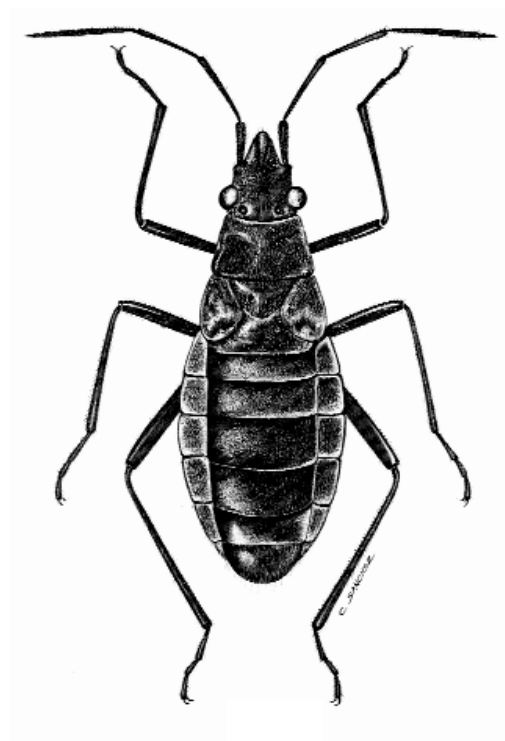


# WĒKIU BUG BASELINE MONITORING

1<sup>ST</sup> QUARTER 2002  
QUARTERLY REPORT



Revised April 2004



*Pacific Analytics, L.L.C.*

Cover : Wēkiu Bug drawn by Mr. C. Sanchez of the University of the Philippines  
College of Science and Humanities.

# WĒKIU BUG BASELINE MONITORING

1<sup>ST</sup> QUARTER 2002  
QUARTERLY REPORT

Prepared for

The Outrigger Telescopes Project  
WM Keck Observatory  
Kamuela, Hawai'i

Revised April 2004



*Pacific Analytics, L.L.C.*

P.O. Box 219  
Albany, Oregon 97321  
[www.statpros.com](http://www.statpros.com)

*Prepared by:*

Pacific Analytics, L.L.C.  
Post Office Box 219  
Albany, Oregon 97321  
Tel. (541) 926-0117  
mail@statpros.com  
www.statpros.com

---

Gregory Brenner  
Senior Associate / Project Manager

# WĒKIU BUG BASELINE MONITORING

## 1<sup>ST</sup> QUARTER 2002 QUARTERLY REPORT

### I. TABLE OF CONTENTS

	Page
I. TABLE OF CONTENTS .....	1
II. EXECUTIVE SUMMARY .....	3
III. INTRODUCTION .....	5
IV. QUESTIONS OF INTEREST .....	7
V. METHODS .....	9
VI. RESULTS .....	15
VII. DISCUSSION .....	23

**This page intentionally left blank.**

Wēkiu Bug Baseline Monitoring  
EXECUTIVE SUMMARY

II. EXECUTIVE SUMMARY

The Mauna Kea Science Reserve (MKSR) is located on the summit of Mauna Kea, the tallest mountain in Hawai'i. Within the reserve are the world's two largest optical telescopes, constituting the W.M. Keck Observatory (WMKO). The slopes of Pu'u Hau 'Oki directly adjacent to and below the WMKO are part of a unique natural environment that supports the Wēkiu bug, a rare insect. Wēkiu bugs generally occupy habitat encompassing an estimated 300 acres (121 hectares) of the summit of Mauna Kea. Small populations of Wēkiu bugs also occur on other nearby cinder cones near the summit.

The National Aeronautics and Space Administration (NASA), together with the California Institute of Technology (CalTech)/Jet Propulsion Laboratory (JPL), the California Association for Research in Astronomy (CARA) and the University of Hawai'i (UH), have proposed to protect and enhance Wēkiu bug habitat on Pu'u Hau 'Oki to mitigate disturbance by on-site construction and installation of the Outrigger Telescopes Project. To that end these participants have prepared the Wēkiu Bug Mitigation Plan and Wēkiu Bug Monitoring Plan. They are also the participants in this Wēkiu Bug Baseline Monitoring Plan.

Sampling of Wēkiu bug habitat was approved to establish baseline population estimates of the Wēkiu bug in the area surrounding the site of the proposed Outrigger Telescopes Project and at a control site on Pu'u Wēkiu. The intended purpose of this activity is to gather reliable scientific information about population trends in both areas that can be used to determine the effectiveness of habitat protection and restoration, and the impacts, if any, due to construction of the Outrigger Telescopes Project.

Sampling of Wēkiu bugs was conducted to answer two main Questions of Interest (QOI's). They are:

- 1) How, where and when are the Wēkiu bug populations changing? Locations of interest include current habitat on Pu'u Hau 'Oki crater and undisturbed Wēkiu bug habitat at Pu'u Wēkiu on the Mauna Kea summit area (for comparison).
- 2) Are weather phenomena, human activities, and/or other factors associated with Wēkiu bug and/or other resident arthropod population change?

