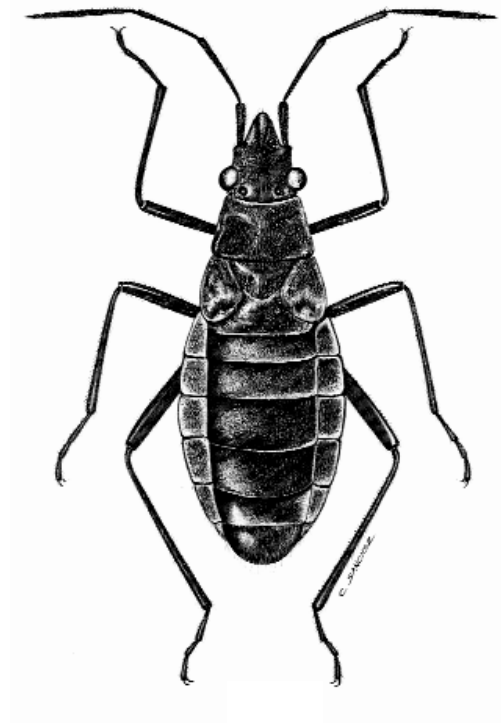


# WĒKIU BUG

## BASELINE MONITORING

QUARTERLY REPORT  
1<sup>st</sup> QUARTER 2006



*Pacific Analytics, L.L.C.*



**WĒKIU BUG**  
**BASELINE MONITORING**

**QUARTERLY REPORT**  
**1<sup>st</sup> QUARTER 2006**

Prepared for

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



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

# WĒKIU BUG BASELINE MONITORING

## QUARTERLY REPORT 1<sup>st</sup> QUARTER 2006

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#### IV. QUESTIONS OF INTEREST

Important Questions of Interest 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 (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  
**RESULTS**

## VI. RESULTS

### SAMPLING

During the 1<sup>st</sup> Quarter 2006 baseline monitoring session there were a total of twenty sampling nights, making two 3-day sampling periods, two 4-day sampling periods, and one 6-day sampling period.

No Wēkiu bugs were captured on Pu‘u Hau‘oki and Pu‘u Wēkiu (Table 1). Approximately four hours were spent searching for Wēkiu bugs in open areas and near the margins of snow fields, but no Wēkiu bugs were observed.

For perspective, average trap capture rates from previous baseline monitoring sessions and the 1982 and 1997/98 Arthropod Assessments are provided (Table 2 and Table 3).

Average trap capture rates reported for the 1982 and 1997/98 arthropod assessments are those measured in comparable locations on Pu‘u Hau‘oki crater and Pu‘u Wēkiu as those measured for Wēkiu Bug Baseline Monitoring. The 1982 measurements were recorded during July and August.

Figure 1 graphs the log<sub>10</sub> average trap capture rates for all Baseline Monitoring on Pu‘u Hau‘oki (beginning 1<sup>st</sup> Quarter 2002). Figure 2 shows the quarterly variation in log<sub>10</sub> average trap capture rates for Baseline Monitoring on Pu‘u Hau‘oki.

**TABLE 1.**  
**1<sup>ST</sup> QUARTER 2006 SAMPLING PERIOD**  
**AVERAGE TRAP CAPTURE RATES**  
 The average number of Wēkiu bugs per trap per 3-days  
 for each sampling period during the 1<sup>st</sup> Quarter 2006 Baseline Monitoring.

Location	03/14/2006	03/18/2006	03/21/2006	03/25/2006	03/28/2006	03/31/2006	<b>AVERAGE ± SE</b>
Pu‘u Wēkiu	0.00	0.00	0.00	0.00	NA	0.00	<b>0.00</b>
Pu‘u Hau‘oki	0.00	0.00	0.00	0.00	NA	0.00	<b>0.00</b>

Wēkiu Bug Baseline Monitoring  
**RESULTS**

**TABLE 2.**  
**QUARTERLY BASELINE MONITORING**  
**AVERAGE TRAP CAPTURE RATES**  
 The average number of Wēkiu bugs per trap per 3-days  
 for each of the Quarterly Baseline Monitoring Sampling Sessions.  
 Yearly average trap capture rates for Baseline Monitoring are in **RED**.

