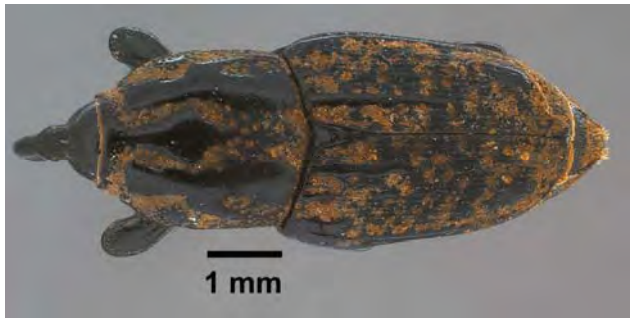
Material examined: **MAUI:** Kahului Airport, Koa haole scrub, 20° 54' 22" N, 156° 25' 56" W, 1 Feb 2000, Malaise trap # 1, *F.G. Howarth, D.J. Preston & J.E. Dockall BL2002-184* (1 spm). Triangle E of Kanaha Pond by canal, *Atriplex* sp., 20° 53' 50" N, 156° 26' 55" W, 17 Nov 2006, gas aspirator, *D.J. Preston, F. & K.Starr, & F.G. Howarth KA2007-221* (4 spms).

Coleoptera: Curculionidae

Sphenophorus cariosus Olivier 1807 **New island record**

The nut-grass billbug is native to eastern N. America and was accidentally introduced to Hawai‘i about 1956. It is considered a potential pest of nut-grass and other sedges in Hawai‘i. Nishida (2002) lists the species from Kaua‘i and O‘ahu, and herein recorded on Maui. Determination was made by GA Samuelson.

Material examined: **MAUI:** Kahului Airport, Wet Spot #3, dry, dead *Leucaena* branches, 20° 54' 29" N, 156° 25' 52" W, 27 Mar 2000 host search , *G.A. Samuelson BL2002-241* (1 spm).



Sphenophorus cariosus, dorsal

Sphenophorus cariosus, lateral

Automontage photos by S. Myers

Coleoptera: Staphylinidae

Carpelimus sp. D **New state record**

Nishida (2002) lists four species of *Carpelimus* none of which are known from Maui. Some these may be included among the three species previously listed from the airport area, but further taxonomic study is needed. *Carpelimus* species D is distinct from the three other species known from the airport area. Determination was made by GA Samuelson.

Material examined: **MAUI:** Kahului Airport, Behind T-shirt factory, Keawe/mixed understory woodland, 20° 53' 49" N, 156° 26' 58" W, 17 Nov 2006, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-170* (5 spms).

Coleoptera: Staphylinidae

Pselaphinae genus sp A **New state record**

This is the first pselaphine or short-winged mold beetle recorded from Hawai'i. These distinctive beetles were formerly classified as a separate family, but currently they are included as a subfamily of rove beetles. Pselaphines generally live in decaying leaf litter, grass tussocks and other cryptic habitats. They believed to be predaceous.

Material examined: **MAUI:** Kahului Airport, Malaise trap site #2, 20° 54' 16" N, 156° 25' 42" W, 3 Dec 1999-16 Dec 1999, Malaise trap, *F.G. Howarth & D.J. Preston BL2002-293* (1 spm).

INSECTA: Diptera: Asilidae

Leptopteromyia mexicanae Martin 1971 **New state record**

The asilids are called robber flies. The adults are predatory and usually hunt flying insects by sallying from a perch. This species prefers to hang from its perch and specializes in capturing soft-bodied homopterans (leafhoppers, planthoppers and relatives). This is the first record of this large family in Hawai'i. Species identification was made by N. Evenhuis and D. Preston.

Material examined: **MAUI:** Kahului Airport, keawe/koa haole/mixed understory woodland, 20° 54' 26" N,156° 25' 50" W, 18 Sep 2006-21 Oct 2006, Malaise trap, *F.G. Howarth, D.J. Preston, F. & K. Starr KA2007-157* (4 spms).

Diptera: Canacidae

Dasyrhicnoessa vockerothi Hardy & Delfinado 1980 **New island record**

This indigenous species was first recorded from Maui in 2006 under the name as *Dasyrhicnoessa* sp. B, family Tethinidae. The tethinids have recently been reclassified and included with the Canacidae (Munari & Evenhuis 2011). They are shore flies and scavenge on flotsam in the littoral zone. Species identification was made by FG Howarth.