Wēkiu Bug Baseline Monitoring  
EXECUTIVE SUMMARY

Nondestructive sampling is the best approach to monitoring rare and sensitive invertebrate species. Special live-traps were developed and tested during the 1997-98 MKSR arthropod assessment and were deployed during Baseline Monitoring. Ten live-traps were installed at the summit of Mauna Kea at designated locations, five on Pu'u Hau 'Oki and five on Pu'u Wēkiu.

The first three-week sampling session was conducted from on February 1, 2002 through February 22, 2002. During this sampling session a total of 35 Wēkiu bugs appeared in or near the traps. All live bugs were released back into their habitat. The trap capture rate during this Baseline Monitoring session ranged from 0 to 2.4 Wēkiu bugs per trap per 3 days of sampling. Thirty-four of the thirty-five Wēkiu bugs captured appeared in traps on

Pu'u Hau 'Oki. The average trap capture rate on Pu'u Hau 'Oki was 0.99 ( $\pm 0.37$ ) Wēkiu bugs per trap per 3 days of sampling. This is about three times greater than the average trap capture rate measured on Pu'u Hau 'Oki during the 1997/98 Arthropod Assessment (0.38 Wēkiu Bugs per trap per 3 days of sampling). The Wēkiu bug population has apparently increased since 1998.

This report represents a presentation of the February 2002 Baseline Wēkiu bug monitoring results. As more data are collected they will be presented quarterly. The next 3-week sampling session will begin in April and continue into May 2002. This report and other Wēkiu bug related documents can be found on the World Wide Web at:  
[www.statpros.com/Wekiu\\_Bug.html](http://www.statpros.com/Wekiu_Bug.html).



**Snow covered summit of Mauna Kea  
viewed from the Saddle Road**



Wēkiu Bug Baseline Monitoring  
INTRODUCTION

III. INTRODUCTION

The Mauna Kea Science Reserve is located on the summit of Mauna Kea, the tallest mountain in Hawai'i. Within the reserve are the world's two largest optical telescopes, constituting the W.M. Keck Observatory (WMKO). The slopes of Pu'u Hau 'Oki directly adjacent to and below the WMKO are part of a unique natural environment that supports the Wēkiu bug, a rare insect. Wēkiu bugs generally occupy habitat encompassing an estimated 300 acres (121 hectares) of the summit of Mauna Kea. Small populations of Wēkiu bugs also occur on other nearby cinder cones near the summit.

Current plans call for adding four to six Outrigger Telescopes on the WMKO site. The Outrigger Telescopes would be placed strategically around the existing Keck Telescopes.

The National Aeronautics and Space Administration (NASA), together with the California Institute of Technology (CalTech)/Jet Propulsion Laboratory (JPL), the California Association for Research in Astronomy (CARA) and the University of Hawai'i (UH), have proposed to protect and enhance Wēkiu bug habitat on Pu'u Hau 'Oki to mitigate disturbance by on-site construction and installation of the

Outrigger Telescopes Project. To that end these participants have prepared the Wēkiu Bug Mitigation Plan and Wēkiu Bug Monitoring Plan. They are also the participants in this Wēkiu Bug Baseline Monitoring Plan.

Sampling of Wēkiu bug habitat was approved to establish baseline population estimates of the Wēkiu bug in the area surrounding the site of the proposed Outrigger Telescopes Project and at a control site on Pu'u Wēkiu. The populations of Wēkiu bugs were last measured at these sites in 1998 during an arthropod assessment conducted as part of the Environmental Impact Statement prepared for the Mauna Kea Master Plan recently approved by the UH Board of Regents. This new monitoring activity will update that information.

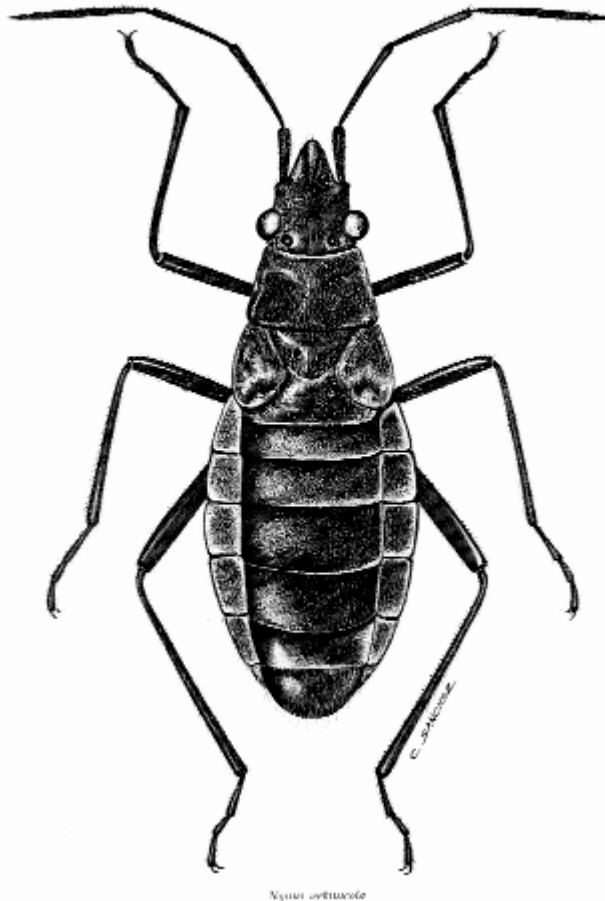
The intended purpose of the current activity is to gather reliable scientific information about population trends in both areas that can be used to determine the effectiveness of habitat protection and restoration, and the impacts, if any, due to construction of the Outrigger Telescopes Project.

