

Biology/Phenology

Tenlined June Beetle Impacts California Almond Production

Marshall W. Johnson<sup>1</sup>, Mark W. Freeman<sup>2</sup>, and Richard Coviello<sup>2</sup>  
<sup>1</sup>Department of Entomology, University of California, Riverside, CA  
<sup>2</sup>University of California Cooperative Extension, Fresno County, CA

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*Abstract:* The grubs of the tenlined June beetle, *Polyphylla decemlineata* (Say) (Coleoptera: Scarabaeidae), have re-emerged as a problem in almond orchards in the sandy regions of the San Joaquin Valley. The 2<sup>nd</sup> and 3<sup>rd</sup> instar grubs are commonly found attacking almond roots. Thousands of almond trees have been removed because of root injury, which leads to reduced shoot growth, decreased foliage, and ultimately losses in almond production. Research is currently underway to: develop grower-usable sampling methods; identify effective soil insecticides and ways to facilitate penetration into the soil; discover and identify entomopathogenic nematodes that attack the grubs; determine the impacts of the scoliid parasitoid *Campsomeris pilipes* on the grub population; and examine the susceptibility of various rootstocks to grub feeding. Most effort to date has been on monitoring and sampling for grubs and adults. Light traps appear effective in monitoring flights of adult males. A “raisin shaker” has been modified to facilitate sifting of soil to locate beetle grubs and pupal cocoons and adults of the scoliid *C. pilipes*. Initial results indicate that the entomopathogenic nematode *Steinernema riobrave* will infect grubs and kill them.

### Introduction

Grubs of the tenlined June beetle (TLJB), *Polyphylla decemlineata* (Say) (Coleoptera: Scarabaeidae), may commonly be found feeding on roots of apple, cherry, prune and almond trees in California. Recent reports indicate that the grubs have caused extensive damage to almond roots in the counties of Fresno, Madera, and San Joaquin (M. Freeman and Paul Verdegaal, personal communication). Tree damage and death have resulted. Some almond and cherry growers have removed whole orchards due to infestations. Over the history of almond production in the San Joaquin Valley, this beetle has only been a significant problem on almond in the Easton area of Fresno County and around Manteca, near Stockton, during the latter half of the 1980s (Van Steenwyk et al. 1990). It appears to be again emerging as a significant problem now (Johnson et al. 2003). The reasons for this are unknown. Likewise, we do not know why the beetle diminished in importance around 1990. Highly infested orchards have been limited to sandy soils. Additionally, root damage and tree death have been noted on walnuts, apples, and stone fruits within the counties of Stanislaus and Merced (Mike McKenry and M. Freeman, per. communication). Recognition of grub-induced damage to trees is difficult in the early stages of an infestation. Typical tree symptoms include poor annual growth, loss of foliage, and leaf tip burn that may be confused with symptoms of “salt damage.” Limb dieback and tree death can follow.

Research is underway to develop grower-usable methods to monitor grubs and beetles, identify effective soil insecticides and insect pathogens for grub control; develop methods to facilitate penetration of toxins or pathogens to soil depths that grubs occupy, and examine horticultural factors (e.g., irrigation schedules, rootstocks, soil type) that may impact grub survival.

### Materials and Methods

**Adult beetles.** Populations of adult beetles were monitored near almond orchards using light traps in 4 and 6 orchard areas southwest of Fresno, CA, during the summers of 2003 and 2004, respectively. Trap catches were checked every 7 to 10 days depending on numbers of adults being caught per night. Counts were averaged to estimate the mean numbers of beetles caught nightly.

**Beetle grubs.** Efforts were made to develop a sampling/collecting technique that produced the highest numbers of beetle grubs with minimal physical effort. A “raisin shaker” was modified to sift soil to recover 2<sup>nd</sup> and 3<sup>rd</sup> instar grubs.

