Pollination of macadamia

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Photo: Brian Cutting

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Project and key aims:

Conducted within project MT13060 Optimising pollination of macadamia & avocado in Australia (funded by Horticulture Innovation Australia with co-investment from the New Zealand Institute for Plant & Food Research Limited and funds from the Australian Government)

Pollination can affect yields and nut quality

- Determine the key pollinating species and their efficiency.
- Floral biology
- Suggestions to improve macadamia pollination

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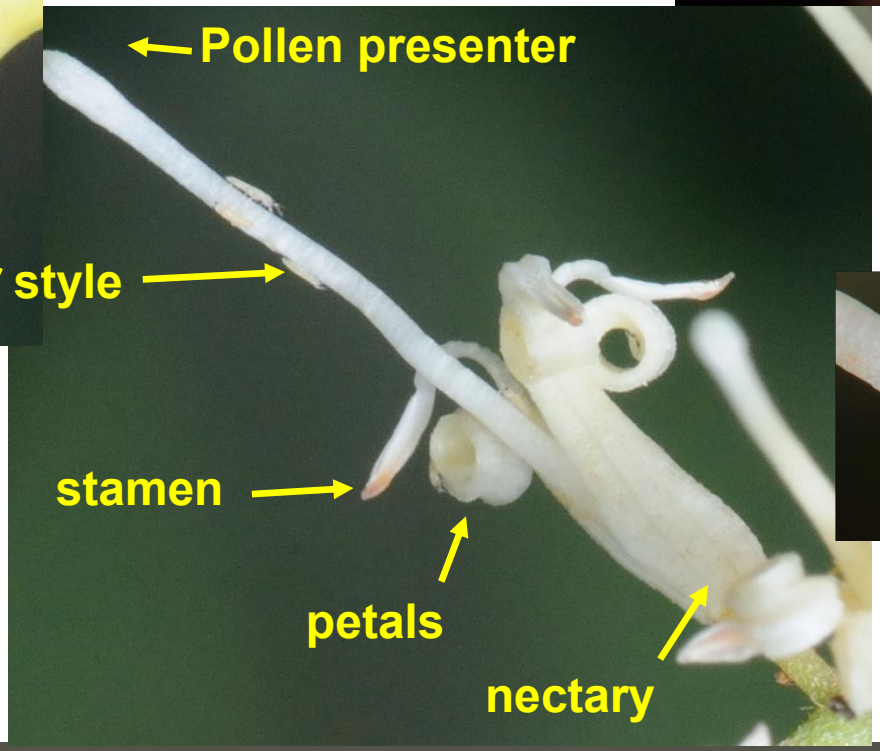
Floral biology

Photo: Brian Cutting

Not typical pollen presentation



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Floral biology

At least partial self incompatibility

Yields increase or improve with cross pollination

Most developing nuts drop off

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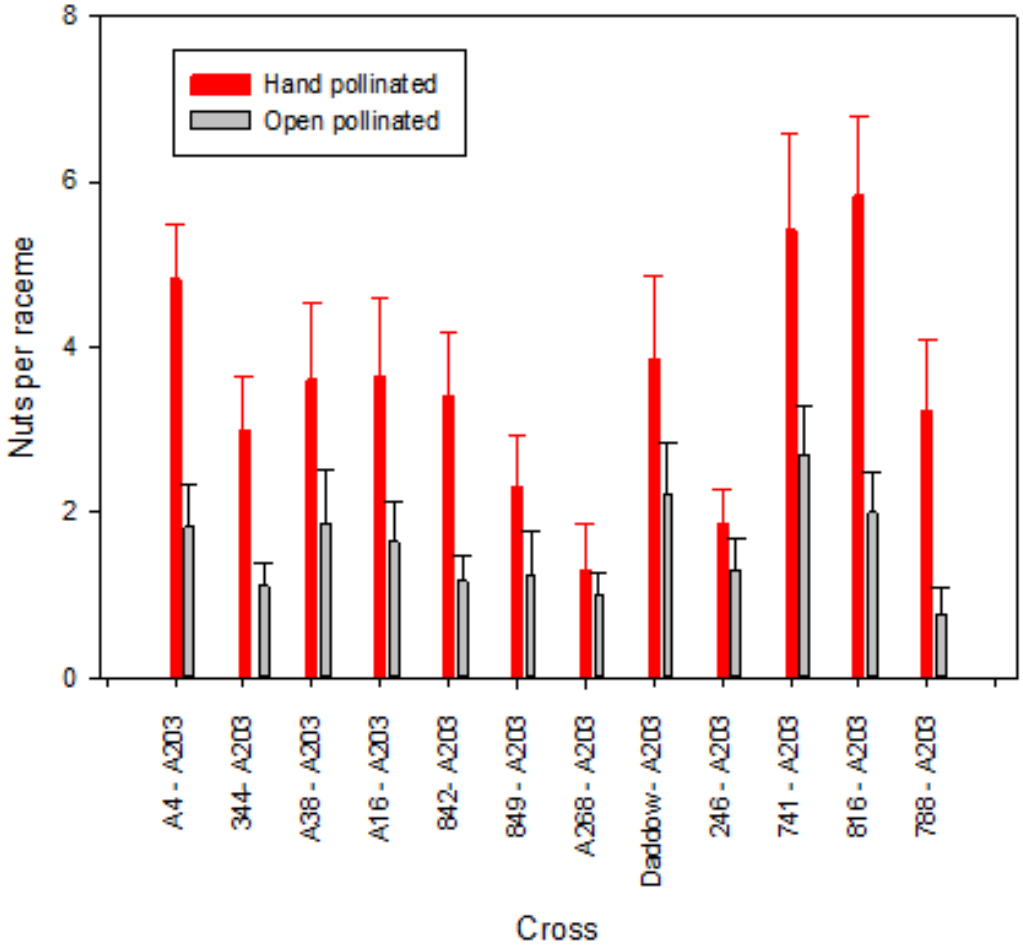
Cross pollination

