

March 1, 2013  
Agenda Item IV.A

MEMO TO: KIRC Commissioners  
THRU: Michael K, Nāho‘opi‘i, Executive Director

FROM: Paul Higashino, Natural Resources Specialist V

SUBJECT: Request by Professor Daniel Rubinoff and Dr. William Haines to Access the Reserve to Study, Collect and Remove Moth Species of *Hyposmocoma* (Fancy Case Caterpillars).

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**RECOMMENDED MOTION:**

Pursuant to HAR § 13-261-14, to approve the Right of Entry (ROE) request of Daniel Rubinoff and Dr. William Haines to access the Reserve to collect moths at Pu‘u ‘O Moa‘ula Nui, Honokanai‘a, Kealaikahiki, Kaukaupapa, and Lua ‘O Kealialalo subject to the ROE permit and the following stipulations: (a) collection limited to four accesses of three nights (12 nights) or further approval; (b) all specimens shall be identified and returned to the KIRC except voucher and type specimens described in ROE; (d) the applicant shall provide KIRC with a copy of all raw data, photos, papers, theses and/or published works that reference this work, prepared or known by the applicant, even if no species were collected and taken; and (e) other conditions authorized and imposed by the Executive Director.

**BACKGROUND & SUMMARY:**

Dr. Matthew Medeiros was granted access to inventory moth species for the KIRC on September 28, 2008. He visited the island on two occasions discovering new species endemic to Kaho‘olawe (see attached journal article Medeiros 2012, Medeiros and Adamski 2012). In July 2011, Dr. Medeiros discovered a *Hyposmocoma* endemic to Kaho‘olawe and new to science. Professor Rubinoff and Dr. Haines are the current experts studying these unique genera of moth; *Hyposmocoma* or “fancy case caterpillar”. Professor Rubinoff has studied *Hyposmocoma* for the past 10 years at the University of Hawai‘i, along with many other groups of Hawaiian insects and invasive species. Dr. Haines, who was born and raised on Maui, got his Ph.D. in the Rubinoff lab working on another group of Hawaiian moths, and is currently working as a junior researcher studying *Hyposmocoma*.

The importance of insects is acknowledged in **The Cultural Plan for Kanaloa Kaho‘olawe**. The plan states the “search for insects is a whole separate focus and should be done in the future because they have a purpose” and it is important to develop lololo (intellect) for cultural objects of Papahānaumoku including insects. (Kanaka‘ole Kanahale et al. 2009, pages 15,189).

The knowledge of the presence of native Hawaiian insect species on Kaho‘olawe supports the KIRC Environmental Restoration Plan (Ho‘ōla Hou I Ke Kino O Kanaloa). For instance the yellow faced bee is frequently found on naio and `ohai while the Hawaiian blue butterfly is frequently found on `a`ali`i. The information gathered guides the Restoration process.

## **METHODS & DISCUSSION:**

The primary goal in conducting research on Kaho‘olawe would be to locate and describe any *Hyposmocoma* species that occur there, but would also identify other insect species encountered or collected, and provide KIRC with a list of those species.

The ROE permit requests to use two different sampling methods. The first method uses bucket traps, which is a random sampling technique, collecting various nocturnal insects (primarily moths), not just *Hyposmocoma*. This is the most efficient way to assess biodiversity, and would provide the most information to KIRC. It also allows sampling at more than one site each night. The second method is blacklighting on a sheet, which is a selective technique and limits biological inventory. This is the method Dr. Medeiros has used in the past to pick and choose which samples to collect.

For collecting caterpillars, 20 individuals per species per site are proposed, because in many cases they tend to be dead, already pupated, or parasitized by wasps, and it is difficult or impossible to determine this in the field. When a single caterpillar case is collected, the odds are not very high that one will end up with a moth. Collection is proposed to take place at Kealaikahiki, Kaukaupapa, Pu‘u ‘O Moaula Nui, Lua ‘O Kealialalo and in the Honokanai‘a area. The applicants would be accompanied by KIRC staff.

The applicants have offered to return all collected specimens to the KIRC except for voucher and type specimen which must be deposited at an accreted museum (University of Hawaii Insect Museum), and have also offered to prepare an exhibit of pinned specimens in an insect drawer for display. A species list will be generated with numbers collected and locations surveyed.

## **LEGAL AUTHORITY:**

Activities within the Reserve are restricted and permitted only for the purposes allowed under State law. The relevant provisions of Hawai‘i Administrative Rules read as follows:

**§13-261-14 Prohibited activities...** (b) Except as authorized by the commission or its authorized representative, activities not provided for in §13-261-13 shall be prohibited, including, but not limited to, the following activities:

- (1) To take, disturb, injure, kill, alter or deface, or possess any form of plant or wildlife or aquatic life;
- (2) To remove, damage, or disturb any natural feature or natural resource;
- (10) To remove or attempt to remove, from the reserve any aquatic life or wildlife... or other naturally-occurring object or resource....

## **RECOMMENDATION:**

Pursuant to HAR § 13-261-14, to approve the Request of Entry (ROE) to access the Reserve to collect moths and caterpillars/casings on Kaho‘olawe, subject to appropriate conditions and restrictions.



# Kaho'olawe Island Reserve Commission

811 Kolu St., Suite 201, Wailuku, HI 96793 • ph. 808-243-5020 • fx. 808-243-5885

ROE 1  
**RECEIVED**

DEC 04 2012

KAHO'OLAWE ISLAND  
RESERVE COMMISSION

## Right of Entry Permit Request

REQUESTOR'S NAME

TITLE

Daniel Rubinoff

Professor

MAILING ADDRESS

3050 Maile Way, Gilmore 310

CITY

STATE

ZIP CODE

EMAIL

Honolulu

HI

96822

rubinoff@hawaii.edu

PRIMARY TELEPHONE

SECONDARY TELEPHONE

808 956 8432

808 956 9123

ORGANIZATION NAME

University of Hawaii, Dept. of Plant and Environmental Protection Sciences

MAILING ADDRESS

CITY

3050 Maile Way, Gilmore 310

Honolulu

STATE ZIP CODE

PRIMARY TELEPHONE

SECONDARY TELEPHONE

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808 956 8432

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GROUP LEADER NAME

TITLE

Daniel Rubinoff

Professor

GROUP SIZE:

TOTAL

ADULTS

MINORS

FUNDING SOURCE

3

3

0

National Science Foundation

ACCESS DATES

ACCESS LOCATION (attach map)

Feb/March 2013

Various sites (see attached proposal and map)

PURPOSE OF ENTRY

Moth surveys

DESCRIPTION OF ACTIVITIES (attach additional pages if necessary)

See attached proposal

CAN ACTIVITIES BE CONDUCTED ELSEWHERE? (explain)

No. This is part of a broader project on moths across the Hawaiian Islands, but Kahoolawe has its own endemic species.

**PLEASE ATTACH THE FOLLOWING DOCUMENTS:**

- Additional page(s) listing Names, contact information, and ages of people requesting entrance.
- Signed Release of Liability Forms for all persons requesting entry.
- Safety and Logistics Plan addressing transportation to/from and protocols within the Reserve.



# Kaho'olawe Island Reserve Commission

ROE 2b

811 Kolu St., Suite 201, Wailuku, HI 96793 • ph. 808-243-5020 • fx. 808-243-5885

## Right of Entry Permit Request

Request Type (Research only)

### X RESEARCH ACCESS

STUDY PROGRAM AND INSTITUTION

NAME/AFFILIATION OF MAJOR PROFESSOR

University of Hawaii, Plant and Env. Protection Sci.

Daniel Rubinoff, University of Hawaii

#### STATEMENT OF PROPOSED RESEARCH ACTIVITIES (attach research plans and necessary materials):

1. How will research results benefit management/conservation of the species?
2. Will the proposed research benefit the Reserve?
3. Is the proposed research important?
4. Explain your research objectives and methods.
5. How is the research to be accomplished? (List research/survey techniques).
6. Can the proposed research be conducted elsewhere?
7. Will specimens be collected/removed? List kind, quantities, storage methods, and disposition?
8. What will be done with the specimens after project completion?
9. Will the proposed research damage or threaten to damage the resources in the Reserve?
10. List steps that will be taken to minimize effects on the species and the surrounding habitat.
11. Has any research been conducted that is similar to the one proposed? If yes, please cite.
12. Who will actively participate (i.e., collect, possess, propagate) on the permit for this research?
13. Will your research require camping or night work?
14. Will your research involve the use of aircraft in any way?
15. Will your research involve the use of a vessel in any way?
16. Will the research require structures/equipment to be left in the field? When will they be removed?
17. Are permits from other agencies required for your research? If yes, list agencies.
18. What is the expected report date for your findings?
19. Are there plans for publication of data or findings gathered from the proposed research?
20. How will research results be disseminated?
21. List funding sources. If this research is supported by grant(s), list grant(s).

Please attach the following documents, as applicable:

- CV/Resume with related educational background and work experience for research participants.
- Signed KIRC Independent Vessel Release of Liability Form, if applicable.
- Copies of Wreck Removal and Pollution Insurance, if applicable.
- State Historic Preservation Division approval if activities involve historic sites.
- All appropriate State and Federal permits.
- List of Hawaii references/cooperators/collaborators (with contact information).
- Attach a **\$50 check for processing fees**, payable to "Kaho'olawe Island Reserve Commission."

- I have reviewed and understood the KIRC Guidelines for Right of Entry Permit Requests.
- I have reviewed, understood, signed, and attached the appropriate KIRC Release of Liability Forms.

