

# Small and Large Bug Damage in Nut Crops

Kent Daane  
University of California, Berkeley  
kdaane@ucanr.edu

Houston Wilson  
University of California, Riverside  
houston.wilson@ucr.edu

# Outline

## Bug Species

Small and Large bugs

Leaffooted bug

## Damage

Economic Injury

Seasonal Biology

Overwintering Biology

## Controls

Biological Control

Insecticides & timing

Monitoring



UC Statewide IPM Project  
© 2000 Regents, University of California

# Bug Species: Small Bug Pests

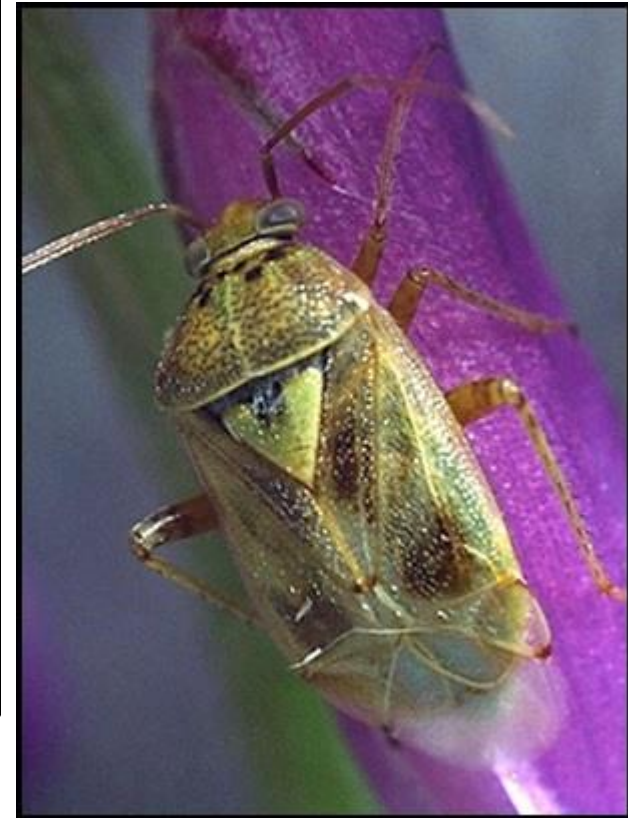
*Calocoris norvegicus*



*Phytocoris relativus*



*Lygus hesperus*

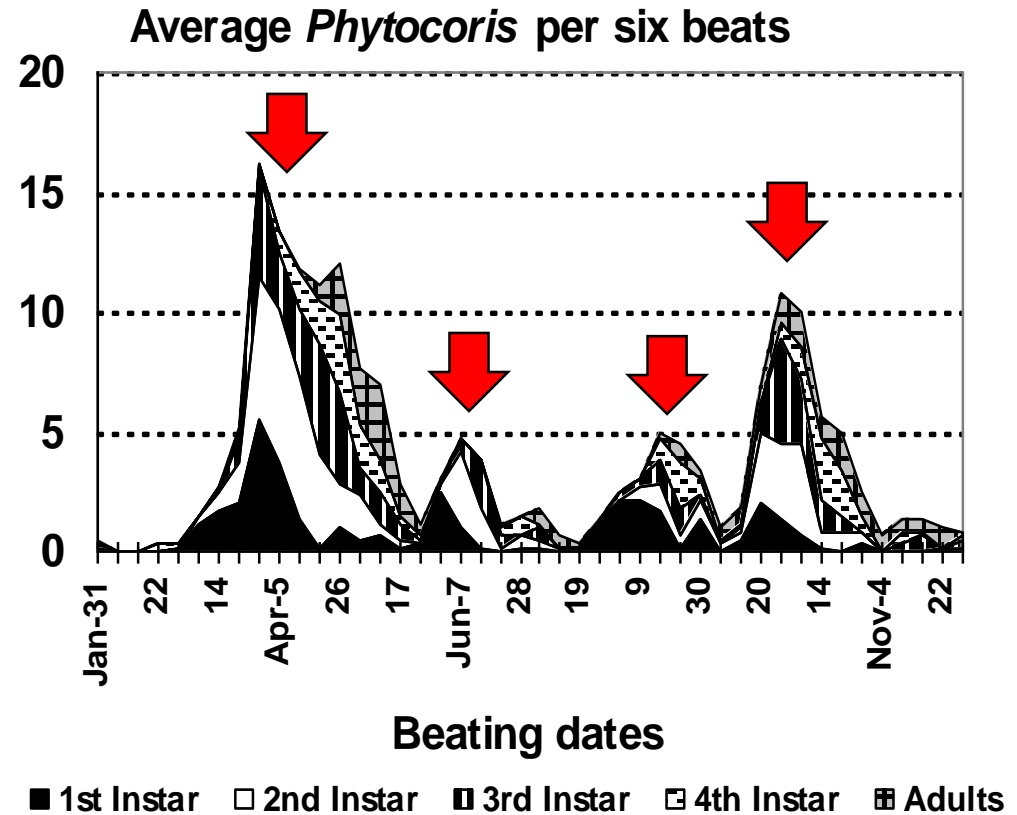


*Photo: web*

# Pistachio Small Bug Pests



*Phytocoris*  
(*Phytocoris relativus* and  
*Phytocoris californicus*)





# Pistachio Small Bug Pests

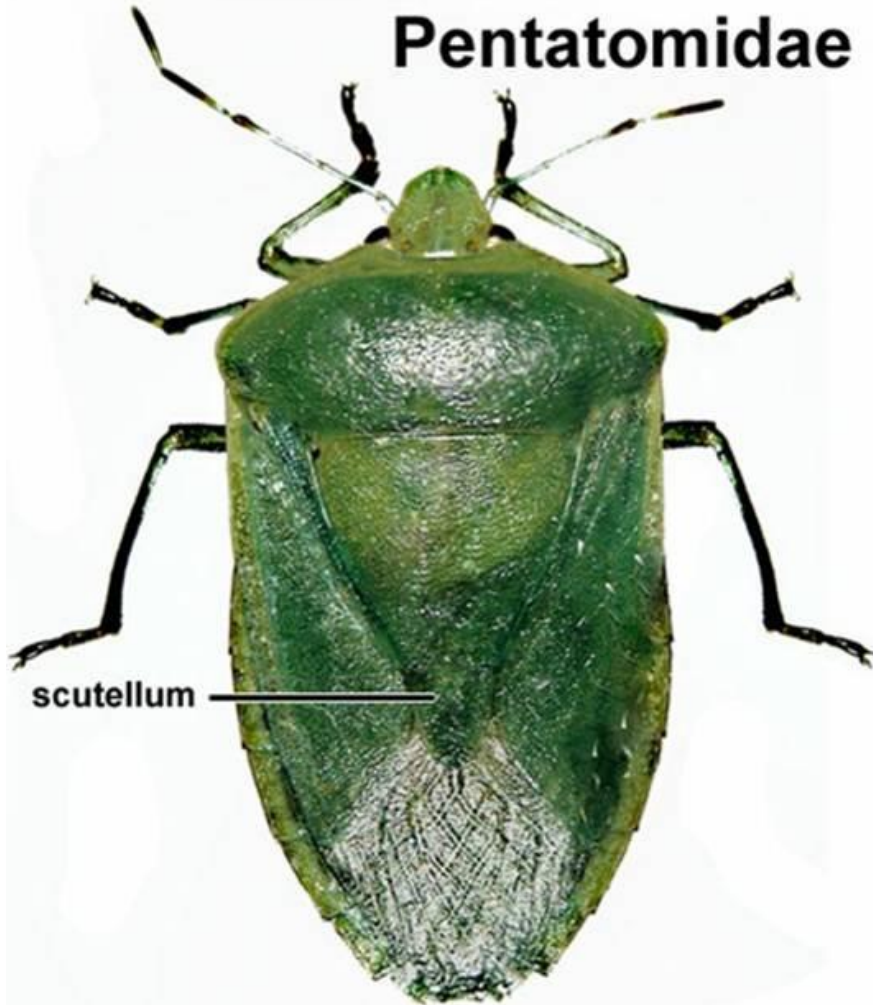


*Phytocoris*  
(*Phytocoris relativus* and  
*Phytocoris californicus*)