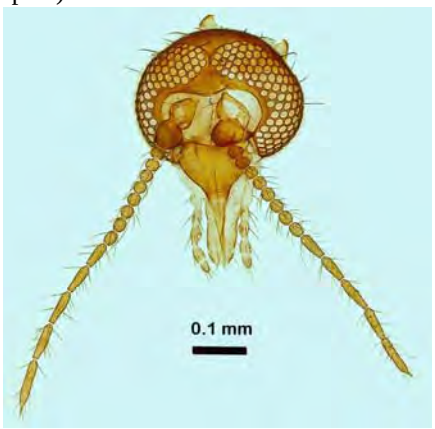
Material examined: **MAUI:** Kahului Airport, West Specklesville, beach & strand, 20° 54' 47" N, 156° 25' 33" W, 20, Jun 2001, sweeping *F.G. Howarth, R. Takumi, F. Starr & K. Martz BL2002-243* (2 spms).

Diptera: Ceratopogonidae

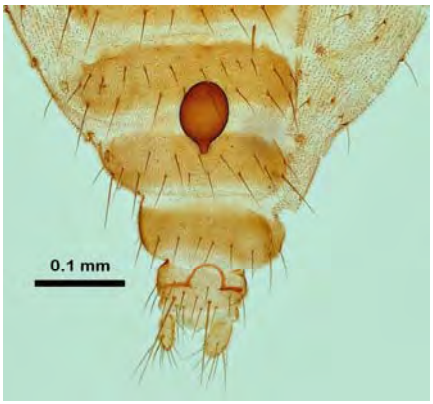
Atrichopogon levis (Coquillett 1901) **New state record**

The grass midge is widespread in N. America. The species was first recorded in Hawai'i as *Atrichopogon* sp. A in Howarth & Preston (2007). This plain brown species is about one-half the size of the yellowish *A. jacobsoni*, the only other *Atrichopogon* known from Hawai'i. Some features of *A. levis* are figured below.

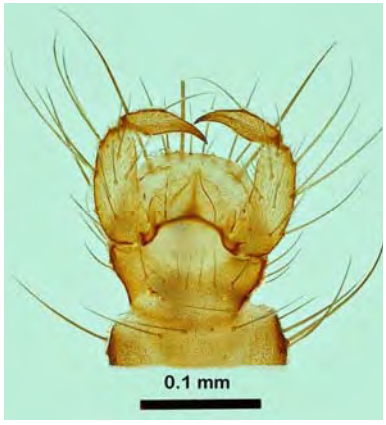
Material examined: **MAUI:** Kahului Airport, Wetland dominated by *Bacopa monnieri*, 20° 54' 16" N, 156° 26' 16" W, 18 Jul 2006, gas aspirator, *F.G. Howarth, D.J. Preston, H. Laederich, F. Starr & K. Starr KA2007-42* (3 spms).



Head, female



Abdomen, female

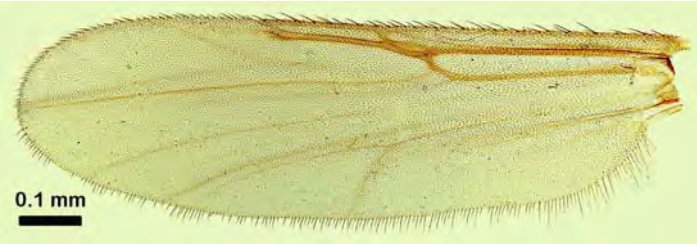


Genitalia, male

Atrichopogon levis

Automontage photos by S. Myers

Sphenophorus ca



Atrichopogon levis, wing, male
Automontage photo by S. Myers

Diptera: Ceratopogonidae
Forcipomyia borbonica Clastrier 1959 **New island record**

Previously, this adventive midge had been reported from O‘ahu and Moloka‘i and now from Maui. The species originates from the Afrotropical Region.

Material examined: **MAUI:** Kahului Airport, near malaise trap site 1, *Leucaena* shrubland, *Leucaena, Cenchrus, Asystasia*, 20° 54' 21(2)" N,156° 25' 56" W, 27 Mar 2000-31 Mar 2000, Lingren funnels (beetle trap) with pinene attractant, *F.G. Howarth, D.J. Preston & G.A. Samuelson BL2002-208A* (1 spm).

Diptera: Chironomidae
Ablabesmyia sp. A **New state record**

This distinctive midge is about 3 mm long with pale grey-spotted wings and conspicuous light and dark banded legs. The larvae are bloodworms in shallow ponds. Adults are attracted to lights, and the species has the potential to become a nuisance in homes and resorts near its habitat.

Material examined: **MAUI:** Kahului Airport, keawe woodland, wetland margin, ruderal, grasses, 20° 53' 46.5" N, 156° 26' 01.5" W, 2 Jun 2003, MV bulb, *F.G. Howarth, D.J. Preston, BL2002-168* (2 spms). 20° 53' 56.5" N, 156° 26' 52.5" W, 26 Jun 2003, MV bulb, *F.G. Howarth, D.J. Preston, K. Starr, & F. Starr, KM2003-37* (1 female). 20° 53' 54" N, 156° 26' 52" W, 26 Jul 2003, MV bulb, *F.G. Howarth, D.J. Preston, KM2003-39* (9 spms). 20° 53' 43" N, 156° 27' 06"W, 23 Aug 2003, MV Bulb, *F.G. Howarth, D.J. Preston, K. Starr, & F. Starr, KM2003-40* (9 spms).

