Managing the Erythrina Gall Wasp Problem in Hawaii by Classical Biological Control

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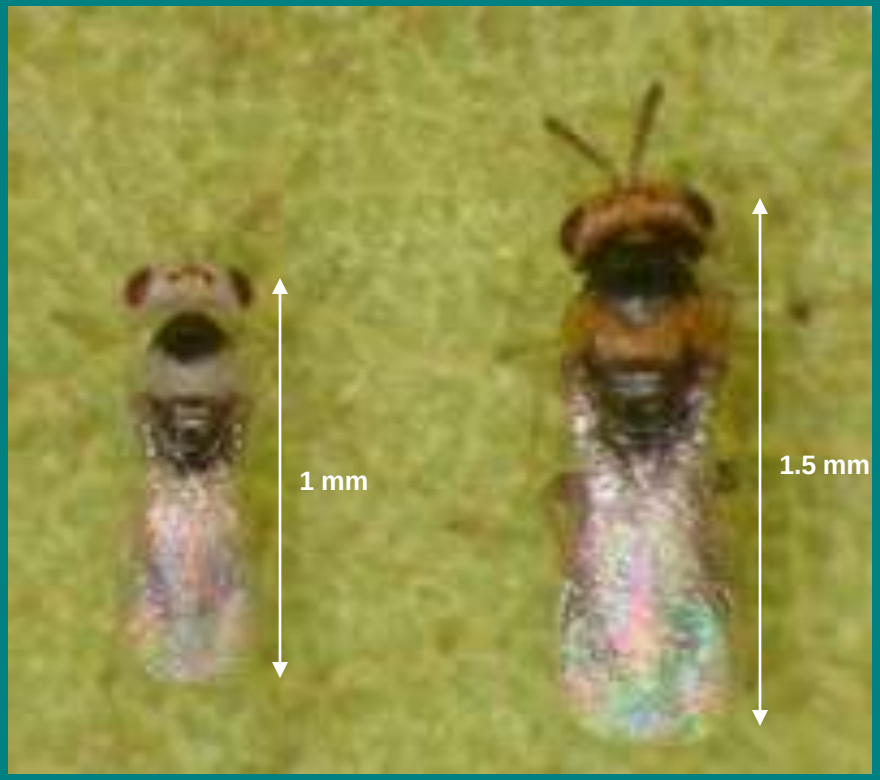
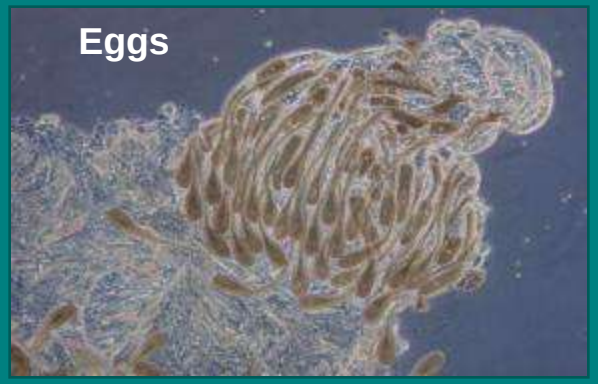
The Target Pest: Erythrina Gall Wasp