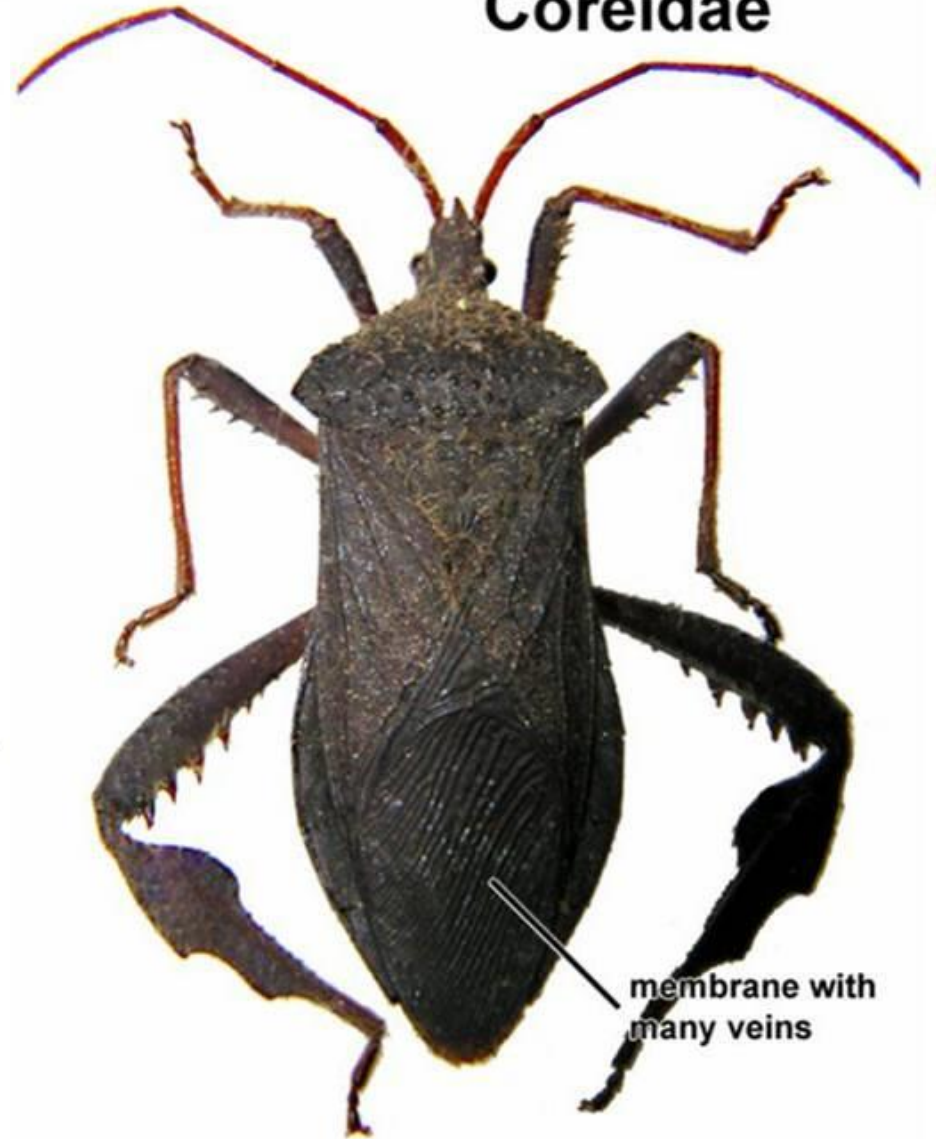
# Bug Species: Large Bug Pests

**Pentatomidae**



*Photo: web*

**Coreidae**





# Stink bugs (Pentatomidae)



**Say's Stink Bug**  
(*Chlorochroa sayi*)



**Uhler's Stink Bug**  
(*Chlorochroa uhleri*)

# Stink bugs (Pentatomidae)



**Green Stink Bug**  
*(Chinavia (Acrosternum) hilare)*



**Red Shouldered Stink Bug**  
*(Thyanta pallidoverins)*



# Stink Bug Developmental Stages



**Green Stink Bug**  
*(Chinavia (Acrosternum) hilare)*



Stinkbug eggs are barrel-shaped



Clustered 1<sup>st</sup> – 2<sup>nd</sup> instars

# Stink Bug Developmental Stages



**Green Stink Bug**  
*(Chinavia (Acrosternum) hilare)*





# Stink Bug Developmental Stages



**Green Stink Bug**  
*(Chinavia (Acrosternum) hilare)*