Diptera: Chironomidae
Corynoneura sp. A **New island record**

The single female of this tiny, unusual midge matches the illustration and description of a female from O‘ahu given by Hardy (1960: 124, fig. 36).

Material examined: **MAUI:** Kahului Airport, HDOA station, irrigated ornamental plantings and lawns, 20° 53' 35" N, 156° 26' 59" W, 28 Aug 2006-18 Nov 2006, sticky trap in *Citrus* sp. baited with fruit, *F. Starr & K. Starr KA2007-149* (1 female).

Diptera: Ephydridae
Discomyza maculipennis (Weidemann 1824) **New island record**

This non-native shore fly was previously recorded from Kaua‘i, O‘ahu and Lisiansky islands.

Material examined: **MAUI:** Kahului Airport, Wetland # 2, Keawe forest/ground: *Sesuvium*, grass, sand, 20° 54' 25" N,156° 25' 58" W, 4 Oct 1999-7 Oct 1999, yellow pan trap, trap #2, *D.J. Preston, F.G. Howarth, J.E. Dockall, F. Starr & K. Martz BL2002-70* (1 spm). 20° 53' 35" N, 156° 26' 59" W, 28 Aug 2006-18 Nov 2006, sticky trap in *Citrus* sp. baited with fruit, *F. Starr & K. Starr KA2007-149* (6 spms).

Diptera: Ephydridae
Ephydra gracilis Packard 1871 **New island record**

This non-native shore fly was previously recorded from Kaua‘i and O‘ahu islands.

Material examined: **MAUI:** Kahului Airport, Wetland near Malaise site #1, wetland margin, *Sesuvium, Leucaena, Pluchea*, 20° 54' 23" N, 156° 25' 54" W, 2 Feb 2000, MV bulb, *F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr BL2002-5* (1 spm).

Diptera: Milichiidae

Milichia orientalis Malloch 1913 **New island record**

This alien filth fly is known from O‘ahu, Hawai‘i, Gardner Pinnacles, Nihoa and Necker islands. Species identification was made by K Arakaki and FG Howarth.

Material examined: **MAUI:** Kahului Airport, 20° 53' 35" N, 156° 26' 59" W, 28 Aug 2006-18 Nov 2006, sticky trap in *Citrus* sp. baited with fruit, *F. Starr & K. Starr KA2007-149* (1 spm).

Diptera: Periscelididae

Stenomicra cf. *fascipennis* Malloch 1927 **New island record**

This tiny (about 3 mm long) fly is provisionally identified as *S. fascipennis*, which was previously recorded from Kaua‘i and O‘ahu. The distinctively marked fly is figured below.

Material examined: **MAUI:** Kahului Airport, Wetland dominated by *Bacopa monnieri*, 20° 54' 16" N, 156° 26' 16" W, 18 Jul 2006, gas aspirator, *F.G. Howarth, D.J. Preston, H. Laederich, F. Starr & K. Starr KA2007-42* (2 spms).

Stenomicra cf. *fascipennis*

Megaselia cf. *brunnelpalpata*

Photos by FGH

Diptera: Phoridae

Megaselia cf. *brunnelpalpata* Beyer 1964 **New island record**

Megaselia brunnelpalpata was described from a few pinned specimens from 5,200 ft elevation above Kona on Hawai‘i Island. The Kahului Airport specimens may be this species, but the original description lacks sufficient details to confirm. *Megaselia brunnelpalpata* is considered endemic. A male is figured above.

Material examined: **MAUI:** Kahului Airport, *Leucaena* shrubland, *Leucaena, Pluchea, Cenchrus, Asystasia,* etc, 20° 54' 22" N,156° 25' 56" W, 18 Apr 20, Malaise trap, *F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F.Starr BL2002-73I* (1 spm). Keawe woodland, 20° 54' 26" N, 156° 25' 50" W, 25 Jun 2003-18 Jul 2003, Malaise trap, *F. & K. Starr, F.G. Howarth & D.J. Preston KM2003-35A* (1 spm). Keawe/koa haole/mixed understory woodland, 20° 54' 26" N, 156° 25' 50" W, 21 Oct 2006-13 Nov 2006, window trap, *F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich KA2007-159* (10 spms). Keawe/koa haole/mixed understory woodland, 20° 54' 26" N,156° 25' 50" W, 21 Oct 2006-13 Nov 2006. Lingren funnels (beetle trap), *F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich KA2007-172* (1 spm).

Diptera: Sarcophagidae

Sarcophaga princeps Wiedemann 1830 **New island record**

This alien flesh fly was previously recorded from Kaua‘i and O‘ahu.