- **Initial discovery of pest in Hawaii (Oahu, April 2005)**



Adult Wasps

The developing wasp causes formation of galls and deformities in plant tissues



Impact of Gall Wasp Infestation on Erythrina Plants

- Before gall wasp invasion

- Shortly after gall wasp invasion

Costs of Gall Wasp Infestation

Decimation of Erythrina trees

Large-scale destruction of trees

Local News

Printable version

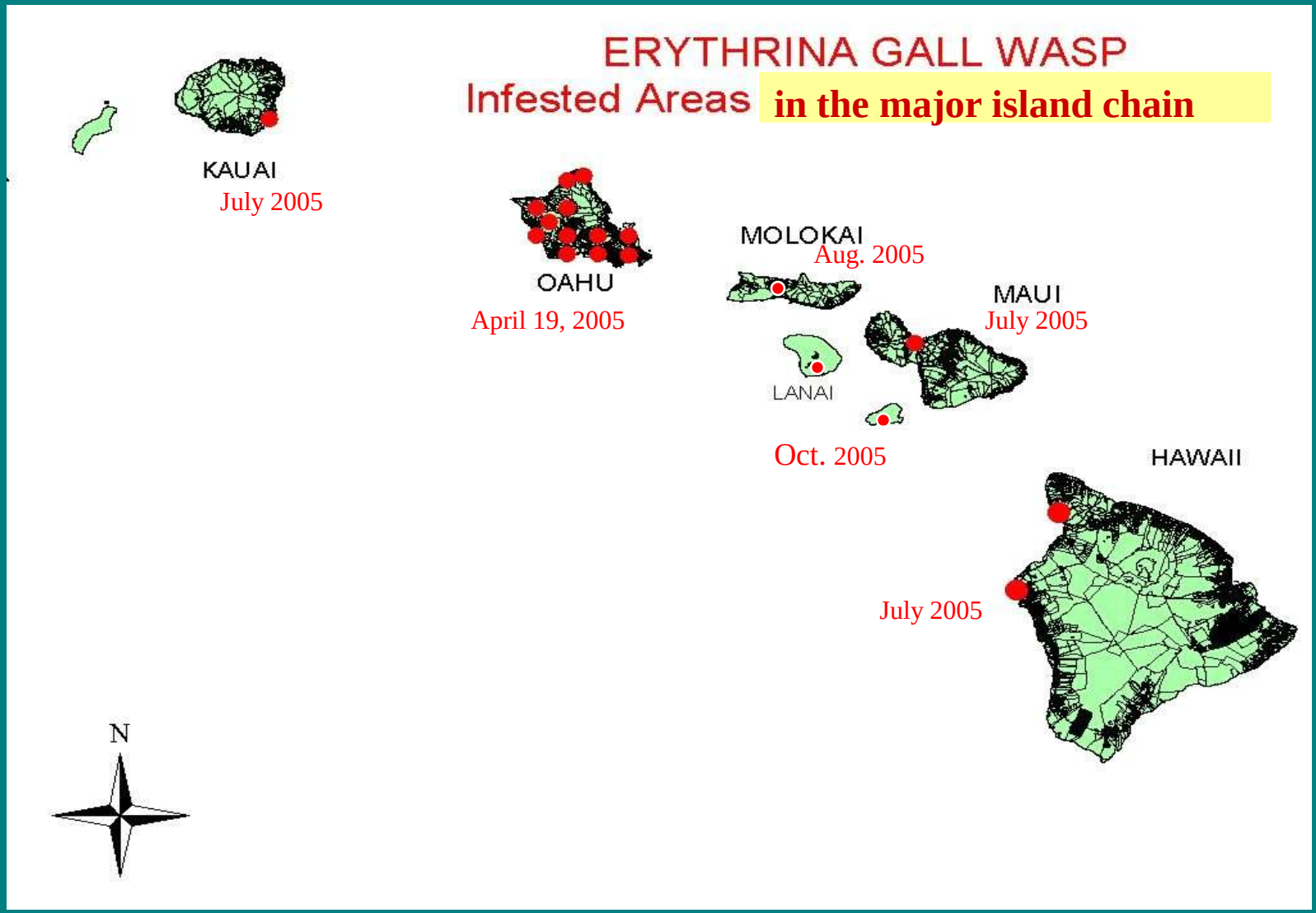
Posted on: Friday, October 13, 2006

City will topple 1,000 trees

By Mary Vorsino
Advertiser Urban Honolulu Writer

Crews are cutting down more than 1,000 trees in city parks and medians that are suffering from infestations of a tiny African gall wasp that threatens to cost the city and state millions of dollars in tree