Location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	Year Avg.
Pu'u Wēkiu 2002*	0.03	0.03	0.3	0.2	<b>0.1</b>
Pu'u Wēkiu 2003	2.8	11.5	0.5	0.0	<b>3.7</b>
Pu'u Wēkiu 2004	0.00	2.0	0.03	0.06	<b>0.5</b>
Pu'u Wēkiu 2005	1.14	0.64	1.26	0.12	<b>0.79</b>
Pu'u Wēkiu 2006	<b>0.00</b>				<b>0.00</b>
Pu'u Hau'oki 2002	1.0	10.3	4.0	4.0	<b>4.8</b>
Pu'u Hau'oki 2003	18.5	90.6	12.4	0.8	<b>30.6</b>
Pu'u Hau'oki 2004	2.1	8.8	0.4	0.21	<b>2.9</b>
Pu'u Hau'oki 2005	15.92	5.09	5.99	0.62	<b>6.91</b>
Pu'u Hau'oki 2006	<b>0.00</b>				<b>0.00</b>

\* - different trap locations on Pu'u Wēkiu in 2002

**TABLE 3.**  
**SAMPLING PERIOD AVERAGE TRAP CAPTURE RATES**  
 The average number of Wēkiu bugs per trap per 3-days  
 for each sampling period during the 1982 and 1997/98 Arthropod Assessments.  
 Average trap capture rates for the 1997/98 Arthropod Assessment are in **RED**.

Location	Aug. 1997	Jan. 1998	Apr-98	Jul-98	1997/98 Avg.	Jul-82
Pu'u Wēkiu	0.15	0	0.07	0.15	<b>0.11</b>	225
Pu'u Hau'oki	0.2	0	0.2	1.1	<b>0.38</b>	105.6

Wēkiu Bug Baseline Monitoring  
**RESULTS**

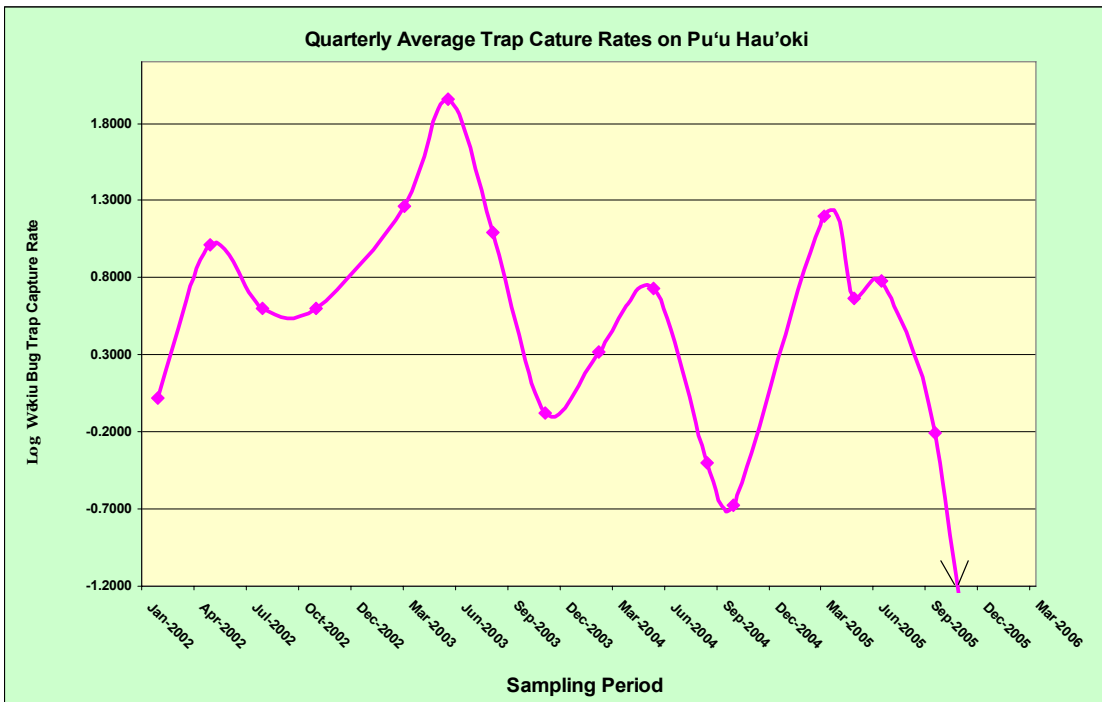


FIGURE 1. Graph of the log<sub>10</sub> Average Wēkiu Bug Trap Capture Rate per Sampling Period on Pu'u Hau'oki since Wēkiu Bug Baseline Monitoring began in February 2002.

