



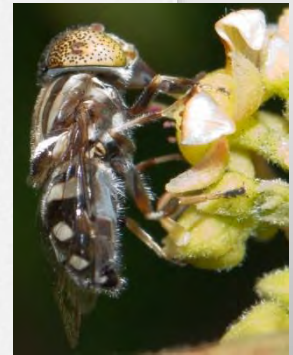
Insect pollinators and Mango flowers - What do we know?



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Outline of talk....

1. Contributions by honeybees and other insect pollinators to crop pollination
2. Mango pollinators in Aus and worldwide?
3. Our mango study in north QLD
4. Future research directions



Wild Pollinators Enhance Fruit Set of Crops Regardless of Honey Bee Abundance

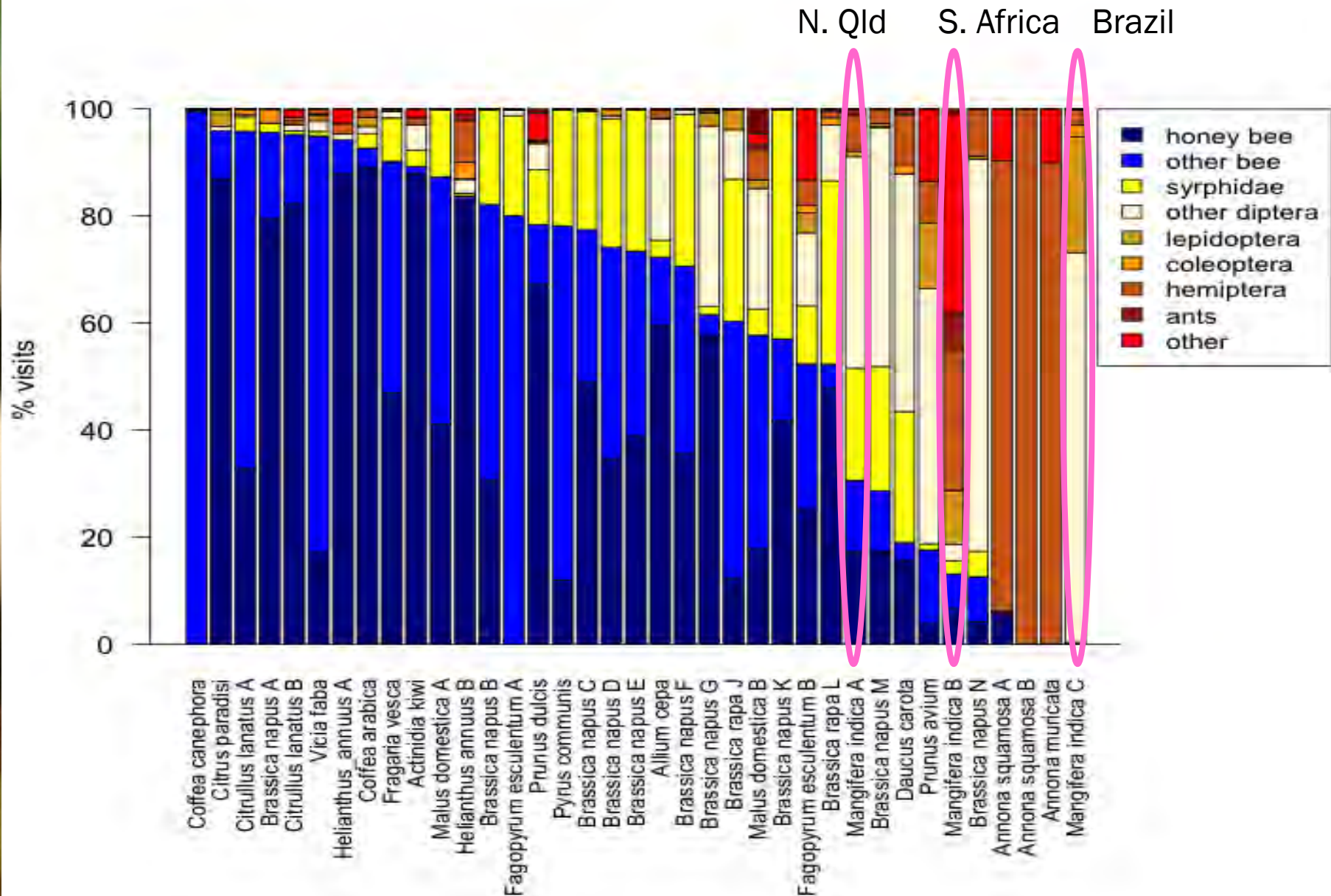
Lucas A. Garibaldi,^{1*} Ingolf Steffan-Dewenter,² Rachael Winfree,³ Marcelo A. Aizen,⁴ Riccardo Bommarco,⁵ Saul A. Cunningham,⁶ Claire Kremen,⁷ Luísa G. Carnevali,^{8,9}