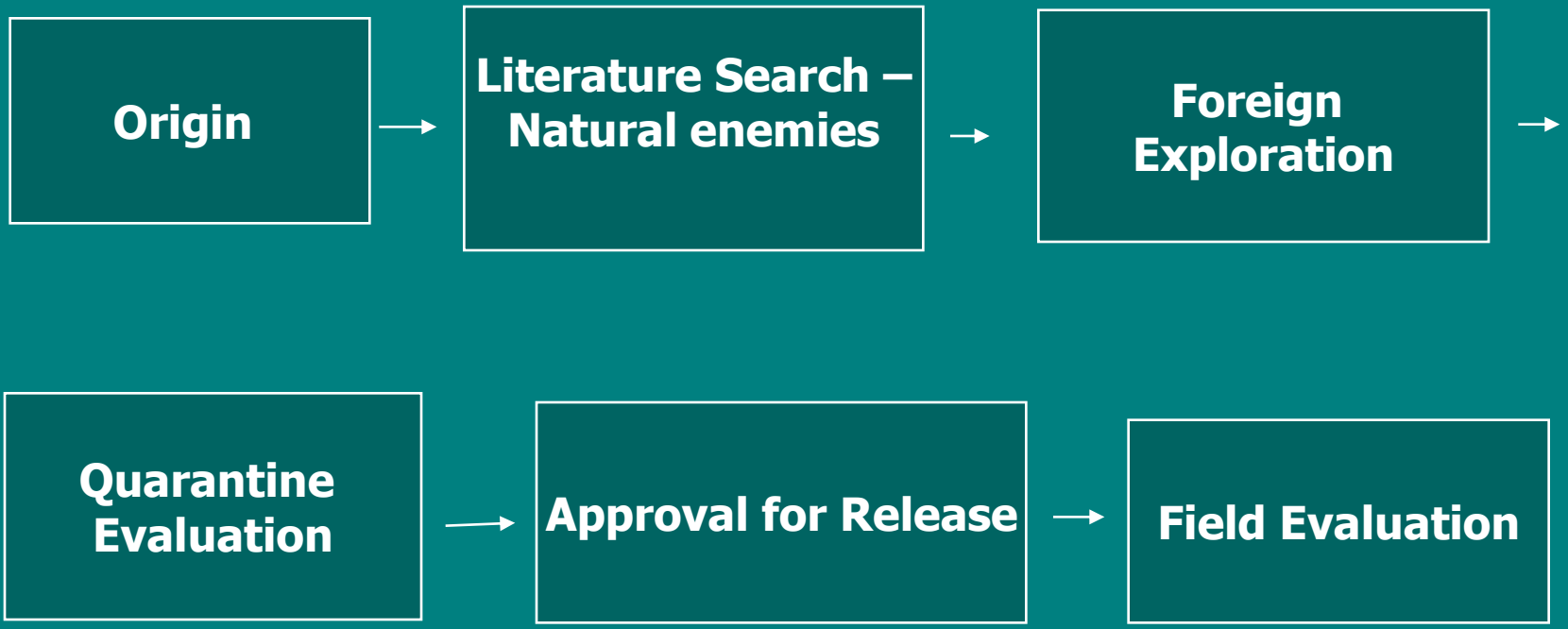
Extent of Gall Wasp Spread in Hawaii



Control Methods

- Mechanical
- Chemical
- Classical biological control

Classical Biological Program



Foreign Exploration for Natural Enemies of the Erythrina Gall Wasp

Dec. 2005 - East & South Africa (HDOA)

Feb. 2006 - Collection from Kenya

March 2006 -South Africa (UH)

April 2006 - West West Africa (UH)

Jan. 2007 - Tanzania (HDOA)

Sept. 2008 – Tanzania (HDOA)

Natural Enemies of the Erythrina Gall Wasp Collected in Africa

Eurytoma erythrinae

Aprostocetus nitens

Biology of the gall wasp natural enemy, Eurytoma erythrinae

An ectoparasitoid, its development consists of the following stages:

Egg: 3 d

Larva: 11 d

Pupa: 4 d

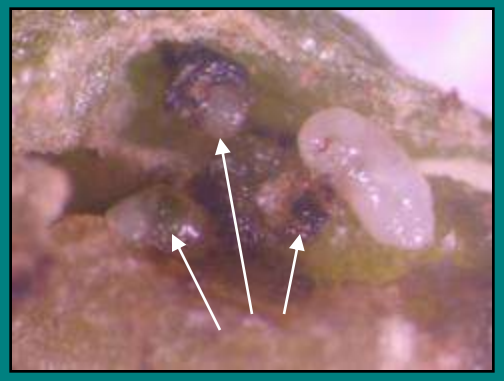
Total Life Cycle: 18 d

Adult Life Span: 40.4 ± 2.2 d

Egg

Eurytomid larva

Pupa



Feeds on more than one host

Pictorials of Non-target Gall Formers Assayed

J. microcarpae

P. utilis

E. xanthochaeta

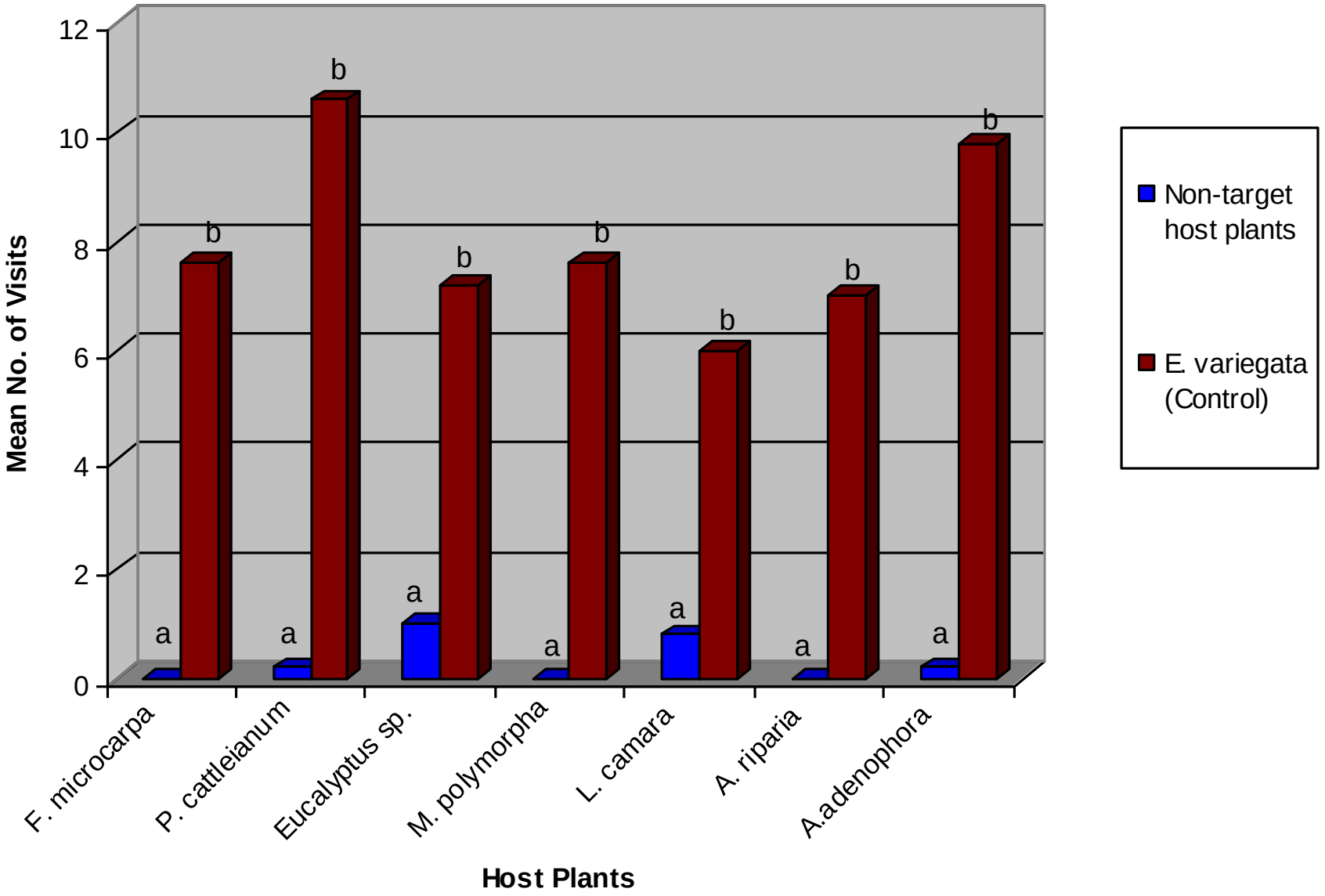
Trioza sp.

