

 Department of
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Regional Development

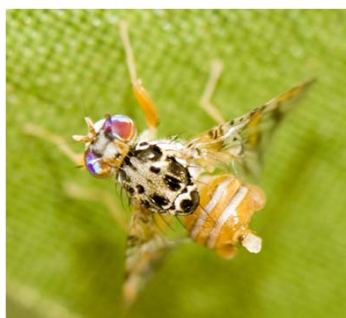


Mediterranean fruit fly (*Ceratitis capitata*)

Dr Sonya Broughton

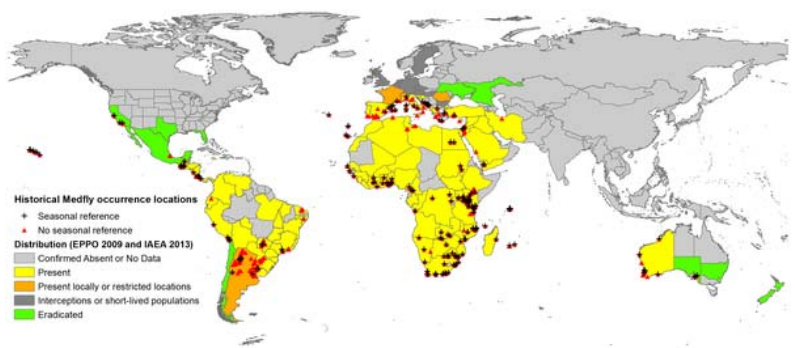


Mediterranean fruit fly (*Ceratitis capitata* Wiedemann)



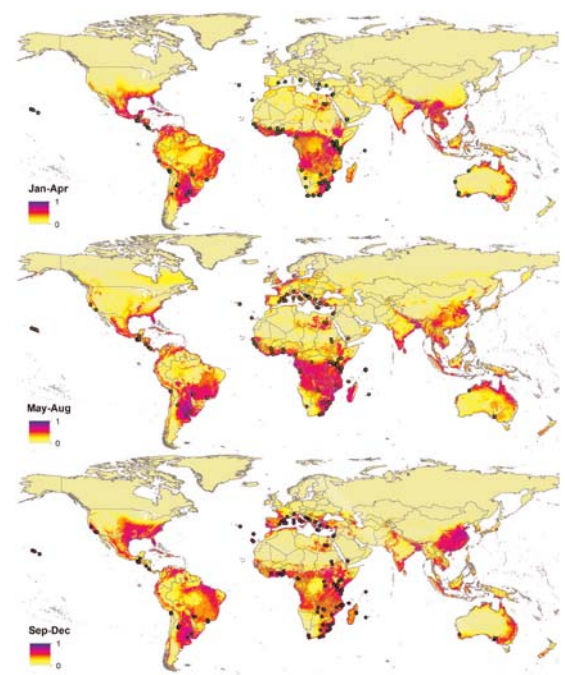
- 1842 – reported from Spain (Africa)
- 1855 – Tunisia
- 1895 – Medfly noted from Claremont (WA)
- 1897 – reported from soft fruit at several places along the Swan River, chiefly around Guildford
 - Eradication considered at the time by WA Agriculture Department
- 1898 – NSW
- 1901 – Brazil
- 1907 – Hawaii
- 1909 – Victoria
- 1915 – Greece
- 1929 – Florida
- 1942 – Mauritius
- 1963-1995 – Chile (eradicated)
- 1975 – California
- 1996 – New Zealand (Auckland; eradicated)

Historical occurrence locations



Szyniszewska AM, Tatem AJ (2014) Global Assessment of Seasonal Potential Distribution of Mediterranean Fruit Fly, *Ceratitis capitata* (Diptera: Tephritidae). PLOS ONE 9(11): e111582. <https://doi.org/10.1371/journal.pone.0111582>

Szyniszewska AM, Tatem AJ (2014) Global Assessment of Seasonal Potential Distribution of Mediterranean Fruit Fly.



A history of fruit fly in WA

1901-1910 – George Compere engaged by Agriculture WA to find and import parasites for fruit flies between 1904-1910

1905 – Leslie Newman appointed to rear insects collected by Compere - species of beetle predators (Staphylinid) from Brazil – larval and pupal predator

1908-1910 – 250,000 egg parasites from India (*Aceratoneuromyia indica*, Eulophid) released at Guildford – did not establish

1914 – most growers on Swan Coastal Plain abandoned growing susceptible fruits such as apricot

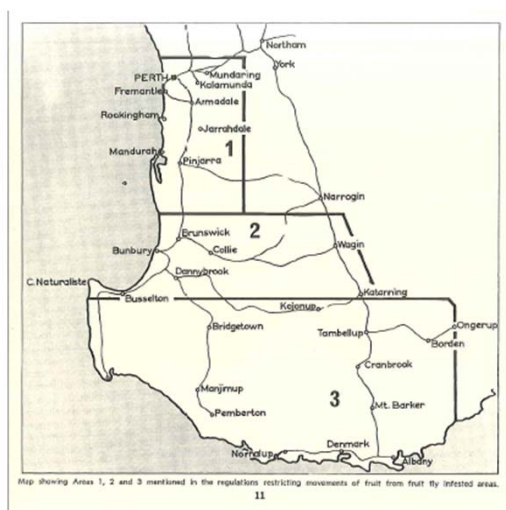
1940s – methyl bromide used for post-harvest disinfestation of fruit fly