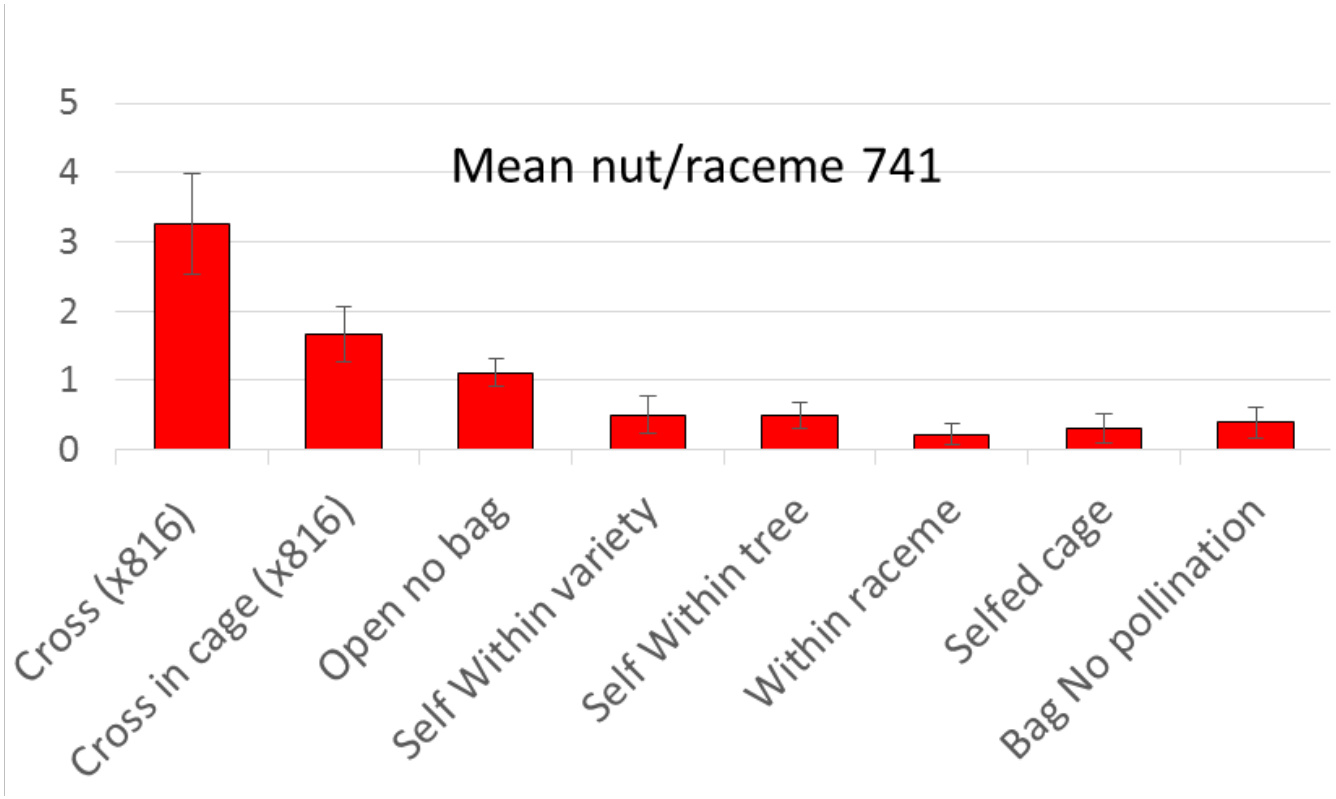
62 Cross pollination trials.