Material examined: **MAUI:** Kahului Airport, Wetland # 2, keawe forest/ ground: *Sesuvium*, grass, sand, 20° 54' 25" N,156° 25' 58" W, 4 Oct 1999-7 Oct 1999, yellow pan trap # 2, *F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz BL2002-70* (1 spm).

Diptera: Sarcophagidae
Sarcophaga ruficornis (Fabricius 1794) **New island record**

This alien flesh fly was previously recorded from Kaua‘i and O‘ahu. Species identification was made by FG Howarth.

Material examined: **MAUI:** Kahului Airport, Hobron wet spot, beach strand and keawe/mixed understory woodland, 20° 54' 01" N, 156° 27' 44" W, 19 Jul 2006, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-18* (1 spm).

Diptera: Scatopsidae
Holoplagia guamensis (Johannsen 1946) **New island record**

This minute black scavenger fly was previously known from Kaua‘i and O‘ahu.

Material examined: **MAUI:** Kahului Airport, *Leucaena* shrubland, *Leucaena, Pluchea, Cenchrus, Asystasia*, etc, 20° 54' 22" N, 156° 25' 56" W, 16 Dec 1999-28 Dec 1999, Malaise trap #1, *F.G. Howarth, D.J. Preston, F. Starr & K. Martz BL2002-73A* (1 spm).

Diptera: Scenopinidae
Scenopinus lucidus Becker 1902 **New island record**

This common black window fly has been reported from seven Hawaiian Islands from Kure to Hawai‘i, including Ni‘ihau, Kaua‘i, O‘ahu, Moloka‘i and Lana‘i, and herein we add Maui.

Material examined: **MAUI:** Kahului Airport, Near taxiway, near Malaise trap #2, *Abutilon*, 20° 54' 17" N, 156° 25' 40" W, 31 Mar 2000, sweep Net, *G.A. Samuelson BL2002-251* (1 spm).

INSECTA: Hemiptera (Heteroptera): Nabidae
Stenonabis species A **New state record**

This predatory bug was first reported as *Nabis* sp. A in Howarth & Preston (2007). It has been identified by DA Polhemus as a species of *Stenonabis*, a large Old World genus with many species from Australia and SE Asia to Africa. It is figured below. Adult body length is approximately 7 mm.

Material examined: **MAUI:** Kahului Airport, Hobron wet spot, 20° 54' 01" N, 56° 27' 44" W, 19 Jul 2006, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-18* (1 spm). Kanaha Pond Reserve, wetland, mixed native/ keawe/mixed alien understory woodland, 20° 53' 53" N, 156° 27' 09" W, 21 Sep 2006, MV bulb, *F.G. Howarth, D.J. Preston, K. Starr, F. Starr & A. Ghotaslou KA2007-57* (1 spm).

Stenonabis species A, lateral view
Automontage photo by S. Myers

Hemiptera: Reduviidae

Ploiaria macrophthalma (Dohrn 1860) **New island record**

This alien predatory thread-legged bug was previously known from O‘ahu but probably occurs on all the islands. It is widespread in the Pacific.

Material examined: **MAUI:** Kahului Airport, Kanaha Pond Reserve, keawe wood-land, ruderal, wetland margin, *Sesuvium*, keawe, *Pluchea*, 20° 53' 46" N, 156° 27' 07" W, 3 Feb 2000, MV bulb, *F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz BL2002-82* (1 spm).

INSECTA: Hemiptera (Homoptera): Delphacidae

Opiconsiva paludum (Kirkaldy 1910) **New island record**

This alien delphacid planthopper was previously known from O‘ahu, Moloka‘i and Hawai‘i, as well as the NW Hawaiian Islands of Kure, Midway, Pearl & Hermes and Laysan.

Material examined: **MAUI:** Kahului Airport, Kanaha Pond Res., *Sporobolus*, keawe, pond margin, 20° 53' 54" N, 156° 27' 23" W, 2 Dec 1999, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr & K. Martz BL2002-81* (3 spms). Kanaha Pond Reserve, Wetland, mixed native/ keawe/mixed alien understory woodland, 20° 53' 48" N,156° 27' 22" W, 14 Nov 2006, MV bulb, *F.G. Howarth, D.J. Preston, K. Starr, F. Starr & H. Laederich KA2007-168* (4 spms).

INSECTA: Hymenoptera: Elasmidae

Elasmus sp A **New state record?**

No Elasmidae have been recorded from Maui, but two adventive species are known from O‘ahu. The two species from Kahului appear to be new to the state. Species identification was made by DJ Preston.

Material examined: **MAUI:** Kahului Airport, Kanaha Pond Res., wetland, Open keawe woodland at pond margin, 20° 53' 42" N,156° 27' 10" W, 4 Nov 1999, MV bulb, *F.G. Howarth, D.J. Preston & J.E. Dockall BL2002-79* (2 spms).