1947 – community baiting schemes widely adopted in Western Australia

1950s – organophosphates such as DDT introduced for fruit fly control

1960 – dimethoate and fenthion registered for use in cover sprays

1959 – 1962 - 43,000 parasitic wasps - *Diachasmimorpha tryoni*, *Fopius arisanus*, *Fopius vandenboschi*, *Psytalia incisae* collected from Hawaii by CSIRO released at 11 locations including Carnarvon



A history of fruit fly in WA

1970s – post harvest disinfection - ethylene dibromide for disinfection (CSIRO/NSW Ag, WA), flood sprays of dimethoate/fenthion, cold disinfection

- **National approach to disinfection - Japan required all fruit exported to be free from Qfly AND Medfly (did not recognise east-west divide)**

1978-1985 – Medfly Sterile Insect Technique trialled in Carnarvon

- bisex strain, project funded by Agriculture WA – cost \$230,000 (equivalent \$651,000 today)
- Eradication from state estimated to cost \$20-25 million over 5-7 years

1989 – 1992 - eradication of Qfly from Perth

- SIT, male annihilation, baiting – cost \$8.2 million (\$15.2 million today)

1993 – trapping grid established for area freedom

- benefit cost analysis of eradicating Medfly \$250 million (Ag WA; \$464.2 million today)

1996 – trapping grid for exotic fruit flies established

1998 – area wide management project proposed for apple in Donnybrook/Manjimup (AP 95045), AWM carried out in citrus (CT98009)

1999 – temperature sensitive lethal strain imported from Vienna (IAEA)

1997-2001 – SIT pilot program in Kimberley (Broome; ground and aerial releases)



The sterile insect technique was trialed successfully in Carnarvon in the 1980s.

A history of fruit fly in WA

2001 – BCA - \$70 million over 6 years (Mumford et al.) \$104.3 million

SIT releases in South Australia (AH 01025)

New baits for fruit fly control – fipronil and spinosad (WA, NSW, Qld)

AgWA – abamectin, borax

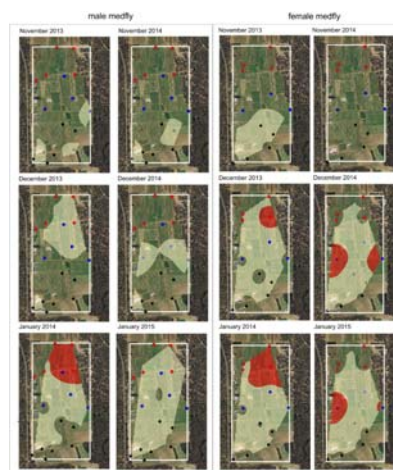
2003 – SIT pilot program in Katanning (WADA) – Vienna 7 strain, isolated population in wheatbelt

2005 – area of low pest prevalence for Midlands area (WADA, AGRIFresh, Moora Citrus, MT12051)

- recommended systems approach and an end-point treatment (cold treatment)

2010 - 2015 – phase out of fenthion/dimethoate

- Sustainable management of Medfly without cover sprays (MT12012)
 - Area wide management in Jarrahdale
 - Field trial new cover sprays (neonicotinoids)
 - Mass trapping (Magnet MED)
 - New lures for Medfly (TML plugs, trap designs)



A history of fruit fly in WA

2014 – present – pilot project eradication of Medfly from Carnarvon

- Royalties for Regions, , DPIRD, HIA - \$3.9 million

2015 – dimethoate/fenthion removed from use

2017- Oxitec (HG13038) – glasshouse trials indicated that flies were comparable to V7 males irradiated at low doses; trial halted due to concerns about 'GM' eggs in fruit affecting international market access

2018 - Systems approach to fruit fly management (CSIRO, NSW, Vic, WA)

Medfly being considered for eradication as part of a national project



Summary of advances - incremental

Biological control

- Parasitoids – incorporated into sterile insect release programs e.g. Hawaii

Monitoring

- Trap design – ongoing experiments, designs
- Automated systems

Male attractants

- Angelica seed oil (1953), trimedlure (1961), capilure (1980s), ceralure (1987, 2000)

– Male annihilation technique

Food based attractants

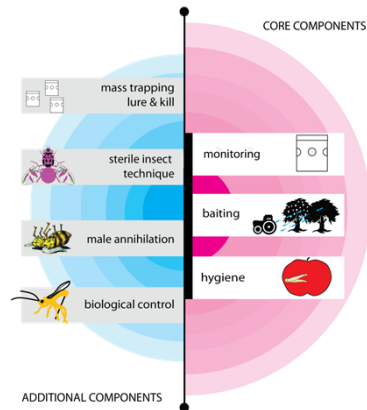
- Two-three part lure (1995) → mass trapping
- Females and males (but differences in temporal/spatial distribution not known)

Bait sprays

- Lead arsenate (1920s) → DDT (1947) → dimethoate/fenthion (1960s) → Malathion (1970)
- Photoactive dye (1992-2000) – failed to be registered
- Spinosad – GF120 (2000) – organic, expensive, can be hard to access when required for eradication programs
- Fipronil – not registered, abamectin trialled in lab experiments (2000)
- IGRs e.g. lufenuron (2004)
 - additives e.g. Xantham gum, polyethylene glycol
 - Different proteins hydrolysate/autolysate

Sterile Insect Technique

- Bisex strain → pupal colour variant → temperature sensitive lethal → self-limiting strain (Oxitec)



Broughton et al. 2015

Thank you

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