Daniel Rubinoff		11/29/2012
PRINT REQUESTOR'S NAME	REQUESTOR'S SIGNATURE	DATE
PRINT ADVISOR'S NAME	ADVISOR'S SIGNATURE	DATE

## STATEMENT OF PROPOSED RESEARCH ACTIVITIES

To: KIRC Commissioners

From: Daniel Rubinoff and William Haines, University of Hawai'i at Mānoa, Department of Plant and Environmental Protection Sciences; Matthew J. Medeiros, Urban School of San Francisco.

Re: Collecting moths on Kaho'olawe

### Personal and Professional Background:

We study the ecology, evolution, and conservation of Hawaiian moths, with a focus on the very diverse genus *Hyposmocoma*, which is found only across the Hawaiian Islands. Professor Rubinoff has studied *Hyposmocoma* for the past 10 years at the University of Hawai'i, along with many other groups of Hawaiian insects and invasive species. Dr. Haines, who was born and raised on Maui, got his Ph.D. in the Rubinoff lab working on another group of Hawaiian moths, and is currently working as a junior researcher studying *Hyposmocoma*. Dr. Medeiros, whose family has been on Maui for three generations, earned his Ph.D. at UC Berkeley, studying the evolution of yet other Hawaiian moth groups.

### Background on our Research:

The genus *Hyposmocoma* is by far the most diverse group of Hawaiian moths, with 350 described species, and many more undescribed species that are new to science. This makes them the second most diverse group of Hawaiian insects, after only *Drosophila* flies. All 350+ *Hyposmocoma* species evolved from a single species that colonized Hawai'i millions of years ago, likely when a single female was carried here on wind currents.

The caterpillars of *Hyposmocoma* moths, which we have named “fancy-cased caterpillars”, spin elaborate portable shelters out of silk, plant material, and other debris, and they drag these cases around with them wherever they go. These cases come in a huge range of shapes and sizes (Fig. 1), and in general, species can be assigned to taxonomic subgroups based on their cases. The shape and ornamentation of cases is often related to the behavior and feeding strategy of caterpillars; for instance, caterpillars that squeeze under bark to feed on dead wood have flat, smooth cases, while those that graze lichens from exposed rocks often cover their cases with lichens, making them superbly camouflaged against predators.



Figure 1: An assortment of cases built by fancy-cased caterpillars in the genus *Hyposmocoma*.

The ecological diversity of *Hyposmocoma* is unparalleled among Hawaiian insects. There are several different types of caterpillars found in streams, and these have evolved the ability to live underwater for weeks at a time. Most species of fancy-cased caterpillars feed on living or dead plant material, algae, or lichens, but there are notable exceptions; an entire group of fancy-cased caterpillars is carnivorous, with some attacking snails or other *Hyposmocoma*, and others scavenging dead insects.

Fancy-cased caterpillars are found in nearly every type of ecosystem in Hawai'i, from the barren atolls of the Northwestern Hawaiian Islands to the lush rainforests of Kauai, and from sea level to the high elevations of Haleakala and Mauna Kea. Although the genus occurs on all the main Hawaiian Islands, as well as most of the Northwestern Hawaiian Islands, individual species have very restricted ranges, nearly all being endemic to single islands. This makes this group a terrific system for looking at the history of dispersal and diversification throughout the Hawaiian Islands. A large part of our research is using genetic data to reconstruct the evolution of *Hyposmocoma* in the context of the geological history of the islands, to determine how often interisland dispersal has occurred, and what factors facilitate speciation.

The fancy-cased caterpillars are very diverse, and exhibit such bizarre behaviors that it is impossible to say what we will find on Kaho'olawe, but we will almost certainly find unique species that are not present on other islands. Kaho'olawe has been overlooked in most studies of native insects, perhaps because many people assume native insects no longer occur there. Although it may be true that many extinctions have occurred, endemic species do remain, and it is important that these be documented.

### **1. How will research results benefit management/conservation of the species?**

Until recently, *Hyposmocoma* had not been documented from Kaho'olawe, although they were presumed to have occurred there, at least in the past. In fact, relatively few insects of any kind were reported from Kaho'olawe in checklists and databases of Hawaiian arthropods. On his collecting trips in 2008 and 2011, Dr. Medeiros collected many moths, including several species of *Hyposmocoma* that are new to science and known only from Kaho'olawe. However, because these were collected by attracting adult moths to lights, we still do not have any information on the ecology of their caterpillars, or the habitat they rely upon. Since they are undescribed, they are not on any biodiversity lists or management plans. In order to monitor populations of an insect species, it must minimally be collected and described. Locating the caterpillars of these moths and understanding more about their ecological requirements may help explain why they could be more resilient than other insects, and also may provide information as to how best to conserve Kaho'olawe's endemic moths into the future.

### **2. Will the proposed research benefit the Reserve?**

Insects no doubt represent most of the native biodiversity remaining on Kaho'olawe, and much of that biodiversity is endemic to Kaho'olawe and not currently documented. Because the island is in a stage of restoration and rehabilitation after decades of misuse, it would seem useful to monitor the recovery of native biodiversity, including insects.

In addition to being an important component of biological diversity, and important in conservation, insects can be an important part of education and cultural identity. The importance of insects as a cultural and biological resource is acknowledged in The Culture Plan for Kanaloa Kaho'olawe (Kanaka'ole Kanahale et al. 2009, pages 15, 189), but it is also acknowledged that very little is known about the insects of Kaho'olawe. From what we gather from this Culture Plan, the first step of developing lololo (intellect) with regards to a cultural resource is to develop passion for a cultural object, which may be a biological entity. Insects are among the most fascinating creatures in the world, and are certainly the most numerous, with over 5,000 native species in Hawai'i, about 1200 of which are moths. Although not every

person is fond of insects, they do inspire passion and curiosity in children and adults alike. We believe some practitioners will be inspired by insects, and *Hyposmocoma* could be especially interesting, since it is likely we will find species that are only found on Kaho'olawe and therefore represent a special aspect of the island's diversity. Based on our sampling on other islands, it is also likely that *Hyposmocoma* caterpillars will be readily and reliably observable in habitats near the basecamp, for instance on boulders at the beach, or on the surface of tree trunks, where their cases can persist for years after the caterpillar has pupated. This means that once you know what to look for, *Hyposmocoma* can be easy to find, making them a good organism for teaching about ecology, evolution, and the scientific process of discovery. This contrasts with most insects, which can be highly mobile, short-lived, or cryptic (for example, feeding internally on plants).

### **3. Is the proposed research important?**

In addition to the conservation importance mentioned above, including species from Kaho'olawe in our analysis of the evolution of fancy cased caterpillars will fill in an important gap with regards to how diversification has occurred within Maui Nui and the Hawaiian Islands as a whole.

### **4. Explain your research objectives and methods.**

Our primary goal in conducting research on Kaho'olawe would be to locate and describe any *Hyposmocoma* species that occur there, but we would also identify other insect species encountered or collected, and provide KIRC with a list of those species. If possible, we would like to use two collection methods: nighttime collections using automated UV light traps, and daytime searches to collect caterpillars and diurnal adults.

### **5. How is the research to be accomplished? (List research/survey techniques).**

For nighttime surveys, we propose to use two different methods to collect nocturnal moths. The first method is by using bucket-style light traps. Each trap consists of a plastic bucket containing an insect killing agent, above which a fluorescent UV light is mounted. The trap is powered by a sealed, non-spillable 12-volt battery, equipped with a light-sensor that turns the trap on at dusk and off at dawn. To prevent entry by larger non-target moths, including the endangered *Manduca blackburni*, a sheet of wire mesh (approximately 1.5 x 1.5cm) will be placed over the funnel entrance of the trap.

The advantage to bucket traps (over the other common method using a light shining on a sheet) is that multiple, widely separated locations can be surveyed at once, and trapping is conducted over the whole night, rather than only part of the night. This is important because some species fly only during part of the night (for example, in the early morning just before dawn). Given a limited amount of time on the island, this method will provide much more complete information about biodiversity than sheet trapping. Bucket traps, deployed in such low numbers, will not have significant impacts on insect populations, and we have been permitted to use these traps in many ecologically sensitive areas in Hawai'i, including NARS, forest reserves, and National Parks. The disadvantage, of course, is that we do not have control over exactly how many specimens are collected. Insects are collected in proportion to their abundance, so the most abundant species in the trap are those that are very abundant in the environment (in Hawai'i, these are almost always invasive species).

In addition, or alternatively, we would like to use the traditional method of shining a UV light on a sheet, in a location near the basecamp. A sheet is hung on a wall or between two poles or trees, and a light is hung in front of the sheet. Insects are attracted to the sheet, and land on it, where specimens of interest can be collected by researchers. The advantage of this method is that it is selective. The disadvantage of this method is that usually only one location can be surveyed per night (usually only for part of the night), and it must be safely accessible in the dark, either by vehicle or by foot. This method is also very sensitive

to windy conditions, because few insects will land on the sheet if it is windy. However, if conditions are favorable, it can be very attractive to moths.