# Leaffooted Bug - Adult



# Leaffooted Bug - Egg hatch





# Leafhopper Bug - Eggs and nymphs



*Photo: RE Rice*



# Leaffooted Bug - Nymphs and adult



*Photo: RE Rice*

# Leaffooted Bug - wing span



*Photo: web*

# Outline

Bug Species

Small and Large bugs

Leaffooted bug

Damage

Economic Injury

Seasonal Biology

Overwintering Biology

Controls

Biological Control

Insecticides & timing

Monitoring

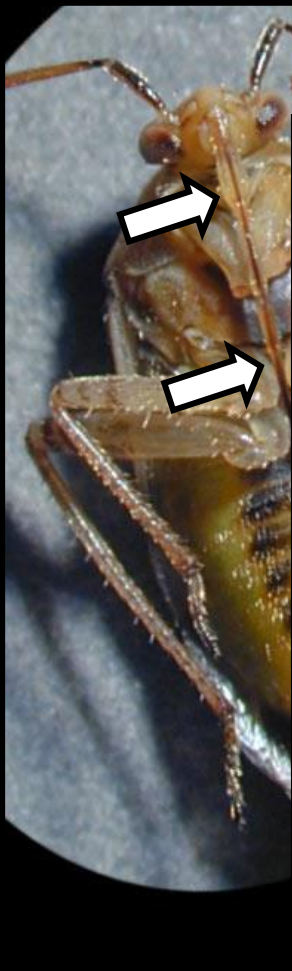




# Bug Damage - Mouthparts

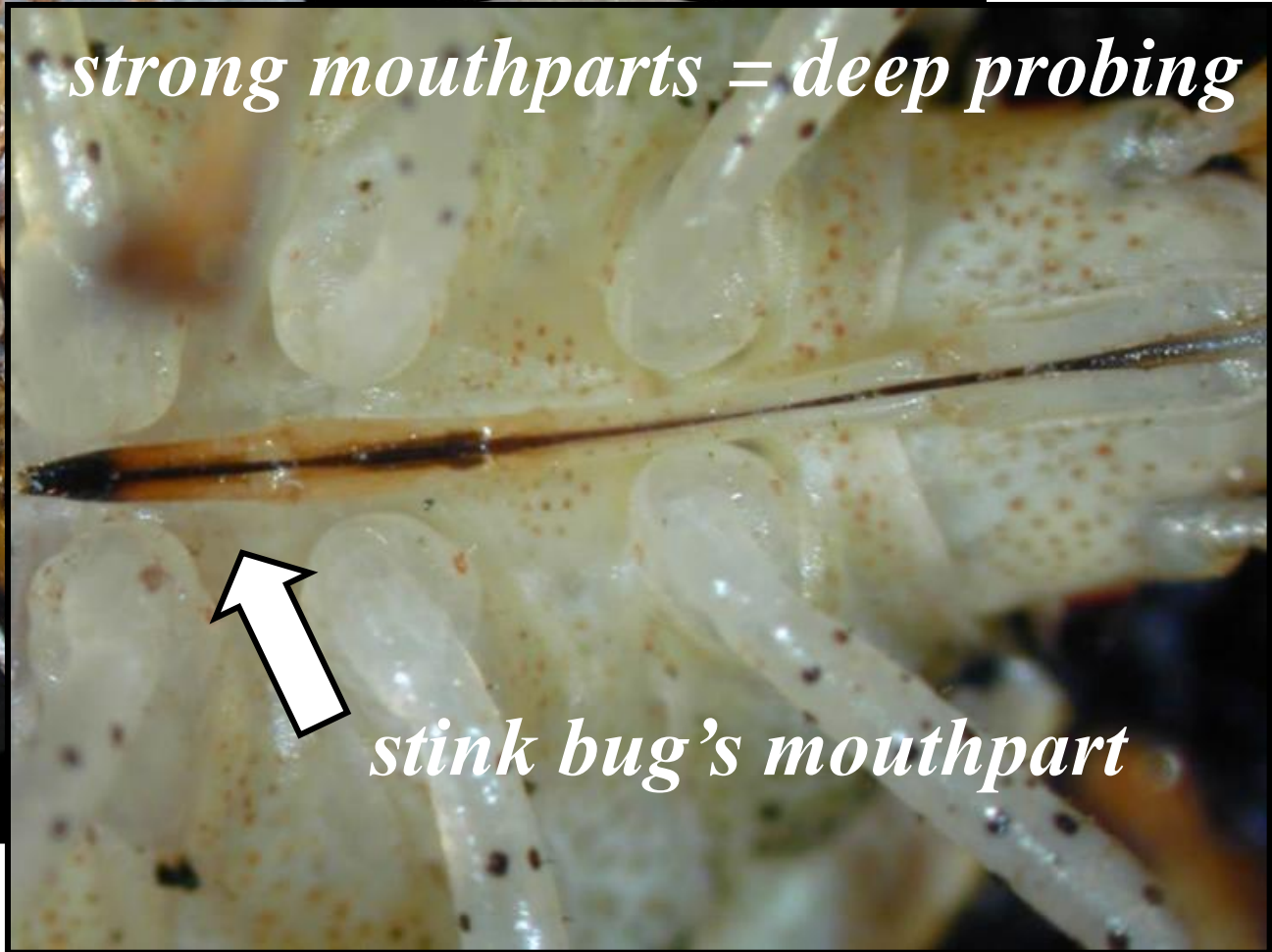


*general seed feeders*



*needle-like mouthparts*

*strong mouthparts = deep probing*



*stink bug's mouthpart*



April-May  
"Dropped nuts"





"Damage signal"  
from insects -  
probably large bug  
at this stage









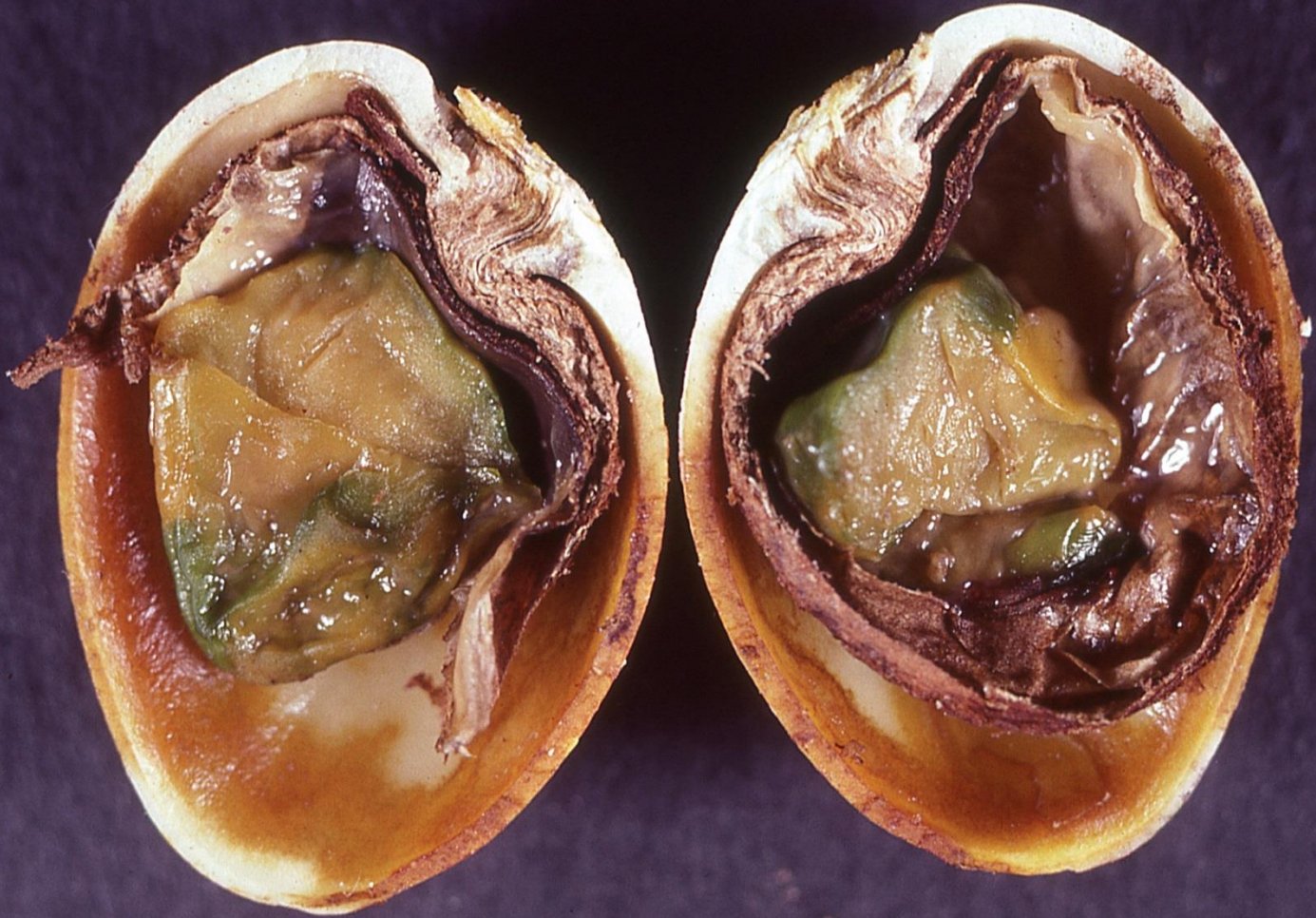


Kernel necrosis and  
"Stigmatomycosis"





