photo: Craig Stehn

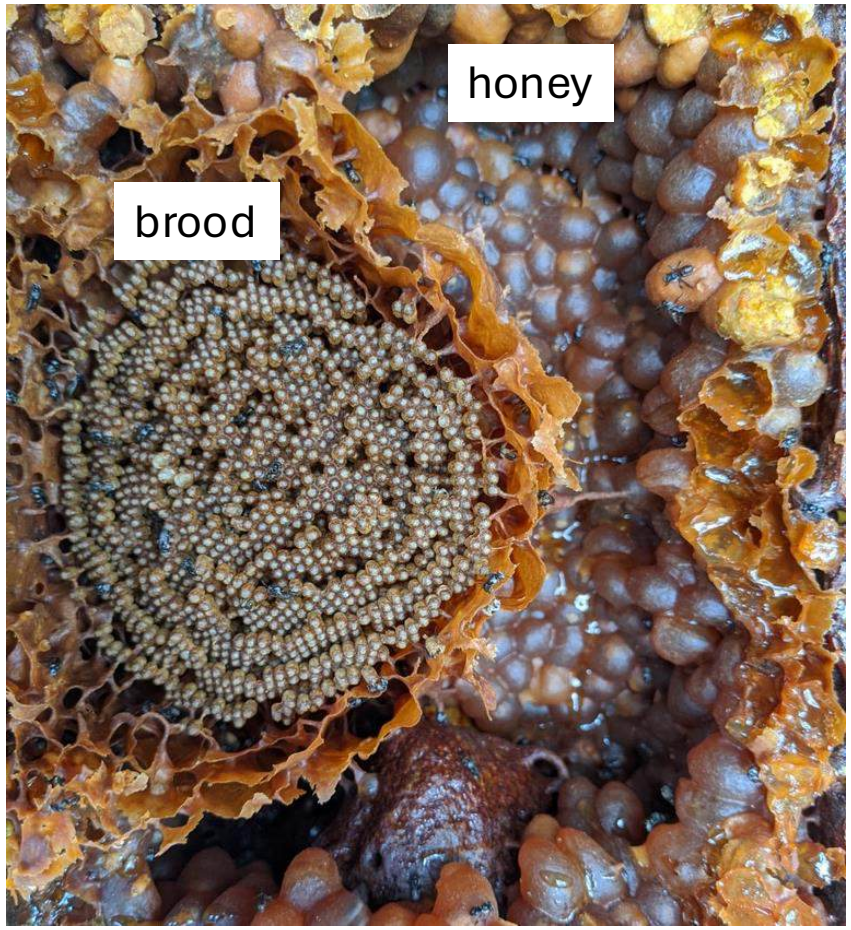
Australia's Amazing Stingless Bees

THE UNIVERSITY OF SYDNEY

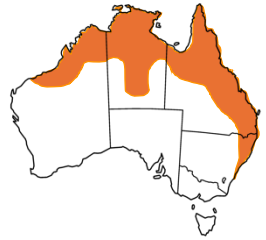
Ros Gloag

The Behaviour Ecology and Evolution (BEE) Lab

www.bee-lab.sydney.edu.au



Australian stingless bees



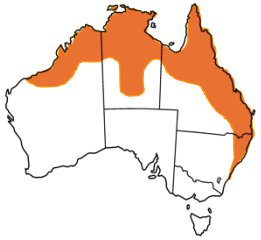
- 11 species
- advanced sociality
- produce and store honey
- tropical & sub-tropical distribution

