spotted wing drosophila preparedness

PROJECT UPDATE

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Some of you may be familiar with the current Hort Innovation funded spotted wing drosophila (SWD) research through our recent research extension activities – last November the project team and regional collaborators hosted two international SWD researchers in several Australian berry growing regions around the country. For those of you who have not yet heard about this project, you can find background information at the **cesar** website - www.cesaraustralia.com/our-projects

Female SWD (left) and male SWD (right). Note that only the male has wing spots. The female has a serrated ovipositor that enables her to pierce and lay eggs into unripe fruit. Credit: Dr Elia Pirtle, cesar

Why has this project been launched?

In short, spotted wing drosophila has caused quite a few headaches overseas. This exotic fly is cryptic (it looks very similar to Drosophila melanogaster, the vinegar fly), it can pierce and lay eggs in unripe fruits still on the vine, and overseas research has found this fly to be persistent in both warm and very cold environments. Larvae stay protected from chemical controls as they feed within the fruit, and adult flies can quickly build up in large numbers, particularly if fruit waste is left to rot in paddocks.

During this two-year project we are collecting overseas data to gain robust, scientific information on best management practices and incursion response protocols. We are also reviewing all the possible pathways by which SWD may arrive in Australia, as well as determining the likely impacts for growers if it were to arrive. Information we collect on best ways to trap for SWD is another important focus. Best baits? Best traps? When to trap? Where to place traps? This is information that we will need if SWD were to be found in Australia. Further, we are trying to build awareness around SWD, to increase the chance of early detection.

The many shades of SWD

A number of factors will influence how SWD management decisions are made in an Australian context. Crop phenology varies markedly between the northern hemisphere and Australia and will impact the flexibility of harvest schedules – a key management tool used in minimising SWD abundance. Within Australia, the wide climatic zones spanned by berry, cherry, grape, and summerfruit growing regions will require some unique management recommendations.

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The most likely times at which SWD populations would flourish here would be heavily influenced by abiotic factors, such as day length and temperature. SWD females will undergo reproductive diapause when outside of 'goldilocks' conditions. Overseas research has shown that females enter reproductive diapause when the photoperiod is less than 14 hours at moderate temperatures (15 or 20 °C), and at temperatures less than 10 °C it will enter this diapause regardless of photoperiod. This is an adaptation which ensures that eggs can be held over during leaner times and are laid at times when larvae stand the best chance of thriving.

In addition, if SWD were to be found in our production areas the surrounding landscape will play an important role in determining likely paddock infestation dates, with recent overseas research drawing a link between proximity of woodland refuges and early infestation of fruit. Our landscapes are also abundant in non-commercial hosts, such as wild blackberry, which could support SWD populations in persisting. Understanding what these non-commercial hosts are likely to be is another key question that will lead to green bridge management advice for farms.

SWD on raspberry in the United States. Image credit: Hannah Burrack, North Carolina State University, Bugwood.org).

To confound matters further, SWD has two distinct morphs – a winter morph (cold adapted) and a summer morph (heat adapted).

These morphs have different pigmentation, with the winter morph showing sporadic appearance of wing spots (so it could look just like a vinegar fly!). The occurrence of two morphs means that SWD is well adapted to happily persisting in the environment throughout the year. Preliminary research from the United States suggests that winter morphs can 'smell' different volatiles to the summer morph. This means that each morph may be seasonally adapted to finding different hosts in cold and warm weather, further increasing its chance of persisting between cropping periods.

You may be getting the impression that this is a complex beast, and you're right – it is! However, with the right preparedness work we can make the idea of managing or eradicating SWD seem much less overwhelming.

Want to learn more?
During November Dr Bethan Shaw (NIAB-EMR) and Professor Rufus Isaacs (Michigan State University) visited berry growing regions in Tasmania, Victoria, New South Wales, and Queensland to speak about SWD. To obtain a copy of Bethan and Rufus's presentations contact us at info@cesaraustralia.com

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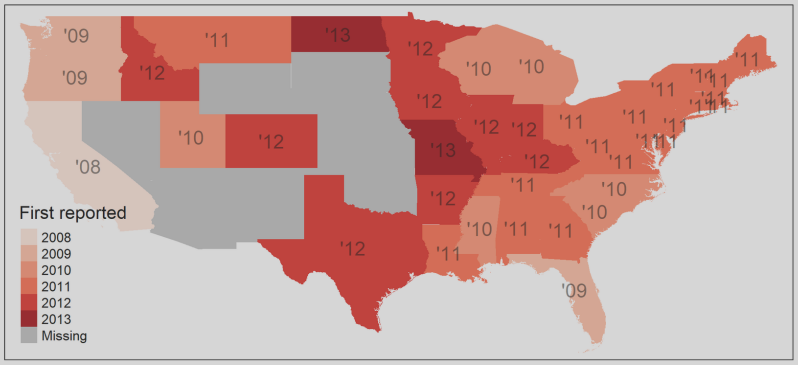

