

Light Brown Apple Moth; Biology, monitoring and control

For Sonoma County Growers In or Close to a
LBAM Quarantine Area, May-June 2009

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Outline

- Description
- Damage
- Monitoring
- Control

Information sources

Frank Zalom, Department of Entomology, UC Davis

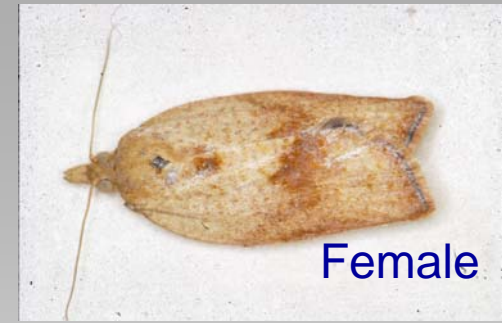
Lucia Varela, UC Cooperative Extension Sonoma County
and Statewide IPM Project

Light Brown Apple Moth

Epiphyas postvittana

Family: Tortricidae

“leafrollers”



Photos: David Williams, Dept of Primary Industries,
Victoria, Australia

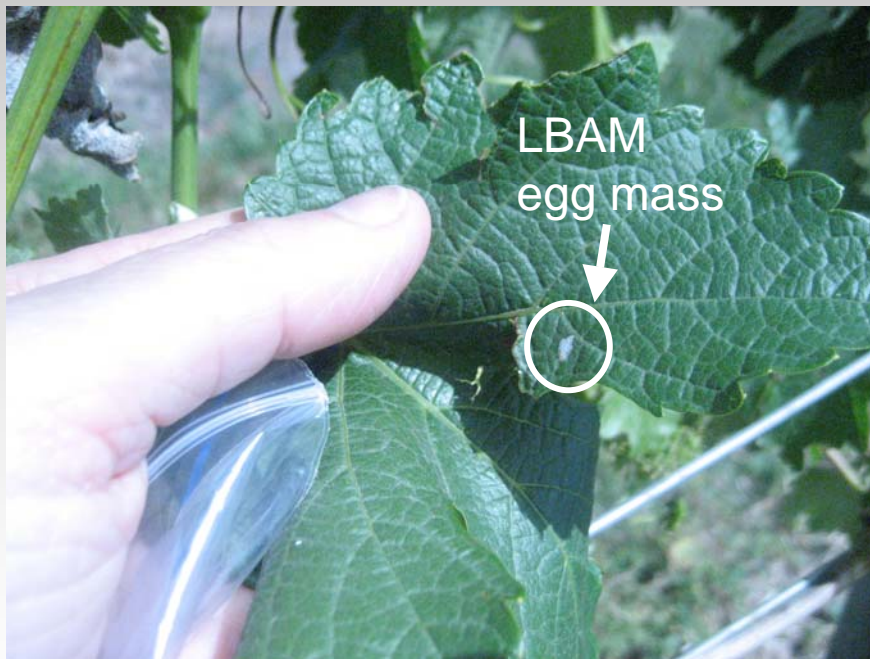


Photo: Lucia Varela, UC Cooperative
Extension Sonoma County and UC IPM Project



Photo: Jack K. Clark, UC IPM Project

Leafrollers in California Vineyards



Photo: Jack. K. Clark

Light Brown Apple Moth (LBAM)



Photo: Jack. K. Clark

Adult Male Wing length

OT 9 mm

OLR 7 mm

LBAM 8 mm

Photo: Ian Kimber; from [www. UKmoths.org.uk](http://www.UKmoths.org.uk)

Light Brown Apple Moth

Native to Australia,
specifically the
southeastern quarter of
Australia



Photo: HortResearch, New Zealand

First detected in California March, 2007 in Berkeley

Shoot tip damage - Ornamental Manzanita in
subdivision median strip, Santa Cruz



Photo: Jack. K. Clark, 2008



Photo: San Francisco, 2008

Light Brown Apple Moth

Adults

Females - 0.27 to 0.5 inch (7–13 mm) long


Males - 0.3 inch (8 mm) long, with a range of 0.23 to 0.4 inch (6–10 mm)