For daytime surveys, we would like to survey whatever locations can be accessed safely and without risk to cultural resources. Caterpillars would be collected into vials and brought back to the laboratory, where they are reared to adults. Many or most of the cases can be inactive (cases persist for years after the caterpillar dies or pupates) or parasitized by wasps, so it would be necessary to collect 10-20 individuals per species to ensure successful emergence of a few adults. When moths emerge, they are prepared as pinned specimens, and a DNA sample is taken for our analyses. Any new species will be formally described. Reprints of publications and photos of all cases and adult moths will be provided to KIRC. Sites recommended by KIRC Restoration staff as being interesting and easily accessible include the coastal sites Honokanaia, Kealaikahiki, and Kaukaupapa, and the mauka sites Moa'ula Nui and Kealialalo (see map below):



**6. Can the proposed research be conducted elsewhere?**

No. The *Hyposmocoma* species collected by Dr. Medeiros are known only from Kaho'olawe. Because nearly all *Hyposmocoma* moths are island endemics, any additional species we find are almost certain to be endemic to Kaho'olawe.

**7. Will specimens be collected/removed? List kind, quantities, storage methods, and disposition?**

Yes. Adult moths will be collected via light trapping by one of the two methods outlined above. The quantities collected will depend on the method permitted. If bucket traps are used, we do not have direct control over the number of specimens collected, because insects are collected in proportion to their abundance in the environment. This may be up to 30 individuals per species at a given site for the more common species, which are usually non-native. If only sheet trapping is used, up to 5 individuals per species will be collected, and we can limit our collecting to *Hyposmocoma*, unless information on other species is desired by the Commission. Most insects cannot be identified to species by sight without comparison to reference material, which is why collecting is usually necessary.



For larval *Hyposmocoma* cases, up to 20 individuals will be collected of each species per site. The reason why more caterpillars are necessary is because we must rear them to adults in the lab, and cases collected in the field are often empty (dead or post-pupation) or parasitized by wasps, which is impossible to determine without rearing. Caterpillars are reared on various diets, depending on the habitat where they were collected. Adult moths and caterpillar cases will be preserved by pinning, and deposited at the University of Hawaii Insect Museum or with KIRC, as detailed below.

**8. What will be done with the specimens after project completion?**

Voucher and type specimens for any new species will be preserved in the University of Hawaii Insect Museum, a public research collection. A type specimen is the specimen on which the species description is based, and it is very important that type specimens be deposited in a museum, where they are accessible to researchers and guaranteed to be protected from damage. Other specimens will be provided to KIRC as a pinned, identified collection, if desired.

**9. Will the proposed research damage or threaten to damage the resources in the Reserve?**

All of our proposed collection methods will have minimal impact on other species or on the physical environment of Kaho'olawe, other than our foot traffic to and from collecting sites. In terms of non-target impacts on other organisms, our collecting methods are largely specific to moths (the only exception being the occasional non-moth insect that is attracted to the light traps). Light trapping in a few locations for a few nights will not have significant impacts on insect populations, and traps will be modified to prevent the capture of larger moths.

**10. List steps that will be taken to minimize effects on the species and the surrounding habitat.**

We will clean all of our equipment thoroughly, including personal footwear, clothing, etc. to remove any seeds or other biological contaminants before traveling to Kaho'olawe. We will only travel and collect specimens in areas approved by the Reserve. To prevent the capture of large moths such as the endangered hawk moth *Manduca blackburni*, wire mesh will be placed over the entrances of bucket traps.

**11. Has any research been conducted that is similar to the one proposed? If yes, please cite.**

Two very similar studies are:

- a. Medeiros, M.J. & Adamski, D. 2012. Three new species of Hawaiian moths from Kahoolawe Island (Lepidoptera: Crambidae & Coleophoridae). *Zootaxa* 3341: 59-63.
- b. Schmitz, P. and D. Rubinoff. 2011. The Hawaiian amphibious caterpillar guild: New species of *Hyposmocoma* (Lepidoptera: Cosmopterigidae) confirm distinct aquatic invasions and complex speciation patterns. *Zoological Journal of the Linnean Society* 162: 15-42.

**12. Who will actively participate (i.e., collect, possess, propagate) on the permit for this research?**

Dr. Rubinoff, Dr. Haines, and Dr. Medeiros have all worked on similar projects previously, and would be the only three researchers involved in this study.

**13. Will your research require camping or night work?**

Although the research involves night work, we would not be camping, but rather setting traps in the afternoon and picking them up in the morning. Active work at night would be restricted to easily accessible areas around the base camp.

**14. Will your research involve the use of aircraft in any way?**

No.

**15. Will your research involve the use of a vessel in any way?**

No.

**16. Will the research require structures/equipment to be left in the field? When will they be removed?**

The light traps are the only equipment that would be left in the field, but only for one night at a time.

**17. Are permits from other agencies required for your research? If yes, list agencies.**

Yes, a state collecting permit from the Division of Forestry and Wildlife is required, and has been obtained (valid through 7 June 2013).

**18. What is the expected report date for your findings?**

We expect to have preliminary results by January 2014, and final published results by 2015.

**19. Are there plans for publication of data or findings gathered from the proposed research?**

Data and findings will be published in peer-reviewed academic journals, and copies of these publications will be provided to the Reserve.

**20. How will research results be disseminated?**

We are also happy to provide the Reserve with our raw data and/or any other desired information.

**21. List funding sources. If this research is supported by grant(s), list grant(s).**

We are supported by a grant from the National Science Foundation, Division of Environmental Biology: Ecological Diversity, Systematics, and Conservation of Hawaii's endemic *Hyposmocoma*

## DANIEL RUBINOFF

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[http://www.ctahr.hawaii.edu/peps/people/fac/profile\\_rubinoff.htm](http://www.ctahr.hawaii.edu/peps/people/fac/profile_rubinoff.htm)

<http://www.ctahr.hawaii.edu/peps/museum/index.htm>

### CURRENT STATUS

- 8/11-present      **Professor, University of Hawaii, Manoa**, Department of Plant and Environmental Protection Sciences-Entomology Graduate program
- 7/07-7/11        **Associate Professor, University of Hawaii, Manoa**, Department of Plant and Environmental Protection Sciences-Entomology Graduate program
- 10/02- present   **Director, University of Hawai'i Insect Museum**  
**Principal Investigator, Biodiversity and Systematics Laboratory**  
•Elected faculty member of the Ecology, Evolution, and Conservation Biology Graduate Program  
•Member of the Graduate Faculty, currently advise three PhD, two Master's students.
- 10/02-6/07      **Assistant Professor, University of Hawaii, Manoa**, Department of Plant and Environmental Protection Sciences-Entomology Graduate program  
•Director, University of Hawai'i Insect Museum  
•Principal Investigator, Insect Biodiversity and Systematics Laboratory

### EDUCATION

**University of California, Berkeley**, Department of Environmental Science, Policy and Management  
•Doctorate of Philosophy in Science , filed June 2001  
•3 year Graduate Research Fellowship, University of California, Berkeley  
•1 year National Science Foundation PEET grant for research in systematics, graduate student researcher

**Cornell University**, College of Agriculture and Life Sciences  
Bachelor of Science Degree in Natural Resources, May 1992  
•Graduated with Distinction  
•Honorable mention, National Science Foundation pre-doctoral fellowship competition

### RESEARCH PROGRAM

- 10/02-present    **Systematics, Conservation, and Ecology**  
•Constructing phylogenies using Morphological and Molecular tools to explore patterns of Evolution, Biodiversity and mechanisms of Ecological Diversification  
•Applying results of systematic analysis to improve Conservation Planning for invertebrates and for tracking origins, quarantine and control of invasive species  
•Ecological research on native insects for both conservation and evolutionary applications

•Studies focusing on the non-target impacts of biological control agents, or other control methods on native insects in developed and natural areas

7/01-10/02 **Postdoctoral Researcher**, Division of Insect Biology, University of California, Berkeley  
•NSF PEET fellow: One year postdoctorate on molecular and morphological systematics of Tortricidae (Lepidoptera)

8/95-6/01 **Graduate Student**, Division of Insect Biology, University of California, Berkeley  
•Advanced to candidacy 1/98  
•Assessed the efficacy of bird (California Gnatcatcher)-based conservation planning on three species of Lepidoptera in endangered southern California coastal sage scrub habitat  
•Constructed a molecular phylogeny of the moth genus *Hemileuca* (Saturniidae) and the *H. electra* species complex to examine patterns of character evolution and conservation implications

10/93-5/95 **Research Assistant**, Dr. Paul Ehrlich, Center for Conservation Biology, Stanford University, Stanford, CA  
•Under Nevada Biodiversity Initiative, designed database and developed standardized water quality tolerance parameters for aquatic invertebrates  
•Used Center's Global Species Database to investigate patterns of diversity and rarity; identified areas of critical concern and developed conservation strategies

6/95-8/95 & 5/94-9/94 **Research Assistant**, Nevada Biodiversity Initiative  
•Studied community structure and population dynamics of butterflies of the Great Basin using standardized surveys and mark-recapture techniques to examine effects of different land use on species composition

## TEACHING EXPERIENCE

10/02-present **Instructor, University of Hawaii**  
•“Invasive Pest Species” PEPS 350 undergraduate class with emphasis on the impacts to native species, ecosystems and agriculture and methods of control across all biomes. This class has been granted a special “Ethics” designation, fulfilling a University-wide requirement after evaluation. Course includes ethical, political and economic implications of Invasive Species issues. In Spring 2010 class was nearly fully enrolled, more than double the number of students the first time it was taught.  
•“Systematics and Phylogenetics” PEPS 662-graduate level class covering theory and methodology with discussion/lab. Culminates in an all day student research symposium attended by faculty and students from several departments. In Fall 2009 class was nearly fully enrolled (23 students), nearly three times the number of students from the first time it was taught.  
•Various graduate seminars, titles and focus varies, one example: “Conflict in Ecology, Evolution, and Conservation Biology”; with 28 students was one of the largest seminars in recent departmental history, also taught an optional seminar on “Speciation” with 25 students, and “Biogeography” with 15 students, and a smaller one: “Invertebrate Conservation”. All seminars fulfill an EECEB graduate program requirement with a 2-credit option.