Kernel necrosis and  
"Stigmatomycosis"









# Role in *Botryosphaeria dothidea* (Bd)



# Bd on field-collected bugs (ca. 25,000)



*Lygus* (0.4%)



*Calocoris* (0.05%)



*Phytocoris* (0.05%)



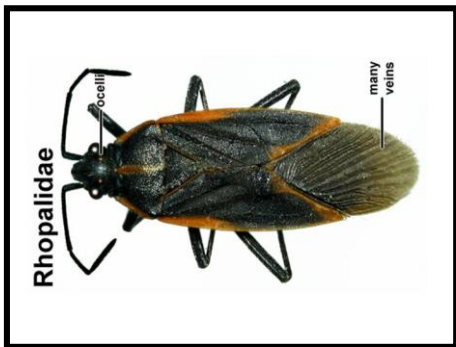
*Redshouldered SB* (0.35%)



*Flat green SB* (0.02%)



*Leaf-footed bug* (0.14%)



*Rhopalids* (0.2%)



*False chinch bug* (1.0%)



*Uhler's SB* (no sample)



# Role in *Botryosphaeria dothidea* (Bd)



Carry  
Bd spores  
Create  
punctures  
for  
entrance

# Seasonal development & damage

**Bug Seasonal  
Development**

**Pistachio & Almond  
Damage**

---

**1) Bug density**

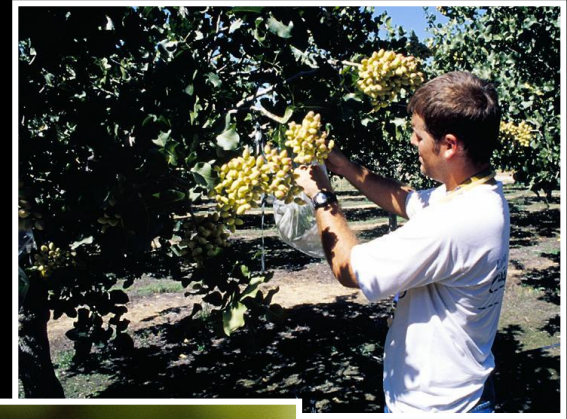
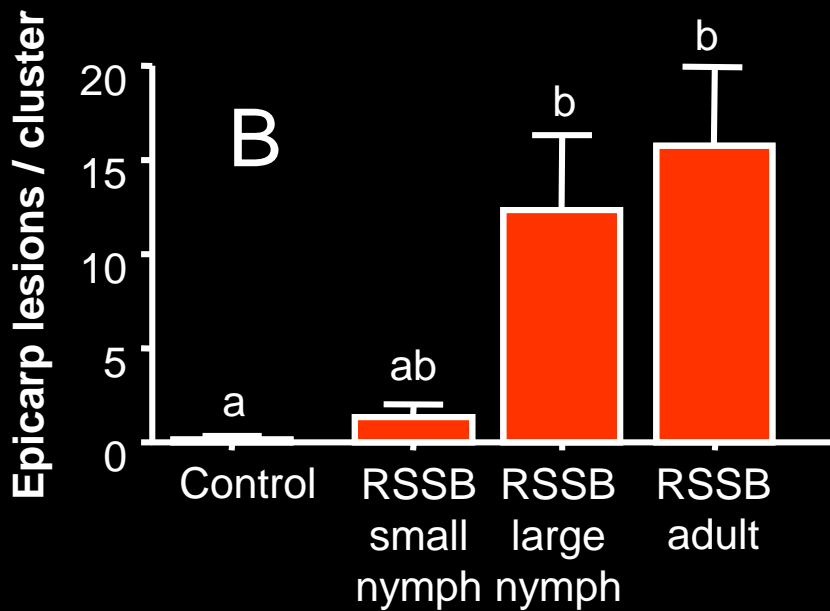
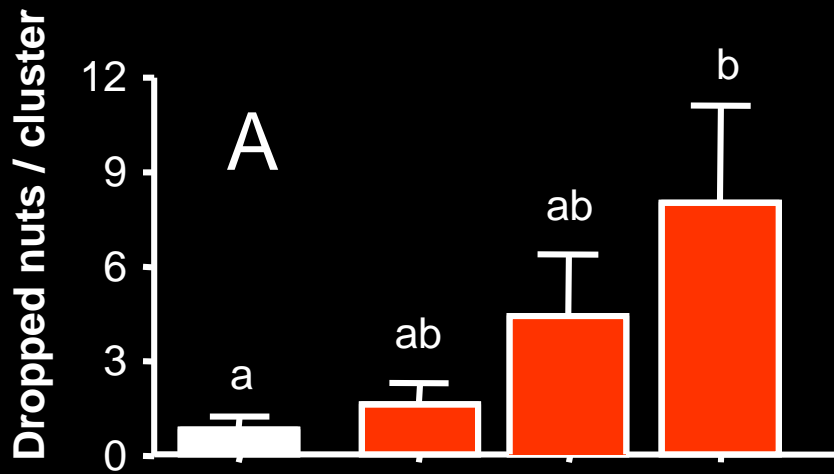
**3) Crop load**