Photo: Brad Oliver, Monterey County Agricultural
Commissioner Office

Males have a fold
along the outer
edge of the
forewing called
the costal fold

Costal fold

1 mm



Wing Pattern Extremely Variable

- Male moth with varying amounts of dark brown on the front wings
- Different wing patterns between males and females and among individuals



2 Male Light Brown Apple Moths (Scale = 0.15 inch)

Photos: Scott Kinnee and Marc Epstein, California Department Food & Agriculture

Light Brown Apple Moth

Larvae

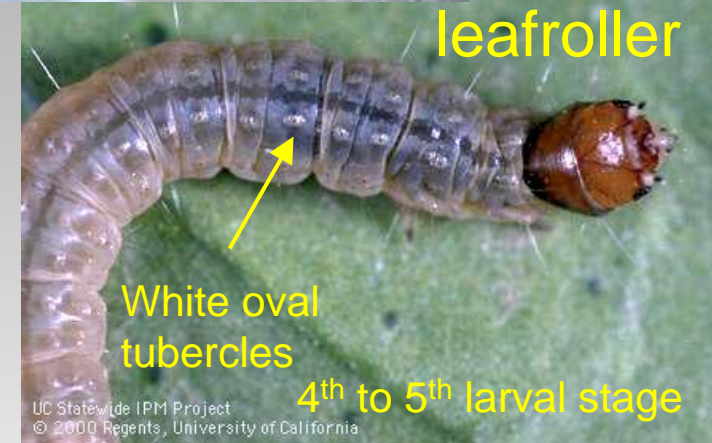
- 5 to 6 larval instars
- Fully grown larvae are pale green (common in leafrollers)
 - Male larvae are about 0.3 inch long
 - Female larvae are about 0.7 inch long



Photo: Jack K. Clark

Light Brown Apple Moth Larva

Larvae



Light Brown Apple Moth

Eggs

Eggs are white to light green when newly laid, broadly oval and flat, and are laid slightly overlapping each other.

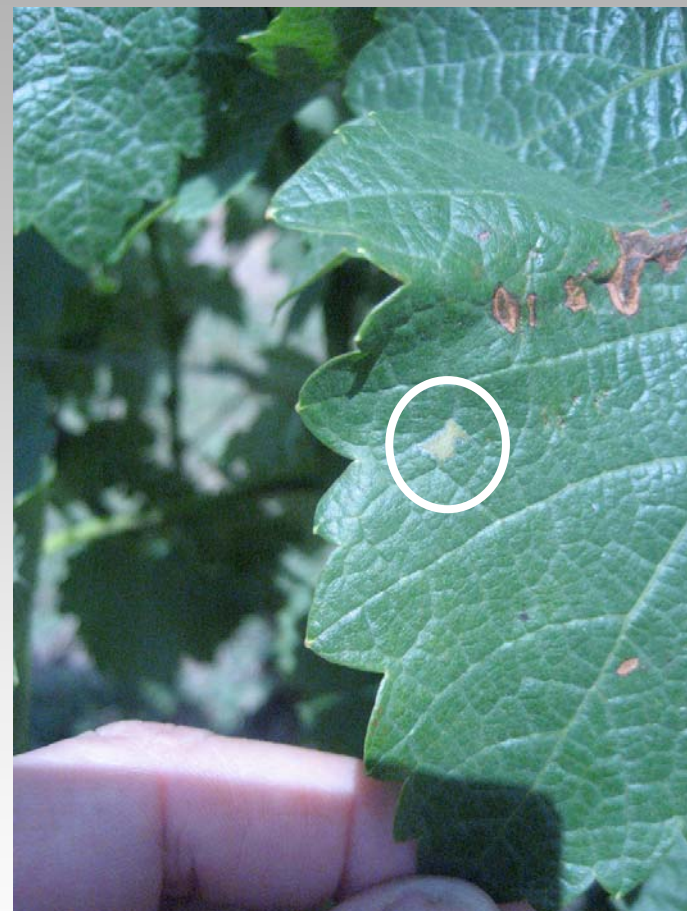
An egg mass may contain up to 170 eggs, but typically has 20 to 50.



