SPOTTED WING DROSOPHILA IN CONTEXT: AN EXAMINATION OF THE CONNECTION BETWEEN FLY POPULATIONS, CROP, AND SURROUNDING LANDSCAPE

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Introduction

Development of sound and effective management practices for spotted wing Drosophila (SWD), *Drosophila suzukii*, requires a thorough understanding of SWD behavior not only in cultivated crops but in adjacent trees and wildlands, as these areas may act as a refuge and alternative food source for the fly. Trap counts and damage levels within a crop may therefore be directly impacted by adjacent vegetation.

Methods

In this study, we examined the spatial and temporal distribution of SWD in a 6-acre, no-spray, commercial blueberry field and the surrounding landscape, located in Corvallis, OR (Benton county; mid-Willamette valley). Beginning in June 2011, red traps baited with a yeast/sugar or apple cider vinegar/soap mixture were placed in blueberry plants, along the perimeter of the blueberry crop, and in trees adjacent to the crop. Traps were serviced and the contents counted weekly, though counts of trap contents were carried out once every two weeks during the late fall-winter period. Traps in blueberry plants were placed at various distances from the edge of the field. Traps were placed in adjacent trees at three levels, including ground, 6 feet (2m), and over 13 feet (4m).

SWD infestation rates were obtained from blueberries at the site. Marketable fruits from plants in trapped areas were collected 3-4 times during the harvest period and reared in individual cups in lab.

Results

Initial increases in SWD trap catches in 2011 and 2012 were observed in June, in traps placed in trees. Over time, trap catches rose within blueberry plants and along the perimeter of the crop, beginning in areas closest to trees and becoming more evenly distributed through the crop during the blueberry harvest period. Trap catches in regions adjacent to the blueberry crop were highest in areas with greatest plant diversity, protection, and shade, particularly those associated with Himalayan blackberry. Throughout the study, SWD abundance in traps placed in trees was positively correlated with trap height.

In 2011, SWD abundance in crop traps increased through mid-November, long after blueberry harvest was complete (Fig. 1). This is consistent with the results of a mass-trapping study at the same site conducted between June 2010 and June 2011, in which trap catches peaked in November and declined after a 12-hour period of freezing temperatures (Fig. 2).

Despite similar trends in crop trap catches in 2010, 2011, and 2012, increases in average trap catches in the crop were observed 2-3 weeks earlier in 2012 than in 2010 or 2011 (Fig. 3). Average trap catches surpassed 1 fly/trap/week on 7/17 in 2012, compared to 8/3 in 2010 and 8/4 in 2011. Calculations of developmental degree-days (DD) for these dates were very close, with average trap catches surpassing 1 fly/trap/week at 536 DD in 2010, 577 DD in 2011, and 517 DD in 2012.

SWD larvae were observed in fruit earlier in 2012 than in previous years. First larvae were observed in 2012 on 7/15 at trap catches of 0.2 SWD/trap/week within the crop. First larvae were observed in 2011 on 7/27, at trap catches of 0.6 SWD/trap/week within the crop. Fruit infestation rates during 2011 and 2012 harvest periods increased steadily as fruit ripened, with samples reaching maximum infestation rates of over 40% in 2011 and over 50% in 2012. Infestation rates within the crop were highest in areas adjacent to diversified vegetation, reflecting the trend found in trap catches.

Conclusion

Ultimately, the knowledge gained in this study will lead to preventative and sound management practices. An understanding of SWD phenology as it relates to degree-day development models will aid in predicting SWD fly events, leading to appropriate timing of treatments and reduced use of unnecessary treatments. Features of the landscape adjacent to a crop may lead to the identification of risk factors that determine the vulnerability of the crop. Once potential hotspots of SWD activity are identified, management tactics can be targeted to these areas. Correlations between trap catches and crop infestation rate may be of great help in establishing damage thresholds.

