

# FOUR DECADES WITH BLUE ORCHARD BEES



BOB



Measuring yields



Logan Bee lab

## LOGAN BEE LAB



Watching bobs in cages



Nesting observation



bob pupa



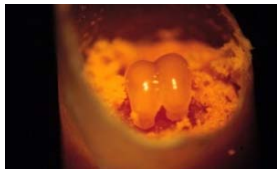
Greenhouse management



Monitoring development



Testing shelter types



Feeding larvae



Field management



Recording nest contents

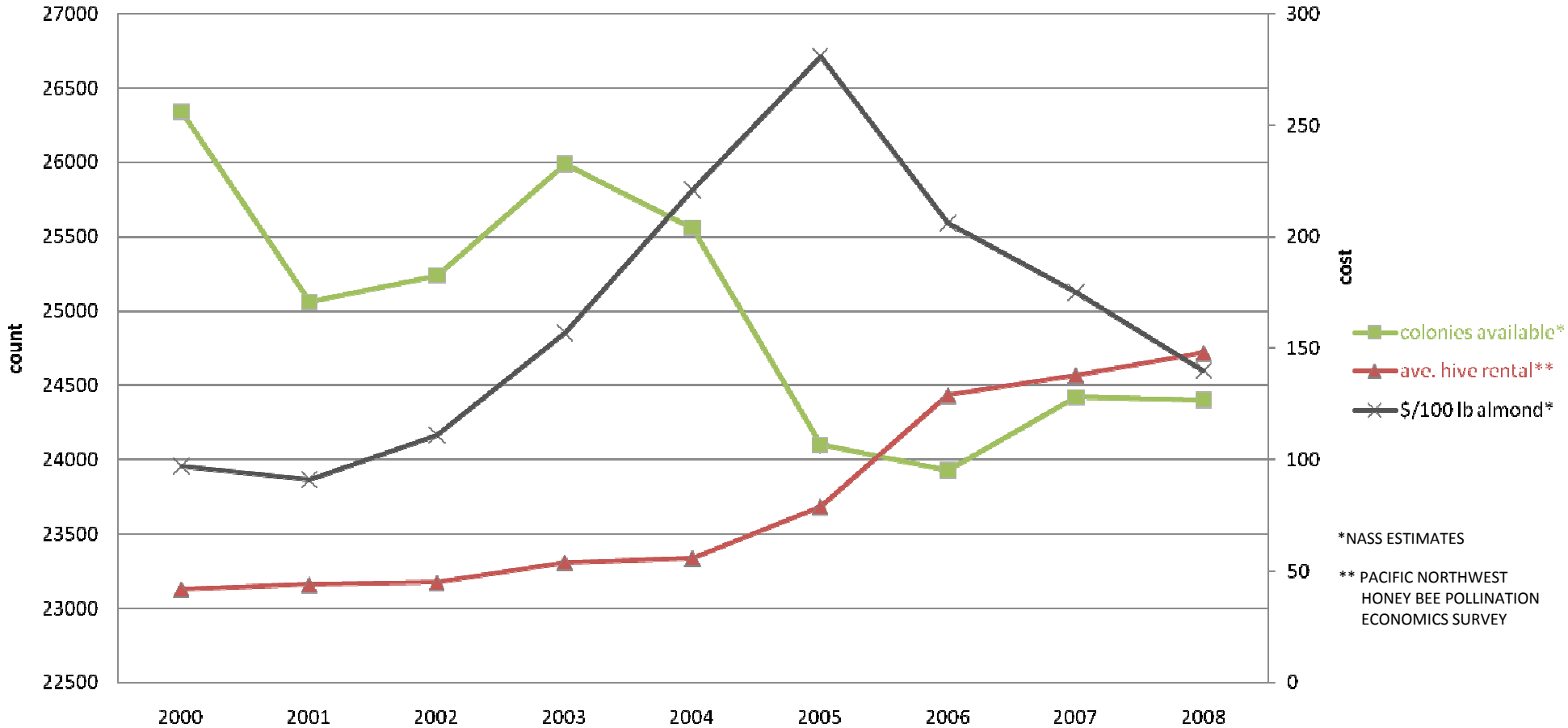


Mites on bob



Flower counts

## ECONOMICS OF LACK OF DIVERSITY



The average hive maintenance cost was \$178/colony (in 2008).  
 Annual pollination income was \$154/colony.  
 A net hive rental loss of \$24. - Michael Burgett (Oregon State U.)