Wēkiu Bug Baseline Monitoring  
 RESULTS

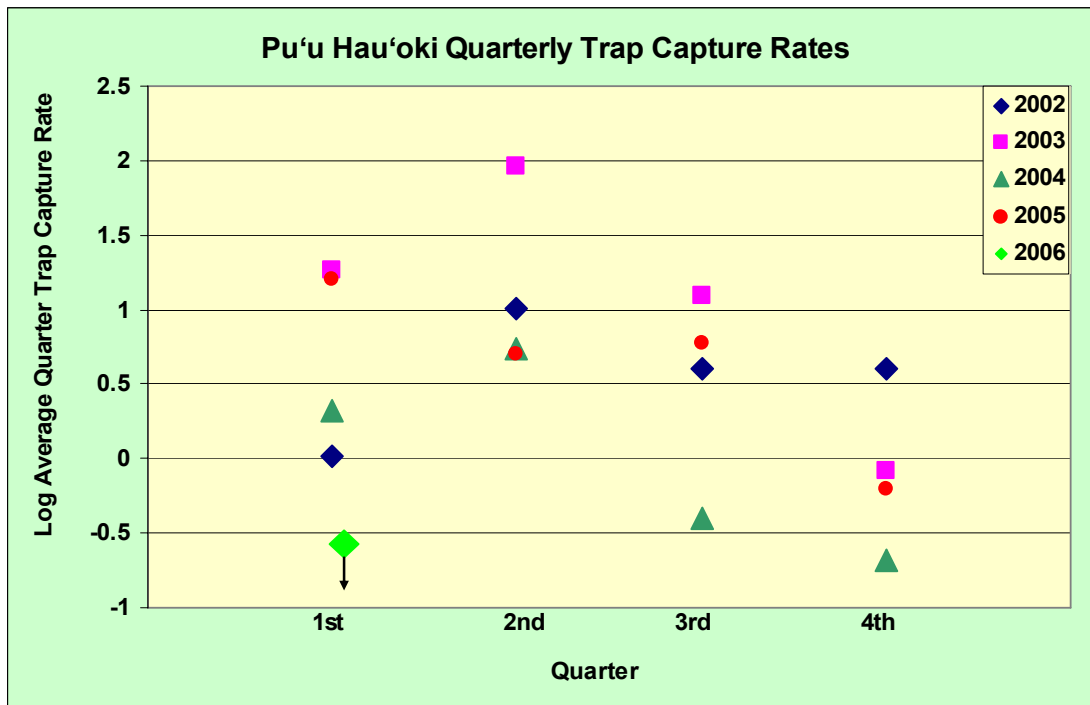


FIGURE 2. Pu'u Hau'oki Quarterly Average Trap Capture Rates.  
 The  $\log_{10}$  average quarterly trap capture rate of Wēkiu bugs on Pu'u Hau'oki  
 for four years of Wēkiu Bug Baseline Monitoring.