Hymenoptera: Elasmidae

Elasmus sp B **New state record?**

No Elasmidae have been recorded from Maui, but two adventive species are known from O‘ahu. The two species from Kahului appear to be new to the state. Species identification was made by DJ Preston.

Material examined: **MAUI:** Kahului Airport, , Kanaha Pond Res., wetland, Open keawe woodland at pond margin, 20° 53' 42" N,156° 27' 10" W, 4 Nov 1999, MV bulb, *F.G. Howarth, D.J. Preston & J.E. Dockall BL2002-79* (3 spms). Kanaha Pond Reserve, Wetland, mixed native/ keawe/mixed alien understory woodland, 20° 54' 26" N, 156° 25' 50" W, 14 Nov 2006, MV Bulb, *F.G. Howarth, D.J. Preston, K. Starr, F. Starr & H. Laederich KA2007-168* (1 spm).

Hymenoptera: Eupelmidae

Eupelmidae genus sp. A **New state record**

This iridescent wasp was identified as a new state record by JW Beardsley in 2000. It may be a species of *Anastatus.* The adult (shown below) is 3 to 4 mm long.

Material examined: **MAUI:** Kahului Airport, *Pluchea*, 20° 53' 46.5" N, 156° 27' 1.5" W, 4 Jun 2000, fogging, *F.G. Howarth, G.A. Samuelson & R. Takumi BL2002-306* (1 spm). Irrigated ornamental plantings and lawns, gas aspirator over lawn, 20° 53' 35" N, 156° 26' 58" W, 20 Sep 2006. *D.J. Preston & F.G. Howarth, KA2007-101* (2 females).

Eupelmidae: genus sp. A

Polynema sp. A

Photos by FGH

Hymenoptera: Mymaridae

Polynema sp. A **New island record?**

This tiny wasp (less than 1 mm long) is possibly endemic, but additional specimens and accurate identification are needed to determine its biogeographic status. Only one *Polynema* species is known from Maui, and that is an unidentified species purposefully introduced for biological control. Eighteen species are known from the islands, and all but two are endemic. Species identification was made by JW Beardsley. A photomicrograph is shown above.

Material examined: **MAUI:** Kahului Airport, near fire rescue station, 20° 54' 16" N, 156° 25' 42" W, 3 Dec 1999-16 Dec 1999, Malaise trap #2, *F.G. Howarth & D.J. Preston BL2002-293* (1 female).

Hymenoptera: Platygasteridae

Platygasteridae genus sp. A **New island record**

No platygasterids have been reported from Maui. Species identification was made by DJ Preston.

Material examined: **MAUI:** Kahului Airport, *Leucaena* shrubland, *Leucaena, Pluchea, Cenchrus, Asystasia,* etc., 20° 54' 22" N, 156° 25' 56" W, 30 May 2000-6 Jun 2000, Malaise trap # 1, *F.G. Howarth, D.J. Preston & J.E. Dockall BL2002-73G* (1 female).

Hymenoptera: Platygasteridae

Platygasteridae genus sp. B **New island record**

No platygasterids have been reported from Maui. This specimen closely resembles an unidentified species from Kaua‘i in the HBS collection. Species identification was made by DJ Preston.

Material examined: **MAUI:** Kahului Airport, Tower Road, *Leucaena* scrub, *Leucaena, Ricinus, Panicum, Botriochloa, Melinus, Cenchrus,* etc., 20° 53' 55" N, 156° 25' 45" W, 2 Dec 1999, gas aspirator, *D.J. Preston & F.G. Howarth BL2002-45A* (1 female).

Hymenoptera: Scelionidae

Telenomus sp. A **New island record**

JW Beardsley identified these as *Telenomus* sp and separated them from his series of *T. vulcanus*. Only three of the eight species known from Hawai‘i have been recorded from Maui. The genus includes native, adventive and purposefully introduced species, and the biogeographic status of this species is unknown.

Material examined: **MAUI:** Kahului Airport, Near fire test site, *Leucaena, Pluchea, Cenchrus, Asystasia* etc., 20° 54' 22" N,156° 25' 56" W, 30 Nov 1999, Malaise Trap #1, *F.G. Howarth, D.J. Preston, J.E. Dockall, F. Starr & K. Martz BL2002-292* (1 spm). Same data except 16 Nov 1999. *F.G. Howarth, D.J. Preston & J.E. Dockall BL2002-178* (4 spms).

INSECTA: Lepidoptera: Choreutidae

Choreutis sp. A **New state record**

This is the first Hawaiian record of the family Choreutidae, or metalmark moths. Larvae are often leaf skeletonizers and a few species are agricultural pests. Adults are diurnal. This moth was listed under unknown family in Howarth and Preston (2007). Species identification was made by DJ Preston.