Total standing acreage 2008 – 665,576

ARTICLE

g bee species  
ple of *Osmia*  
achilidae)

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Field Experiments with *Osmia lignaria propinqua* Cresson as a Pollinator in Almond Orchards: II, 1976 Studies  
(Hymenoptera: Megachilidae)  
P. F. TORCHIO  
Bee Biology & Systematics Laboratory, Agricultural Research, Science & Education Administration, USDA, Utah Agricultural Experiment Station, Journal article 2548, Utah State University, UMC 53, Logan 84322

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Abstracts  
BLUE ORCHARD BEE EMERGENCE AND ACTIVITY WITH SEASONAL FRUIT TREES  
Bee Biology Laboratory, Utah State University, Logan, Utah 84322

Abstracts  
8474 ASILS  
Cell division did not appear to precede abscission of flowers or mature fruits. During abscission a decrease in wall polysaccharides was evident.  
315 (FS V)  
KULL, HAROLD, DEPARTMENT OF BOTANY, MARYLAND COLLEGE

# The Future of Crop Pollination

by P. F. TORCHIO  
USDA, Agricultural Research Service  
Bee Biology Laboratory, Logan, Utah

Diversification

POLLINATION

BEES AS

Effect of Wintering on Emergence Time in

The primary requirements for managing pollinators were

BEES

## Development and Emergence (Hymenoptera)

Bee Biology and Systematics Laboratory

ABSTRACT The solitary bee *Osmia lignaria propinqua* Cresson (Hymenoptera: Megachilidae) becomes adults and remains in the orchard at various stages of development when reared at various temperatures whereas bees reared at 20°C took 30 days to emerge. Developmental stages responded to temperatures averaging 22°C significantly developed faster than at the extremes (fluctuating temperatures) could be predicted. Emergence of bees reared at 20°C was 1 mo ahead of best exposed populations for pollination of orchards.

KEY WORDS: blue orchard bee, solitary bee

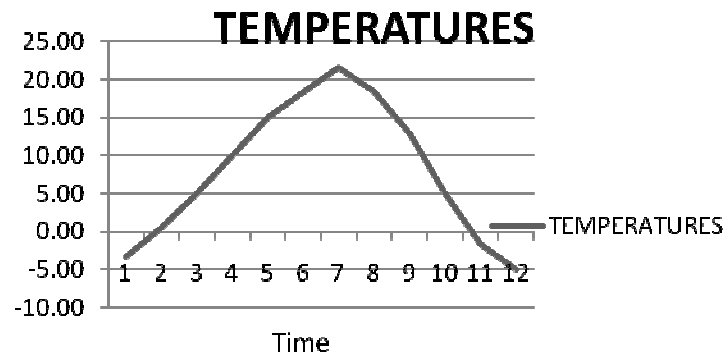
*Osmia lignaria* Say is a univoltine Nearctic solitary bee that overwinters in the soil and emerges early in the year, March-May, of the geographical area. After mating, it builds their nests in preestablished cavities, burrows in timber. Nests consist of a series of cells delimited by mud partitions, each with an egg deposited. Completed cells are sealed with a mud plug. Although *O. lignaria* is a solitary species, females are strongly attracted to the genera *Prunus*, *Malus*, and *Pyrus* (Rosaceae).

Because of its superiority as a fruit tree pollinator, methods to manage *O. lignaria* have been sought and developed (e.g., Torchio 1982a, 1985; Bosch and Kemp 1999). Nests with nesting materials and adult covers are placed in orchards shortly before harvest and moved after petal fall. Bee progeny are stored for the remainder of the year. By the fifth instar completes consumption of the provision; defecates, and spins a cocoon strands from the labial glands (Torchio stage (prepupa), the bee undergoes a diapausal stage (probably diapause-mediated diapause) that lasts 7-11 mo until it pupates becomes an adult in late summer. Adults inside the cocoon, and a period of diapause is necessary for them to overwinter and emerge the following spring.