- All but 2, cross > open
- All but 7 <1 nut/raceme

Photo: Mark Goodwin



Self vs Cross pollination



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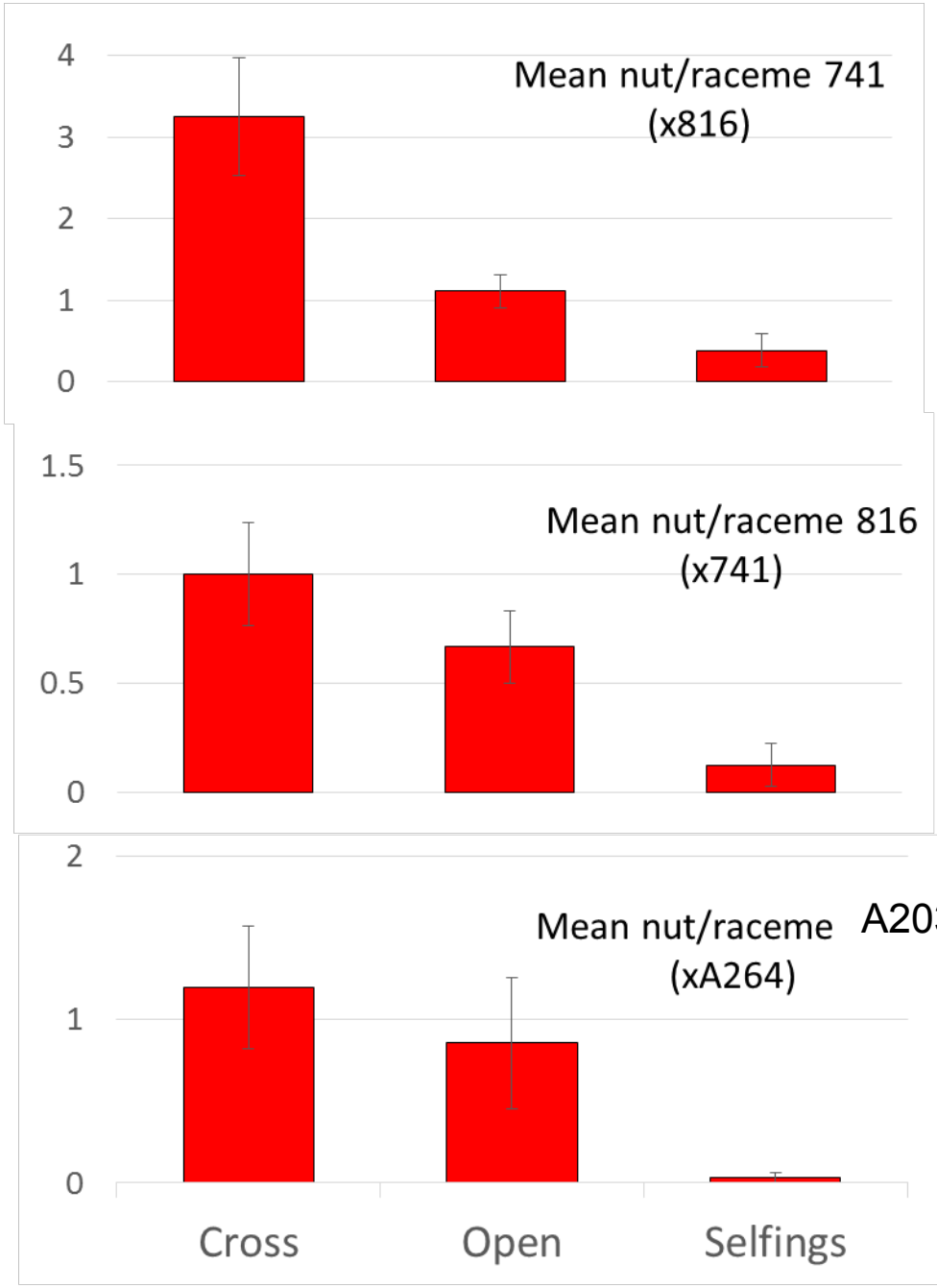
Self vs Cross