5/01-present **Research Supervisor**, UC Berkeley and the University of Hawaii

•Training undergraduates and graduate students in molecular systematics, including laboratory and theoretical procedures. I currently employ and supervise **Thirteen** undergraduate , graduate students and postdocs in my laboratory on a wide range of research projects.

1/98-present **Guest Lecturer**, University of Hawaii, University of California, Berkeley  
•Designed and presented multiple lectures for Conservation Biology, Introductory Entomology, Insect Natural History, and Insects and Human Society courses

1-5/96,1-5/98 **Teaching Assistant**, University of California, Berkeley  
•Taught Introductory Entomology  
•Conducted twice weekly laboratories with lectures, designed lab practicals, led field surveys

### **Other Activities**

11/02-present **Director, University of Hawaii Insect Museum**  
• Revitalized the UHIM collection for research, developed loan and all administrative policies and procedures  
•Upgraded the condition of the collection, including a survey of holdings and development of on-line searchable database  
•Incorporated over 50,000 new specimens in 9 years  
• Recruited funding to support museum student workers and equipment upgrades, and applied for museum improvement grants  
•Written grants to fund improvements and assessments of the collection  
•Direct active outreach program in which elementary schools visit the UHIM for a program conducted by my Museum-based graduate and undergraduate students

1/04-present **Co-Editor of the Proceedings of the Hawaiian Entomological Society**

6/03-present **Editorial board member of the Journal for Research on the Lepidoptera**

10/02-present **Doctoral dissertation committee member**  
• 18 graduate students in Departments of Plant and Environmental Protection Sciences, Zoology, Marine Biology and Botany, University of Hawaii  
•College of Tropical Agriculture alumni awards committee  
•Search committees for tenure-track faculty positions in PEPS

1/12-present **State of Hawaii, Agriculture Entomology Subcommittee**  
Evaluate importations approved by the State board of Agriculture

1/99- 10/02 **CityBugs: Urban Biodiversity and Technology Outreach**  
• Co-wrote \$150,000 grant to fund 3-year urban biodiversity and technology program  
• Entomological co-leader and author of interactive, internet and field-based lesson plans

## PUBLICATIONS

- Haines, W.P. and D. Rubinoff. 2012. Molecular phylogenetics of the moth genus *Omiodes* Guenée (Crambidae: Spilomelinae), and the origins of the Hawaiian lineage. *Molecular Phylogenetics and Evolution* **65**: 305-316.
- Kawahara, A. Y. and D. Rubinoff. 2012. Three new species of Fancy Case caterpillars from threatened forests of Hawaii (Lepidoptera, Cosmopterigidae, *Hyposmocoma*). *Zookeys* **170**: 1–20. doi: 10.3897/zookeys.170.1428.
- Rubinoff, D. M. San Jose, and A. Y. Kawahara. 2012. Phylogenetics and species status of Hawaii's endangered Blackburn's Sphinx Moth, *Manduca blackburni* (Lepidoptera: Sphingidae). *Pacific Science*, **66**:31-41.
- Kawahara, A.Y., N. Tangalin, D. Rubinoff. 2011. Life-history notes on the fern-mining endemic *Hyposmocoma (Euperissus) trivitella* Swezey 1913 (Lepidoptera: Cosmopterigidae) from Kauai and a report of associated parasitoids (Hymenoptera: Bethyridae). *Proceedings of the Hawaiian Entomological Society* **43**: 9-12.
- Wahlberg, N. and D. Rubinoff. 2011. Anomalous areas and awkward ages: alleviating concerns. *Systematic Entomology*, **36**: 604–606.
- Kawahara, A. Y., K. Nishida, and D. Rubinoff. 2011. Behavior of the Hawaiian Dancing Moth, *Dryadula terpsichorella* (Tineidae: Dryadulinae). *Journal of the Lepidopterist's Society* **65**: 133-135.
- Wahlberg, N. and D. Rubinoff. 2011. Vagility across *Vanessa* (Lepidoptera: Nymphalidae): mobility in butterfly species does not inhibit the formation and persistence of isolated sister taxa. *Systematic Entomology* **36**: 362-370.
- Schmitz, P. and D. Rubinoff. 2011. Ecologically and Morphologically Remarkable New Cosmet Moth Species of the Genus *Hyposmocoma* (Lepidoptera: Cosmopterigidae) Endemic to the Hawaiian Islands with Reference to the Spectacular Diversity of Larval Cases. *Annals of the Entomological Society of America* **104**: 1-15.
- Schmitz, P. and D. Rubinoff. 2011. The Hawaiian amphibious caterpillar guild: New species of *Hyposmocoma* (Lepidoptera: Cosmopterigidae) confirm distinct aquatic invasions and complex speciation patterns. *Zoological Journal of the Linnean Society* **162**: 15-42.

- Rubinoff, D., B. S. Holland, M. San Jose, and J. Powell. 2011. Geography may not facilitate invasions: Hawaii is not the source of the California invasion by the light brown apple moth (*Epiphyas postvittana*). *PLoS ONE* 6(1): e16361. doi:10.1371/journal.pone.0016361
  
- Leblanc, L., R.I. Vargas, and D. Rubinoff. 2010. A comparison of non target captures in BioLure and liquid protein food lures in Hawaii. *Proceedings of the Hawaiian Entomological Society* 42: 15-22.
  
- Rubinoff, D. and M. San Jose. 2010. Life History and Host Range of Hawaii's Endangered Blackburn's Sphinx Moth (*Manduca blackburni* Butler). *Proceedings of the Hawaiian Entomological Society* 42:53-59.
  
- Eiben, J. A. and D. Rubinoff. 2010. Life history and captive rearing of the Wekiu bug (*Nysius wekiuicola*, Lygaeidae), an alpine carnivore endemic to the Mauna Kea volcano of Hawaii. *Journal of Insect Conservation* 14: 701-709.
  
- Leblanc, L., R. I. Vargas, and D. Rubinoff. 2010. Captures of Pest Fruit Flies (Diptera: Tephritidae) and Nontarget Insects in BioLure and Torula Yeast Traps in Hawaii. *Environmental Entomology*. 39: 1626-1630.
  
- Rubinoff, D. and P. Schmitz. 2010. Multiple aquatic invasions by an endemic, terrestrial Hawaiian moth radiation. *Proceedings of the National Academy of Sciences, USA* 107:5903-5906.
  
- Leblanc, L., R.I. Vargas, and D. Rubinoff. 2010. Attraction of *Ceratitidis capitata* (Diptera: Tephritidae) and Endemic and Introduced Nontarget Insects to BioLure Bait and Its Individual Components in Hawaii. *Environmental Entomology* 39:989-998
  
- King, C. B. A, W. P. Haines and D. Rubinoff. 2010. Impacts of invasive parasitoids on declining endemic Hawaiian leafroller moths (*Omiodes*: Crambidae) vary among sites and species. *Journal of Applied Ecology*. 47:299-308.
  
- Rubinoff, D. B.S. Holland, A. Shibata, R. H. Messing, and M. G. Wright. 2010. Rapid invasion despite extremely low genetic diversity in the invasive *Erythrina* Gall Wasp (*Quadrastichus erythrinae* Kim Delvare and La Salle 2004. *Pacific Science* 64:23-31.
  
- Leblanc, L., P. M. O'Grady, D. Rubinoff, and S. L. Montgomery. 2009. New Immigrant Drosophilidae in Hawaii, and a Checklist of the Established Immigrant Species. *Proceedings of the Hawaiian Entomological Society* 41:121-127.
  
- Rubinoff, D, K. H. Osborne, and A. Kawahara. 2009. Synonymization of the euphonious *Arctonotus* Boisduval, 1852 (Sphingidae: Macroglossinae) based on molecular phylogenetic analysis. *Journal of the Lepidopterist's Society* 63:233-235.
  
- Schmitz, P. and D. Rubinoff. 2009. New Species of *Hyposmocoma* (Lepidoptera, Cosmopterigidae) from the remote Northwestern Hawaiian Islands of Laysan, Necker and Nihoa. *Zootaxa* 2272: 37-53.