Wēkiu Bug Baseline Monitoring  
INTRODUCTION

This is the first Quarterly Report of Baseline Monitoring. The results of the sampling effort conducted January 28 through February 22 are reported. Preliminary comparisons to previously collected data will be presented, along with new interpretations and analysis of correlations of changes in Wēkiu

bug populations with weather related phenomena.

The next sampling will be begin in April and continue into May 2002. This report and other Wēkiu bug related documents can be found on the World Wide Web at:  
[www.statpros.com/Wekiu\\_Bug.html](http://www.statpros.com/Wekiu_Bug.html).



Wēkiu Bug, *Nysius wekiuicola*.

Wēkiu Bug Baseline Monitoring  
QUESTIONS OF INTEREST

**IV. QUESTIONS OF INTEREST**

Important Questions of Interest (QI's) are those with answers that can be efficiently estimated and that yield the information necessary for management decision-making. The following Questions of Interest were developed in the Baseline Monitoring Plan and are the focus of this report.

*Question 1*

How, where and when are the Wēkiu bug populations changing? Locations of interest include current habitat on Pu'u Hau 'Oki crater and undisturbed Wēkiu bug habitat at Pu'u Wēkiu on the Mauna Kea summit area (for comparison).

**Justification:**

Baseline monitoring of Wēkiu bugs will yield reliable scientific information about the current status of Wēkiu bugs, and trends in their population. The information will be useful to compare to status and trends during construction of the proposed Outrigger Telescopes.

**Monitoring goals:**

- 1) To provide historical records of change in Wēkiu bug population attributes, and characteristics,
- 2) To detect trends, periodicities, cycles, and/or other patterns in those changes, and
- 3) To associate auxiliary phenomena, attributes, and characteristics with trends and patterns of change in Wēkiu bug population attributes, and characteristics

Wēkiu Bug Baseline Monitoring  
QUESTIONS OF INTEREST

*Question 2*

Are weather phenomena, human activities, and/or other factors associated with Wēkiu bug and/or other resident arthropod population change?

**Justification:**

Snow, rain, day/night temperatures, and other weather phenomena may be associated with Wēkiu Bug population change. Monitoring these indirect factors will aid in understanding trends in Wēkiu Bug population change.

**Monitoring goals:**

To associate environmental phenomena and attributes, and characteristics of human activities with trends and patterns of change in Wēkiu Bug populations.



**Snow covered Wēkiu bug habitat on Pu'u Hau 'Oki**

Wēkiu Bug Baseline Monitoring  
METHODS

V. METHODS

**Live Traps**

Nondestructive sampling is the best approach to monitoring rare and sensitive invertebrate species. Data on relative abundance can be collected with specially designed live-traps that cause minimal disturbance to Wēkiu bugs or their habitats. Non-destructive live-traps were developed and tested during the 1997-98 MKSR arthropod assessment. These live-traps provide Wēkiu bugs with food, moisture, and protection from predators and can