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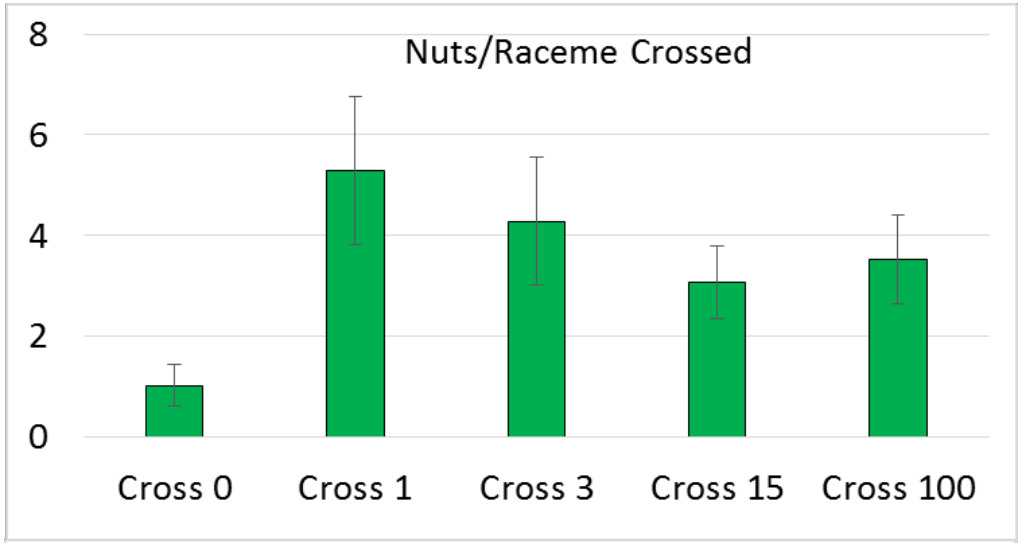
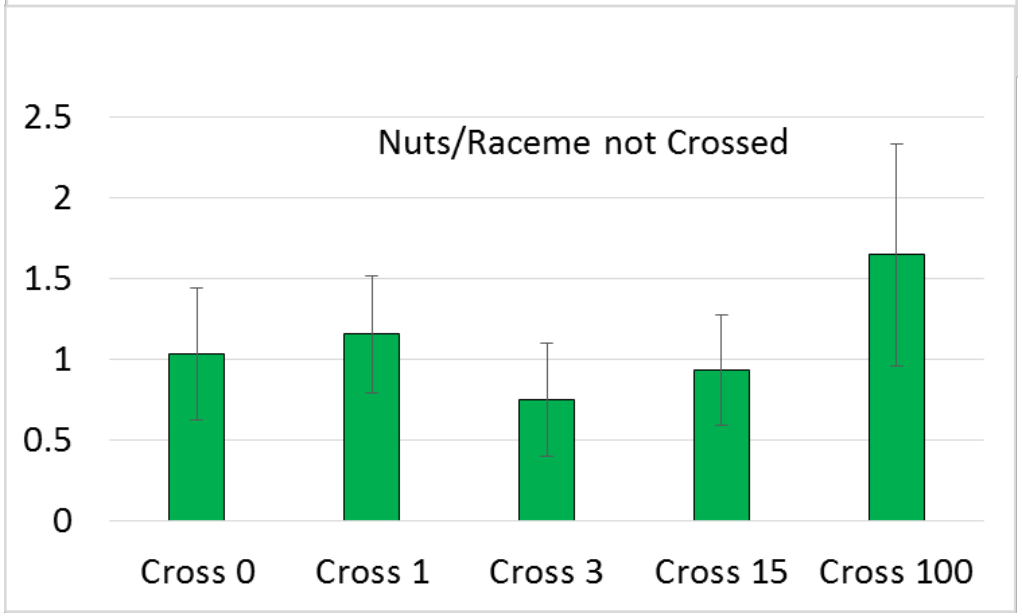
How much cross pollination? 741





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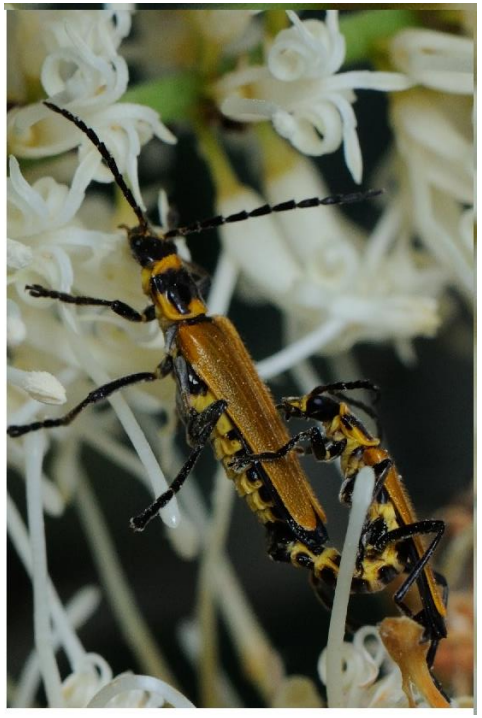
Pollinators of Macadamia



Photos: Brian Cutting

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Pollen Deposition: stigmas styles

Ranking of pollinators based on frequency of pollen deposition

	Sampled	Stigma	Near stigma (>5mm)	Style
Stingless Bees	33	1	3	4
Honey Bees	79	5	4	3
Lycid Beetles	13	3	2	1
Cantharid Beetles	11	2	1	1
Nose Flies	10	4	5	5
Control	68	6	6	6

- Bees beetles and flies capable of pollination
- Stingless bees deposited pollen to stigma more than other insects (just over 50% of visits)

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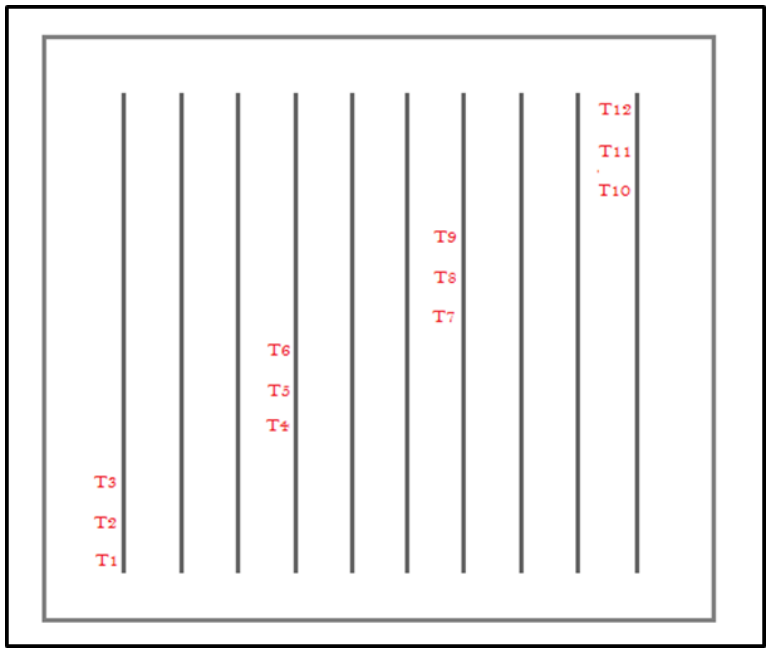
Pollinators