- Leblanc, L., D. Rubinoff and R.I. Vargas. 2009. Attraction of Nontarget Species to Fruit Fly (Diptera: Tephritidae) Male Lures and Decaying Fruit Flies in Traps in Hawaii. *Environmental Entomology* **38**: 1446-1461.
- Haines, W. M. Heddle, P. Welton and D. Rubinoff. 2009. A recent outbreak of the Hawaiian koa moth, *Scotorythra paludicola* (Lepidoptera: Geometridae), and a review of outbreaks between 1892 and 2003. *Pacific Science* **63**:349-369
- Hunsdorfer, A. K., D. Rubinoff, M. Attié, M. Wink, and I. J. Kitching. 2009. A revised molecular phylogeny of the globally distributed hawkmoth genus *Hyles* (Lepidoptera: Sphingidae), based on mitochondrial and nuclear DNA sequences. *Molecular Phylogenetics and Evolution* **52**:852-865.
- King, C., D. Rubinoff, and W. Haines . 2009. Biology and distribution of a recently rediscovered endemic Hawaiian leafroller moth, *Omiodes continuatalis* (Crambidae). (Cover Feature) *Journal of the Lepidopterist's Society* **63**: 11-20.
- Le Roux, J. J. and D. Rubinoff. 2009. Molecular data reveals California as the potential source of an invasive leafhopper species, *Macrostelus* sp. Nr. *severeni*, transmitting the aster yellows phytoplasma in Hawaii. *Annals of Applied Biology* **154**: 429-439.
- Roe' AD, Weller' SJ, Baixeras' J, Brown' J, Cummings' MP, Davis' D, Kawahara, AY, Parr, C, Regier, JC, **Rubinoff, D**, Simonsen' TJ, Wahlberg' N, and A Zwick. 2009. Evolutionary Framework for Lepidoptera Model Systems (Chapter 1) in Molecular Biology and Genetics of Lepidoptera Editors: M Goldsmith and F Marec. Taylor and Francis, LLC.
- Rubinoff, D. and J. J. Le Roux. 2008. Evidence of repeated and independent Saltational Evolution in a Peculiar Genus of Sphinx Moths (*Proserpinus*: Sphingidae). *PLoS ONE* **3** (12): e4035.doi:10.1371/journal.pone.0004035.
- Rubinoff, D. 2008. Phylogeography and ecology of an endemic radiation of Hawaiian aquatic case-bearing moths (*Hyposmocoma*: Cosmopterigidae). *Philosophical Transactions of the Royal Society of London B* **363**: 3459-3465.
- King, C. B. A. and D. Rubinoff. 2008. Host Acceptance and Suitability of Endemic Hawaiian Leafroller Moth *Omiodes continuatalis* (Lepidoptera: Crambidae) for four Non-native parasitoid Species. *Proceedings of Hawaiian Entomological Society*. **40**:pp. 11-17.
- Schmitz, P. and D. Rubinoff. 2008. Three new species of *Hyposmocoma* (Lepidoptera, Cosmopterigidae) from the Hawaiian Islands, USA based on morphological and molecular evidence. *Zootaxa*.**1821**: 49-58.
- Cognato, A. and D. Rubinoff. 2008. New Exotic Ambrosia Beetles Found in Hawaii (Curculioinidae: Scolytinae: *Xyleborina*). *Coleopterists Bulletin* **62**:421-424.
- Gentz' M. C. , D. Rubinoff, and J. K. Grace. 2008. Phylogenetic analysis of subterranean termites (*Coptotermes* spp., Isoptera: Rhinotermitidae) indicates the



origins of Hawaiian and North American invasions: Potential implications for invasion biology. *Proceedings of the Hawaiian Entomological Society* **40**:pp.1-9.

- Snyder, J. F., Warren, A. D., **Rubinoff, D.** and G. T. Austin. 2008. *Zizina otis* (F. 1787) Becomes Established on Oahu, Hawaii (Lepidoptera: Lycaenidae: Polyommatainae). *News of the Lepidopterist's Society* **50**. pp.3-6.
- King, C and D. Rubinoff. 2008. First record of fossorial behavior in Hawaiian leafroller moth larvae, *Omiodes continuatalis* (Lepidoptera: Crambidae). *Pacific Science* **62**:147-150.
- Rubinoff, D. 2007. Circling the wagons: Agriculturalists and Conservation Biologists must cooperate to protect endemic Hawaiian invertebrate diversity and control invasive species. *Proceedings of the Hawaiian Entomological Society* **39**: 1-5.
- Rubinoff, D., S. Cameron, and K. Will. 2006. A Genomic Perspective on the Shortcomings of Mitochondrial DNA for "Barcoding" Identification. *Journal of Heredity***97**: 581-594.
- Rubinoff, D. 2006. DNA Barcoding evolves into the Familiar. *Conservation Biology*. **20**:1548-1549.
- Cameron, S., D. Rubinoff and K. Will. 2006. Who Will Actually Use DNA Barcoding and What Will it Cost? *Systematic Biology*. **55**: 844-847.
- Rubinoff, D. 2006. Utility of Mitochondrial DNA Barcodes in species conservation. *Conservation Biology* **20**:1026-1033.
- Prado, S. S. D. Rubinoff and R. P.P. Almeida. 2006. Vertical Transmission of a Pentatomid Caeca-associated Symbiont. *Annals of the Entomological Society of America*. **99**: 577-585.
- Rubinoff, D and W. P. Haines. 2006. *Hyposmocoma molluscivora* Description. *Science* **311**:1377.
- Rubinoff, D., S. Cameron, and K. Will. 2006. Are plant DNA barcodes a search for the Holy Grail? *Trends in Ecology and Evolution*.**21**:1-2.
- Rubinoff, D. and B. S. Holland. 2005. Between Two Extremes: Mitochondrial DNA is neither the Panacea nor the Nemesis of Phylogenetic and Taxonomic Inference. *Systematic Biology* **54**: 952-961.
- Rubinoff, D. and W. P. Haines. 2005. Web-spinning caterpillar stalks snails. *Science***309**:575.
- Rubinoff, D. and J. Powell. 2004. Conservation of fragmented small populations: endemic species persistence on California's smallest channel island. *Biodiversity and Conservation* **13**: 2537-2550
- Will, K. and D. Rubinoff. 2004. Myth of the molecule: DNA barcodes for species cannot replace morphology for identification and classification. *Cladistics* **20**:47-55.

- Rubinoff, D and F.A. H. Sperling. 2004. Mitochondrial DNA sequence, morphology and ecology yield contrasting conservation implications for two threatened Buckmoths (*Hemileuca*: Saturniidae). *Biological Conservation* **118**: 341-351.
  
- Rubinoff, D. 2002. Endangered plants as guides for saving endemic insects in California. *Fremontia*, **30**: 62-66.
  
- Rubinoff, D. and F.A.H. Sperling. 2002. Evolution of ecological traits and wing morphology in *Hemileuca* (Saturniidae) based on a two gene phylogeny. *Molecular Phylogenetics and Evolution*. **25**: 70-86.
  
- Rubinoff, D. 2002. Observations of Adult and Larval Behavior in the Winter Sphingid, *Arctonotus lucidus* (Sphingidae). *The Journal of the Lepidopterists' Society*.**55**: 78-79.
  
- Rubinoff, D. 2001. Evaluating the California Gnatcatcher as an Umbrella Species for conservation of Coastal Sage Scrub. *Conservation Biology* **15**:1374-1383.
  
- McElfresh, J.S., J. G. Millar, and D. Rubinoff. 2001. (E4,Z9)-tetradecadienal, a sex pheromone for three North American species in the genus *Saturnia*. *Journal of Chemical Ecology*, **27**: 791-806.
  
- Rubinoff, D and J. A. Powell. 1999. Description of *Diedra* , new genus (Lepidoptera: Tortricidae: Tortricinae:Archipini), and three new species, based on phylogenetic analysis *Annals of the Entomological Society of America*, **92**: 473-487
  
- Rubinoff, D. 1998. Field observations on mating behavior and predation of *Hemileuca electra*(Saturniidae) *The Journal of the Lepidopterists' Society*, **52**: 212-214
  
- Rubinoff, D. and K.H. Osborne. 1997. Two new species of Asteraceae-feeding *Bucculatrix* (Bucculatricidae) from California. *The Journal of the Lepidopterists' Society*, **51**: 227-236
  
- Rubinoff, D. 1996. California scrub jay predation on the arboreal salamander (*Aneides lugubris*.) *Herpetological Review*, **27**: 135

# WILLIAM P. HAINES

## CURRICULUM VITAE

University of Hawai'i at Mānoa  
Department of Plant and Environmental Protection Sciences  
3050 Maile Way, Gilmore 310  
Honolulu, HI 96822

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### EDUCATION

#### **University of Hawai'i at Mānoa, Honolulu, HI.**

Ph.D., Entomology (Ecology, Evolution & Conservation Biology). December 2011

Dissertation: The biogeography, phylogenetics, and population structure of Hawaiian Lepidoptera, with a focus on the genus *Omiodes* (Crambidae).

#### **Cornell University, Ithaca, NY.**

B.S. in Biological Sciences\*, *magna cum laude*, May 1999. GPA: 3.84

Honors thesis: Evaluation of the bryophyte *Leucobryum glaucum* as a food source for two generalist insect herbivores: *Acheta domesticus* (Orthoptera: Gryllidae) and *Trichoplusia ni* (Lepidoptera: Noctuidae).

\*Also completed all requirements for a B.S. in Entomology

### PROFESSIONAL EXPERIENCE

#### **Junior Researcher. December 2011 – present**

Department of Plant and Environmental Protection Sciences, University of Hawai'i at Mānoa, Honolulu, HI. Research on evolution and ecology of Hawaiian moths in the genus *Hyposmocoma*. Supervisor: Daniel Rubinoff.

#### **Research Specialist II. August 2010 - present**

Bishop Museum, Honolulu HI. Insect identification on a part-time basis. Supervisor: Neal Evenhuis.

#### **Graduate Research Assistant. 2008 - 2010**

Department of Plant and Environmental Protection Sciences, University of Hawai'i at Mānoa, Honolulu, HI. Advisor: Daniel Rubinoff.

#### **Biological Consultant. June 2009**

Pacific Analytics, LLC. Entomological field work and identification at Haleakala National Park and summit. Supervisor: Greg Brenner.

#### **NSF Graduate Research Fellow. 2005 - 2008**

Department of Plant and Environmental Protection Sciences, University of Hawai'i at Mānoa, Honolulu, HI.