Fruit set increased with flower visitation by wild insects in 100% of the 41 crop systems worldwide. In contrast, fruit set increased significantly with flower visitation by honey bees in only 14% of the systems surveyed.

Overall, wild insects pollinated crops more effectively; an increase in wild insect visitation enhanced fruit set by twice as much as an equivalent increase in honey bee visitation.

increase in honey bee visitation. Visitation by wild insects and honey bees promoted fruit set independently, so pollination by managed honey bees supplemented, rather than substituted for, pollination by wild insects. Our results suggest that new practices for integrated management of both honey bees and diverse wild insect assemblages will enhance global crop yields.

Insects other than bees are good crop pollinators



Insect Pollination of Mango in Northern Australia

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Wasps



Bees



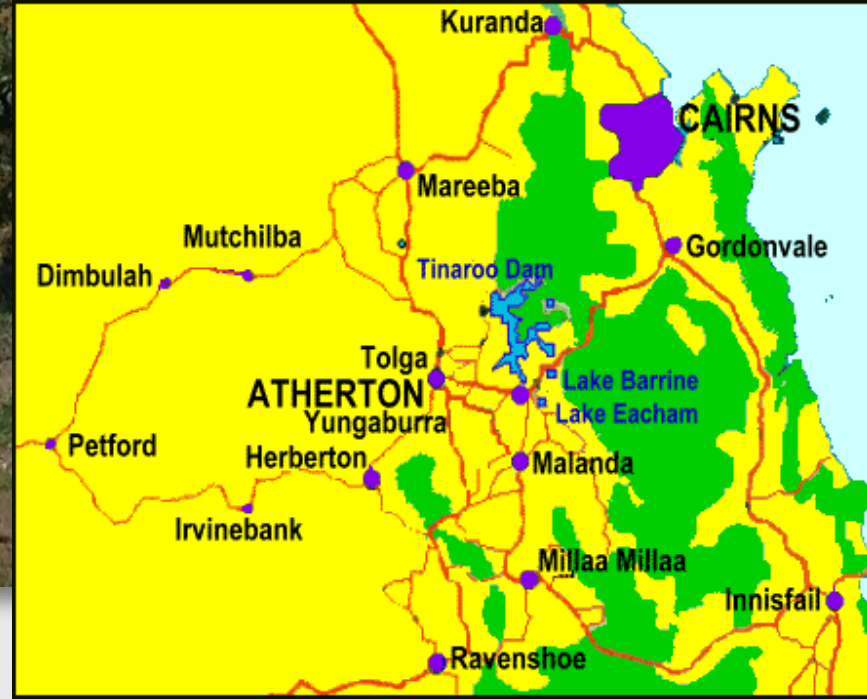
Large Ants

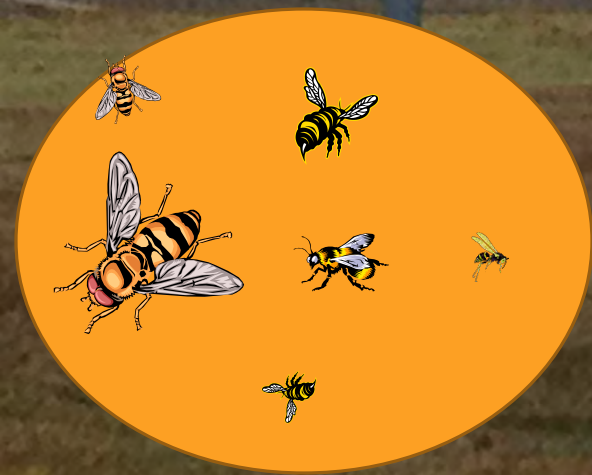


Large flies

KP variety in Darwin, Humpty Doo and Kununurra.

