

The Phenology, demography and distribution of Australia's fruit flies – a coordinated national research program.

As the horticulture sector, and other impacted stakeholders, call for a national approach to Fruit Fly Management (National Fruit Fly Seminar, 2021) it's timely to bring to light a current, national fruit fly research project. **The Phenology, demography and distribution of Australia's fruit flies** project is bringing together fruit fly researchers and knowledge to provide our regulators of domestic and international trade with current and comprehensive scientific and technical information. This information will not only underpin regulatory aspects of fruit fly management in Australia, but in-field management as well.

The Department of Agriculture and Fisheries (DAF) Queensland is leading this \$8.4million dollar fruit fly project, funded through the [Australian Government Smart Fruit Fly Management Measure](#), with contributions from State and Territory governments under an intergovernmental agreement. This is a truly national and collaborative R&D effort; DAF are partnering with high-calibre fruit fly researchers from New South Wales, Victoria, South Australia, Western Australia, and the Northern Territory, as well as the [Fruit Fly Group](#) from the Queensland University of Technology. The project is strongly lead by Peter Leach (DAF) and Professor Tony Clarke (QUT) and is due to conclude in 2022.

Bringing Australia's foremost researchers together is not only strengthening the research capacity across Australia but is also allowing work to occur concurrently and consistently, for the first time, on different Australian flies, including *Bactrocera tryoni* (Queensland fruit fly), *Bactrocera neohumeralis* (Lesser Queensland fruit fly), *Bactrocera aquilonis* (Northern Territory fruit fly), *Bactrocera jarvisi* (Jarvis' fruit fly), *Zeugodacus cucumis* (Cucumber fruit fly) and *Dirioxa pornia* (Island fly).

The project is focussed on three core elements of fruit fly research: (a) the seasonal cycles affecting fly activity (phenology), (b) fly reproductive patterns and population changes (demography) and (c) where the flies actually are (distribution), hence the name of the project. Trapping networks for fly distribution have been established across Australia; in NSW for *B. jarvisi*, *B. neohumeralis* and *Z. cucumis*, in the NT for *B. jarvisi* and in WA for *B. aquilonis*. Across all the trapping sites established since December 2020, flies have only been collected within the existing reported distribution in NSW and NT. In WA, *B. aquilonis* have been detected in Wyndham and Kununurra only, and both sites are north of Broome which is the current southern-most record of *B. aquilonis* from historical data (1992-2020).

Through collating and analysing Australia-wide field data, and at the same time exploring the physiology of Queensland fruit fly, we will better understand what's driving the near-synchronous spring emergence of flies that we see all the way from Cairns to the Yarra Valley. Together, a better understanding of fruit fly phenology, population dynamics, behaviour and ecology will support the future development of accurate predictive models. We are aiming to answer some key, fundamental questions such as:

1. What are the relative effects of environment on fruit fly phenology across different regions?
2. What is the time period over which fruit fly abundance is sensitive to climate variables?
3. What is the variation in the timing of phenological events?

On top of all that, we are also reviewing host status and investigating host preference, determining fly longevity, and developing molecular-based diagnostic tools for large, multi-species trap catches. Improving fruit fly diagnostic capabilities has a broad benefit for surveillance and response activities.

Already protocols for DNA extraction of bulk fruit fly samples have been refined, and two new fruit fly LAMP assays, for *B. jarvisi* and *D. pomia*, have been designed. Lure improvement work for *Z. cucumis* is also underway.

Over the remainder of the project watch out for updates on the different project components in more detail. For further information, contact Dr. Penny Measham.

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