## NESTING MATERIALS



## TEMPERATURE REGIME



## REDUCE NEST ASSOCIATES

Predators



Parasites



scavengers



## NEST MATERIALS



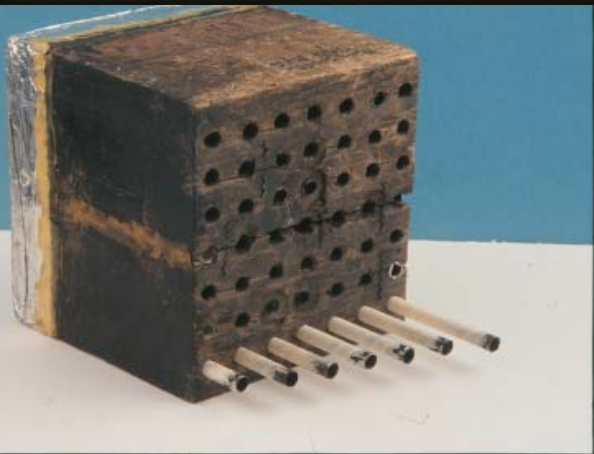
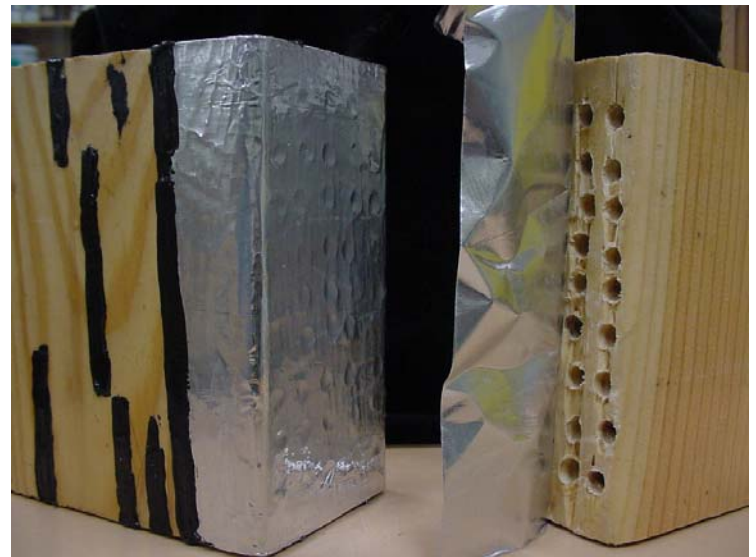
Holes  $\frac{3}{4}$ " apart,  $\frac{19}{64}$ " diameter



