# N O T E

# Trapping Grape Root Borer (Lepidoptera: Sesiidae) in Vineyard and Non-Vineyard Habitats in Virginia[1]

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Many wine and table grape vineyards in the MidAtlantic and southeastern regions of the United States are at risk from infestation by the grape root borer, *Vitacea polistiformis* (Harris) (Snow et al. 1991, J. Entomol. Sci. 26: 157-168). Wild species of *Vitis*, which serve as hosts for grape root borer larvae (Brooks 1907, W. VA. Agr. Expt. Stn. Bull. 110: 19-30), are widespread and abundant throughout much of the pest's range, and it is from these that infestations in commercial vineyards originate (All et al. 1987, Down to Earth 43: 10-12). Grape root borer larvae feed on the roots of all commercially important species of *Vitis* (Brooks 1907, All et al. 1987) and can cause problems ranging from reduced vigor and productivity to vine death (reviewed in Olien et al. 1993, HortScience 28: 1154-1156). Newly-planted vineyards are susceptible to attack (Clark and Enns 1964, J. Kansas Entomol. Soc. 37: 56-63; All et al. 1987), and the likelihood of infestation may increase as vineyards age (Harris et al. 1994, J. Econ. Entomol. 87: 1058-1061).

Following the identification of the grape root borer sex pheromone (Schwarz et al. 1983, Tetrahedron Letters 24: 1007-1010; Snow et al. 1987, J. Entomol. Sci. 4: 371-374), several studies used pheromone traps to examine the insect's abundance and distribution in the eastern United States (Alm et al. 1989, J. Econ. Entomol. 82: 1604-1608; Snow et al. 1991; Webb et al. 1992, J. Econ. Entomol. 85: 2161-2169; Harris et al.1994; Bergh et al. 2005, J. Entomol. Sci. 40: 337-342). Whereas the majority of data reported were from trapping in commercial or experimental vineyards, a few studies also included information from traps placed in nonvineyard habitats. Alm et al. (1989) deployed traps in 62 Ohio counties with and without commercial vineyards. Thirty-eight counties in the southern half of the state were infested with grape root borer, including 11 without commercial vineyards, but only the presence or absence of grape root borer, and not trap counts, were reported from most vineyards and from all nonvineyard sites sampled. Pooled data from two nonvineyard sites in Georgia and data from a single nonvineyard site in Michigan were included in an

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extensive survey of grape root borer abundance and seasonal flight activity reported by Snow et al. (1991). Only 34 moths were captured in Michigan, which is considered the northern range of this species (Snow et al. 1991). The combined capture of moths from four traps at two sites in Georgia was 797 in both 1986 and 1987, representing the largest published counts of grape root borer in nonvineyard habitats. Webb et al. (1992) deployed traps in nine locations in Florida, including three traps at a single nonvineyard site in Miami, and reported a maximum total weekly capture of about 40 moths.

Given that wild hosts of grape root borer are widespread and abundant and provide a potential reservoir of moths that may infest commercial vineyards, more information is needed on the abundance of this pest in its native habitat and the risk that those populations may pose. Furthermore, because grape root borer males are robust insects and strong fliers that may be able to respond to a pheromone source over a considerable distance, information on the size of populations in native habitats is important to correctly interpret the results of pheromone trap-based monitoring in vineyards.

To examine the relative abundance of grape root borer in nonvineyard habitats, a study involving the deployment of pheromone-baited traps in and around apple orchards and vineyards in northern Virginia was conducted in 2005. Five commercial apple orchards in Frederick Co. were selected, based on their isolation from vineyards and on being immediately adjacent to native forest containing wild grapevines. Four commercial vineyards (Rappahannock, Fauquier and Shendandoah counties) and one experimental vineyard at the Alson H. Smith, Jr. Agricultural Research and Extension Center (Frederick Co.) were selected, based on their proximity to native forest with wild grape. Three plastic, delta-style sticky traps baited with a grape root borer pheromone lure (Suterra, Portland, OR) were deployed at each site as follows: 50 m into the forest adjacent to each crop, at the forest edge, and 50 m from the edge of the crop into the orchard or vineyard. Traps were suspended at a height of about 1.5 m, using trellis wires in vineyards, branches of apple trees in orchards and available vegetation, including wild grapevines, at the forest edge and inside the forest. At eight sites, the three traps formed a line that was approximately straight, whereas at two vineyard sites the trap in the forest was off-line, due to a property line at one location and to a steep gulley at another. To avoid or minimize the problem of trap liners becoming "saturated" with moths, the number of moths captured in each trap was recorded twice weekly, and the trap liner was either replaced or the insects were removed, depending upon the number of moths captured and the condition of the liner. Traps were deployed from 18 July through 19 August, spanning the period of peak flight activity of grape root borer in Virginia (Bergh et al. 2005). Using sites as replicates, separate analyses of the mean number of male grape root borer moths captured among locations (forest, forest edge, crop) were conducted for apple orchards and vineyards, using ANOVA and Tukey's test (PROC ANOVA, SAS Institute, 2001, Cary, NC) at the 5% significance level. The mean total number of moths captured was compared between orchard and vineyard sites using the *t*-test (PROC TTEST, SAS Institute, 2001, Cary, NC).