Number of orchards surveyed for each macadamia variety.

Variety	Central Queensland	South East Queensland	Northern Rivers
741	7	6	3
344	0	7	5
842	0	4	4
Daddow	0	3	1



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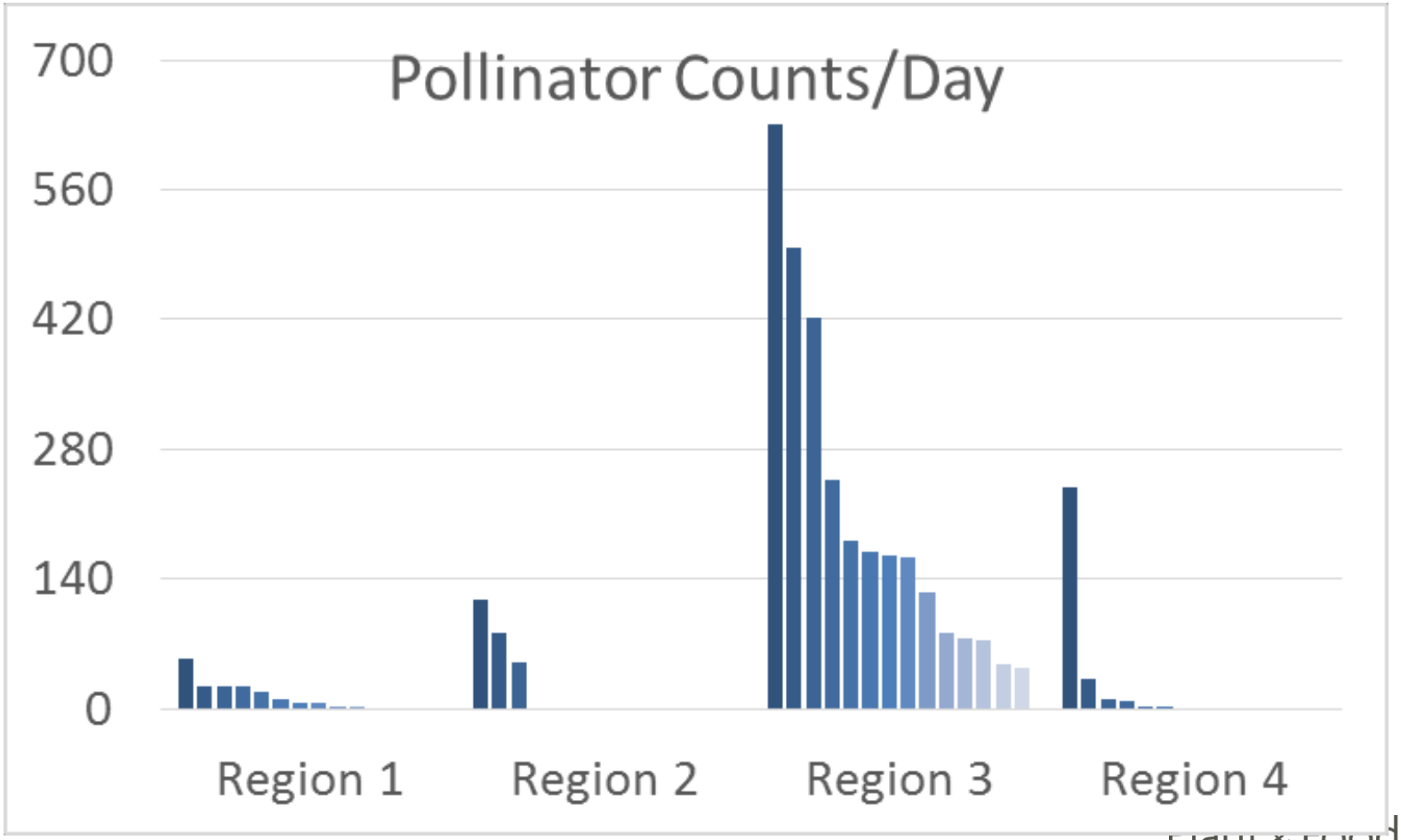
Number of pollinators