Developing embryo



LBAM egg masses on grape leaves



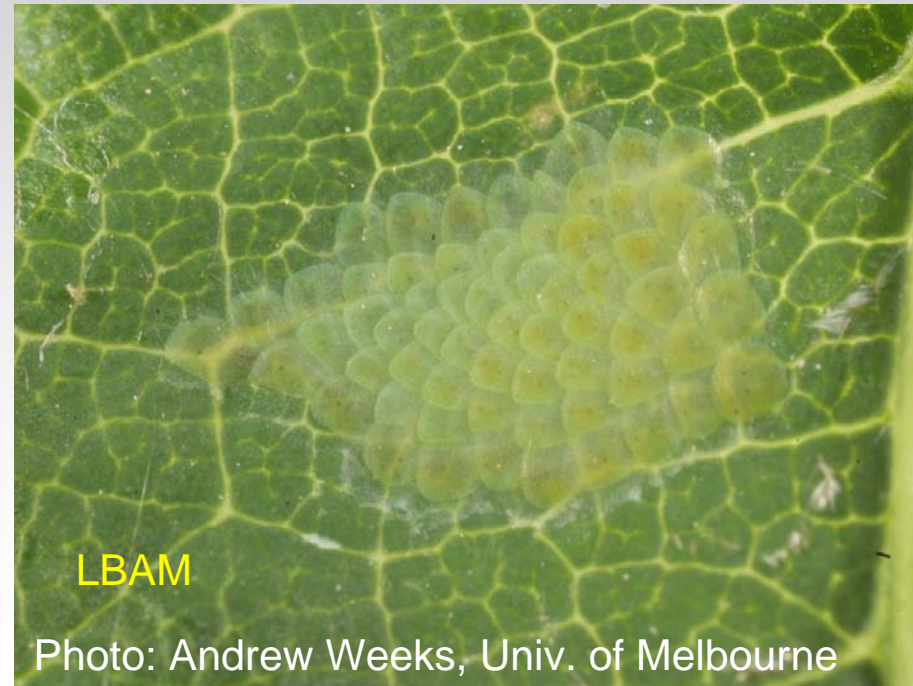
Egg masses are on top of leaf and near the edge

Photos: Lucia Varela

Light Brown Apple Moth

Eggs

Eggs laid in masses on leaves, described as 'shinglelike' or like fish scales.