**Wēkiu Bug Baseline Monitoring  
RESULTS**

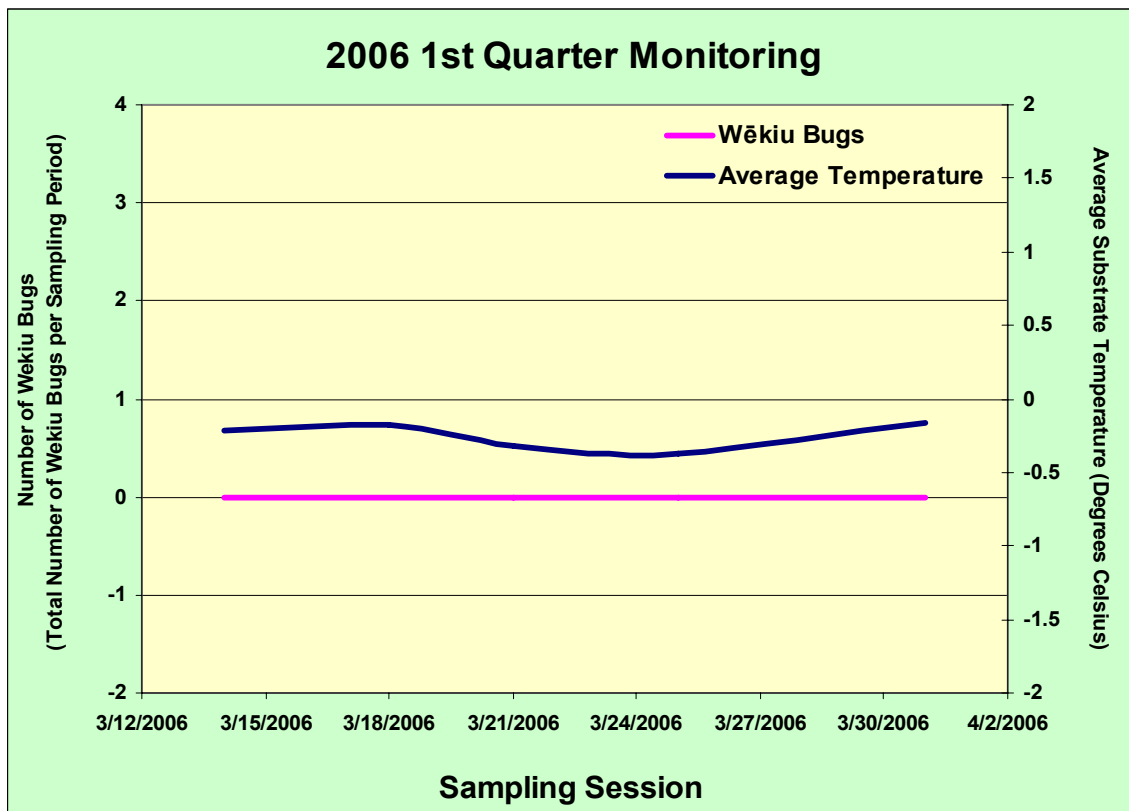


FIGURE 3. Plot of Average Temperature (Celsius) and Total Number of Wēkiu Bugs Captured per Sampling Period at all sampling locations during the 1<sup>st</sup> Quarter 2006 sampling session.