Ophelimus sp.

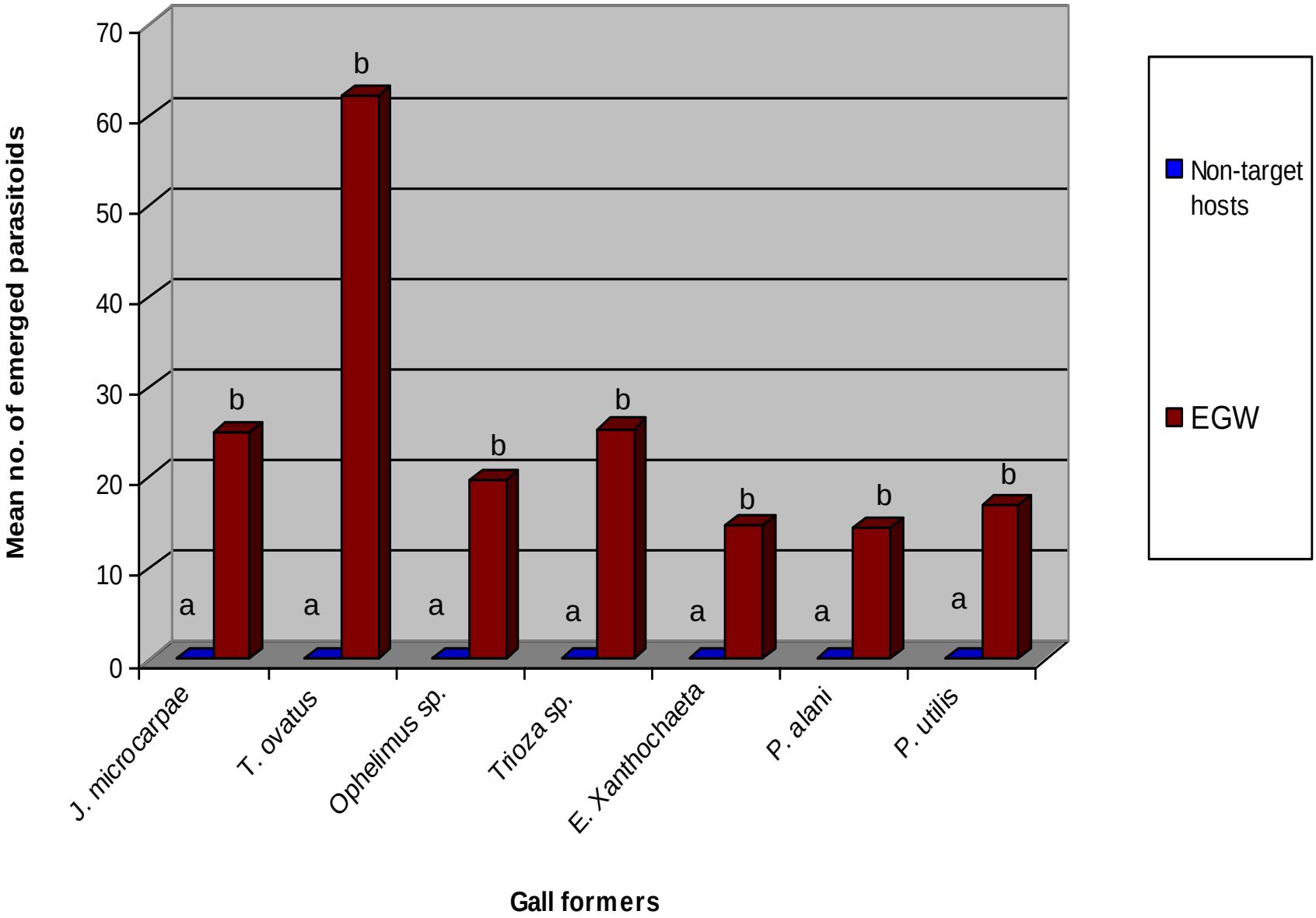
P. alani

T. ovatus

Host Preference by the Eurytomid



Emergence of the Eurytomid



Summary of Risk Assessment Activities