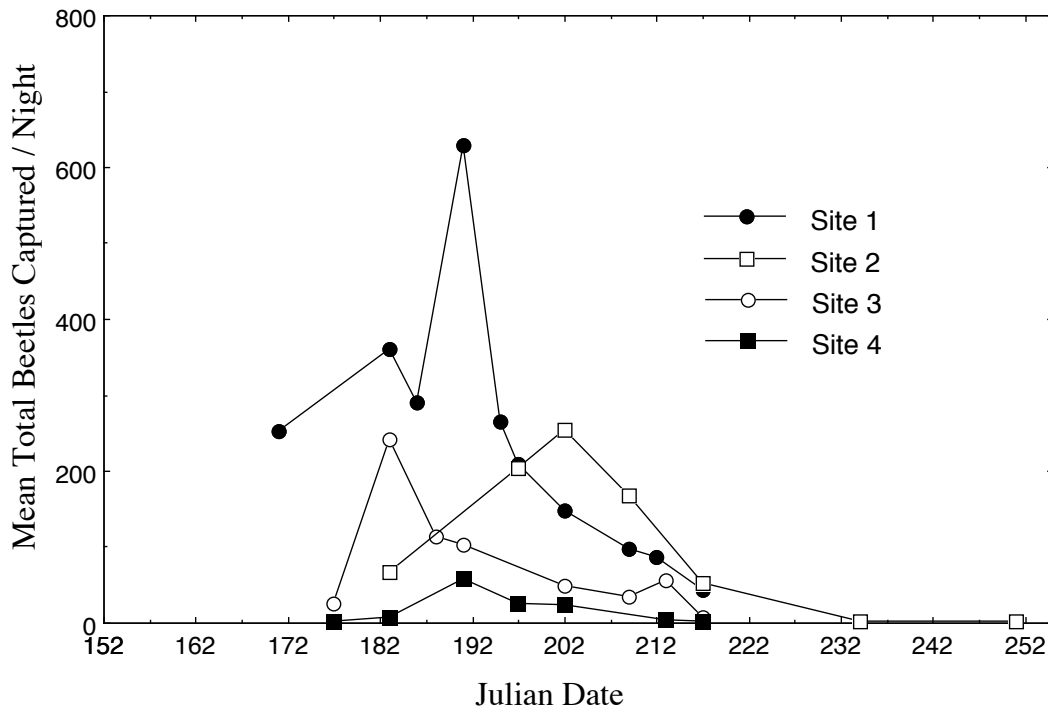
### Results and Discussion

**Adult beetles.** In summer 2003, beetles were captured from mid-June to mid-August (Fig. 1). The highest nightly trap catches were recorded in July (Julian date 192) with the highest being > 620 beetles per trap per night. Males were predominantly recovered in the traps. Ratios of males to females varied from 1:1 to 406:1. In summer 2004, beetle catches were about 6-fold smaller than recorded in the previous summer and did not surpass a mean of 100 adults per night (Fig. 2). However, traps were placed in the field at a later time than in 2004. Ratios of males to females varied from 2:1 to 92:1.

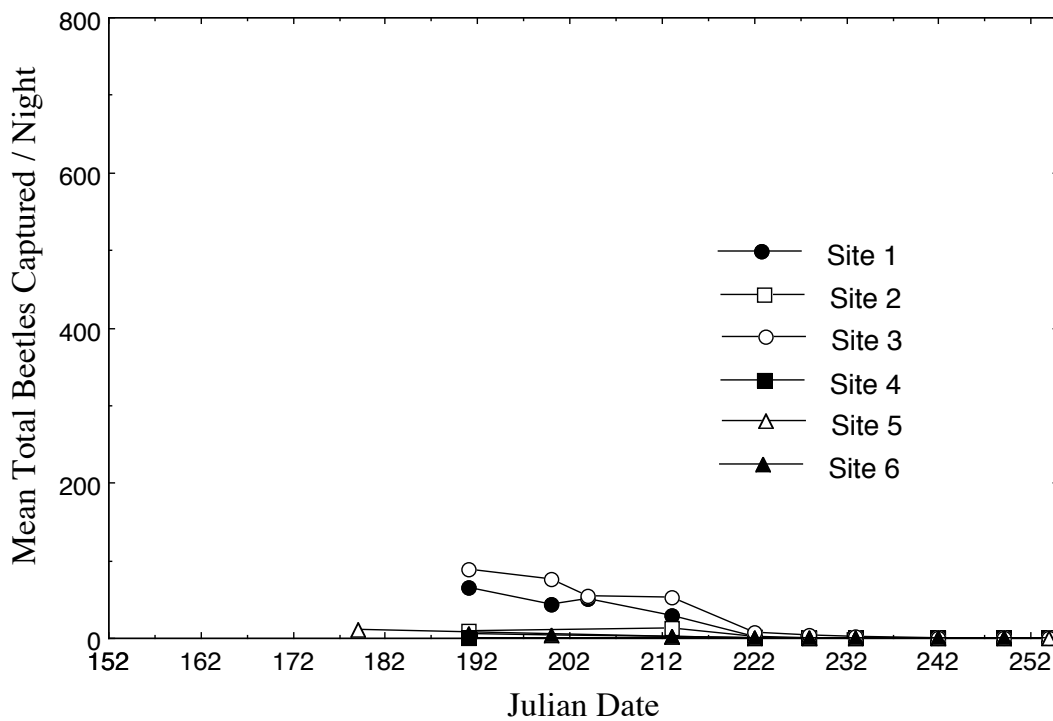
**Beetle grubs.** Sampling of grubs must be done in the vicinity of tree roots in orchards with bare floors. Good results were obtained when soil was examined between 5 and 40 cm in depth. The raisin shaker substantially improved our ability to process soil and locate 2<sup>nd</sup> and 3<sup>rd</sup> instar grubs because greater quantities of soil could be sieved with reduced physical labor. Additionally, pupal cocoons and adults of the scoliid parasitoid *Campsomeris pilipes* were also easily recovered from the soil. Because the parasitoid cocoons are “soil colored,” they were often missed when soil was not sieved. Future sampling will be conducted using the raisin shaker to process soil samples. Grubs may be found in the absence of emergence holes produced by adult beetles when leaving the soil substrate.

### References Cited

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- Van Steenwyk, R. A., D. Rough, and P. S. Verdegaal. 1990.** Biology and control of the tenlined June beetle in almonds. California Agriculture 44(4): 25–27.



**Fig. 1.** Mean numbers of total tenlined June beetles captured per night in light traps at four sites southwest of Fresno, CA, during summer 2003.



**Fig. 2.** Mean numbers of total tenlined June beetles captured per night in light traps at six sites southwest of Fresno, CA, during summer 2004.