**2) Bug size**

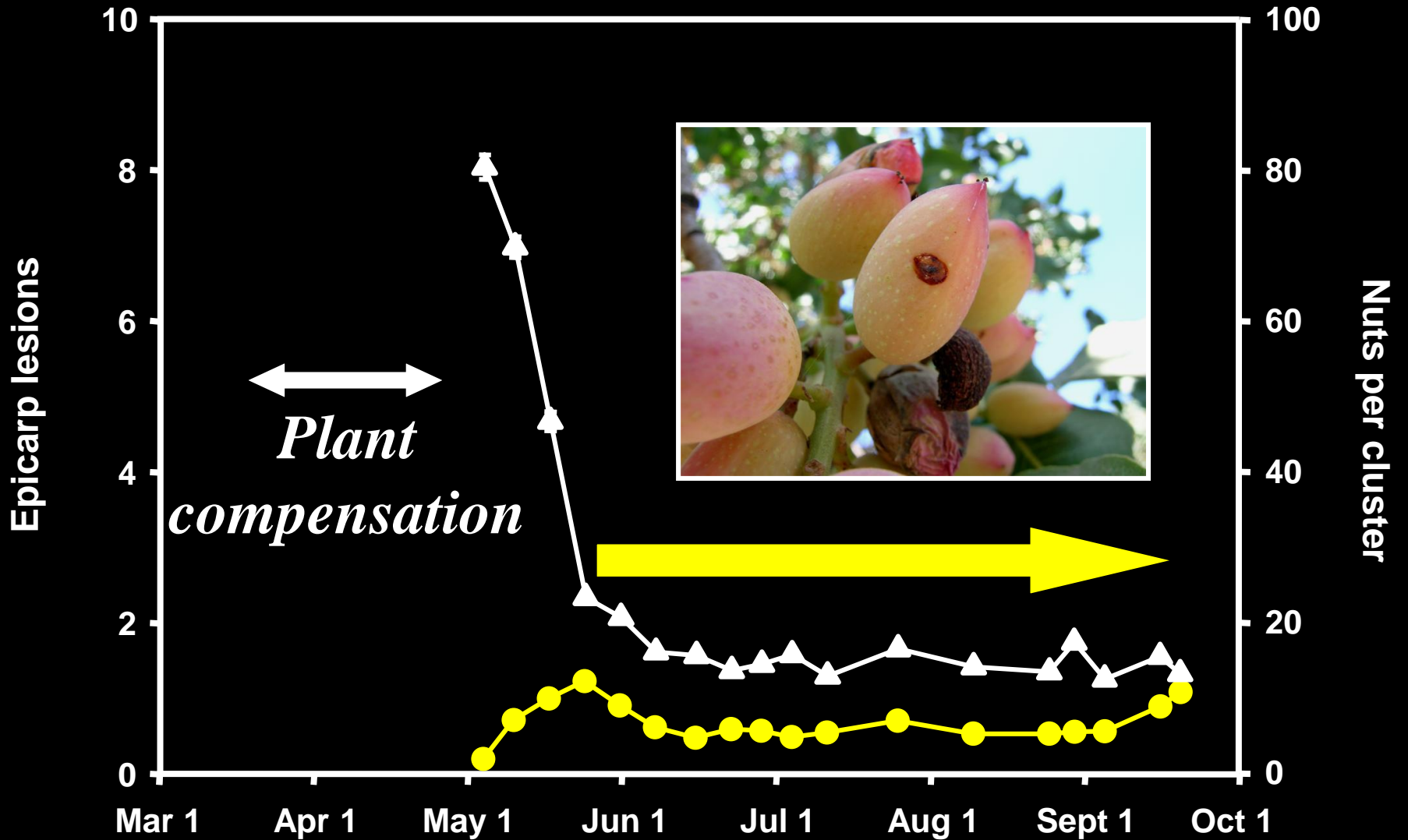
**4) Shell hardness**



## 2) Bug size - Pistachio cage study with RSSB

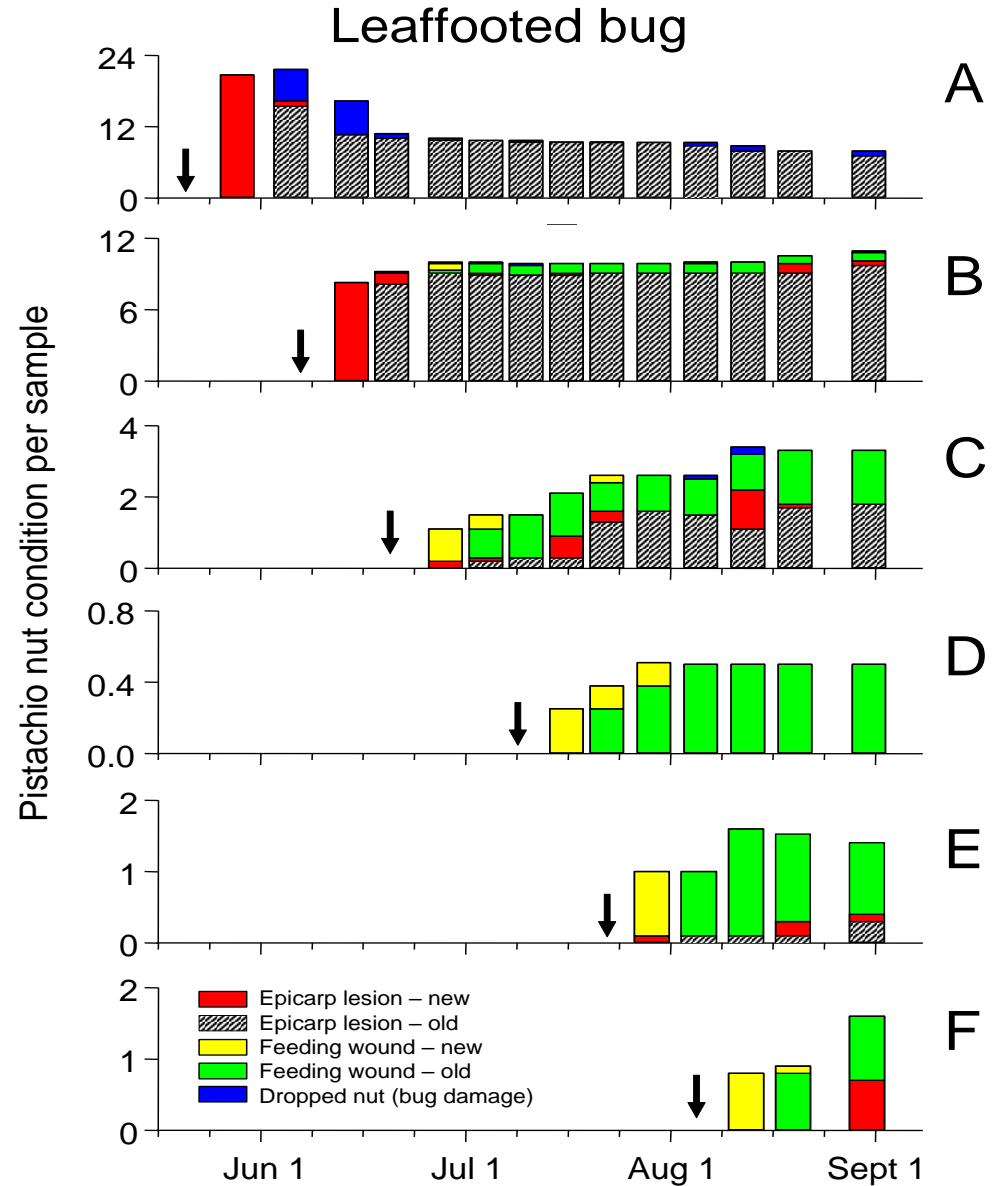


# 3) Crop load & compensation





# 4) Shell hardness - feeding period



# Outline

Bug Species

Small and Large bugs

Leaffooted bug

Damage