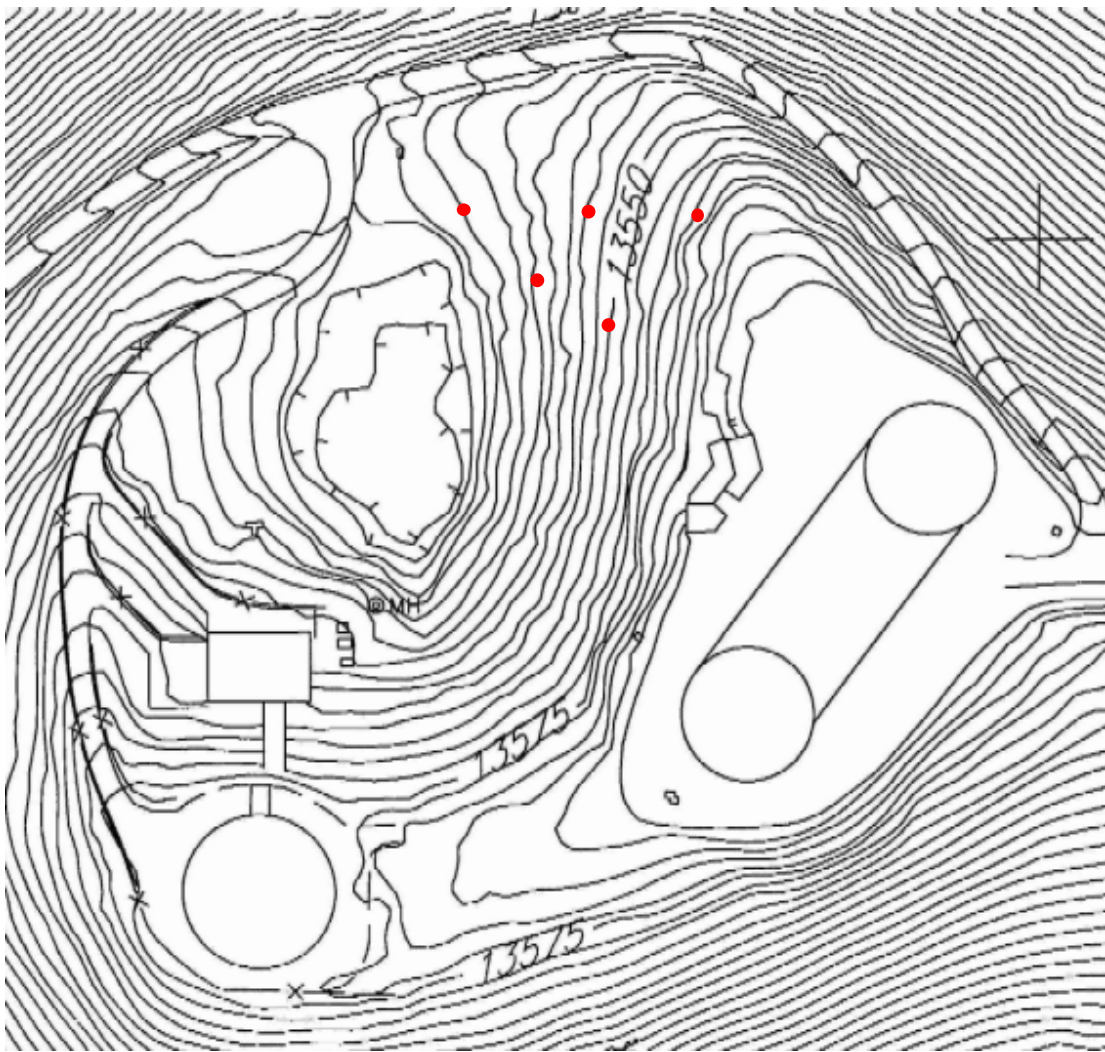
sustain captured individuals for several days.

Ten live-traps were installed at designated locations, five on Pu'u Hau Oki and five on Pu'u Wēkiu (Maps 1 and 2). Trap locations varied slightly from predetermined sites because a recent snow event covered much of the habitat. The cinder beneath the snow was frozen solid and digging was impractical without excessive disturbance. Live-traps were set in patches of cinder where snow had melted and the cinder was not frozen.



An open cinder patch and installed live-trap on Pu'u Wēkiu

Wēkiu Bug Baseline Monitoring  
METHODS



Map 1. Pu'u Hau Oki Live Traps. The locations of Live Traps on Pu'u Hau Oki during the February 2002 Baseline Monitoring sampling session.



Wēkiu Bug Baseline Monitoring  
METHODS

Protocol for Installing and Setting Live-Traps

The habitat sampled was accessed with a minimum of disturbance to the habitat and cinder slopes. Traps were installed at each sampling station by carefully digging into the cinder, disturbing only the amount of cinder necessary to set up the trap (Step 1). A hardware cloth tube was inserted into the holes so that the top of the tube was slightly below the existing surface (Step 2). The hole around the tube was refilled with the cinder that was removed from the hole and a 4-inch apron of local ash and small-sized cinder was created around each trap (Step 3). The apron allows Wēkiu bugs to easily walk into the traps.

Traps were set by placing reservoir cups into the wire tubes and pouring about 15 ml of purified water into the reservoir (Step 4). About a teaspoon of shrimp paste was spread on the coffee filter wick in the trap cups and two to three pieces of re-hydrated shrimp were added to each cup (Step 5). Four to five pieces of native cinder, 1/2" to 1" in diameter were added and the trap cups were placed into the reservoir cups such that the coffee-filter wicks made contact with the water reservoirs (Step 6).

Chum, consisting of pureed pre-moistened shrimp, was distributed

around the traps and a teaspoon of shrimp paste was spread on the bottom of the cap rocks (Step 7). Irrigation flags to mark the locations were wrapped around cap rocks, ten to fifteen inches in diameter. The cap rocks were then placed over each trap such that the entire trap was shaded from sunlight (Step 8).

Traps were checked for Wēkiu bugs every three days during the sampling session. During each live-trap check, an area about 20 cm in diameter around the live-trap was checked for the presence Wēkiu bugs. The trap cups were then removed and carefully inspected for Wēkiu bugs. Live Wēkiu bugs were counted and released to cinder habitat at least one meter away from the live-trap. Dead bugs were collected in vials filled with alcohol.

Live-traps were reset by topping off the water reservoir, and by placing new bait and chum in and around the live-traps. When the 3-week sampling session was complete, trap cups were removed, and cap rocks placed over the wire tubes. Small identification tags containing contact information were attached to the flag wires. The same locations will be used for future sampling.