- Started March 2006, completed Dec. 2006
- EA submitted, 2007
- Release permit approved Nov. 2008

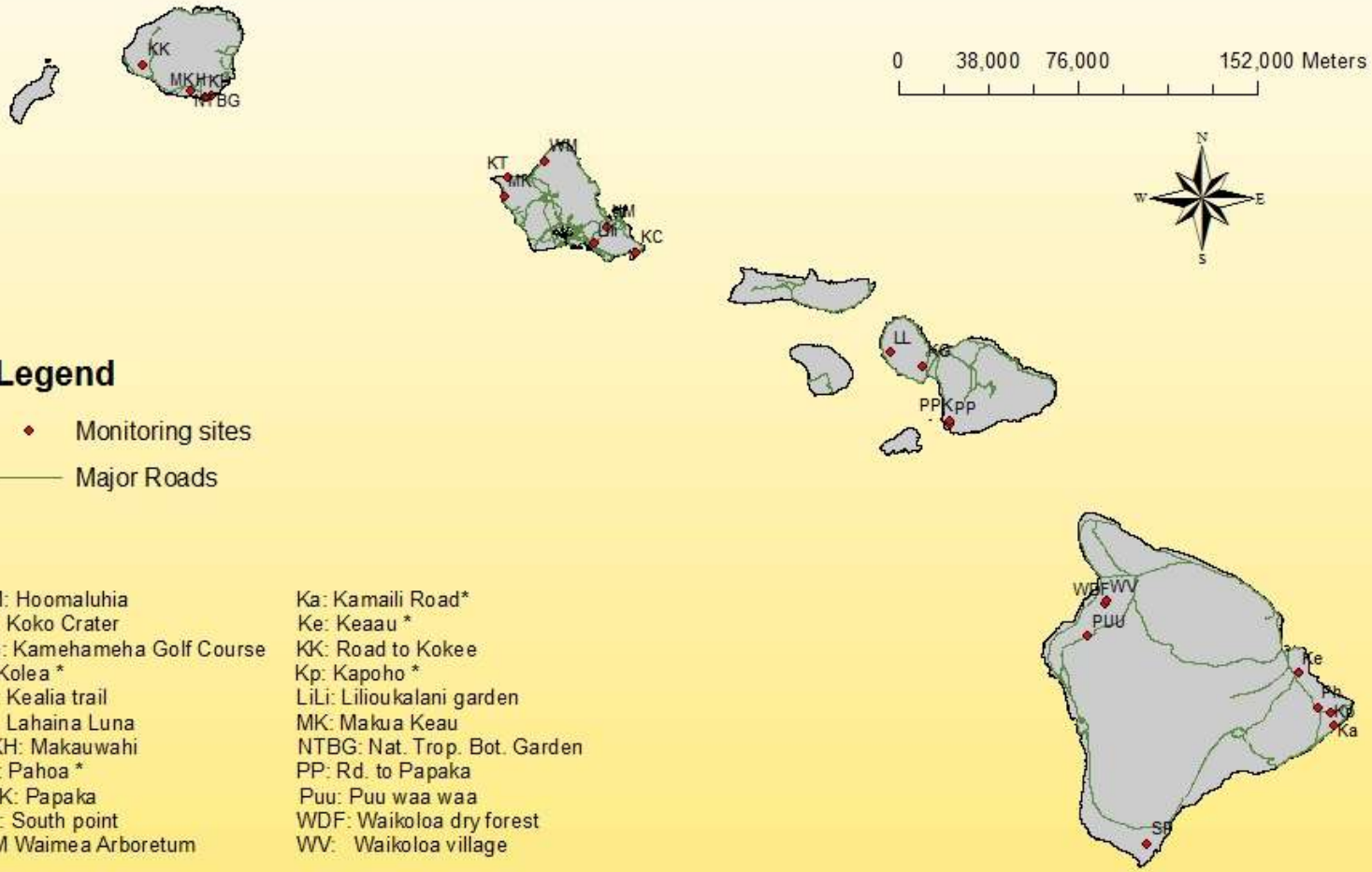
Field Evaluation of the Eurytomid Parasitoid: Pre- and Post-Release