Economic Injury

Seasonal Biology

Overwintering Biology

Controls

Biological Control

Insecticides & timing

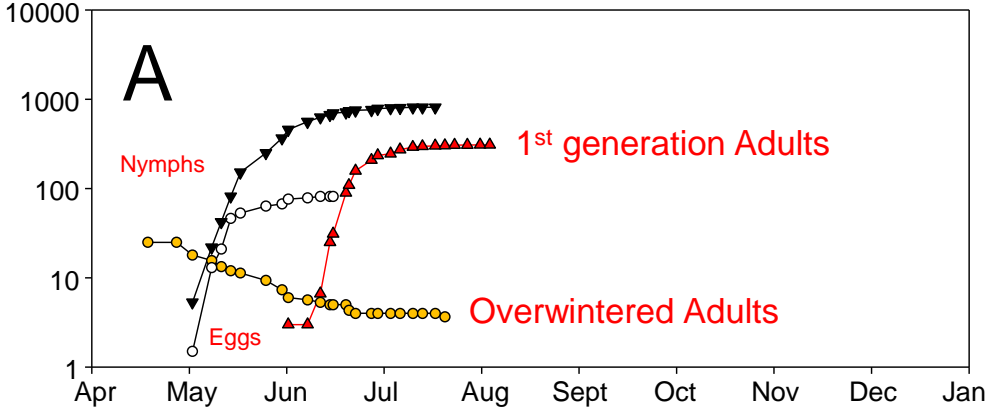
Monitoring





# Leaffooted Bug Presence & Density

Cumulative numbers of leaffooted bug

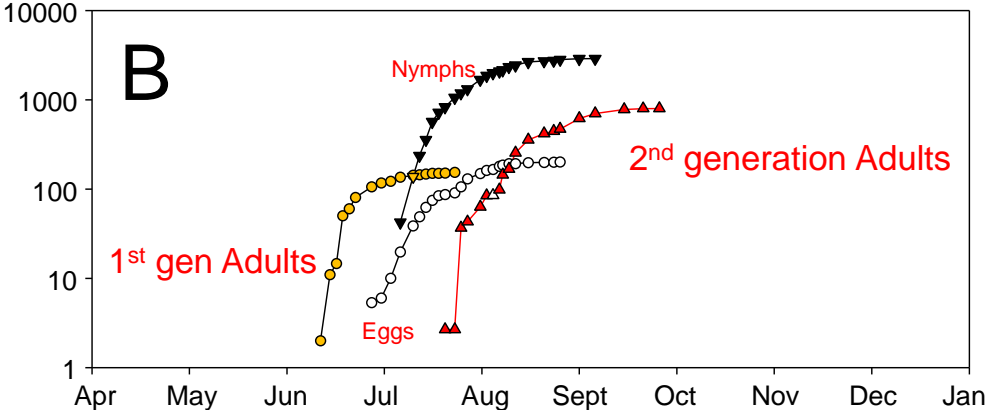
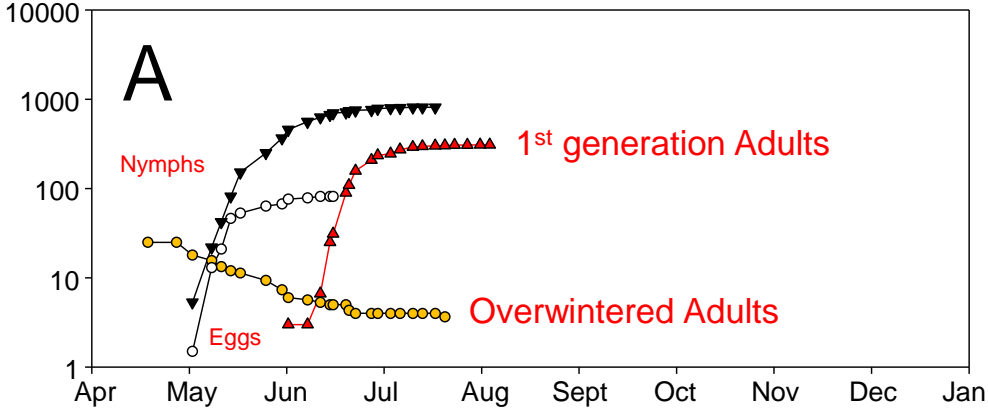