At orchard and vineyard sites there was a significant effect of trap location on the capture of grape root borer males (orchards: $F = 8.52$; df = 2,12; $P < 0.05$; vineyards: $F = 15.4$; df = 2,12; $P < 0.005$) (Fig. 1A and B). Numerically or significantly greater numbers of moths were captured in traps within each crop than in traps at the forest edge and significantly more than in traps within the forest. Numerically more moths

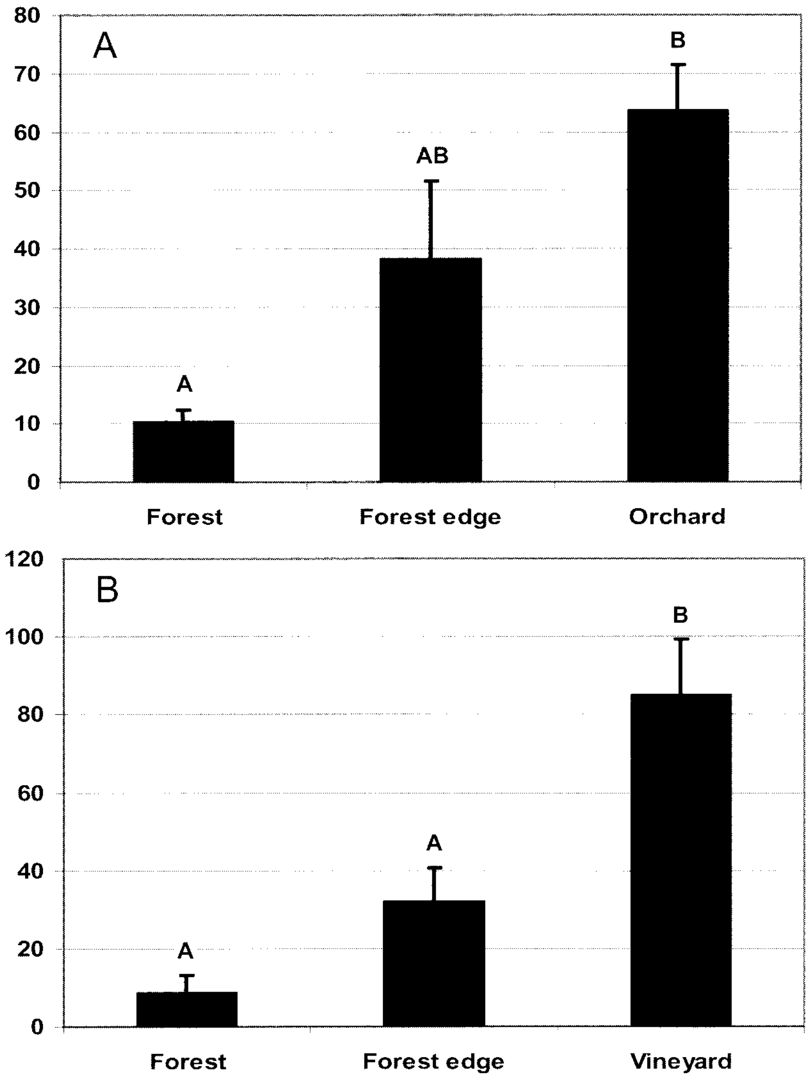


Fig. 1. The number of male grape root borer captured in pheromone traps deployed inside and outside of apple orchards and vineyards in Virginia.

were captured at the forest edge than in the forest at orchard and vineyard sites. The total number of male grape root borer captured per site did not differ significantly between orchard and vineyard sites ($t = -0.67$, df = 8, $P = 0.5219$) (orchard: mean ± SE = 112.2 ± 8.4; vineyard: mean ± SE = 125.6 ± 18.2).

The relatively large numbers of grape root borers captured at apple orchard sites during a 4-wk interval that spanned its peak flight period in Virginia compare most closely with the numbers reported from season-long trapping at two nonvineyard sites in Georgia (Snow et al. 1991), and provide further evidence of the potential threat to commercial vineyards that these populations may represent. Differences in the number of moths captured among trap locations at all orchard and vineyard sites likely reflect aspects of the behavior of grape root borer and show that trap placement is an important consideration for accurate assessment of populations in native habitats. Traps placed 50 m into the forest captured the fewest moths at all sites, conforming with an early observation that wild fox grape vines, *Vitis labrusca* L., growing in the woods were not as infested as those growing within a vineyard (Brooks 1918, U.S. Dept. Agric. Bull. 730: 28 pp.). Traps placed 50 m within vineyards and orchards captured the greatest number of moths, suggesting that mate-seeking behavior by male grape root borer occurs preferentially in more open and sunny habitats than in fully or partially shaded areas.

The similar numbers of male grape root borers captured at orchard and vineyard sites casts doubt on the ability of pheromone traps to accurately reflect infestation levels in all vineyards and under all circumstances. Furthermore, these data contradict the conclusion from a previous study by Bergh et al. (2005). They deployed pheromone-baited traps in transects that extended from the forest into adjacent vineyards in Virginia. At each of four sites, the number of moths captured within the vineyard was significantly greater than the number captured in the native forest, leading them to conclude that moth captures inside vineyards reflected primarily the emergence of moths from within them. It is now apparent that data from pheromone traps deployed within vineyards can be significantly influenced by moths that originate from native hosts growing nearby and do not necessarily reflect infestation levels within a commercial planting. This does not, however, negate the utility of pheromone traps for monitoring grape root borer. For example, pheromone traps deployed in newly-established vineyards that are not infested by the pest could provide important baseline data on population levels in the vicinity of the planting. Increases in the annual capture of moths as these vineyards age may reflect the infestation of vines. In older vineyards, knowledge of the moth "pressure" from outside the planting might be helpful in interpreting the infestation status of the vineyard. Captures within a vineyard that consistently exceed those outside the planting may prove to be a reflection of differences in the size of the respective populations. Conversely, in vineyards under active management of grape root borer, reductions in the number of moths captured over consecutive seasons may reflect the effects of intervention. Finally, as suggested by All et al. (1987), vineyard site selection should take into consideration the proximity to and relative abundance of native hosts of grape root borer.

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