Study area: Mareeba, Nth QLD





Summary of approach



1. Rate of flower visitation along 50m transect
2. Single visit to bagged flower stigma
3. Foraging behaviour within and between trees
4. Life history characteristics?

Summary of approach

1. Rate of flower visitation along 50m transect



Potential Pollinators: The most frequent visitors to mango flowers near Mareeba, August 2014

Bees and Wasps: Hymenoptera

Most common bees (Family: Apidae)



Native bee
(small white faced)



Honey bees
(*Apis mellifera*)

Wasps and other bees

Wasps



Other bees



Other insect orders: the most frequently observed

Beetles: Coleoptera



The most common was the green hairy beetle, and these spent a long time on flowers



Several varieties of ladybirds were present.

Butterflies: Lepidoptera

The most common were species of Tiger Moths (day flying moths of the Arctiidae family)



Flies: Diptera

Blowflies (Family: Calliphoridae)



Green blowfly
species 1
(large)



Green blowfly
Species 2
(large)



Blue blowfly
(small)



Tachinidae
Black tip
(small)



Large pointy nose

Hoverflies (Family: Syrphidae)

Grey hoverfly
(small)



Yellow hoverfly
(small)



Other flies observed: grouped together with other minor species

Drone fly
(Syrphidae)



Bibionidae



Sarcophagidae
(flesh flies)



10 other species were observed in small numbers.