Choreutis sp. A
Automontage photo by S. Myers

Material examined: **MAUI:** Kahului Airport, Wetland margin, irrigated lawn, 20° 54' 16" N,156° 26' 16" W, 18 Jul 2006, host search, *Hibiscus* hedge, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-20* (1 spm).

Lepidoptera: Pterophoridae
Lioptilodes cf. *parvus* (Walsingham 1880) **New island record**

This immigrant species is from SW N. America and first recorded from O‘ahu and Hawai‘i islands in 1952.

Material examined: **MAUI:** Kahului Airport, Keawe/ironwood/mixed understory woodland, 20° 54' 26" N, 156° 26' 01" W, 16 Nov 2006, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-169* (1 spm).

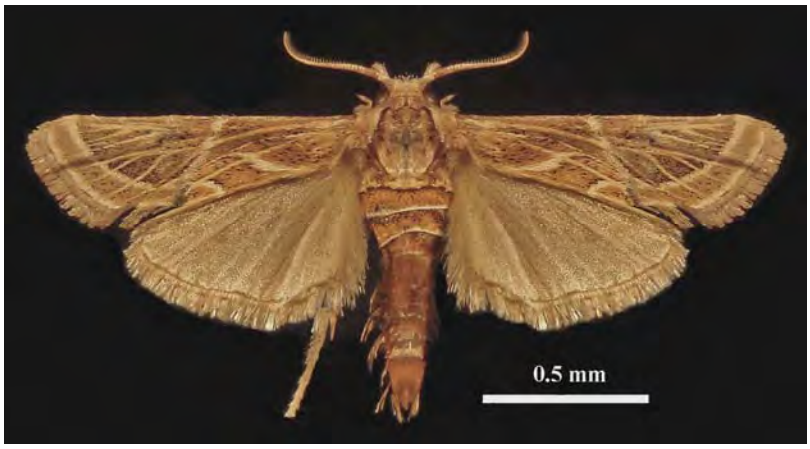
Lepidoptera: Pyralidae
Ectomyelois ceratoniae (Zeller 1839) **New island record**

This nearly cosmopolitan stored products pest was introduced to Hawai‘i before 1910, but has been recorded previously only from the islands of Kaua‘i and O‘ahu.

Material examined: **MAUI:** Kahului Airport, Keawe/ironwood/mixed understory woodland, 20° 54' 26" N, 156° 26' 01" W, 16 Nov 2006, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-169* (2 spms). Behind T-shirt factory, 20° 53' 49" N,1 56° 26' 58" W, 17 Nov 2006, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-170* (8 spms).

Lepidoptera: Pyralidae
Loryma cf. *recusata* (Walker 1863) **New state record**

This species was listed as an unknown Crambidae in the 2002, 2006 and 2007 reports. It matches a specimen from New Guinea identified by E. Munroe as *Loryma* sp. *Loryma recusata* is the only known Asian species and is recorded from India and SE Asia to New Guinea. The other species in the genus are Afrotropical. Species identification was made by DJ Preston.



Loryma cf. *recusata*
Photo by FGH

Material examined: **MAUI:** Kahului Airport, keawe woodland, dry shrubland, 20° 54' 26" N, 156° 26' 05" W, 30 Apr 2000, MV Bulb, *F.G. Howarth & D.J. Preston BL2002-166* (1 spm). keawe woodland, wetland margin, 20° 53' 49" N, 156° 27' 23" W, 19 Sep 2006, MV Bulb, *F.G. Howarth & D.J. Preston KA2007-60; MV Bulb* (1 spm).

INSECTA: Orthoptera: Gryllidae
Cycloptiloides americanus (Saussure 1870) **New island record**

This small straw-colored cricket often occurs in houses and is widely distributed by commerce. It is recorded from Kaua‘i, O‘ahu, Moloka‘i and Hawai‘i but probably occurs on all inhabited Hawaiian Islands.

Material examined: **MAUI:** Kahului Airport, UPS Junction, Ruderal, hedge and leaflitter, 20° 53' 45" N, 156° 26' 40" W, 5 Oct 1999, on bare ground, *F.G. Howarth & D.J. Preston BL2002-346* (1 spm).

INSECTA: Psocoptera: Ectopsocidae
Ectopsocus perkinsi Banks 1931 **New island record**

This tramp bark louse is recorded from Kure, Midway, Nihoa, O‘ahu, and Hawai‘i.

Material examined: **MAUI:** Kahului Airport, mixed shrubs, *Atriplex semibacata* (Australian salt bush), 20° 54' 23" N,156° 25' 54" W, 3 Feb 2000, gas aspirator, *D.J. Preston, J.E. Dockall, F. Starr & K. Martz BL2002-215A* (4 spms).