UC Statewide IPM Project  
© 2000 Regents, University of California



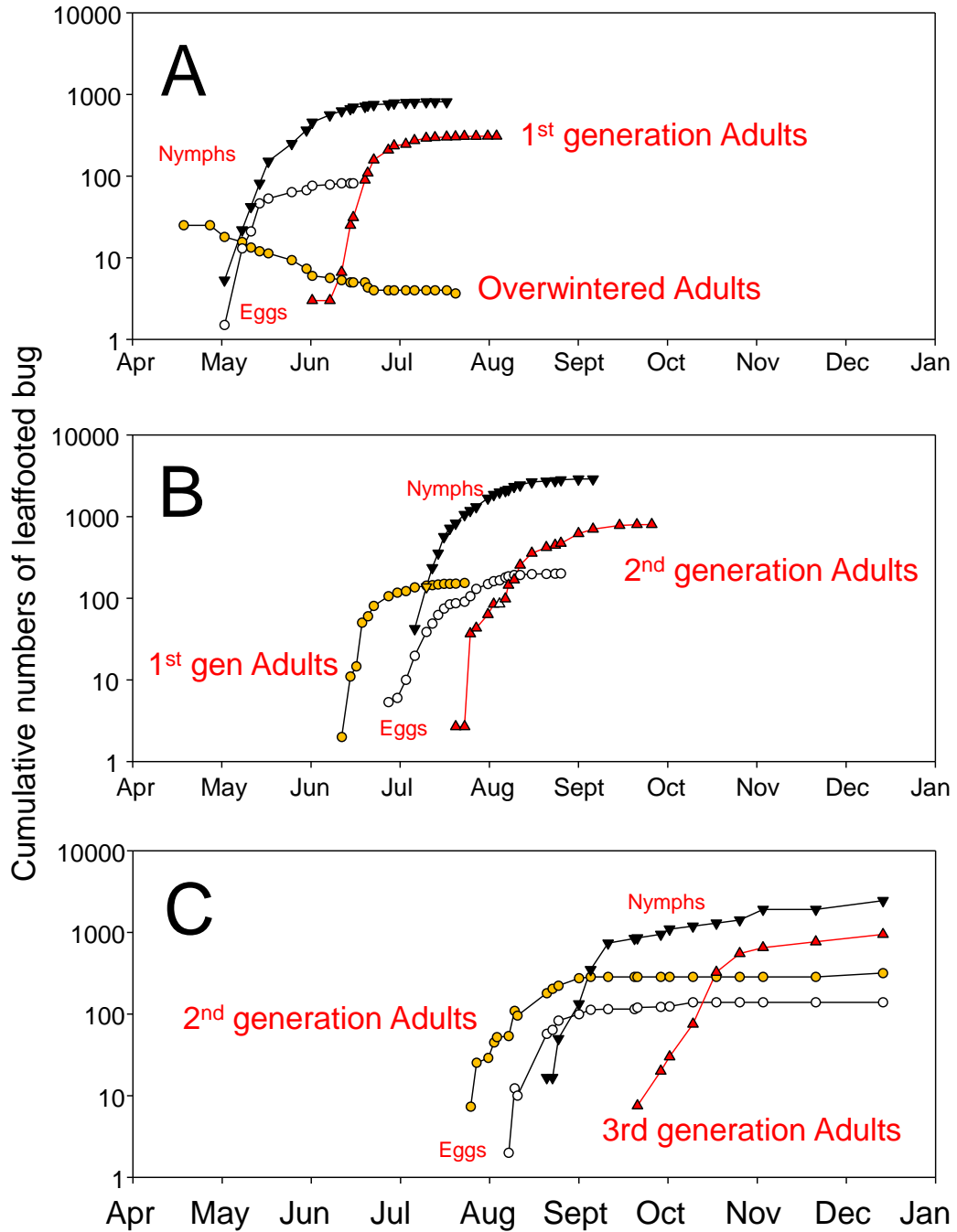
# Leaffooted Bug Presence & Density

Cumulative numbers of leaffooted bug





# Leaffooted Bug Presence & Density





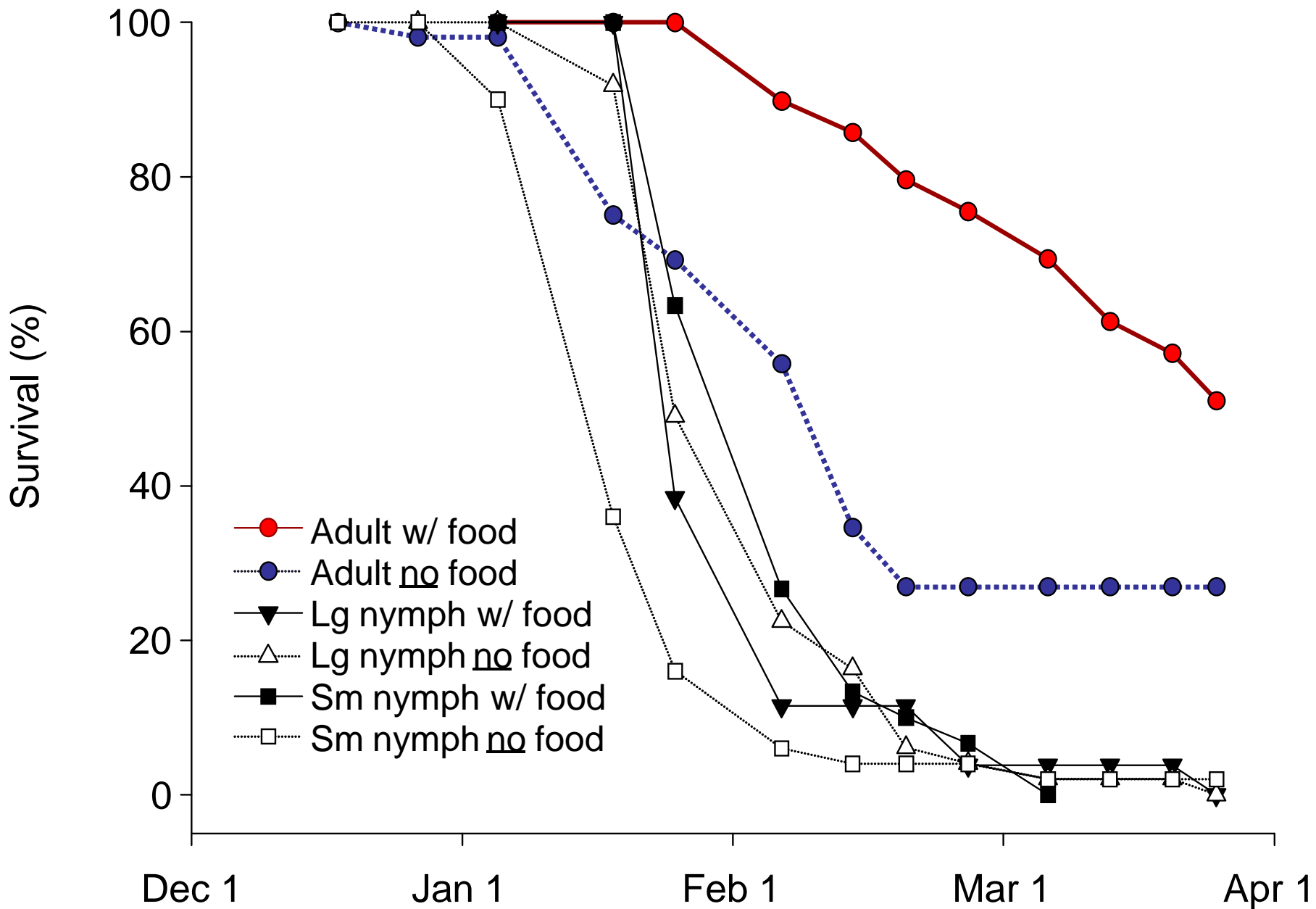
# Overwintering aggregations & biology





# LFB's OW survival - Development stages?



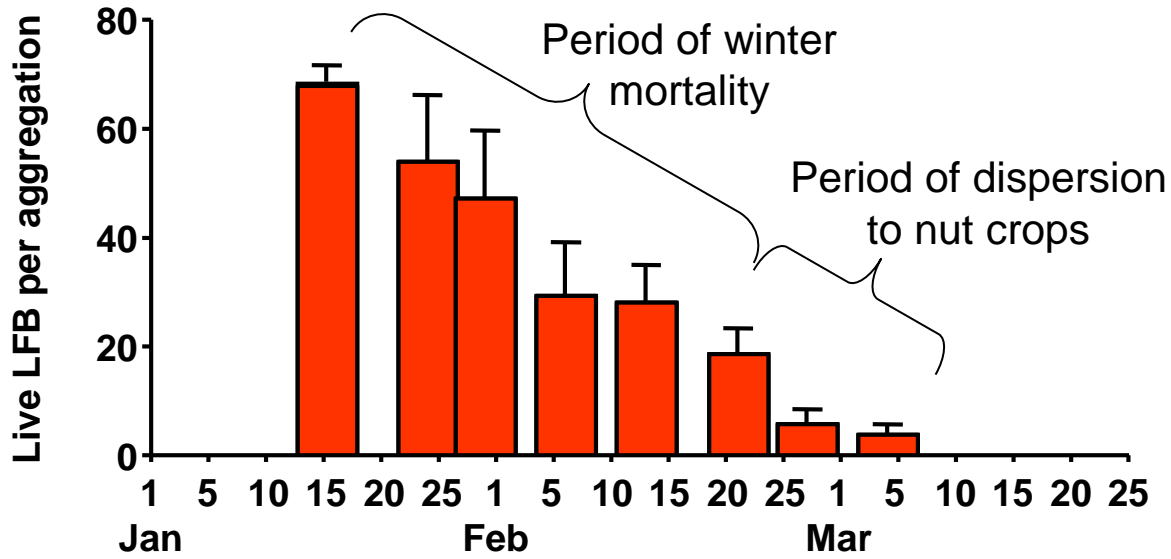
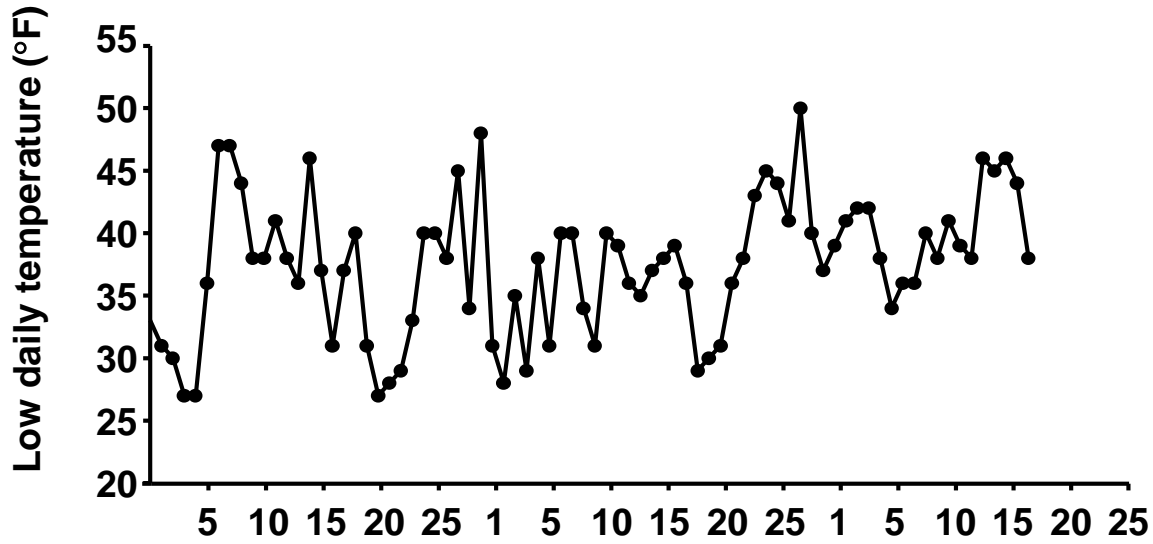