**Wēkiu Bug Baseline Monitoring  
METHODS**

**Setting a Wēkiu Bug Live-Trap**



Step 1  
Dig Trap Hole



Step 2  
Install Wire Tube



Step 3  
Create Trap Apron



Step 4  
Fill Reservoir



Step 5  
Bait Trap



Step 6  
Add Cinder Habitat



Step 7  
Distribute Chum Bait



Step 8  
Emplace Cap Rock

Wēkiu Bug Baseline Monitoring  
METHODS

Weather Data

Daily weather data from the UKIRT Observatory on the summit of Mauna Kea was downloaded from the World Wide Web at *www.maunakeaweather.hawaii.edu*. The UKIRT Observatory is located on Pu'u Kea, and is adjacent to the Pu'u Wēkiu sampling sites, and is less than one-half mile away from the Pu'u Hau 'Oki sampling sites.

Average temperature, average wind-chill temperature, average barometric pressure, and average humidity were

calculated for each 3-day sampling session from the UKIRT Observatory weather data. Minimum and maximum temperatures for the 3-day sampling sessions were also noted from the data.

Archive photographs were taken from fixed points on Pu'u Hau 'Oki and on Pu'u Wēkiu. Photographs were taken at the beginning of each sampling period to record snow coverage and changes in Wēkiu bug habitats through time.



**Pu'u Kea Observatories.** A view of Pu'u Kea from Pu'u Hau 'Oki. UKIRT Observatory, where weather data were collected, is the last building on the right. IRTF Observatory on Pu'u Hau 'Oki is in the foreground on the left.

Wēkiu Bug Baseline Monitoring  
RESULTS

## VI. RESULTS

There were a total of twenty-one sampling nights, making seven 3-day sampling periods. A total of thirty-five Wēkiu bugs were captured, thirty-four in Pu'u Hau 'Oki and one in Pu'u Wēkiu. The trap capture rate (number of Wēkiu bugs per trap per 3-days) ranged from zero to 2.4 Wēkiu bugs.

The overall trap capture rate during the 3-week sampling session was 0.99 ( $\pm 0.37$ ) Wēkiu bugs for Pu'u Hau 'Oki, and 0.03 ( $\pm 0.03$ ) Wēkiu bugs for Pu'u Wēkiu (Table 1). For comparison, average trap capture rates for the 1997/98 Arthropod Assessment are provided (Table 2).

**TABLE 1.**  
**SAMPLING PERIOD AVERAGE TRAP CAPTURE RATES**  
The average number of Wēkiu bugs per trap per 3-days  
for each 3-day sampling period for 1<sup>st</sup> Quarter 2002 Baseline Monitoring.

	2/4/02	2/7/02	2/10/02	2/13/02	2/16/02	2/19/02	2/22/02
<b>Pu'u Weki</b>	0.00	0.00	0.00	0.20	0.00	0.00	0.00
<b>Pu'u Hau Oki</b>	0.00	0.75	1.00	0.00	2.20	2.40	0.60

**TABLE 2.**  
**SAMPLING PERIOD AVERAGE TRAP CAPTURE RATES**  
The average number of Wēkiu bugs per trap per 3-days  
for each sampling period during the 1997/98 Arthropod Assessment.  
Average trap capture rates for 1997/98 and  
1<sup>st</sup> Quarter 2002 are in the last 2 columns.

	August 1997	January 1998	April 1998	July 1998	Avg. 1997/98	Avg. Feb 2002
<b>Pu'u Weki</b>	0.15	0.00	0.07	0.15	<b>0.11</b>	<b>0.03 (<math>\pm 0.03</math>)</b>
<b>Pu'u Hau Oki</b>	0.20	0.00	0.20	1.10	<b>0.38</b>	<b>0.99 (<math>\pm 0.37</math>)</b>

**TABLE 3. FEBRUARY 2002 WEKIU BUG TRAP CAPTURE DATA**

	2/4/02			2/7/02			2/10/02			2/13/02		
	adult WB	juvenile WB	other Inverts	adult WB	juvenile WB	other Inverts	adult WB	juvenile WB	other Inverts	adult WB	juvenile WB	other Inverts
<b>Pu'u Wekiu</b>												
Trap 1	0	0	0	0	0	0	0	0	0	1	0	0
Trap 2	0	0	0	0	0	0	0	0	0	0	0	0
Trap 3				0	0	0	0	0	0	0	0	0
Trap 4				0	0	0	0	0	0	0	0	0
Trap 5							0	0	0	0	0	0
<b>Pu'u Hau Oki</b>												
Trap 1	0	0	0	0	0	0	2	0	0	0	0	0
Trap 2	0	0	0	0	0	0	0	0	0	0	0	0
Trap 3	0	0	0	3	0	0	2	0	0	0	0	0
Trap 4	0	0	0	0	0	0	1	0	0	0	0	0
Trap 5							0	0	0	0	0	0