Psocoptera: Ectopsocidae

Ectopsocus spilotus Thornton & Wong 1968 **New island record**

This tramp bark louse is recorded from O'ahu, and Hawai'i.

Material examined: **MAUI:** Kahului Airport, near Kanaha Beach Park, mixed shrub, *Schinus, Pluchea*, etc., 20° 54' 18" N, 156° 26' 12" W, 5 Aug 1999, gas aspirator, *F.G. Howarth, D.J. Preston & R.A. Englund BL2002-5A* (1 spm). Hisbiscus hedge and lawn, 20° 53' 45" N,156° 26' 38" W, 5 Oct 1999, gas aspirator, *F.G. Howarth, D.J. Preston & J.E. Dockall BL2002-21* (2 spms). Tower Road, *Leucaena* scrub, *Leucaena, Ricinus, Panicum, Botriochloa, Melinus, Cenchrus*, 20° 53' 55" N,156° 25' 45" W, 2 Dec 1999, gas aspirator, *BL2002-45A* (1 spm). Wetland margin near Malaise site #1, *Leucaena, Sesuvium, Pluchea*, 20° 54' 23" N, 156° 25' 54" W, 2 Feb 2000, MV bulb, *F.G. Howarth, D.J. Preston, J.E. Dockall, K. Martz & F. Starr BL2002-53* (12 spms). *Leucaena* shrubland, *Leuceana, Pluchea, Cenchrus, Asystasia,* etc., 20° 54' 22" N, 156° 25' 56" W, 2 Nov 1999-3 Dec 1999, Malaise trap #1, *F.G. Howarth, D.J. Preston & J.E. Dockall BL2002-73K* (1 spm). Near HDOA Insectary, ornamental *Hibiscus rosa sinensis*, 20° 53' 35" N,1 56° 26' 59" W, 17 Jul 2006, gas aspirator, *D.J. Preston, F.G. Howarth, F. Starr, K. Starr & H. Laederich KA2007-38* (1 spm). Keawe-koa haole woodland, 20° 54' 26" N, 156° 25' 50" W, 18 Sep 2006-21 Oct 2006, window trap, *F.G. Howarth, D.J. Preston, F. & K Starr, & H Laederich KA2007-67* (6 spms). Same data except: 21 Oct 2006-13 Nov 2006, *F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich KA2007-159* (10 spms).

Psocoptera: Lachesillidae

Lachesilla pedicularia (Linnaeus 1758) **New island record**

This is a common tramp species with a nearly worldwide distribution. It is an occasional pest of stored products, thus it is surprising that it has not been reported previously from Maui.

Material examined: **MAUI:** Kahului Airport, *Leucaena* shrubland, *Leuceana, Pluchea, Cenchrus, Asystasia*, etc., 20° 54' 22" N, 156° 25' 56" W, 2 Nov 1999-3 Dec 1999, Malaise trap #1, *F.G. Howarth, D.J. Preston & J.E. Dockall BL2002-73K* (3 spms), Kanaha Pond Reserve, *Sporobolus*, keawe, pond margin, 20° 53' 54" N, 156° 27' 23" W, 2 Dec 1999, MV Bulb, *F.G. Howarth, D.J.Preston, F.Starr & K.Martz BL2002-81* (1 spm). Kanaha Pond Reserve, keawe, *Sesuvium*, native shrubs, 20° 53' 57" N, 156° 27' 14" W, 3 Mar 2000, MV bulb, *F.G. Howarth, D.J. Preston, K. Martz, F. Starr & J.E. Dockall BL2002-83 (*1 spm). Keawe-koa haole woodland, 20° 54' 26" N, 156° 25' 50" W, 18 Sep 2006-21 Oct 2006, window trap, *F.G. Howarth, D.J. Preston, F. & K Starr, & H Laederich KA2007-67* (5 spms). Same data except: 21 Oct 2006-13 Nov 2006. *F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich KA2007-159* (6 spms). Kanaha Pond Reserve, wetland, mixed native/ keawe/mixed alien understory woodland, 20° 53' 48" N, 156° 27' 22" W, 14 Nov 2006, MV bulb, *F.G. Howarth, D.J. Preston, K. Starr, F. Starr & H. Laederich KA2007-168* (1 spm).

Psocoptera: Myopsocidae

Myopsocus sp. A **New state record**

This large bark louse lives on large tree trunks at Kahului. Its size and wing pattern resemble some native species of Psocidae, and it was mistakenly listed as *Ptycta* sp A in the 2007 report. However, the species belongs to a completely different family, the Myopsocidae, which has not previously been recorded in Hawai'i. The genus occurs in both the New and Old World, and the origin of this species is unknown.