#### **NSF GK-12 Teaching Fellow. 2003 - 2005**

Ecology, Evolution, and Conservation Biology Graduate Program, University of Hawai'i at Mānoa, Honolulu, HI.

#### **Entomological Research Specialist. 2001 - 2003**

Research Corporation of the University of Hawaii (Cooperative agreement with U.S. Geological Survey, Biological Resources Division, Haleakalā Field Station, HI).

Designed and carried out research into the efficacy of insecticides for Argentine ant control. Supervisor: Lloyd Loope, USGS.

**Research Specialist. 2000 - 2001**

Research Corporation of the University of Hawai'i (Cooperative agreement with U.S. Geological Survey, Biological Resources Division, Kilauea Field Station, HI).  
Researched the ecology of native and invasive insects. Supervisor: David Foote, USGS.

**Biological Sciences Intern. 1999-2000**

U.S. Geological Survey, Biological Resources Division, Kilauea Field Station, HI

**Undergraduate Researcher 1998-1999**

Cornell University, Boyce Thompson Institute for Plant Research, Ithaca, NY

**Undergraduate Research Assistant 1997-1999**

Cornell University Orchards, Ithaca, NY

**Undergraduate Teaching Assistant 1998**

Cornell University, Department of Entomology, *Spider Biology*, Ithaca NY

**PUBLICATIONS**

- Vorsino, A., C. B. King, **W. P. Haines**, and D. Rubinoff. *In review*. Modeling the habitat retreat of the rediscovered endemic Hawaiian moth *Omiodes continuatalis* Wallengren (Lepidoptera; Crambidae). PLoS ONE.
- Haines, W. P.** and D. Rubinoff. 2012. Molecular phylogenetics of the moth genus *Omiodes* Guenée (Crambidae: Spilomelinae), and the origins of the Hawaiian lineage. *Molecular Phylogenetics and Evolution*. 65: 305-316.
- Haines, W. P.**, F. Starr, K. Starr, and W.G. King. 2011. A new record of the fruit piercing moth *Oraesia excavata* (Butler) (Noctuidae: Calpinae: Calpini) for Hawai'i and the United States. *Journal of the Lepidopterists' Society*. 65(1): 53-57.
- Krushelnycky, P.D., **W. Haines**, L. Loope and E. Van Gelder. 2011. The Haleakala Argentine ant project: a synthesis of past research and prospects for the future. Pac. Coop. Stud. Unit Tech. Rep. 173. University of Hawai'i at Mānoa, Department of Botany. Honolulu, HI. 127 pp.
- King, C. B. A., **W. P. Haines**, and D. Rubinoff. 2010. Impacts of invasive parasitoids on declining endemic Hawaiian leafroller moths (*Omiodes*: Crambidae) vary among sites and species. *Journal of Applied Ecology* 47: 299-308.
- Bressan A., J. Arneodo, M. Simonato, **W.P. Haines**, and E. Boudon-Padieu. 2009. Characterization and evolution of two bacteriome-inhabiting symbionts in cixiid planthoppers (Hemiptera: Fulgoromorpha: Pentastirini). *Environmental Microbiology*. 11(12): 3265-79.
- Haines, W. P.** and J. A. A. Renwick. 2009. Bryophytes as food: comparative consumption and utilization of mosses by a generalist insect herbivore. *Entomologia Experimentalis et Applicata* 133: 296-306.
- Haines, W. P.**, M. L. Heddle, P. Welton and D. Rubinoff. 2009. A recent outbreak of the Hawaiian koa moth, *Scotorythra paludicola* (Lepidoptera: Geometridae), and a review of outbreaks between 1892 and 2003. *Pacific Science* 63:349-369.
- King, C., D. Rubinoff, and **W. P. Haines**. 2009. Biology and distribution of a recently rediscovered endemic Hawaiian leafroller moth, *Omiodes continuatalis* (Crambidae). *Journal of the Lepidopterist's Society* 63: 11-20.
- Kaufman, L.V., C. B. A. King, L. L. Leblanc, and **W. P. Haines**. 2008. *Triclistus* nr. *aitkeni* a new adventive species to the Hawaiian Islands. Proceedings of the

- Hawaiian Entomological Society 40: 55-59.
- Handler, A. T., D. S. Gruner, **W. P. Haines**, M. W. Lange, and K. Y. Kaneshiro. 2007. Arthropod surveys on Palmyra Atoll, Line Islands, and insights into the decline of the native tree *Pisonia grandis* (Nyctaginaceae). *Pacific Science* 61: 485-502.
- Haines, W. P.** 2006. *Discover Life: Ants – Hawaii Identification Guide and Checklist*. [Interactive online key to ants](#).
- Haines, W. P.** and G. A. Samuelson. 2006. The Eucalyptus snout beetle, *Gonipterus scutellatus* (Coleoptera: Curculionidae), recently established in the Hawaiian Islands. *Bishop Museum Occasional Papers* 88 (Records of the Hawaii Biological Survey): 25-26.
- Rubinoff, D. and **W. P. Haines**. 2005. Web-spinning caterpillar stalks snails. *Science* 309: 575.
- Haines, W.P.** and D. Foote. 2005. Rapid assessment of invertebrate fauna of the Kona Forest Unit of Hakalau National Wildlife Refuge. Hawai'i Cooperative Studies Unit, Technical Report HCSU-001. University of Hawai'i at Hilo. 93pp.
- Haines, W. P.**, J. Giffin and D. Foote. 2004. Rediscovery of five species of *Omiodes* Guenée (Lepidoptera: Crambidae) on Hawaii Island. *Bishop Museum Occasional Papers* 79 (Records of the Hawaii Biological Survey): 45-49.
- Johnson, P. J., **W. P. Haines** and D. Foote. 2001. A new generic combination and Hawaiian Island record for *Adelocera beardleyi* (Coleoptera: Elateridae). *Bishop Museum Occasional Papers* 69 (Records of the Hawaii Biological Survey): 29-31.

## GRANTS/ AWARDS

- D. Elmo Hardy Graduate Student Award, 2008 (Award recipient)**  
University of Hawai'i award for research in insect systematics (\$1500).
- Entomological Society of America, Annual Meeting, 2008 (Award recipient)**  
Student competition for the President's Prize, 1<sup>st</sup> place display presentation.
- Entomological Society of America, Annual Meeting, 2007 (Award recipient)**  
Student competition for the President's Prize, 2<sup>nd</sup> place oral presentation.
- Hawai'i Conservation Conference, 2007 (Award recipient)**  
Student oral presentation award, runner up (\$250)
- Achievement Rewards for College Scientists Foundation, 2006 (Award Recipient)**  
Maybelle Roth Award for Conservation Biology. (\$5000)
- Hawai'i Invasive Species Council, 2005-2006 (Grant co-author and collaborator)**  
Extinguishing the Fire Ant Through Education: Using the Hoike o Haleakala Curriculum for Early Detection on Maui (\$7800). Awarded to Maui Invasive Species Committee.
- Toyota Tapestry Grant, 2005-2006 (Collaborator)**  
Anticipating an invasion on Maui: monitoring *Wasmannia auropunctata*, the little red fire ant. (\$8500). Awarded to Sherri Garcia, Seabury Hall High School
- U.S. Fish and Wildlife Service, 2004-2006 (Grant author and administrator)**  
Assessment and mapping of native plants and invertebrates from Makawao Forest Reserve, Maui, Hawai'i (\$26,795). Awarded to Pacific Cooperative Studies Unit, University of Hawai'i.
- U.S. Department of Agriculture TSTAR Grant, 2004-2006 (Grant co-author)**  
Empirical evaluation of the target and non-target impacts of biological control introductions on native moths and their threatened sister taxa. (\$233,698). Awarded to Daniel Rubinoff, University of Hawai'i
- NSF Graduate Research Fellowship, 2005-2008 (Fellowship recipient)**  
(\$30,000/year for three years)

**Xerces Society, 2003-2004 (Award recipient)**

Joan Mosenthal Dewind Award (\$3,750)

**NSF GK-12 Teaching Fellowship, 2003-2005 (Fellowship recipient)**

(\$27,500/year for two years)

**PRESENTATIONS**

Hawai'i Conservation Conf., Honolulu, HI, Jul 2012 (Speaker and symposium leader)  
Lepidopterists' Society Annual Meeting, Denver, CO, Jul 2012  
Pacific Entomology Conference, Honolulu, HI, Feb 2012  
Entomological Society of America, Pacific Branch Meeting, Waikoloa, HI, Mar 2011  
Evoluncheon, University of Hawai'i, Honolulu, HI, Apr 2010  
Hawai'i Conservation Conference, Honolulu, HI, Jul 2009  
Entomological Society of America, Pacific Branch Meeting, San Diego, CA, Mar 2009  
Entomological Society of America, San Diego, CA, Dec 2007  
Hawai'i Conservation Conference, Honolulu, HI, Jul 2007  
Entomological Society of America, Pacific Branch Meeting, Maui, HI, May 2006  
CTAHR Student Symposium, University of Hawai'i, Honolulu, HI, Apr 2006  
Evolution 2006, Stony Brook, NY, June 2006  
Entomological Society of America, Ft. Lauderdale, FL, Dec 2005  
Evoluncheon, University of Hawai'i, Honolulu, HI, Sep 2005  
CTAHR Student Symposium, University of Hawai'i, Honolulu, HI, Apr 2005  
Evoluncheon, University of Hawai'i, Honolulu, HI, Mar 2005  
Amy Greenwell Botanical Garden "Horti-Cultural" Festival, Kailua-Kona, HI, Feb 2004  
Pacific Entomology Conference, Honolulu, HI, Feb 2005  
Entomological Society of America, Salt Lake City, UT, Nov 2004  
Lepidopterists' Society, Washington, DC, Jul 2004  
Hawai'i Conservation Conference, Honolulu, HI, Jul 2004  
Hawai'i Conservation Conference, Honolulu, HI, Jul 2003  
Hawai'i Conservation Conference, Honolulu, HI, Jul 2002  
Society for Conservation Biology, Hilo, HI, Jul 2001  
Workshop on Conservation Biology of Hawaiian *Drosophila*, Hilo, HI, Mar 2001