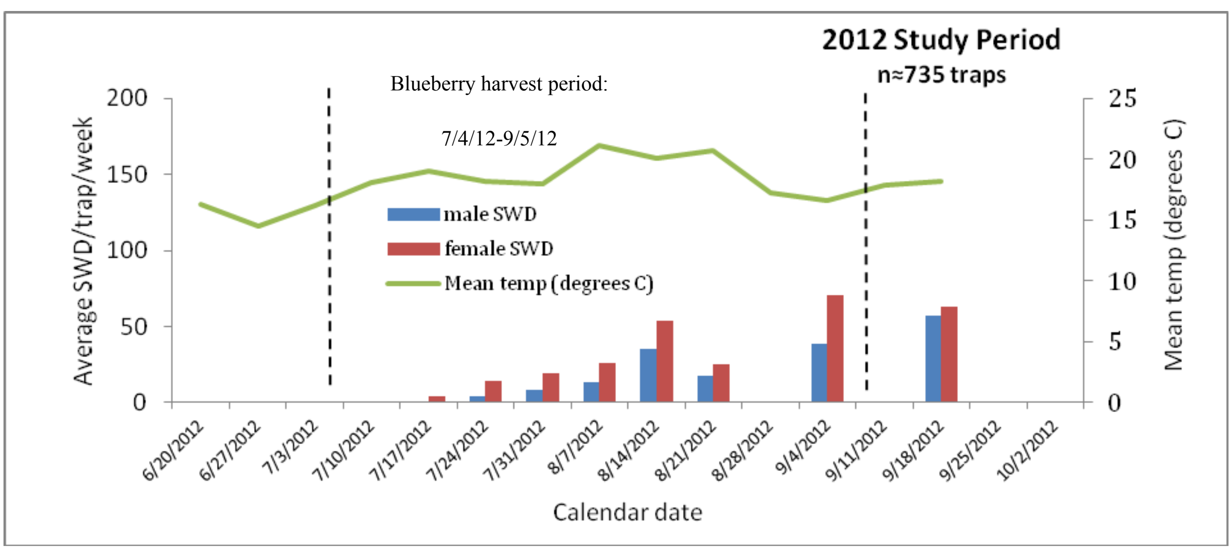

Figure 3. Seasonal phenology of male and female SWD catches in traps placed in a blueberry field between 6/20/12 and 9/18/12 in the mid-Willamette Valley (Benton county).