	2/16/02			2/19/02			2/22/02			SUM	
	adult WB	juvenile WB	other Inverts	adult WB	juvenile WB	other Inverts	adult WB	juvenile WB	other Inverts	adult WB	juvenile WB
<b>Pu'u Wekiu</b>											
Trap 1	0	0	1 lycosid	0	0	0	0	0	0	1	0
Trap 2	0	0	0	0	0	0	0	0	0	0	0
Trap 3	0	0	0	0	0	0	0	0	0	0	0
Trap 4	0	0	0	0	0	1 larva	0	0	0	0	0
Trap 5	0	0	0	0	0	0	0	0	0	0	0
<b>Pu'u Hau Oki</b>											
Trap 1	2	2	0	4	1	0	0	0	0	6	3
Trap 2	0	0	0	0	0	0	2	0	0	2	0
Trap 3	5	0	0	2	0	0	1	0	0	13	0
Trap 4	2	0	1 aphid	4	1	0	0	0	0	10	1
Trap 5	0	0	0	0	0	0	0	0	0	0	0

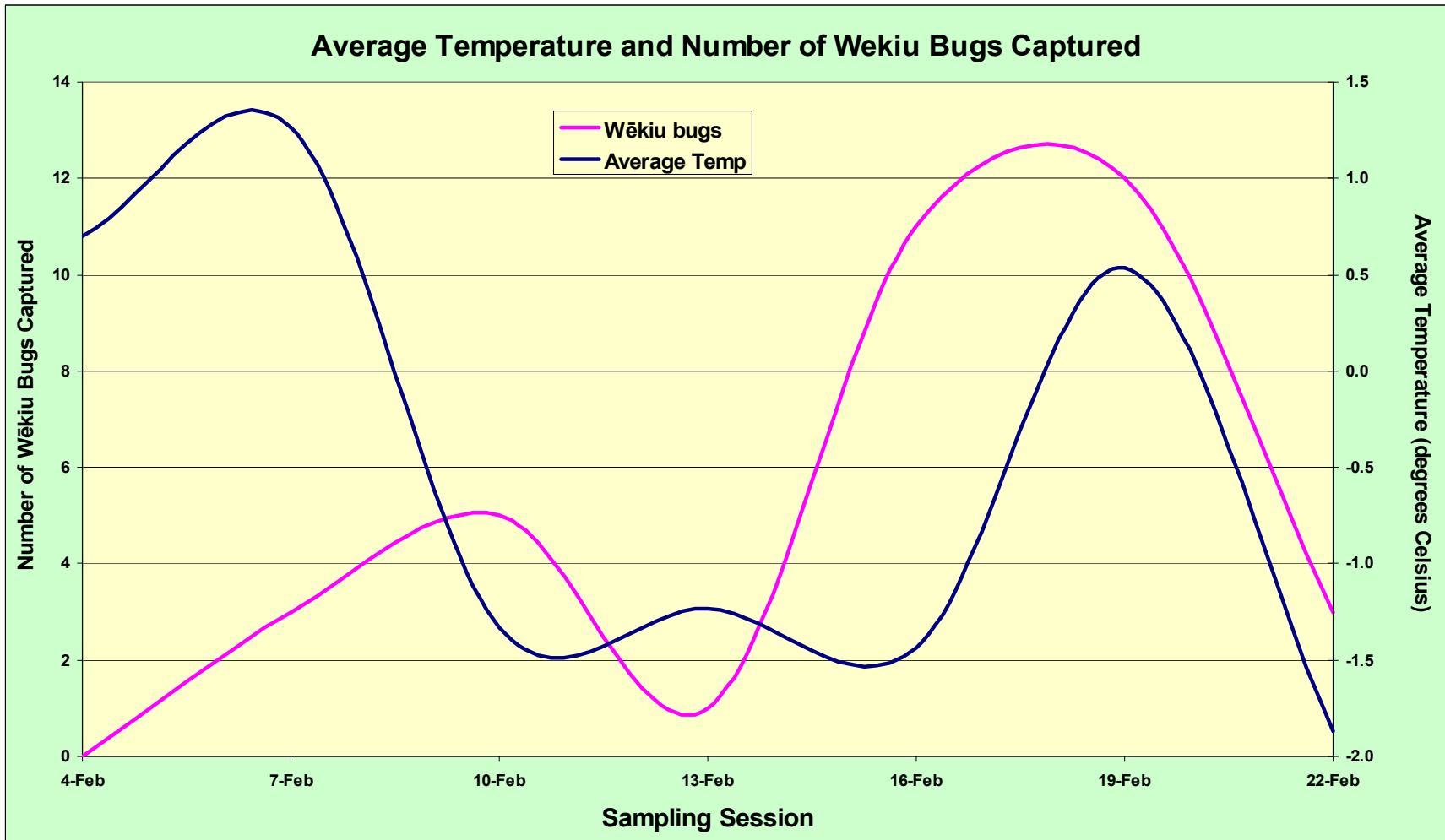


FIGURE 1. Plot of Average Temperature and Total Wēkiu Bug Captured for Seven Sampling Periods 1<sup>st</sup> Quarter 2002.