Tetragonula carbonaria

stingless bee

honey bee

Australian stingless bees



- 11 species
- advanced sociality
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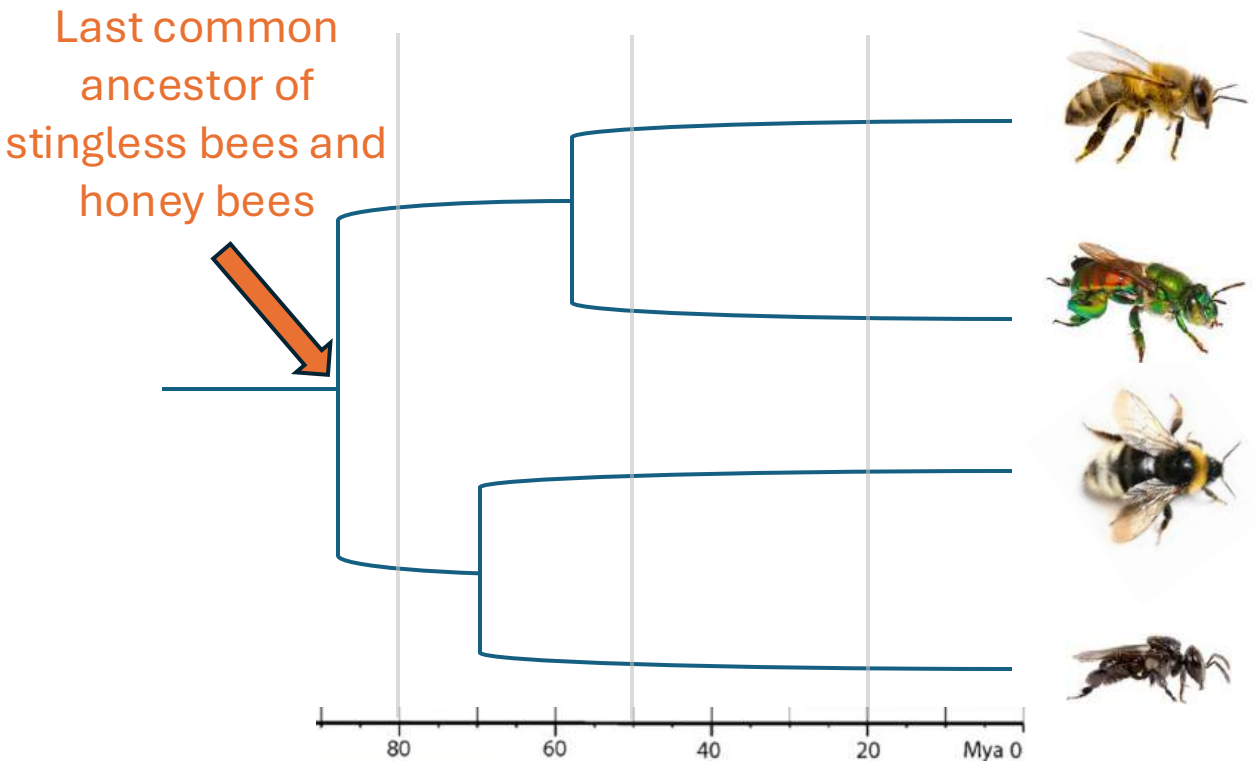
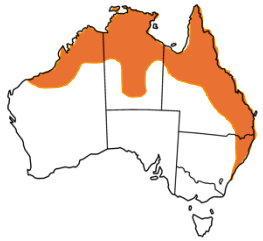
- tropical & sub-tropical distribution
- easy to keep and transport in hives
- generalist foragers – pollinate crops
- ambassadors for insect conservation



Australian stingless bees



- 11 species
- advanced sociality
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- ambassadors for insect conservation

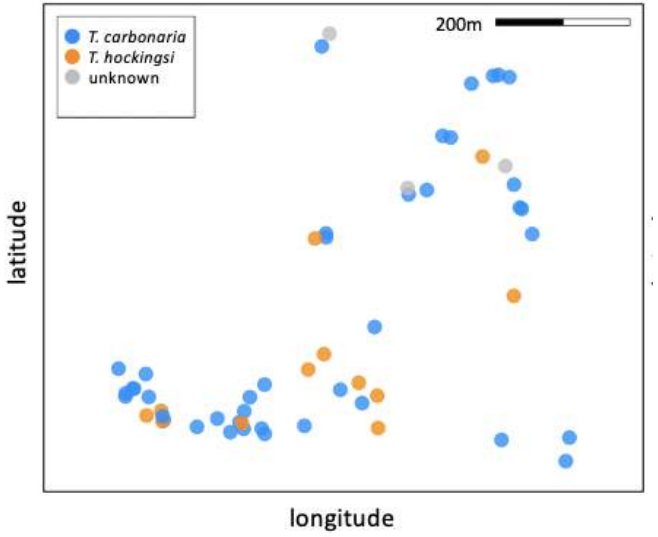
Making new colonies

Strategy 1: Find a new nest site close to the old one and slowly transfer provisions to it

Strategy 2: Steal a nest!