**PROFESSIONAL MEMBERSHIPS**

Hawaiian Entomological Society  
Entomological Society of America  
Lepidopterists' Society  
American Bryological and Lichenological Society

**PROFESSIONAL REFERENCES**

Daniel Rubinoff (Current Supervisor)  
Professor, University of Hawai'i at Mānoa, Honolulu, HI  
(808) 956-8432, rubinoff@hawaii.edu

Cynthia B. King (Collaborator)  
Entomologist, Hawai'i Division of Forestry and Wildlife, Honolulu, HI  
(808) 587-0019, cynthia.b.king@hawaii.gov

Lloyd Loope (Former Supervisor 2001-2003)  
Research Biologist, United States Geological Survey, Makawao, HI  
(808) 572-2405, lloope@usgs.gov

Matthew J. Medeiros  
1. The Urban School of San Francisco  
2. Department of Integrative Biology  
University of California, Berkeley, &

#### Education

2000. B.A. *cum laude*, Hamline University, Minnesota. Graduation with Honors in Biology. Advisor: B.J. Ploger.  
2009: Ph.D., Department of Integrative Biology, University of California, Berkeley. Advisor: R. Dudley.

#### Research Interests

1. Evolution of insect flightlessness
2. Biogeography of the Hawaiian & Pacific Lepidoptera
3. Phylogenetics and taxonomy of Lepidoptera

#### Teaching Activities

High School Biology & Chemistry Teacher: August 2011 – present, The Urban School of San Francisco, San Francisco, CA.  
High School Biology & Chemistry Teacher: August 2009 – June 2011, Landon School, Bethesda, MD.  
GK-12 Fellow: Exploring California Biodiversity (community outreach). July 2007 – June 2009. University of California. Berkeley, CA.  
Graduate Student Instructor, Introduction to Biology. January 2004 – May 2005 and January 2005 – Summer 2007. University of California. Berkeley, CA.  
Graduate Student Instructor, Island Biology and Geomorphology. August 2005 – December 2005. Moorea, French Polynesia.  
Graduate Student Instructor, Human Anatomy. August 2003 – December 2003. University of California. Berkeley, CA.

#### Publications

Medeiros, M.J. & Dudley, R. In Press. Jumping performance in flightless Hawaiian Grasshopper moths (Xyloryctidae: *Thyrocopa* spp.). Proceedings of the Hawaiian Entomological Society.  
Medeiros, M.J. & Adamski, D. 2012. Three new species of Hawaiian moths from Kahoolawe island (Lepidoptera: Crambidae & Coleophoridae). *Zootaxa* 3341: 59-63.  
Medeiros, M.J. & Gillespie, R.G. 2011. Biogeography and the evolution of flightlessness in a radiation of Hawaiian moths (Xyloryctidae: *Thyrocopa*). *J. Biogeography* 38: 101-111.  
Medeiros, M.J. 2009. A revision of the endemic Hawaiian genus *Thyrocopa* (Lepidoptera: Xyloryctidae: Xyloryctinae). *Zootaxa* 2202: 1-47.  
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Medeiros, M.J. 2008. A new species of flightless, jumping, alpine moth of the genus *Thyrocopa* from Hawaii (Lepidoptera: Xyloryctidae: Xyloryctinae). *Zootaxa* 1830: 57-62.  
Ploger, B.J., & Medeiros, M.J. 2004. Unequal food distribution among *Ardea alba* nestlings: parental choice or sibling aggression? *J. Avian Biol.* 35: 399-404.

- Borrell, B.J., & Medeiros, M.J. 2004. Thermal stability and muscle efficiency in hovering orchid bees (Apidae: Euglossini). *J. of Exp. Biol.* 207: 2925-2933.
- Medeiros, M.J., Emond, E.E., & Ploger, B.J. 2000. An unusual type of sibling aggression in black-crowned night herons. *Condor* 102: 439-441.

### Fellowships and Grants

- National Science Foundation International Research Fellowship Program. 2009.  
(Declined in order to teach.)
- Walker Fund for Systematics Research in Entomology. 2006, 2007, and 2008.
- NSS Ralph W. Stone Graduate Fellowship in Cave and Karst Studies. 2006.
- Cave Research Foundation Karst Research Grant. 2006.
- Xerces Society DeWind Award for Lepidoptera Research and Conservation. 2006.
- Society for Integrative and Comparative Biology Research Grant. 2004.
- Pacific Rim Research Project Mini-Grant from University of California. 2004.
- Sigma Xi Grant in Aid of Research Award. 2004.
- Honorable Mention. National Science Foundation Graduate Research Fellowship. 2003.
- Lund Summer Research Program Award from Hamline University. 2000.
- Lund Summer Research Program Award from Hamline University. 1999.
- Student Research Grant from the Oregon Field Ornithologists. 1995.

### Presentations

- Invited Presentation:* How molecular phylogenetics can inform conservation: Three case studies from Hawaiian moths. Hawaii Conservation Conference. July 2012. Honolulu, HI.
- Colonization Patterns Provide Clues to Larval Case Types in *Hyposmocoma* (Lepidoptera: Cosmopterigidae) on an Uninhabited, Severely Degraded Hawaiian Island. Pacific Branch, Entomological Society of America. March 2012. Portland, OR.
- Invited Presentation:* The Evolution of Flightlessness in Cave and Alpine Hawaiian Moths. Sonoma State University, Biology Dept. Seminar Series. October 2011. Rohnert Park, CA.
- Both Biological Enemies and Human Taxonomic Error are Responsible for Declines in Endemic Hawaiian Insect Populations. Hawaii Conservation Conference. August 2010. Honolulu, HI.
- Invited Presentation:* The Evolution of Flightlessness in Cave and Alpine Hawaiian Moths. Pacific Branch, Entomological Society of America. March 2009. San Diego, CA.
- Evolution of cave-living in Hawaiian *Schrankia* (Lepidoptera: Noctuidae). Entomological Society of America. November 2008. Reno, NV.
- Invited Seminar:* The Evolution of Flightlessness in Cave-dwelling and Alpine Hawaiian Moths. California State University, East Bay, Earth and Environmental Sciences Dept. Seminar Series. May 2008. Hayward, CA.
- Independent loss of flight in two closely related species of Hawaiian "grasshopper moths" (*Thyrocopa*: Xyloryctidae). Entomological Society of America. December 2007. San Diego, CA.
- Evolution of cave-living in Hawaiian *Schrankia* (Lepidoptera: Noctuidae). Invertebrate Biodiversity & Conservation Conference. Poster presentation with F.G. Howarth and R.G. Gillespie. December 2007. Brisbane, Australia.
- Invited Seminar:* Evolution of Flightlessness in Hawaiian Moths. Pacific University. October 2007. Forest Grove, OR.
- Colonization of Caves by Flightless Hawaiian Moths. Pacific Branch, Entomological Society of America. March 2007. Portland, OR.



- Repeated evolution of cave dwelling moths. Society for Integrative and Comparative Biology. January 2006. Orlando, FL.
- Positional orientation in perching damselflies (*Ischnura ramburii*): Do they care where they face? Animal Behavior Society. August 2000. Atlanta, GA.
- Positional orientation in the damselfly *Ischnura ramburii*. Minnesota Academy of Science. April 2000. Moorhead, MN.
- An unusual form of sibling aggression in black-crowned night herons (*Nycticorax nycticorax*). Poster presentation. Minnesota Academy of Science. April 1999. St. Paul, MN.

#### **Research Experience**

- Inventory of the Lepidoptera of Kahoolawe, Hawaii. 2008 - present. Field study in Hawaii.
- Taxonomic revision of the New World Adelidae (Lepidoptera: Incurvarioidea). Fall 2009 - present. In collaboration with Don Davis, Smithsonian Institution.
- Flightlessness in cave and alpine Hawaiian moths. Summer 2004 - Spring 2009. Field study in Hawaii.
- Exploring flight loss in Hawaiian cave-dwelling moths. Winter 2004. Pilot field study in Hawaii.
- Flight biomechanics of orchid bees. Summer 2002. Field and lab studies on Barro Colorado Island, Smithsonian Tropical Research Institute, Republic of Panama. Brendan Borrell, principal investigator.
- Positional orientation of damselflies. January and summer 1999. Field study in Kahului, HI. Advisor: Dr. B.J. Ploger.
- Sibling aggression in great egrets. Summer 1998. Field study in Ashby, MN. Dr. B.J. Ploger, principal investigator.
- Sibling aggression in black-crowned night herons. Summer 1998. Field study in Ashby, MN. Dr. B.J. Ploger, principal investigator.
- Nesting patterns of long-billed marsh wrens. Summer 1995. Advisors: Drs. R.E. Stockhouse and P.T. Lopez.