Visit rate to flowers



Native
bees/wasps

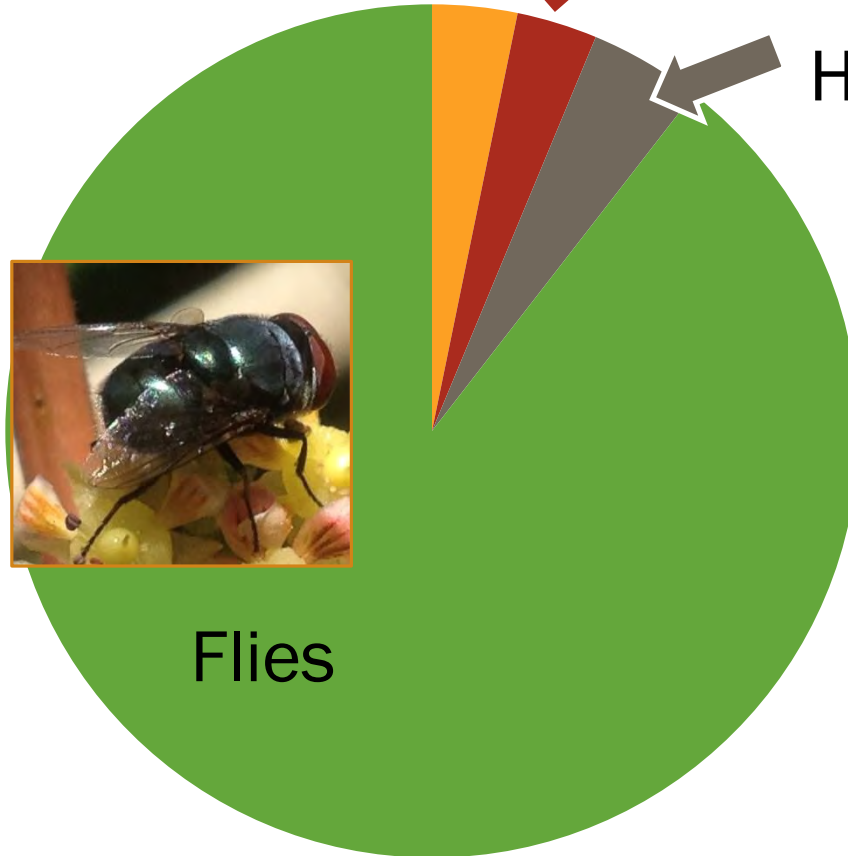
Beetles



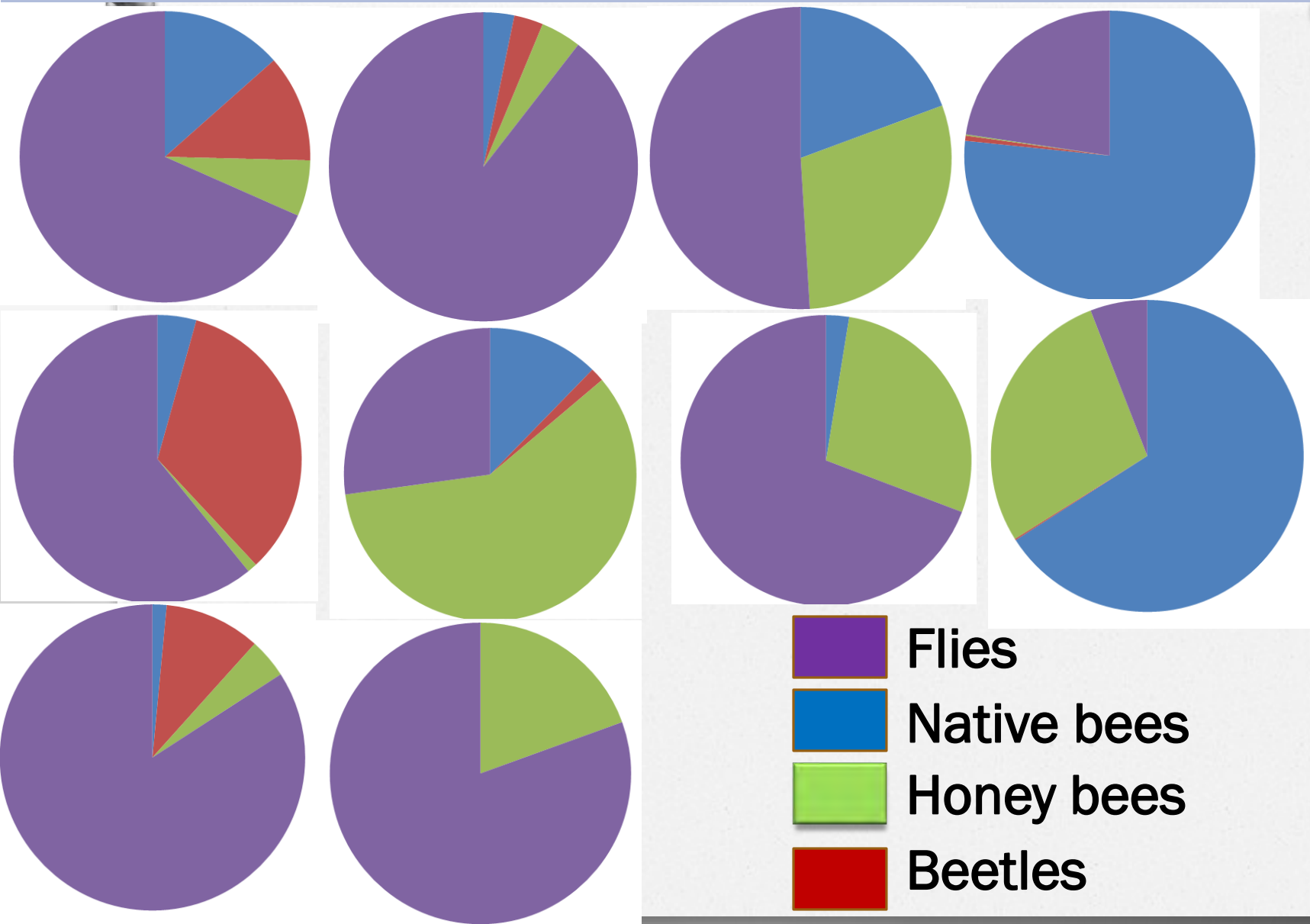
Honey bee



Flies

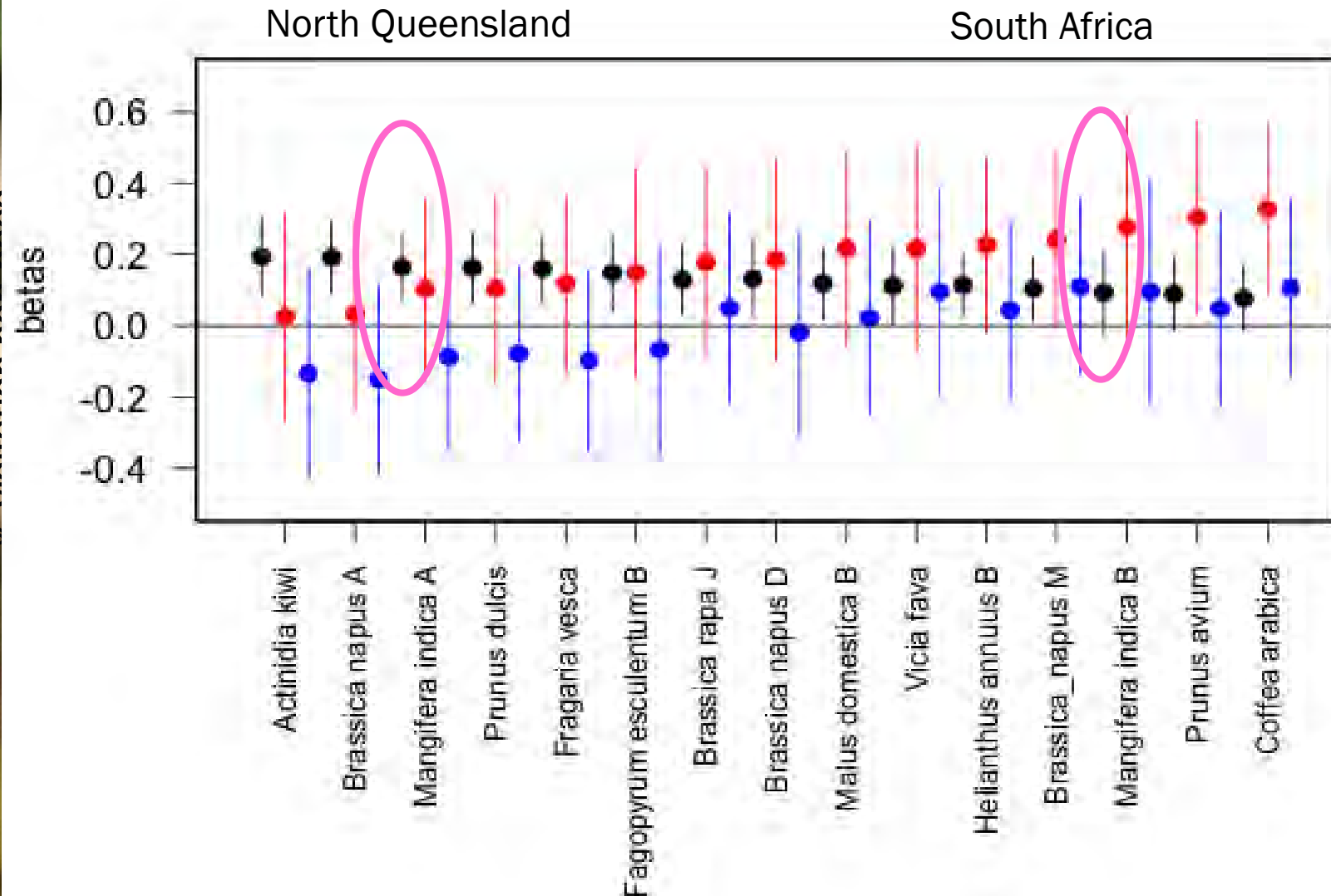


Variation in pollinators at different farms



Visit rate is related to fruit set

Black circles represent non bees; Blue circles represent honeybees and red circles represent wild bees.