Video from: https://www.youtube.com/watch?v=9v-KuU8nYh0 (S. Porter)

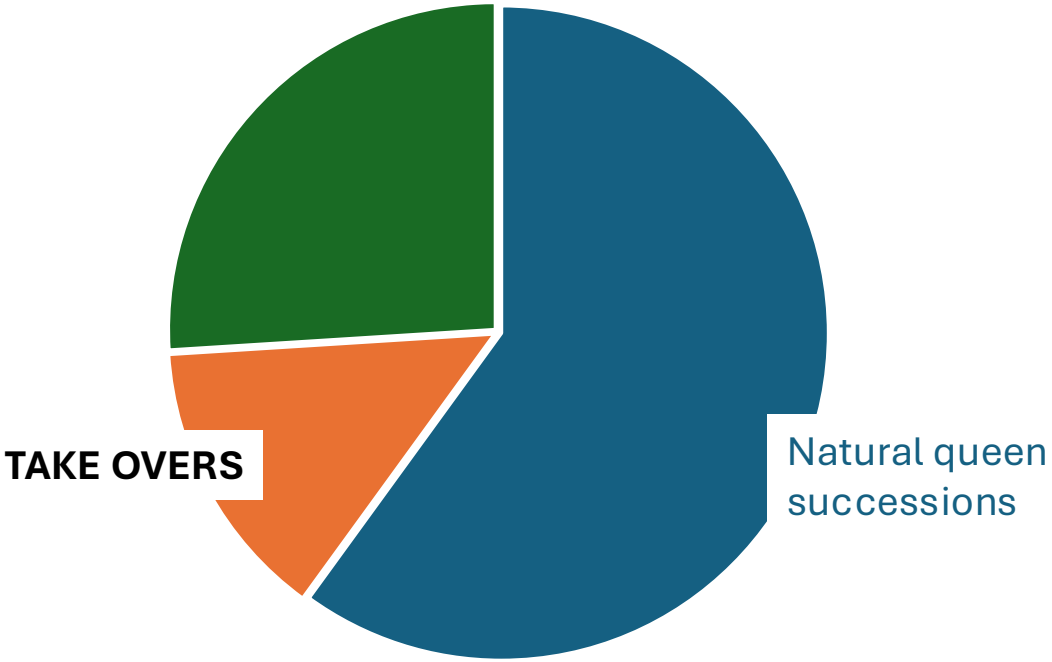
Starting map of colonies (2017)



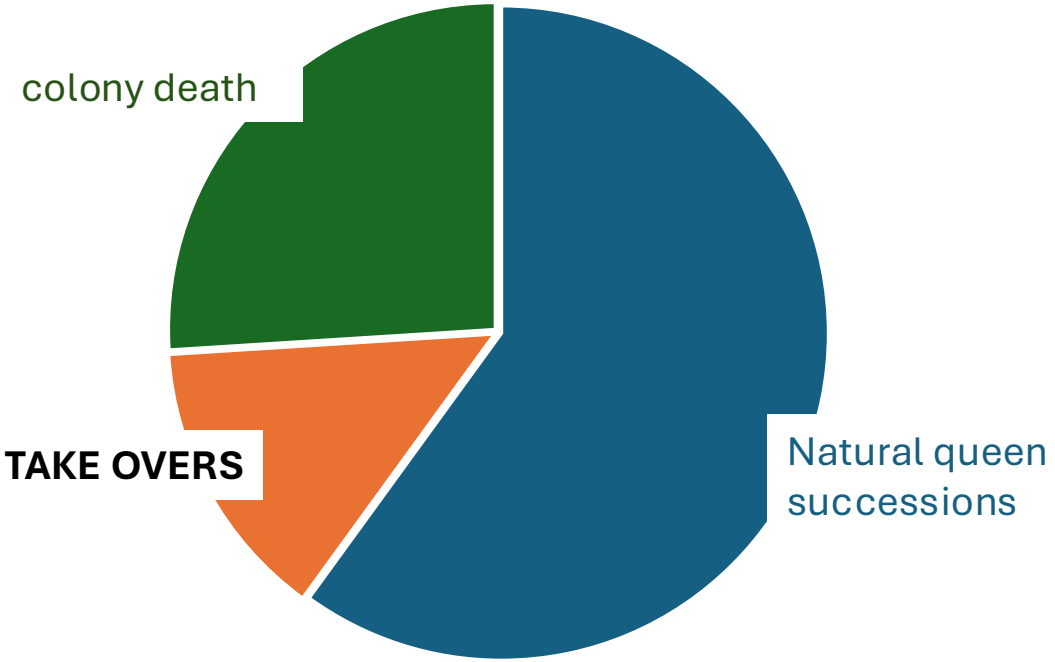
How often do nest takeovers occur in wild nests?