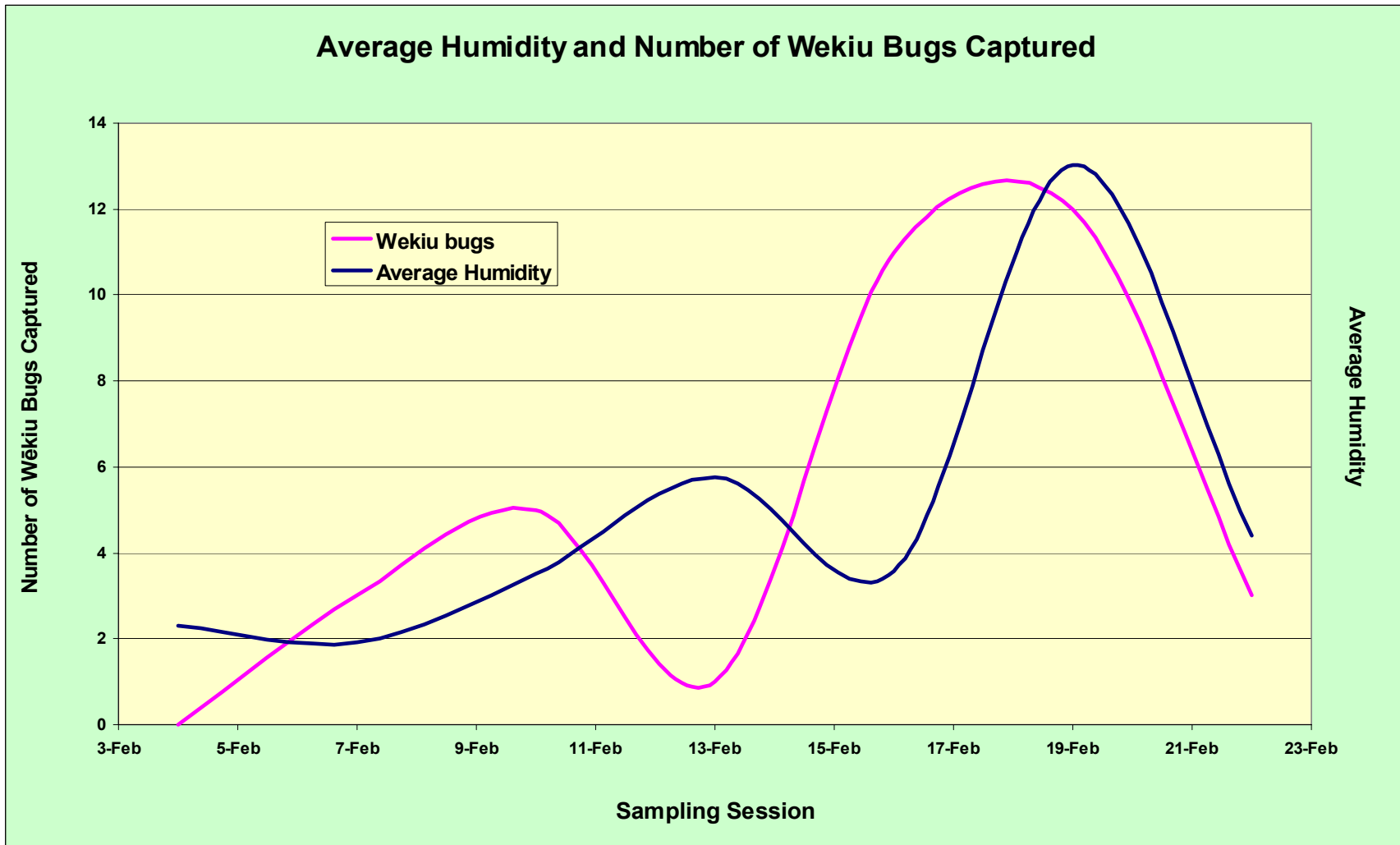


FIGURE 2. Plot of Average Humidity and Total Wēkiu Bug Captured for Seven Sampling Periods 1<sup>st</sup> Quarter 2002.



Wēkiu Bug Baseline Monitoring  
**RESULTS**

**Pu‘u Wēkiu Photographic Archive**



**Pu‘u Wēkiu inner slope  
February 04, 2002**



**Pu‘u Wēkiu inner slope  
February 10, 2002**



**Pu‘u Wēkiu inner slope  
February 13, 2002**



**Pu‘u Wēkiu inner slope  
February 16, 2002**





XX

**Wēkiu Bug Baseline Monitoring  
RESULTS**

XX

**This page intentionally left blank.**



Wēkiu Bug Baseline Monitoring  
DISCUSSION

especially significant given that no Wēkiu bugs were captured in winter sampling (January 1998) during the 1997/98 study. It appears that Wēkiu bug populations may be increasing on Pu‘u Hau ‘Oki.

The average trap capture rate on Pu‘u Wēkiu was 0.03 Wēkiu bugs per trap per 3 days of sampling (Table 2). During the 1997/98 study this number was 0.11 Wēkiu bugs per trap per 3 days of sampling (Table 2). Evidently the Wēkiu bug population has remained stable or continued to decline on Pu‘u Wēkiu.