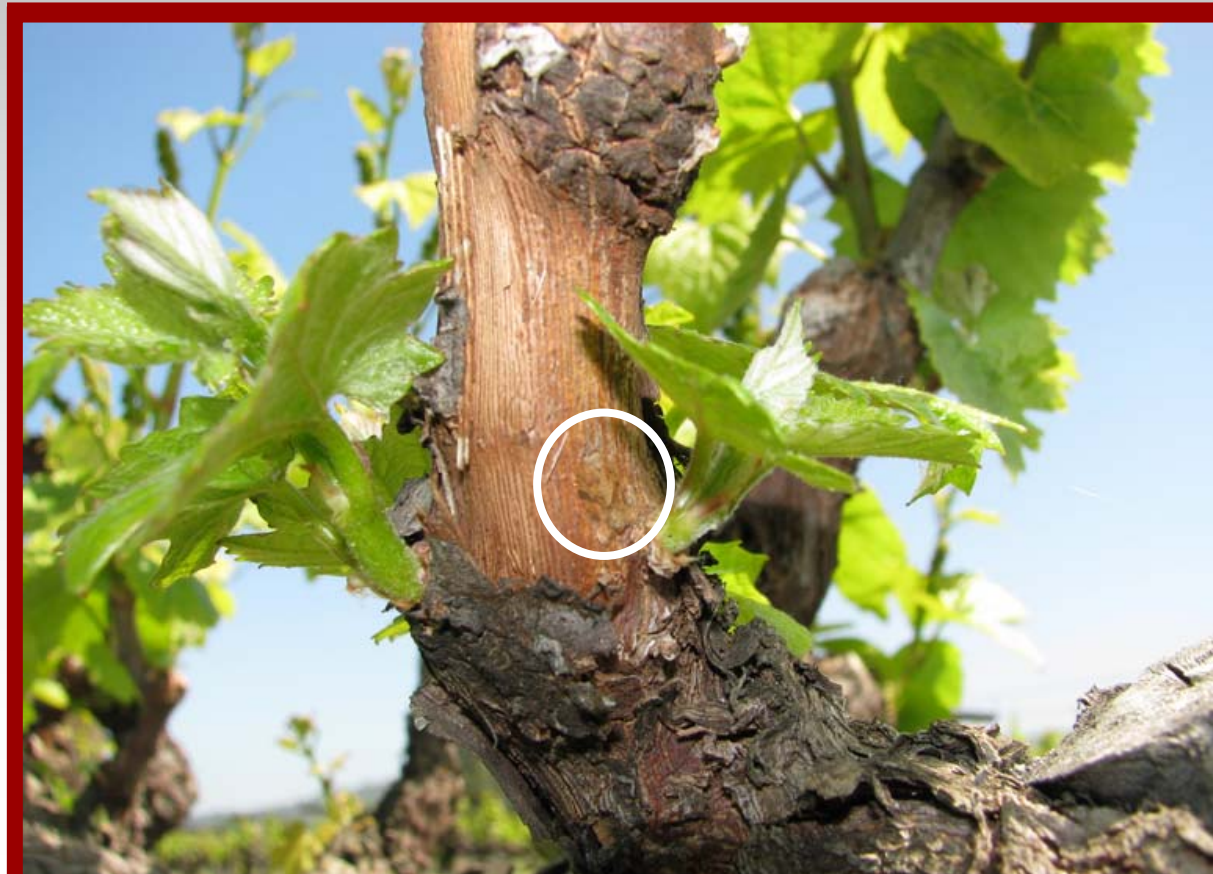


Photos: Jack K. Clark

Light Brown Apple Moth

- Moths are not active during the day.
- Flight occurs at dusk (mostly) or just after dawn.
- Disperse about 100 meters from source.

**Adult leafrollers
in vineyards are
difficult to see!
Orange Tortrix
moth, Sonoma
County**



Monitoring

Light brown apple moth (and OT and OLR) overwinter as larvae



- On broadleaf weeds
- Cluster mummies



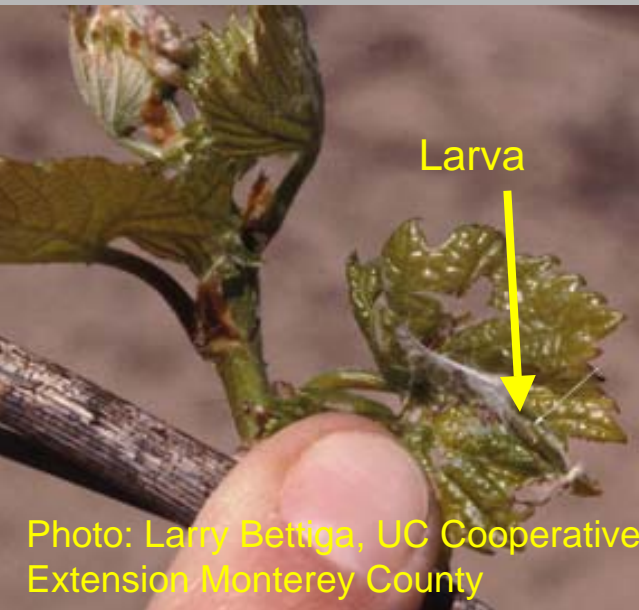
Larvae may occasionally cause feeding damage to the buds

Moths emerge in late winter or early spring



Photos: Jack K. Clark

Monitoring In Early Spring



Photos: Lucia Varela



- Females oviposit egg masses on the upper side of grape leaves or weeds
- Emerging larvae tie leaves together on young shoots and feed inside these “nests”
- *Early spring: monitor shoots for webbing of leaves*

Monitoring

Bloom through Harvest



Larvae enter clusters as early as bloom

- Feeding may cause loss of flowers or newly set berries.
- Later, larvae feed along the cluster stem and on the berries.
- *Beginning at bloom: monitor clusters for webbing and larvae*

Most Significant Damage

Feeding inside the cluster after veraison may increase incidence of Botrytis bunch rot.



Monitoring

Pheromone traps

- Are available for LBAM
- Are commonly used in many IPM programs
- There are currently *several hundred* traps inside LBAM Quarantine Areas. Additional traps are placed throughout the county. All are serviced by regulatory agencies.



Light Brown Apple Moth

Monitoring

In March and April - Look for larvae in rolled or webbed-together leaves and put out pheromone traps to learn if adult males are nearby.