Summary of approach

2. Single visit to virgin stigma



Dominant Mango Pollinators: Average pollen transferred in a single visit to mango flowers, Mareeba region, August 2014

Bees (Family: Apidae)



Small white-faced native bee
(*Tetragonula carbonaria*)

7 pollen grains per flower visit



Honey bees (*Apis mellifera*)

2.7 pollen grains per flower visit

Beetles: Coleoptera



Green/blue hairy beetle
(*Tenebrionid_sp*)

1.7 pollen grains per flower visit

Flies: Diptera

Blowflies (Family: Calliphoridae)



Green blowfly
(*Lucilia_sp.*)
2.9 pollen grains per flower visit



Blue blowfly
(*Calliphoridae sp.*)
6.8 pollen grains per flower visit



Black tip fly
(*Rhininae sp. 1*)
4.2 pollen grains per flower visit



Large pointy nose black tip fly
(*Rhininae sp. 2*)
2.6 pollen grains per flower visit

Hoverflies (Family: Syrphidae)



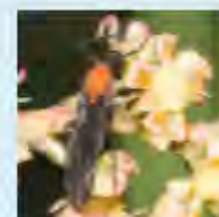
Grey hoverfly
(*Syritta sp.*)
2.2 pollen grains per flower visit



Yellow/orange hoverfly
(*Syrphidae sp.*)
3.2 pollen grains per flower visit

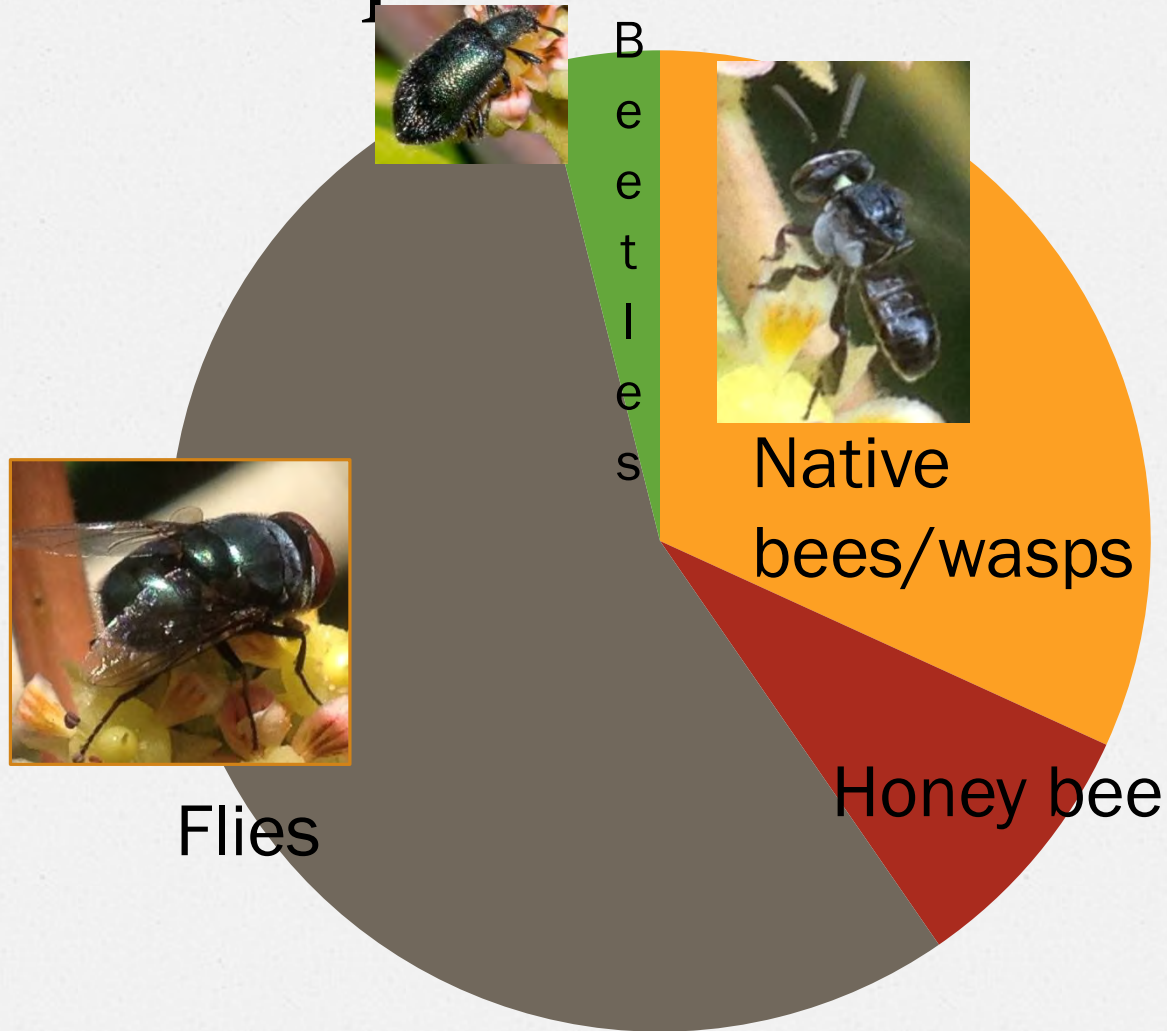


Bent-abdomen Hoverfly
(*Allobacha sp.*)
0.8 pollen grains per flower visit



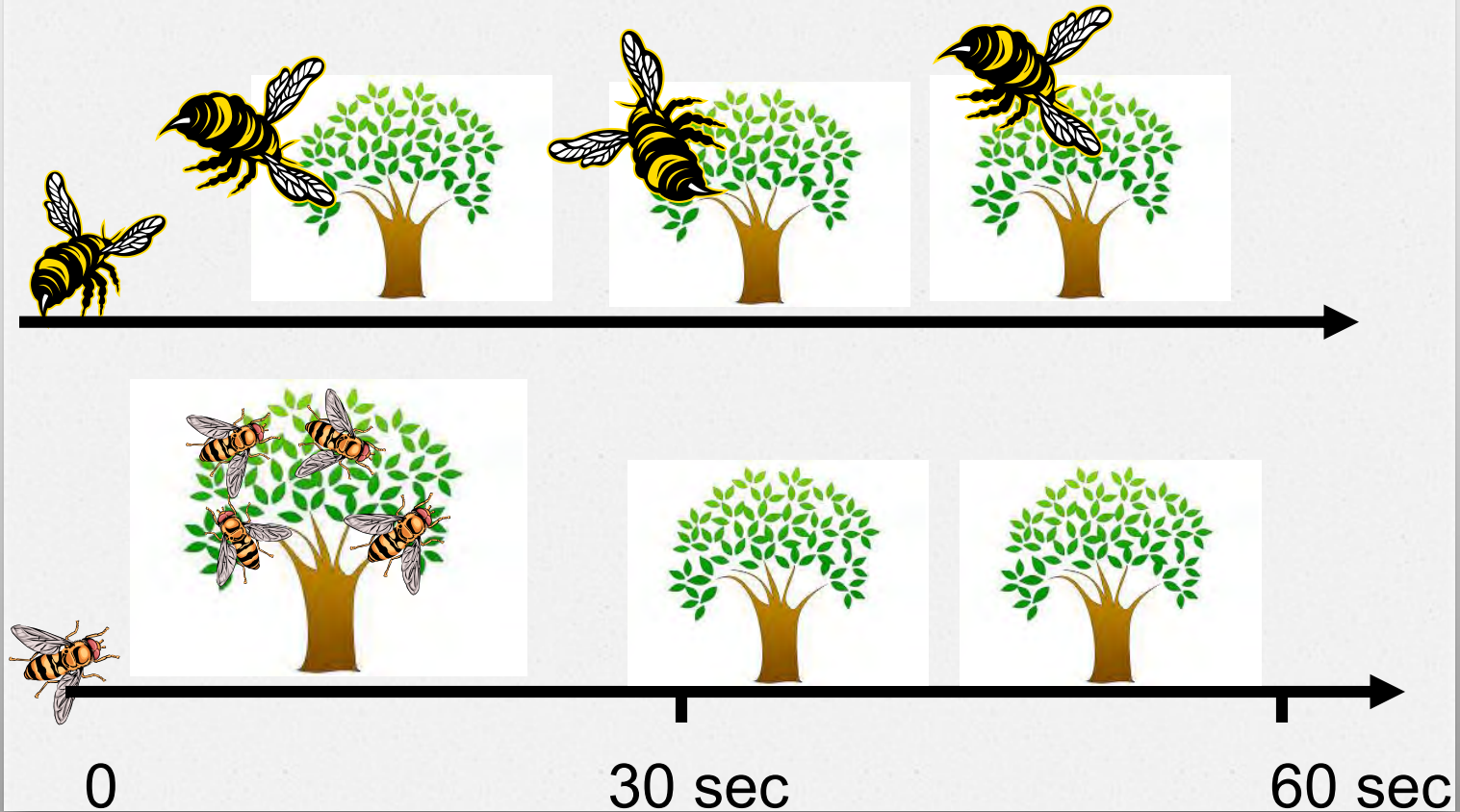
Other flies:
Bibionid fly
(*Plecia sp.*)
1.6 pollen grains per flower visit