**Wēkiu Bug Baseline Monitoring  
RESULTS**

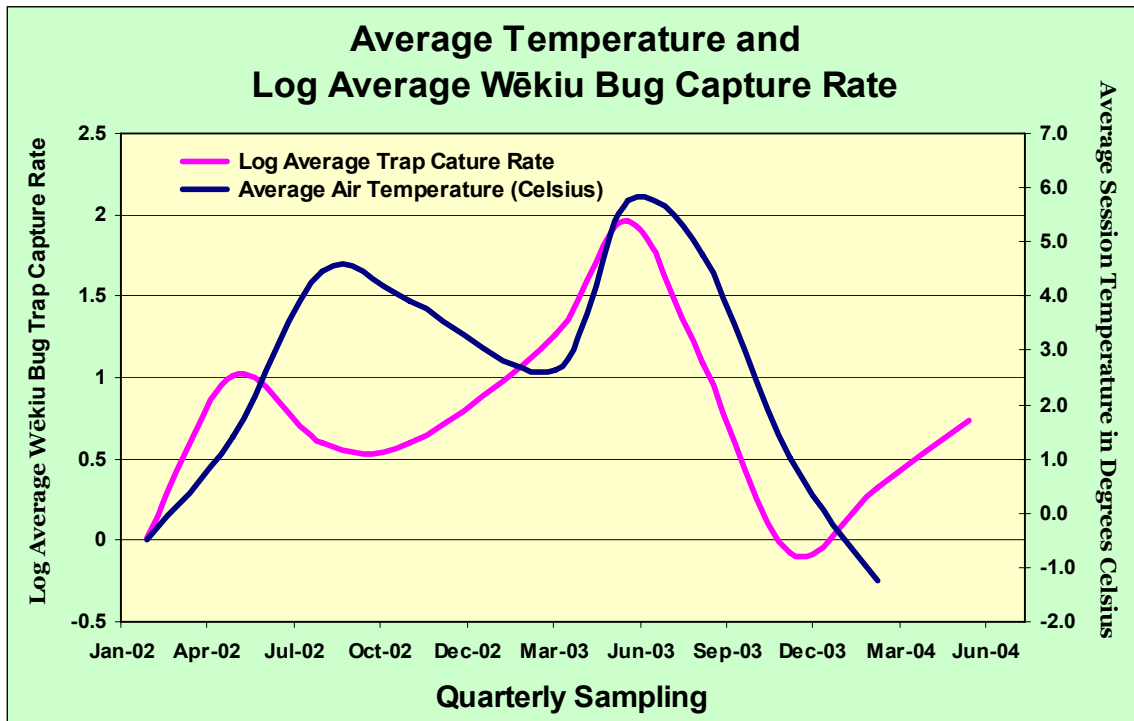


FIGURE 4. Plot of Baseline Monitoring Session Average Temperature (Celsius) and Natural Log Average Number of Wēkiu Bug Trap Capture Rate per Session on Pu‘u Hau‘oki.

Wēkiu Bug Baseline Monitoring  
RESULTS

Pu'u Hau'oki Inner Slope Photographic Archive

MARCH 2006  
TRAPS 1 - 5



Pu'u Hau'oki inner slope  
March 11, 2006



Pu'u Hau'oki inner slope  
March 14, 2006



Pu'u Hau'oki inner slope  
March 18, 2006



Pu'u Hau'oki inner slope  
March 21, 2006











Pu'u Wēkiu Photographic Archive

MARCH 2006  
TRAPS 1 - 5



Pu'u Wēkiu inner slope  
March 11, 2006



Pu'u Wēkiu inner slope  
March 14, 2006



Pu'u Wēkiu inner slope  
March 18, 2006



Pu'u Wēkiu inner slope  
March 21, 2006











## VII. DISCUSSION

### Trapping Data

Permission to begin Baseline Wēkiu bug monitoring was received on January 21, 2002. On January 28, 2002 Pacific Analytics personnel installed 10 live-trap monitoring stations in designated areas, five on the inner slopes of Pu'u Hau'oki and five on the slopes of Pu'u Wēkiu. Sampling began in February 2002.

Over the four quarters of monitoring during 2002, 696 Wēkiu bugs were captured in live-traps, and Wēkiu bug trap capture rates averaged 4.82 bugs per trap per 3-day trapping period on Pu'u Hau'oki, and 0.13 bugs per trap per 3-day trapping period on Pu'u Wēkiu.

Over the four quarters of monitoring during 2003, 4,237 Wēkiu bugs were captured in live-traps. Wēkiu bug trap capture rates averaged 30.57 bugs per trap per 3-day trapping period on Pu'u Hau'oki, and 3.71 bugs per trap per 3-day trapping period on Pu'u Wēkiu.

Over the four quarters of monitoring during 2004, 518 Wēkiu bugs were captured in live-traps. Wēkiu bug trap capture rates averaged 2.9 bugs per trap per 3-day trapping period on Pu'u

Hau'oki, and 0.5 bugs per trap per 3-day trapping period on Pu'u Wēkiu.

Over the four quarters of monitoring during 2005, 1,383 Wēkiu bugs were captured in live-traps. Wēkiu bug trap capture rates averaged 6.9 bugs per trap per 3-day trapping period on Pu'u Hau'oki, and 0.8 bugs per trap per 3-day trapping period on Pu'u Wēkiu.

No Wēkiu bugs were captured or observed during the 1<sup>st</sup> Quarter 2006 sampling period. This was the first Quarterly sampling period during which no Wēkiu bugs were observed on Pu'u Hau'oki. Trap capture rates have typically been low during the colder months of previous sampling periods, and the severe mountain storms and snow cover experienced during March probably influenced Wēkiu bug activity.

There have been two other Quarterly sampling periods during which no Wēkiu bugs were captured on Pu'u Wēkiu, 4<sup>th</sup> Quarter 2003 and 1<sup>st</sup> Quarter 2004. A significant amount of snow fell during those Quarters as well, and average temperatures were low.