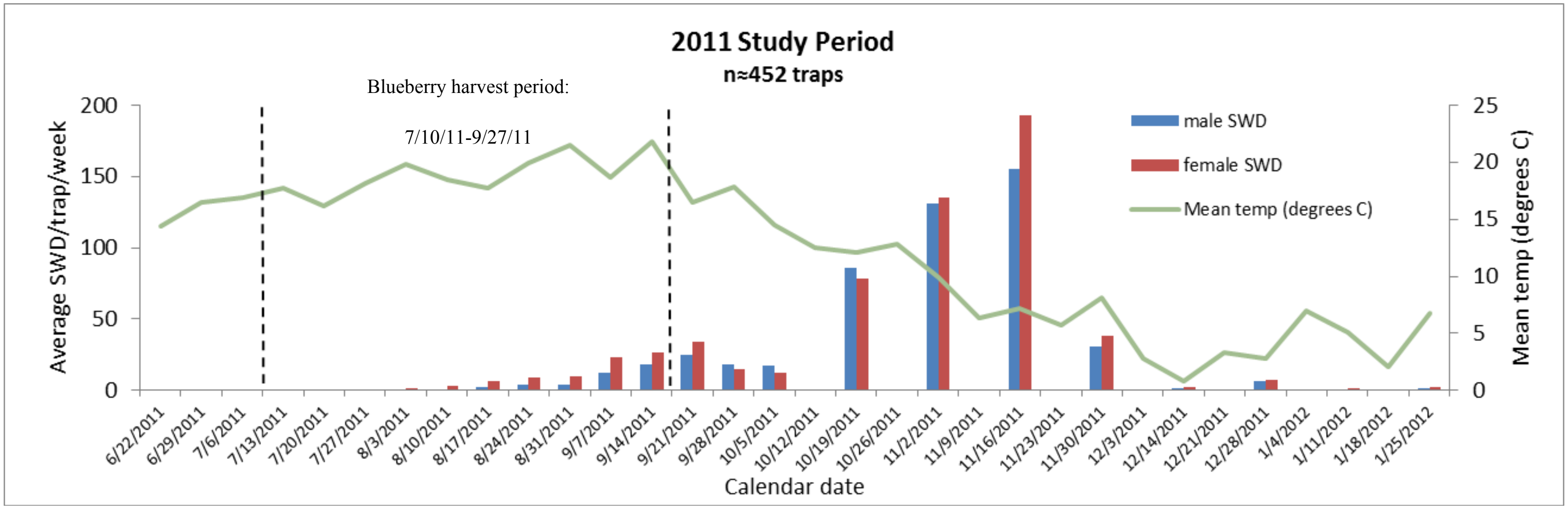

Figure 1. Seasonal phenology of male and female SWD catches in traps placed in a blueberry field between 6/22/11 and 1/25/12 in the mid-Willamette Valley (Benton county).

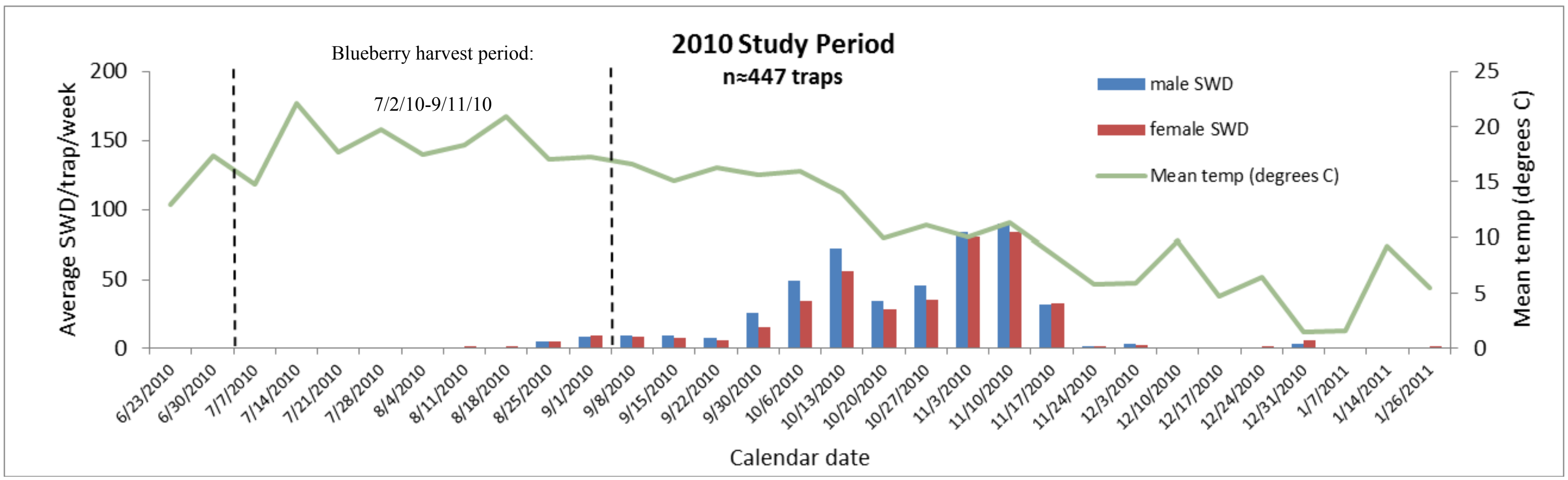

Figure 2. Seasonal phenology of male and female SWD trap catches in a mass-trapped blueberry field between 6/23/10 and 1/26/11 in the mid-Willamette Valley (Benton county).