Pollen deposited on flower



Summary of approach

3. Foraging within and between trees



Pollinator behaviour at flowers

- Anderson 1982 –Diptera and native bees more frequently moved from tree to tree
- We found similar results
- Videos of pollinator behaviour



Life History Characteristics

- Body size



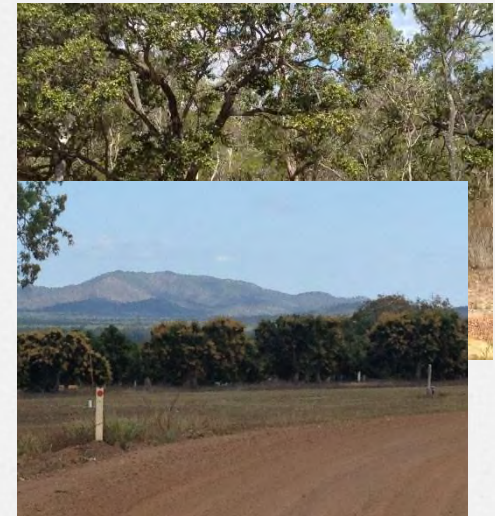
- Diet



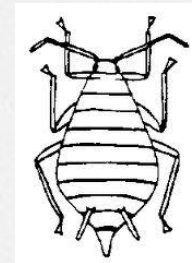
- Social / solitary



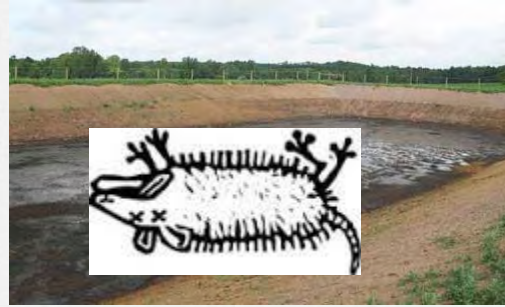
Why is all this info important?



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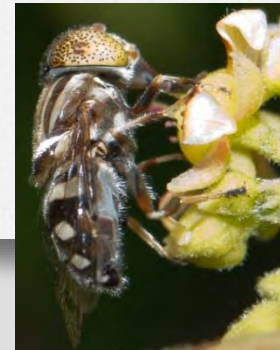
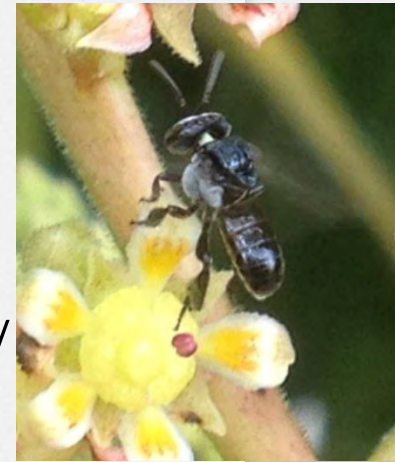


Why is all this info important?



Summary and future research....

- Pollinators vary in efficiency and identity depending on location and farm management
- We need to find out more about who is pollinating what
- Differences among cultivars in pollination requirements and insect preferences
- We need to know a bit about their life-styles and what they need to feed, nest, shelter to better manage them
- Relationships between pollinators and yield ? Need to do more on pollen tube growth and fruit set



Advertisement!

Acknowledgements

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- The background image shows a group of people standing in a field with trees. The image is partially obscured by two text boxes: a blue one on the left and an orange one on the right. The blue box contains text about finding pollinators and contact information. The orange box contains a list of acknowledgements.
- Are you interested in finding out what pollinates your trees?
 - Contact me on
 - rrader@une.edu.au

- UNE seed grant awarded to R.Rader and C.Gross
- Sue Jaggard
- Nicole Bonney
- Benjamin Fouilly
- Heath Milne
- Claudia Vicary
- 10 farmers who let us on their farms...