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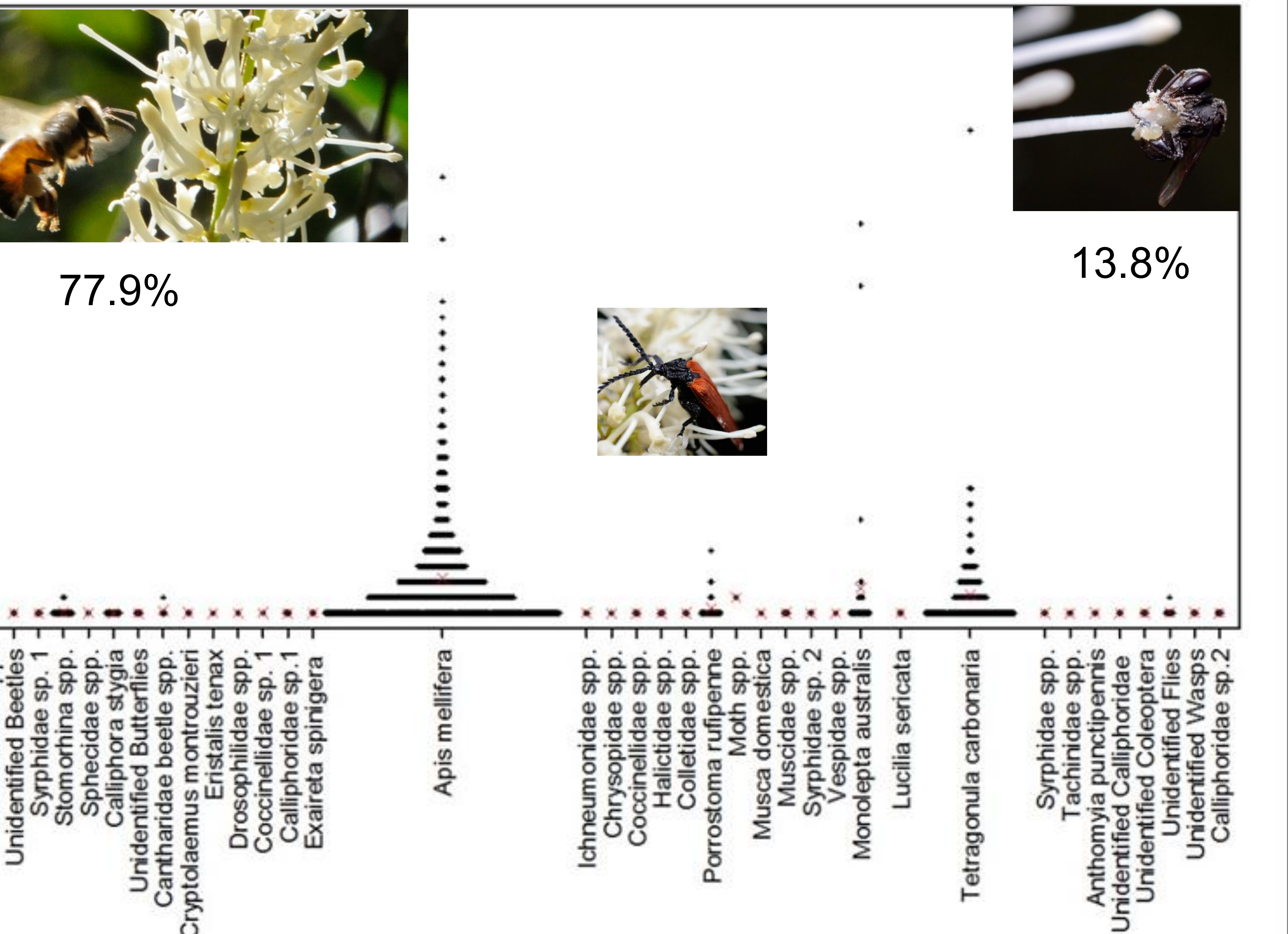
77.9%
13.8%
Unidentified Beetles
Syrphidae sp. 1
Stomorhina spp.
Sphecidae spp.
Calliphora stygia
Unidentified Butterflies
Cantharidae beetle spp.
ryptolaemus montrouzieri
Eristalis tenax
Drosophilidae spp.
Coccinellidae sp. 1
Calliphoridae sp.1
Exaireta spinigera
Apis mellifera
Ichneumonidae spp.
Chrysopidae spp.
Coccinellidae spp.
Halictidae spp.
Colletidae spp.
Porrostoma rufipenne
Moth spp.
Musca domestica
Muscidae spp.
Syrphidae sp. 2
Vespidae spp.
Mondepta australis
Lucilia sericata
Tetragonula carbonaria
Syrphidae spp.
Tachinidae spp.
Anthomyia punctipennis
Unidentified Calliphoridae
Unidentified Coleoptera
Unidentified Flies
Unidentified Wasps
Calliphoridae sp.2