# Winter Monitoring for Leafhopper Bugs





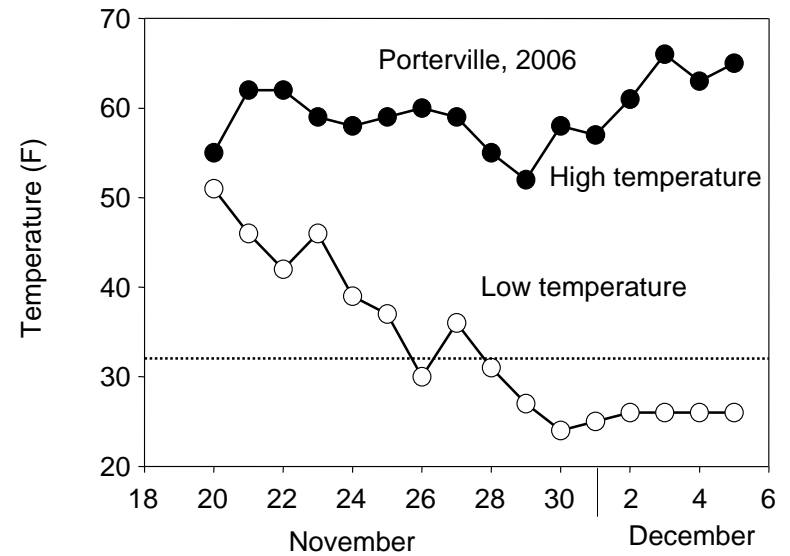




# Overwintering Temperatures?



# Overwintering Temperatures?



Winter temperature  
Shelter from cold  
Food for adults



# Outline

Bug Species

Small and Large bugs

Leaffooted bug

Damage

Economic Injury

Seasonal Biology

Overwintering Biology

Controls

Biological Control

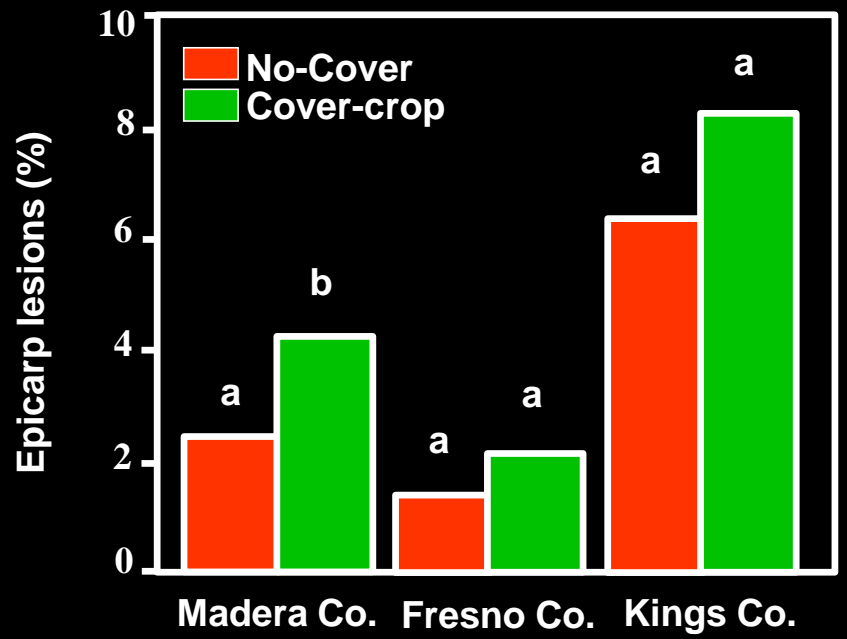
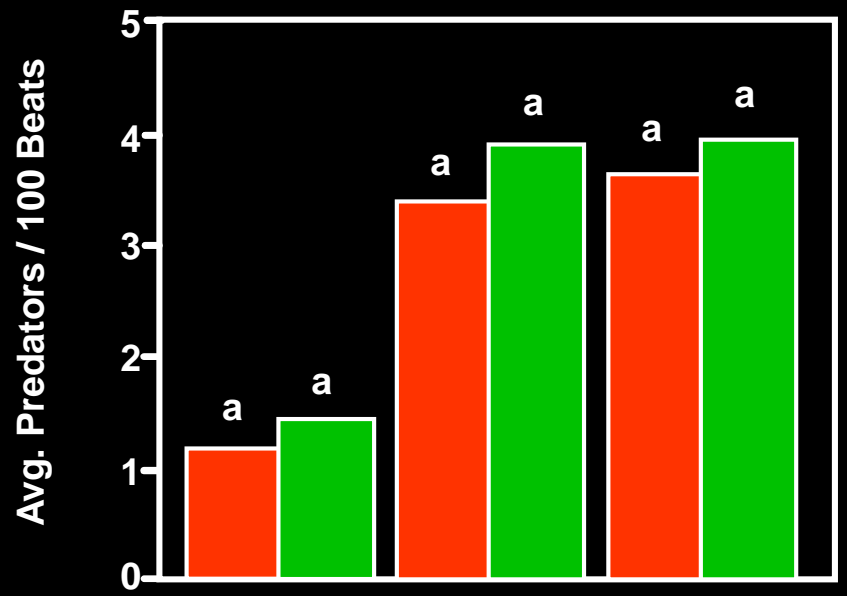
Insecticides & timing

Monitoring









Conclusions: If large bugs numbers are recorded, insecticides remain most reliable option. But remember (1) crop load compensation, (2) bug size, and (3) mid- to late-season shell-hardening,



Pyrethroids (April-May) are often used for bugs. Materials are broad-spectrum, David Haviland suggests these sprays are connected to Gill's mealybug problems



# Monitoring for Small & Large Bugs



Sweep samples for small bugs  
Beat samples for large bugs  
easy, species in canopy &  
immediate response  
Monitor damaged nuts  
indicates bug presence  
shows "%" crop damage  
Critical sampling period  
April-June (pistachios)  
March- May (almonds)

# Monitoring for Small & Large Bugs



Sweep samples for small bugs  
Beat samples for large bugs  
easy, species in canopy &  
immediate response  
Monitor damaged nuts  
indicates bug presence  
shows "%" crop damage  
Critical sampling period  
April-June (pistachios)  
March- May (almonds)



# Monitoring for Small & Large Bugs



Sweep samples for small bugs  
Beat samples for large bugs  
easy, species in canopy &  
immediate response

Monitor damaged nuts

indicates bug presence  
shows "%" crop damage

Critical sampling period

April-June (pistachios)

March- May (almonds)

# Monitoring for Small & Large Bugs



Sweep samples for small bugs  
Beat samples for large bugs  
easy, species in canopy &  
immediate response  
Monitor damaged nuts  
indicates bug presence  
shows "%" crop damage  
Critical sampling period  
April-June (pistachios)  
March- May (almonds)