Thick tubes

6" deep holes





Sealed backs

Breathable material



Face Southeast

Partial afternoon shade

Protect from rain



3 holes per female released

## TEMPERATURE REGIMES



Respirometer measuring  $O_2$  and  $CO_2$  of individual bees

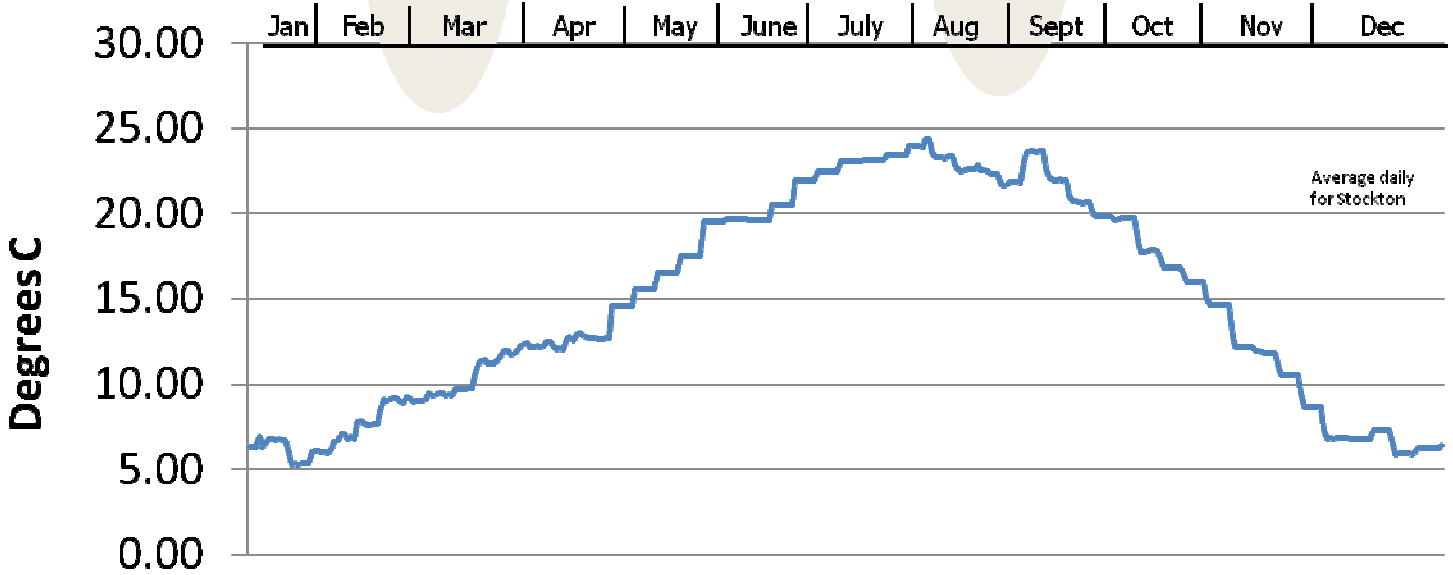
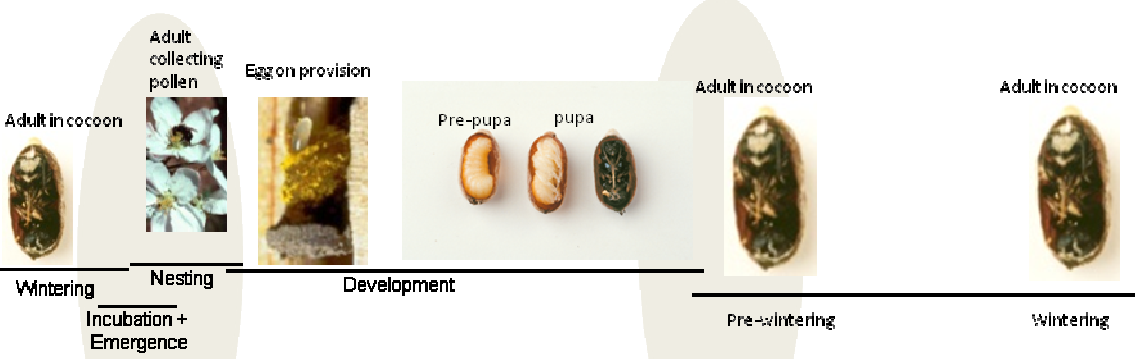


Natural temperatures



Temperature cabinets

# TEMPERATURE AND DEVELOPMENT



# COMMON PREDATORS & PARASITES

## Parasitoids



Leucospis

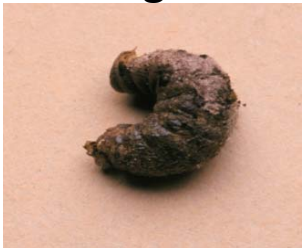


Monodontomeris



Melittobia

## Pathogen



chalkbrood

## Cleptoparasites



Chrysura



Sapyga



Stelis



Tricrania

## Nest scavengers



Dermestid



Tribolium



Mites



Ptinis

## Predators



Trichodes



Fence lizard



robin



Field mouse



# CHERRY YIELDS OVER TIME

Year	Pollinator	Cherry Yield (Kg.)	O. lignaria (Factor increase)	population compounded (6,000start)
• 1992	<i>A. mellifera</i>	-	-	
• 1993	<i>A. mellifera</i>	3,040	-	
• 1994	<i>A. mellifera</i>	5,545	-	
• 1995	<i>A. mellifera</i>	4,820	-	
• 1996	<i>A. mellifera</i>	3,695	-	
• 1997	<i>A. mellifera</i>	-	-	
• <b>1998</b>	<b><i>O. lignaria</i></b>	<b>14,875</b>	<b>5.44</b>	<b>32,400</b>
• 1999	<i>O. lignaria</i>	4,150	2.17	70,308
• 2000	<i>O. lignaria</i>	16,935	4.21	295,997
• 2001	<i>O. lignaria</i>	4,415	1.03	304,877
• 2002	<i>O. lignaria</i>	-	2.45	746,948
• 2003	<i>O. lignaria</i>	6,680	0.73	545,272

# How to Manage the Blue Orchard Bee



As an Orchard Pollinator

JORDI BOSCH & WILLIAM KEMP

For more details on management –  
*How to Manage the Blue Orchard Bee* is  
available for free in PDF format at:  
<http://www.sare.org/publications/bob.htm>

## Orchard management



3 acre apple orchard, 1984



200 acre almond orchard, 2009

**2010 and beyond**