Pollen Flow

Fluorescent powder
Different times of day
Six different orchard blocks

Photos: Brian Cutting

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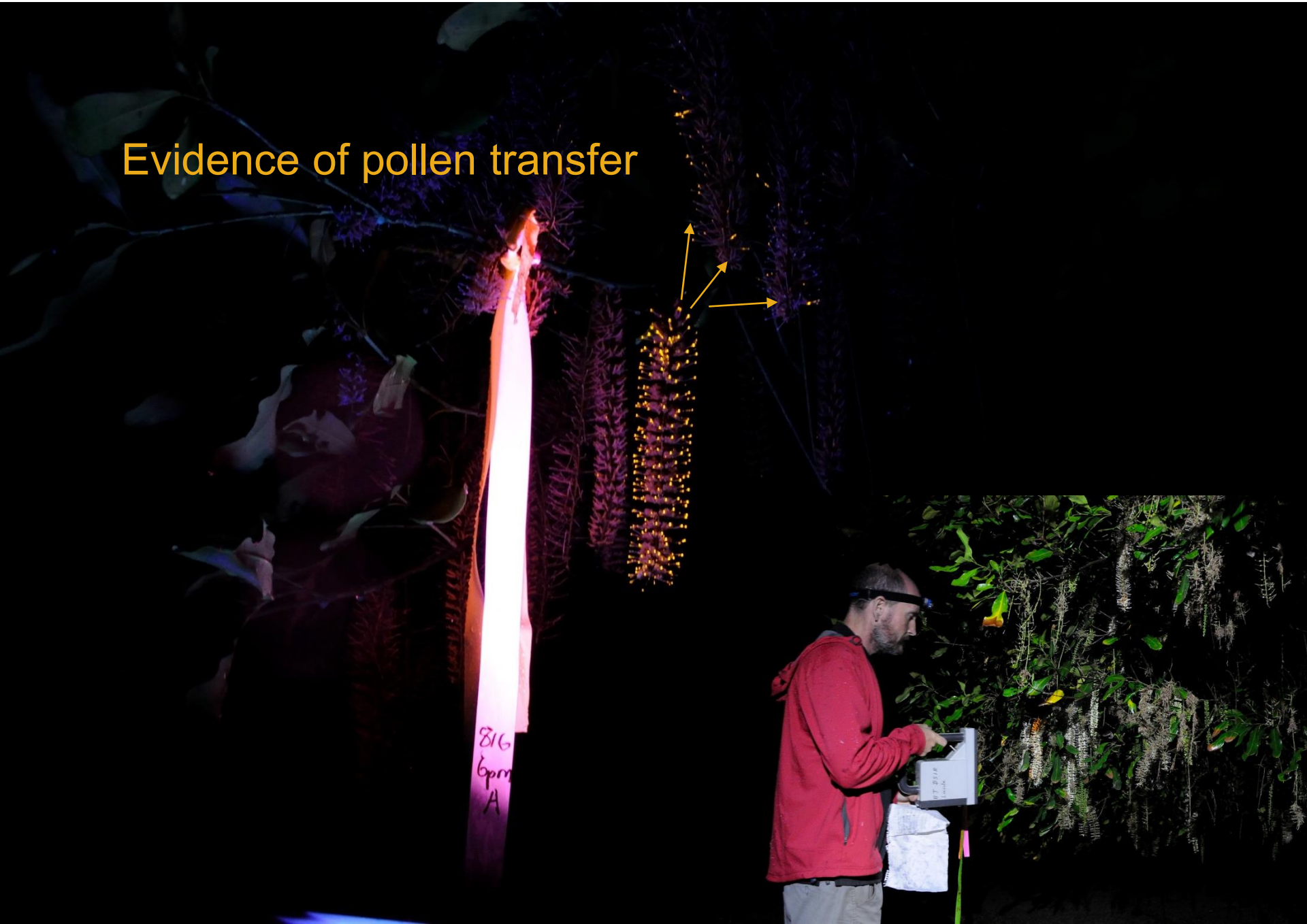
Evidence of pollen transfer