#### **Professional Societies**

- Entomological Society of America  
Hawaiian Entomological Society  
National Speleological Society



# SCIENTIFIC PERMIT

## NATIVE INVERTEBRATE RESEARCH

DEPARTMENT OF LAND AND NATURAL RESOURCES  
1151 PUNCHBOWL STREET, RM. 325, HONOLULU, HI 96813  
PH: (808)587-0019, FAX: (808)587-0160, EMAIL: cynthia.b.king@hawaii.gov

**EFFECTIVE: 7 JUNE 2012 – 7 JUNE 2013**

**Endorsement No: FHM12-291**

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### Endorsement for a Proposal to Study/Collect Native Invertebrate Animals (Exclusive of T/E Species)

Terms & acronyms used in this document: DLNR = Department of Land and Natural Resources. DOFAW = Division of Forestry and Wildlife. NARS = Natural Area Reserves System. T/E = Threatened/Endangered (specially-protected rare native organisms).

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The Board of Land and Natural Resources hereby grants permission -- under the authority of: (1) Hawaii Revised Statutes (1993) Chapter 195D Conservation of Aquatic Life, Wildlife, and Land Plants, specifically Paragraph 195D-4-f License; and (2) DLNR Chapter 124 Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds, specifically Paragraph 13-124-4 Scientific, Propagation, and Educational Permits -- to:

#### PRINCIPAL PERMIT HOLDER:

Daniel Rubinoff  
Assistant Professor  
UH Manoa, PEPS  
3050 Maile Way, Gilmore Hall 310  
Honolulu, HI 96822  
Phone: (808) 956-8432 Fax: (808) 956-2428  
Email: rubinoff@hawaii.edu

#### RESEARCH ASSISTANT(S):

Mike San Jose Zachary Williams  
William Haines  
Jesse Eiben  
Natalia Tangalin  
Keahi Bustamente  
Brenden Holland  
Stephanie Joe

... to study/collect the following **NATIVE INVERTEBRATE** species in the amounts and with the methods/materials/equipment specified below. **The purpose/objectives of the study:** to conduct a general survey to identify associations and systematics of Cosmopterigid moths (*Hyposmocoma* spp.) in particular and other moth genera as they are opportunistically encountered, to help determine their conservation status. Collections will be done on the islands of: **Kaua'i** (Na Pali-Kona FR, Pu'u Ka Pele FR, Alaka'i Wilderness Preserve, Lihu'e-Koloa FR, Nonou FR, Moloaa FR, Halelea FR, Kalepa FR, Kealia FR, Mana Plains FR, Kokee State Park); **O'ahu** (Honolulu Watershed FR, Wai'anae Kai FR, 'Ewa FR, Mokulei'a FR, Schofield Barracks FR, Hau'ula FR, Kaipapau FR, Kaneohe FR, Kuaokala FR, Kuliouou FR, Makua Keau FR, Nanakuli FR, Pupukea-Paumalu FR, Round Top FR, Waiahole FR, Waimanalo FR); **Moloka'i** (Moloka'i FR); **Lanai** (Game Management Area); **Maui** (Kahikinui FR, Kula FR, Makawao FR, Waihou FR, West Maui FR); **Hawai'i** (Hamakua FR, Hauola FR, Hilo FR and Watershed, Honua'ula FR, Kapapala FR and Canoe Forest Management Area, Ka'u FR, Keauohana FR, Kohala FR and Watershed FR, Malama Ki FR, Manowaialee FR, South Kona FR, Mauna Kea FR, Mauna Loa FR, Nanawale FR, 'Ola'a FR, Panaewa FR, Pu'u Wa'awa'a FR and Wildlife Sanctuary, Waiakea FR, Upper Waiakea FR, Waiaha Springs FR, Wao Kele O Puna FR, Volcano Village).

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Common name	Scientific name	No. of species
Fancy case caterpillars Various trap bycatch	<i>Hyposmocoma</i>	Maximum of 50 per spp./site

#### **Methods/Materials/Equipment:**

Visual searches for caterpillars and their host substrate by day and black light trapping by night. Traps may be left in place overnight; camping may be done in areas too dangerous or remote to traverse after dark. Leaf litter samples will also be collected (maximum of 5 gallons of leaf litter per site). All samples will be transported back to the laboratory with host plant material for rearing and detailed molecular and morphological studies.

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The following are general conditions/understandings:

- A. This endorsement is non-transferable or assignable.
- B. Each Permit Holder is individually responsible and accountable for his or her, own actions.
- C. This endorsement does not in any way make the Board of Land and Natural Resources of the State of Hawaii liable for any claims of personal injury or property damage to the Principal Permittee or Sub-Permittee or their party which may occur while engaged in activities permitted under this endorsement; further, the Principal Permit Holder and Sub-Permit Holder agree to hold the State harmless against any claims of personal injury, death or property damage resulting from the activities of the Principal Permit Holder or Sub-Permit Holders.
- D. Principal Permit Holder shall provide, or make available for inspection, any raw data that may be obtained under this endorsement when requested by DOFAW.
- E. The endorsement shall become valid when the Principal Permit Holder has read the endorsement in-toto and acknowledges understanding and agreement to abide by the conditions by signing (affixing his/her signature) in the space provided on page 4 of the document.
- F. Persons in violation of the terms and conditions of this permit and/or related or appropriate laws may be subject to criminal and or administrative penalty under Hawaii Revised Statutes §183-4, §183-5, §171-6.4 §171-31.6, Hawaii Administrative Rules §13-104-3, §13-124-8, §13-195D-9, or as otherwise provided by law. Infractions or misconducts will constitute grounds for revocation of this permit and criminal prosecution. Any person whose permit has been revoked shall not be eligible to apply for another permit until the expiration of two years from the date of revocation.
- G. This endorsement may be revoked for due cause (fire danger being one, violating any of the conditions being another).
- H. Specimens will be deposited in Bishop Museum and/or the University of Hawaii at Manoa Insect Museum upon completion of project; duplicates may be deposited in host institution so all material is accounted for and may be located for any future research or other needs.
- I. The proposed activities to be conducted fall under DOFAW's exemption list of June 12, 2008, including but not limited to **Exemption Class 5: Basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource.** Division analysis of the proposed resource management actions concluded it will provide a positive environmental benefit and will be done in a manner to have no negative impact on the conditions that define the area. Furthermore, the cumulative impact of these and similar actions over the duration of the permit (1-year) will not have a significant adverse impact and will have minimal or no significant effect on the environment and are exempt from the need to prepare an environmental assessment.

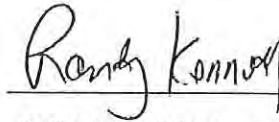
The following are special conditions/understandings:

- A. The Principal Permit Holder shall submit a report of activities for the permit period, prior to expiration of permit. The reports are due to DOFAW's main office (Attn: Entomologist) no later than one month before expiration date. The reports should indicate: When, what island, what species (best guesses are acceptable), the number of specimens collected per species, and other information required by any of the conditions of this endorsement. Copies of receipts, or other indications, for any specimen deposited at DOFAW-authorized repositories shall be attached to the reports. The last report shall summarize/compile the accomplishments for the endorsement period. Permits are granted on a calendar year basis, even in the case of multi-year projects. If renewal is needed, submit a progress report and next year's plan in advance of expiration (at least one month) to allow time for staff evaluation and processing of renewal. **Failure to submit reports and requests in advance will result in denial of further permits in the area until resolved.**
- B. This endorsement authorizes the Principal Permit Holder and Sub-Permit Holders to study/collect the organisms listed on Page 1 ONLY and only in the amounts and manner specified.
- C. A copy of this endorsement and a photo identification card must be carried by the Principal Permit Holder and Sub-Permit Holders while engaged in activities permitted under this endorsement.
- D. **This endorsement in no way authorizes access onto property. Permission must be acquired separately.**
- E. Prior to conducting study/collecting activity on DOFAW lands, the Principal Permittee and Sub-Permittees need to have permission from the appropriate DOFAW District Offices. Write to:  
  
Kaua'i Branch Manager, Division of Forestry & Wildlife, 3060 Eiwa Street Rm. 306, Lihue, HI 96766. (808) 274-3433; fax (808) 274-3438.  
  
O'ahu Branch Manager, Division of Forestry & Wildlife, 2135 Makiki Heights Drive, Honolulu, HI 96822. (808) 973-9778; fax (808) 973-9781.  
  
Maui (& Moloka'i) Branch Manager, Division of Forestry & Wildlife, 54 South High Street, Wailuku, HI 96793. (808) 984-8100; fax (808) 984-8111.  
  
Hawai'i Branch Manager, Division of Forestry & Wildlife, Mailing address: PO Box 4849, Hilo, HI 96720. Street address: 19 E. Kawili St. (808) 974-4221; fax (808) 974-4226.
- F. A Special Use Permit is needed for NARS areas. Contact the NARS Commission Executive Secretary, Division of Forestry and Wildlife, 1151 Punchbowl Street Rm. 325, Honolulu, HI 96813. (808) 587-0063; fax (808) 587-0064.
- G. NOTE: For the protection of the forests and other wildland areas from pest infestations (particularly weeds and plant diseases), please clean off your shoes when moving from one island to the next.

I, **DANIEL RUBINOFF**, have read the general and special conditions/understandings listed on pages 2 and 3, understand them, and hereby agree to abide by them.



**DANIEL RUBINOFF**  
Principal Permit Holder



*for* **PAUL J. CONRY**, Administrator  
Division of Forestry and Wildlife