- sampled workers from 58 nests – used genetic data to compare turnover over a period of five years
- 2 species present: *Tetragonula carbonaria* and *Tetragonula hockingsi*

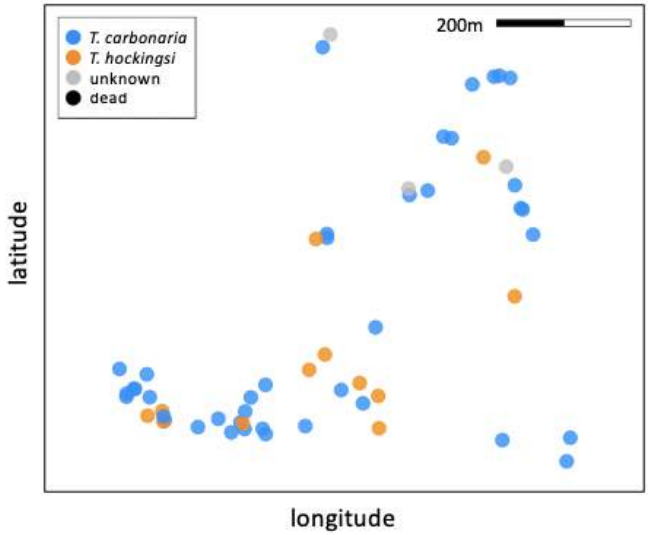
Estella sampling stingless bee nests



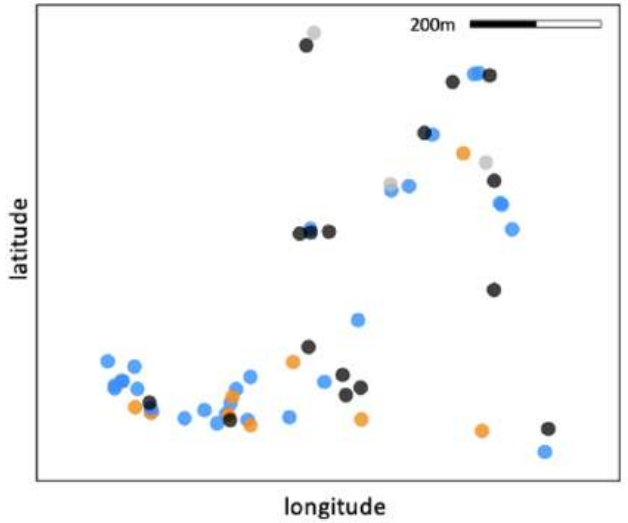
Estella sampling stingless bee nest



Starting map



Five years later...



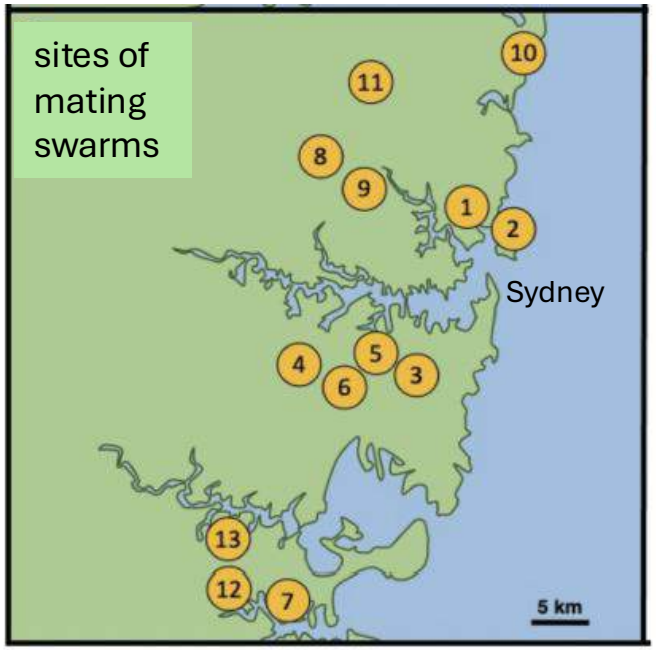
Stingless bee males

Male roosts at night

Male mating aggregation adjacent to re-queening colony

Image: F. Bueno

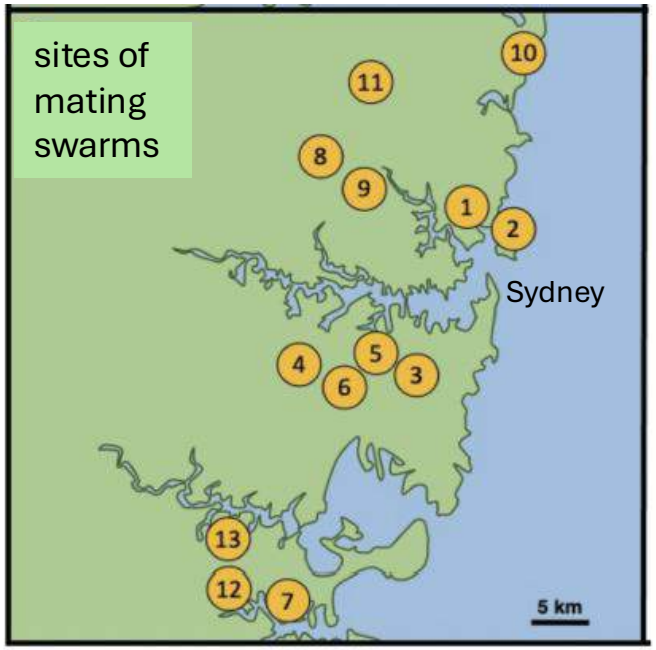
Male mating aggregation adjacent to re-queening colony