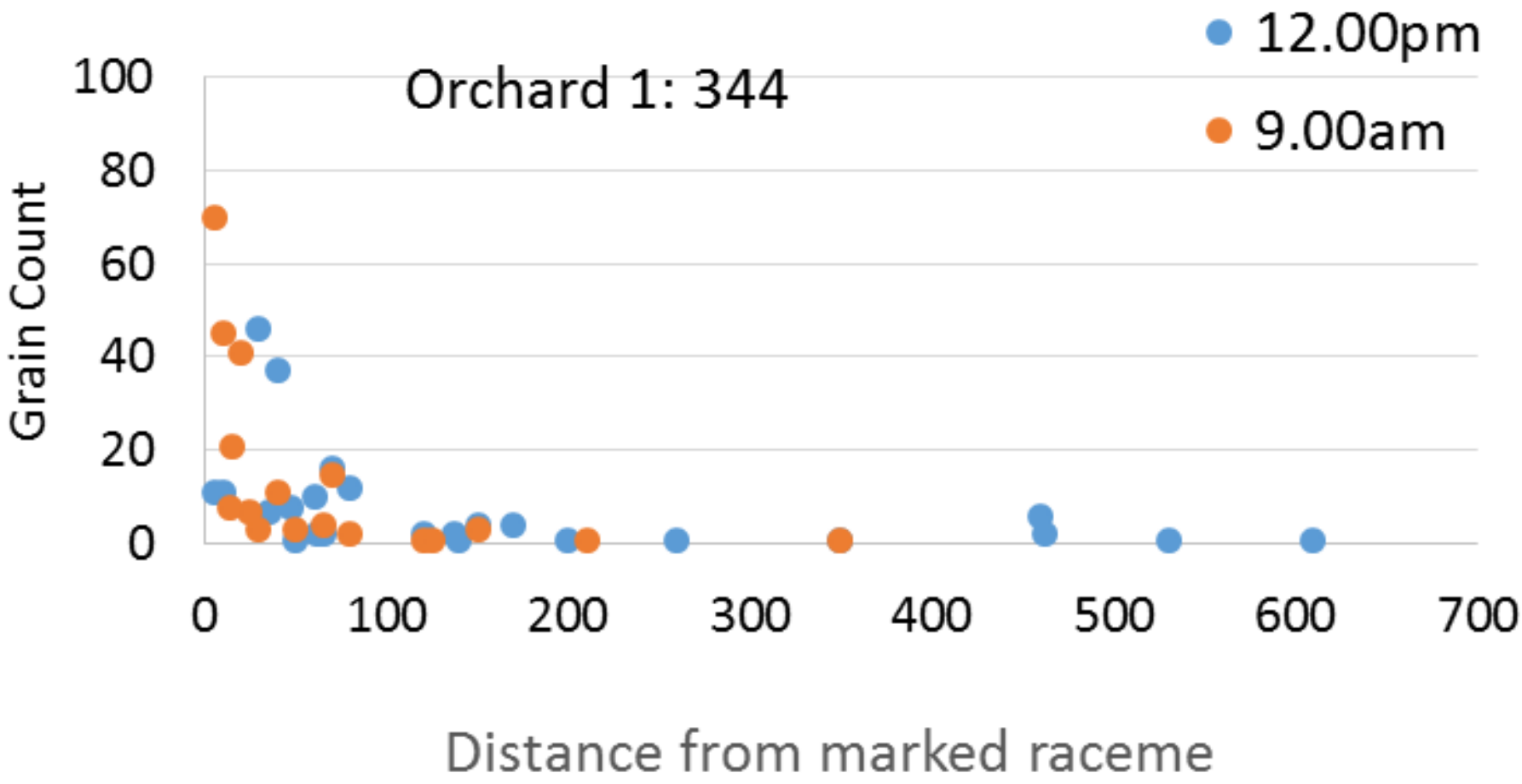
Pollen Flow

Orchard 1: 422 pollinators

Orchard 2 2: 53 pollinators

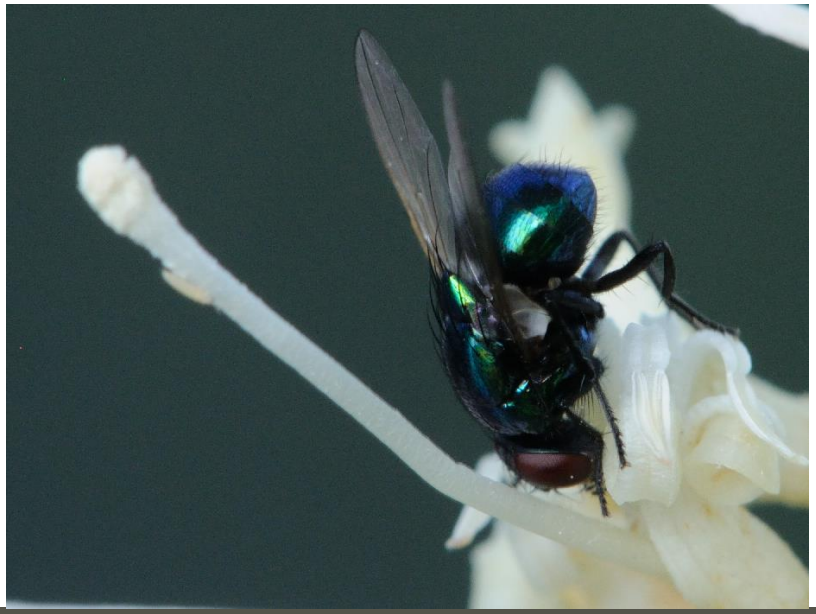
Transferred powder	Orchard 1	Orchard 2
Pollen Presenter	163	8
Styles	119	13
Petals	141	14
Buds	1	1
Stems	2	1
Total	**426**	**37**

Pollen flow vs flower visitors



Summary

- Most varieties cross pollination better yields
- Various insects pollinators
- High variability pollinators between blocks
- Powder movements suggest insects key



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Suggestions

- Mixing varieties (rows)
- Replace trees with alternative variety if possible
- Prune to add light to the canopy

Suggestions

- Include honey bees and stingless bees,

- Support wild species

  (eg Lycid beetles, flies)

- Minimise impact of pesticides

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Support wild species (eg Lycid beetles, flies)

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