It was noted during the February 2002 Baseline Monitoring that the cinder slopes of Pu‘u Wēkiu remained frozen longer than those on Pu‘u Hau ‘Oki. Snow persisted longer on Pu‘u Wēkiu as well (see Photographic Archive above). It is possible that the snow and frozen cinder hindered Wēkiu bug activity and that once the cinder thaws, Wēkiu bug activity may increase.

While the average Baseline Monitoring trap capture rate is high compared to the 1997/98 Arthropod Assessment, it is very low compared to the trap capture rate measured during the 1982 Arthropod Assessment (105.61 Wēkiu bugs per trap per 3 days of sampling). Populations have not yet returned to former highs and protection is likely

critical for future survival of the Wēkiu bug.

The Wēkiu bug population has apparently increased since 1998. The number of Wēkiu bugs captured during the 3-week sampling session (36 Wēkiu bugs in sixty-four 3-day trap periods) was about the same as the number collected during the five one-week sampling sessions over 18 months of sampling for the 1997/98 Arthropod Assessment (30 Wēkiu bugs in one hundred fifty-six 3-day trap periods) on Pu‘u Hau ‘Oki and Pu‘u Wēkiu. Several more Wēkiu bugs were observed under rocks and in cinder along the slope break and inner slopes of Pu‘u Hau ‘Oki during the recent sampling session, a rare event during the 1997/98 Arthropod Assessment.

Four hundred and seventy-three Wēkiu bugs were captured during a Smithsonian Institution sponsored survey of Pu‘u Hau Kea in the Mauna Kea Ice Age Reserve in August 2001. This area has never before been sampled and the Smithsonian endeavor did not include sampling elsewhere on Mauna Kea. Therefore, inferences about Wēkiu bug population changes and causes of decline from this information may be unreliable and premature.

Wēkiu Bug Baseline Monitoring  
DISCUSSION

Recent snow events have deposited significantly more snow on Mauna Kea than occurred during the 1997/98 assessment. It has been hypothesized that Wēkiu bugs may be responding to the larger snow events of the last two years, or other environmental phenomena, and increasing their populations. The true cause of their decline and apparent recent recovery currently remains unknown.

**Weather Data**

The number of Wēkiu bugs captured in live-traps appears to vary with average air temperature (Figure 1). The highest trap captures occurred when average air temperature was higher than zero degrees centigrade, and lowest when average air temperature was lower than below minus one degree centigrade. More information will need to be collected before conclusive inferences can be made about Wēkiu bug response to changes in air temperature.

The correlation between the number of Wēkiu bugs captured in live-traps and average humidity does not appear to be as strong as that for average air temperature (Figure 2). However, the highest number of Wēkiu bug were captured when average humidity was high. More data will be gathered during future Baseline Monitoring sessions that may provide better

insight into Wēkiu bug habitat preferences.

**Other Observations**

The W.M. Keck Observatory has begun to implement some of the Wēkiu bug protection measures recommended in the Wēkiu Bug Mitigation Report (Pacific Analytics, 2000). While these protection measures were specifically designed to protect Wēkiu bugs during the proposed Outrigger Telescopes Project, their implementation will also protect Wēkiu bugs and their habitat during regular WMKO operations.

For example, during the First Quarter Baseline Monitoring session, a new camera device was added to the Keck Observatory (WMKO). The device, called DEIMOS, was transported to the WMKO site on February 16, 2002.



**DEIMOS camera tractor and trailer at the WMKO site.**

Wēkiu Bug Baseline Monitoring  
DISCUSSION

The tractor and trailer were pressure-washed before advancing up the Mauna Kea Access Road. The tractor and trailer were inspected for alien arthropods by a Pacific Analytics entomologist and found to be free of any signs of ants and spiders.



**Tractor and trailer wheel wells and under-carriage were inspected** and found to be free of alien arthropods.

The WMKO site was free of trash, and several times, WMKO personnel were observed inspecting the site around the observatory for wind-blown debris.



**Tracks on summit cones resulting from skiers**

The deep snow that accumulated during January and February attracted many people to the summit for snow play. Visitors were observed from Pu’u Hau Kea and other lower cinder cones all the way to the summit on Pu’u Wēkiu.

Snow play was observed on slopes where Wēkiu bug habitat is known to exist. According to newspaper reports, snow play on Haleakala in January “caused environmental damage to the rare plants and insects atop the volcano...” The impacts on Wēkiu bugs due to snow play on the Mauna Kea summit cones are unknown.

**Upcoming Events**

**April 2002 - Wēkiu bug survey**

The US Fish and Wildlife Service, the Smithsonian Institution, and the B.P. Bishop Museum are planning a survey for Wēkiu bugs. The survey will begin April 22 and continue for two weeks. The information will be used to assist the Office of Mauna Kea Management in planning natural resource management on the MKSR.

**2<sup>nd</sup> Quarter 2002 Baseline Monitoring**

The next 3-week Baseline Monitoring sampling session will begin in April and continue into May 2002. The next