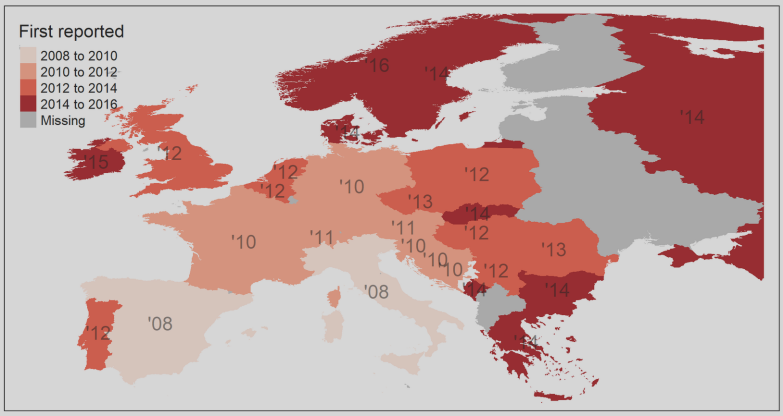

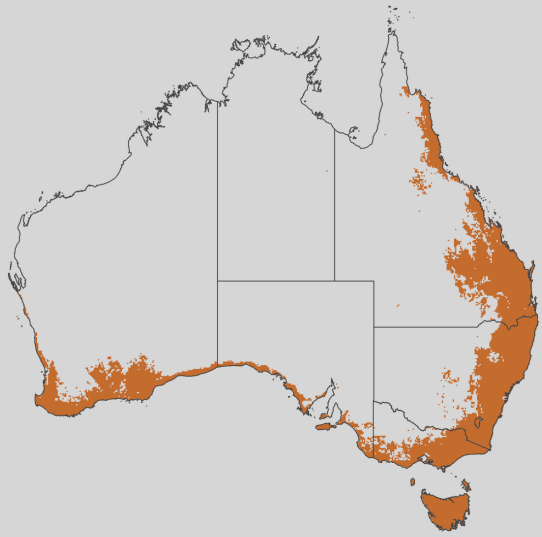

Rate of SWD spread in the US (top), Europe (middle), and SWD establishment potential in Australia (bottom). Map credits: Dr James Maino, **cesar**

Some exciting maps

A part of this project, our predictive modeller, Dr James Maino, has been hard at work developing an establishment and spread model that can simulate the movement of SWD across the Australian landscape. This includes short distance active dispersal (little wings flapping hard) and long-distance human assisted jumps (hiding in a delicious berry and watching the scenery flash by). This model will aid biosecurity authorities and industry respond to an incursion effectively if SWD were to be found here.

James is also developing an Australia specific growth model that will help us understand the likely peaks and troughs of abundance each season, as well as where this fly is most likely to set up shop.

While these prediction tools are still under development, what we can show you is some maps that highlight the very fast rate of spread throughout Europe and the United States, and the Australian regions that would most suit the lifestyle of SWD.

While these maps are much better appreciated as a fancy video, with darkening shades of red popping up in an alarmingly fast sequence, by taking note of the dates of spread and the colour variations, you can get a good idea of how quickly SWD has spread throughout Europe and the United States.

Will you take our 'gaps' poll?

We would love to get your input here on what SWD RD&E gaps are highest priority. Prioritising these gaps will help us direct energy to the high impact areas and will help others in government and industry also prepare. It will take you approximately 10 minutes, and replies are anonymous. Survey findings will be included in the final workshop report and distributed to affected industries. Take our poll.

Plant Health Australia, cesar, and Plant & Food Research NZ, with support from Hort NZ, are working together on a spotted wing drosophila (SWD) research and extension initiative. This is a collaborative project between Australia and New Zealand, and the aim is to increase how prepared horticultural industries are to detect, respond to, and manage this fly if it were found in either country.

This project has been funded by Hort Innovation, using the strawberry, raspberry and blackberry, cherry and summerfruit research and development levies and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Kirkpatrick, D. et al. (2018) Comparative Antennal and Behavioral Responses of Summer and Winter Morph Drosophila suzukii (Diptera: Drosophilidae) to Ecologically Relevant Volatiles. Environmental Entomology. 1-7.

Pelton, E. et al. (2016) Earlier activity of Drosophila suzukii in high woodland landscapes but relative abundance is unaffected. Journal of Pest Science. 89: 725-733.

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Sial, A. et al. (2018) Management Recommendations for Spotted Wing Drosophila in Organic Berry Crops. UGA Cooperative Extension Bulletin 1497.

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SWD Organic Grower Management Guide (MSU)
https://www.canr.msu.edu/ipm/uploads/files/SWD/SWDOrganicBerryCrops.PDF

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