- Four locations on each island were pre-selected as monitoring sites
- Trees (up to 10) per site were designated as sampling units

Field Monitoring of EGW and Eurytomid Parasitoid: Experimental Protocol

- Assess EGW damage on trees by rating up to 20 young shoots.
- Rate tree canopy using an arbitrary rating scale.
- Measure diameter and length of 10 young branches per tree; rate damage in each branch.
- Take photo images of trees and branches.
- Sample plant parts to quantify impact of parasitism with gall dissection and adult emergence (parasitoid & gall wasp) data.

Eurytoma erythrinae Monitoring Sites



Legend

- Monitoring sites
- Major Roads

HM: Hoomaluhia
KC Koko Crater
KG: Kamehameha Golf Course
Kl Kolea *
KT: Kealia trail
LL: Lahaina Luna
MKH: Makauwahi
Pa: Pahoa *
PPK: Papaka
SP: South point
WM Waimea Arboretum

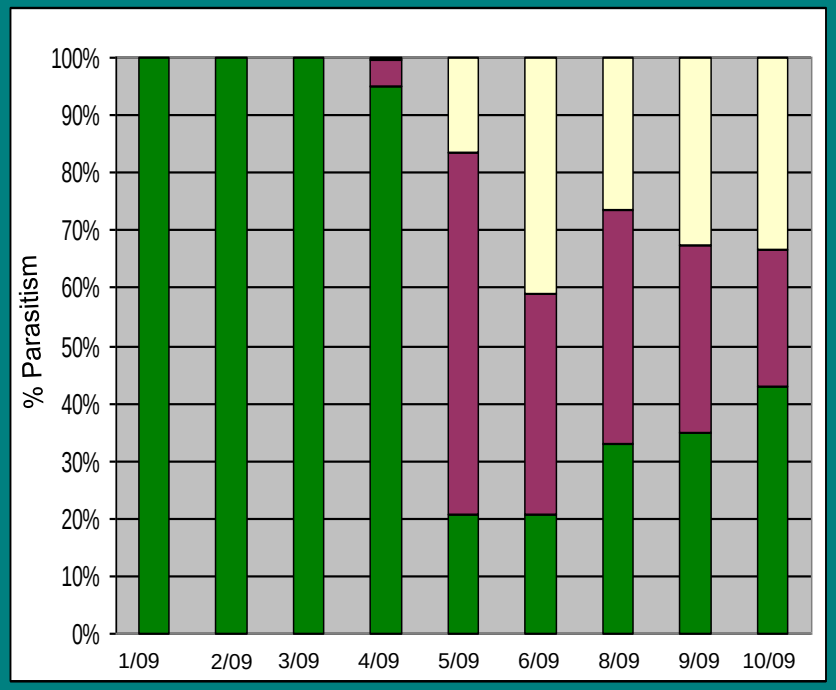
Ka: Kamaili Road*
Ke: Keaau *
KK: Road to Kokee
Kp: Kapoho *
LiLi: Lilioukalani garden
MK: Makua Keau
NTBG: Nat. Trop. Bot. Garden
PP: Rd. to Papaka
Puu: Puu waa waa
WDF: Waikoloa dry forest
WV: Waikoloa village