Beginning just prior to bloom and up until bunch closure - Look for webbing in clusters

Control

An application must be made before bunch closure. Larvae must be exposed.



Control

Sanitation

- Mow broadleaf plants before bud break
- Remove cluster mummies when pruning and place them in row middles to be chopped

Insecticides

- *Bacillus thuringiensis* ssp. *Kurstaki*[#]
- Spinosad
 - Success[®]
 - Entrust[®] #
- Intrepid[®] 2F
- Delegate[®]

acceptable for use on organic grapes



www.ipm.ucdavis.edu

Grape—Caterpillar Monitoring Form

Supplement to UC IPM Pest Management Guidelines: Grape

Grower/Vineyard: _____ Date: _____

Comments: _____

Directions:

1. **At rapid shoot growth**, start to monitor 20 vines weekly by looking at 5 vines in each quadrant of the vineyard for omnivorous leafroller, orange tortrix (in coastal areas), and light brown apple moth (LBAM).
2. **From bloom onward**, continue monitoring omnivorous leafroller, orange tortrix (in coastal areas), and light brown apple moth, and start monitoring for grape leaffolder and western grape leaf skeletonizer.
3. On each vine, check for pests and the damage they cause according to the pests in the seasons below.

Season	Omnivorous leafroller	Orange tortrix (coastal areas) / LBAM	Grape leaffolder	Western grapeleaf skeletonizer
Early in rapid shoot growth	<ul style="list-style-type: none"> • Monitor for webbed leaves. • If you see webbing and frass, look for caterpillars. • Map out areas of concern for bloom monitoring. 	<ul style="list-style-type: none"> • Monitor for webbed leaves. • Unroll the leaves and look for leafroller larvae, pupa, or parasite cocoon. • Map out areas of concern for bloom monitoring. 	<ul style="list-style-type: none"> • See bloom below. 	<ul style="list-style-type: none"> • See bloom below.
Bloom and after	<ul style="list-style-type: none"> • Examine 10 flower/fruit clusters in the center of each of the 20 vines, for a total of 200 clusters. • Record the number of infested clusters. 	<ul style="list-style-type: none"> • Examine 10 flower/fruit clusters in the center of each of the 20 vines, for a total of 200 clusters. • Record the number of infested clusters, note parasitization. 	<ul style="list-style-type: none"> • Count the number of rolled leaves per vine. Unroll leaves and look for both healthy and parasitized larvae. • Record the number of leaffolder caterpillars and parasitized larvae. 	<ul style="list-style-type: none"> • Check for skeletonized leaves. • Record presence or absence of healthy or infested larvae.

Record your results and treat if needed using the treatment table thresholds on page 2.

Grower/Vineyard: _____ Date: _____

Comments: _____

Quadrant	Vine	Omnivorous leafroller	Orange tortrix / LBAM	Grape leaffolder		Western grapeleaf skeletonizer	
		Number of flower/fruit clusters infested out of 10	Number of flower/fruit clusters infested out of 10 (note parasitization)	Number of grape leaf folder	Number of parasitized larvae	WGLS (+ or -)	Infected with virus (+ or -)
1	1						
	2						
	3						
	4						
	5						
2	6						
	7						
	8						
	9						
	10						
3	11						
	12						
	13						
	14						
	15						
4	16						
	17						
	18						
	19						
	20						
		Total infested:	Total infested:	Total:	Total:	Total:	Total:
			Average: (Total/200 x100) _____				
		At bloom, treat if any larvae are found. After bloom, treat if 2 or more clusters (1% or more) are infested.	Orange tortrix: Treatment may be warranted if an average of 0.5 to 1 larva per vine is found and no parasites are present. LBAM: Treat before bunch closure if any verified larvae found.	Treatment may be warranted if population levels increase. Treat when larvae are young, before they roll leaves around themselves.		Treat if larvae are found and no granulosis virus is evident.	

Information

- <http://www.ipm.ucdavis.edu>
 - Pest Management Guidelines
 - Light brown apple moth in California: Quarantine, Management and Potential Impacts
- California Agriculture: April-June 2008
“Light brown apple moth’s arrival in California worries commodity groups”
- ➔ ■ <http://cesonoma.ucdavis.edu>
 - Leafrollers in Vineyards ID Sheet
- <http://www.cdffa.ca.gov>