Myopsocus sp. A

Photo by FGH

Material examined: **MAUI:** Kahului Airport, Hobron wet spot, 20° 54' 01" N, 56° 27' 44" W, 19 Jul 2006. MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-18* (1 spm). Wetland dominated by *Bacopa*, 20° 54' 16" N, 156° 26' 16" W, 18 Jul 2006, fogging *Thespesia populnea, F.G. Howarth, D.J. Preston, H. Laederich, F. Starr & K. Starr KA2007-37* (6 spms). Beach strand and keawe/mixed understory woodland, 20° 54' 01" N, 156° 27' 44" W, 19 Jul 2006, searching *Prosopis pallida* (keawe) trunks at night, *F.G. Howarth, D.J.*

Preston, F. Starr & K. Starr KA2007-48 (10 spms). Keawe/koa haole/mixed understory woodland, 20° 54' 26" N, 156° 25' 50" W, 21 Oct -13 Nov 2006, Malaise trap, *F. & K. Starr, F.G. Howarth, D.J. Preston & H. Laederich KA2007-171* (6 spms).

Psocoptera: Philotarsidae

Aaroniella sp. A **New state record**

This distinctively marked alien bark louse is figured below. This is the first record of the family in Hawai'i. The genus occurs in both the New and Old World, and the origin of this species is unknown.

Material examined: **MAUI:** Kahului Airport, keawe woodland, wetland margin, ruderal, grasses, 20° 53' 56.5" N, 156° 26' 52.5" W, 26 Jun 2003, MV bulb, *F.G. Howarth, D.J. Preston, K. Starr, F. Starr & J.E. Dockall KM2003-37* (1 spm). Hobron wet spot, 20° 54' 01" N, 156° 27' 44" W, 19 Jul 2006, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-18* (2 spms). Kanaha Pond Reserve, wetland, mixed native/ keawe/mixed alien understory woodland, 20° 53' 53" N, 156° 27' 09" W, 21 Sep 2006, MV bulb, *F.G. Howarth, D.J. Preston, K. Starr, F. Starr & A. Ghotaslou KA2007-57* (2 spms). Keawe/koa haole/mixed understory woodland, 20° 54' 26" N,156° 25' 50" W, 21 Oct 2006-13 Nov 2006, window trap, *F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich KA2007-159* (5 spms).

Aaroniella sp. A

Haplophalus sp. A

Photos by FGH

Psocoptera: Philotarsidae

Haplophalus sp. A **New state record**

This alien bark louse is figured above.

Material examined: **MAUI:** Kahului Airport, Kanaha Pond Reserve, keawe, *Sesuvium*, native shrubs, 20° 53' 57" N, 156° 27' 14" W, 3 Mar 2000, MV bulb, *F.G. Howarth, D.J. Preston, K. Martz, F. Starr & J.E. Dockall BL2002-83* (1 spm). Industrial area/buildings / plant nursery, 20° 53' 39" N, 156° 26' 46" W, 4 Feb 2000, beating sheet, *Leucana leucocephala, F. Starr, K. Martz, F.G. Howarth & D.J. Preston BL2002-118* (1 spm). Hobron wet spot, 20° 54' 01" N, 156° 27' 44" W, 19 Jul 2006, MV bulb, *F.G. Howarth, D.J. Preston, F. Starr, K. Starr & H. Laederich KA2007-18* (6 spms). Keawe/koa haole/mixed understory woodland, 20° 54' 26" N, 156° 25' 50" W, 18 Jul 2006-18 Sep 2006, Malaise trap, *F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. Laederich KA2007-65* (1 spm). Keawe/koa haole/mixed understory woodland, 20° 54' 26" N, 156° 25' 50" W, 21 Oct 2006-13 Nov 2006, window trap, *F. Starr, K. Starr, F.G. Howarth, D.J. Preston & H. LaederichKA2007-159* (1 spm).

CRUSTACEA: Isopoda: Philosciidae

Littorophiloscia culebrae (Moore 1901) **New island record**

This marine littoral wood louse, or slater, is considered adventive. In Hawai'i, the species has been recorded from Midway, Pearl and Hermes, Lisianski and O'ahu.

Material examined: **MAUI:** Kahului Airport, Near Hobron Pt., Rocky beach strand, littoral, General, 20° 54' 02" N, 156° 27' 42" W, 9 Jul 2006. *F.G. Howarth, F. Starr K. Starr, D.J. Preston & H. Laederich KA2007-47* (1 spm).

Isopoda: Platyarthridae

Niambia sp. A **New island record**

This wood louse was first recorded from O'ahu by Taiti & Ferrara, 1991. The species is not known to occur outside of Hawai'i, but it is believed to be an immigrant. This is the first report of its presence outside O'ahu.

Material examined: **MAUI:** Kahului Airport, keawe-koa haole woodland, window trap, 20° 54' 26" N, 156° 25' 50" W, 18 Sep 2006-21 Oct 2006. *F.G. Howarth, D.J. Preston, F. & K Starr, & H Laederich KA2007-67* (1 spm).

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