* Sites with *E. variegata*

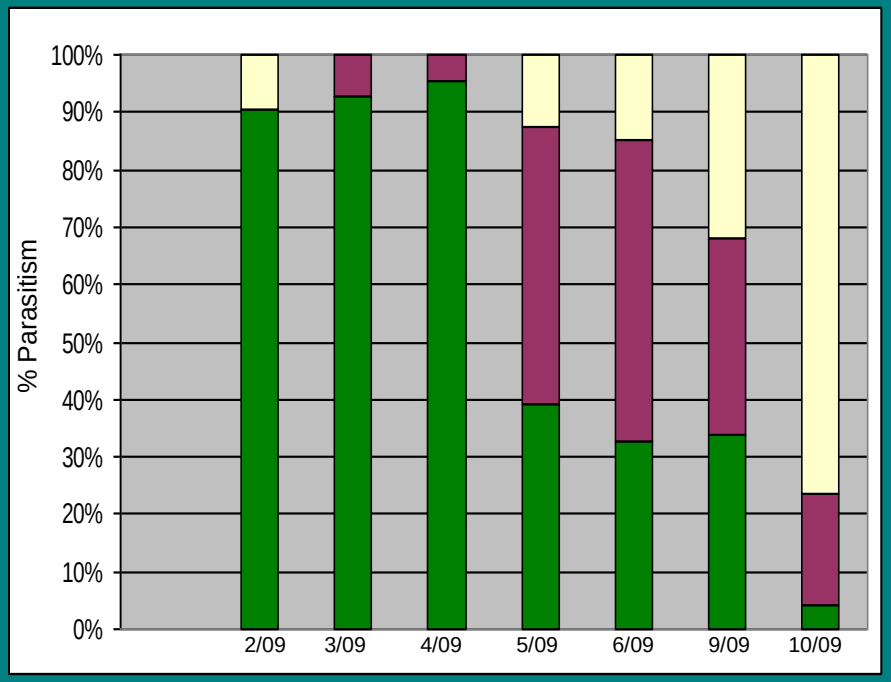
How the Eurytomid Parasitoid has Fared in the Host Habitat: Findings from Microscopic Examination of Erythrina galls

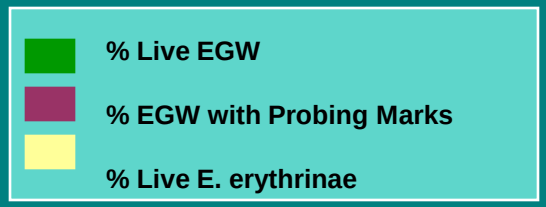
Parasitism of Erythrina Gall Wasp by *E. erythrinae*

Liliuokalani Botanical Garden



Kealia Trail





Implications of Findings

- Eurytoma population increasing
- Higher population affecting all stages of EGW
- Trees in some sites doing better than others

Unknown *Eupelmid* sp. in the Field

Less than 5% parasitism rate

85 % of Eupelmids found in dissections - parasitizing EGW

Another Promising Natural Enemy of EGW

Aprostocetus nitens

Biology of *Aprostocetus* sp.

- Ectoparasitoid
- Parthenogenic
- Duration of life cycle ~18 days
- Avg. longevity ~ 101 days

Risk Assessment of Aprostocetus

- Host specificity tests completed – May 2009
- Seven non-target gall formers were tested
- Five replications – Choice Tests
- Three replications – No Choice Tests

Summary of Results

- **Preference of EGW**
- **Occasional landing on non-targets**
- **No emergence of *Aprostocetus nitens* from non targets**
- **No evidence of parasitism in galls**

Acknowledgments

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