How far do males travel?

Experiment:

- hive splits to attract mating swarms
- males sampled at each swarm
- genetic analysis to find brother pairs
- modelling to estimate dispersal distances



How far do males travel?

Average: 2-3 km

(4x - 6x typical flight range of workers)

Maximum: 20km

(potentially more if queens hard to find…)

Experiment:

- hive splits to attract mating swarms
- males sampled at each swarm
- genetic analysis to find brother pairs
- modelling to estimate dispersal distances

How far do males travel?

Some paint-marked males flew 4.5km in 48 hours

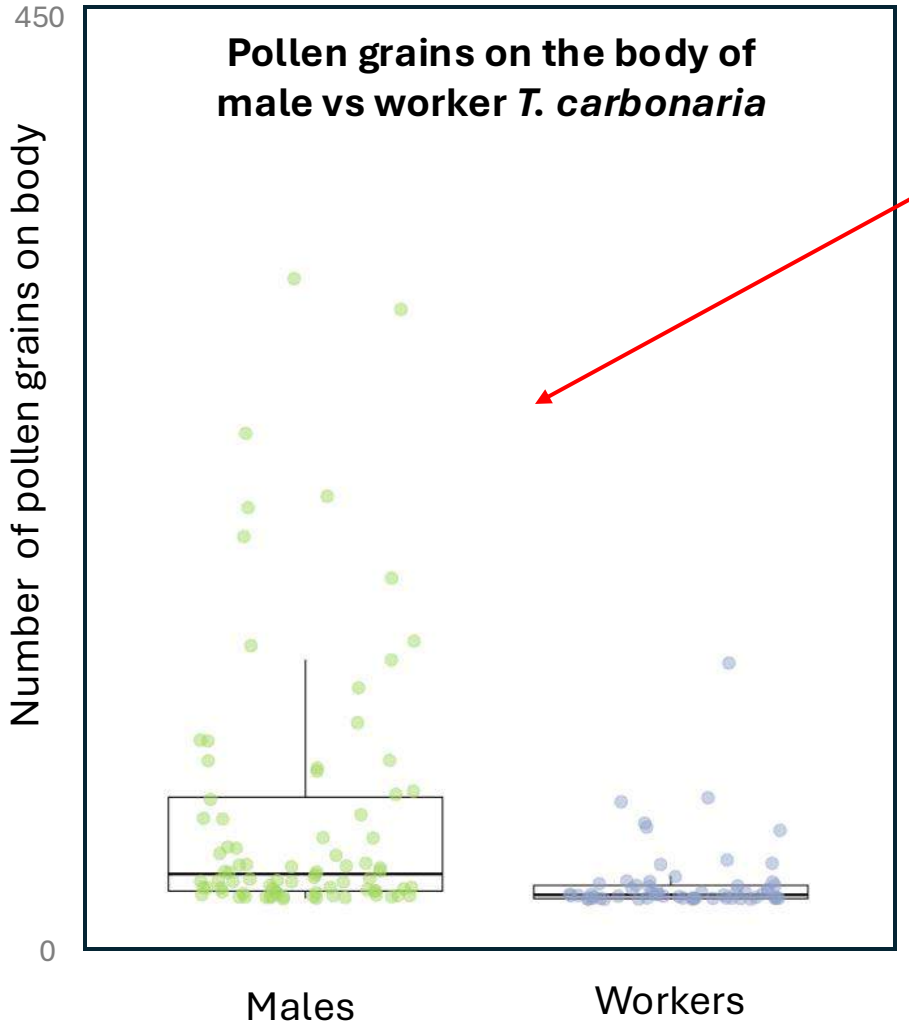
thousands of paint marked males released at known distance from mating aggregation

How far do males travel?

Some paint-marked males flew 4.5km in 48 hours

males maintain gene flow
in fragmented forests

Males as pollen vectors

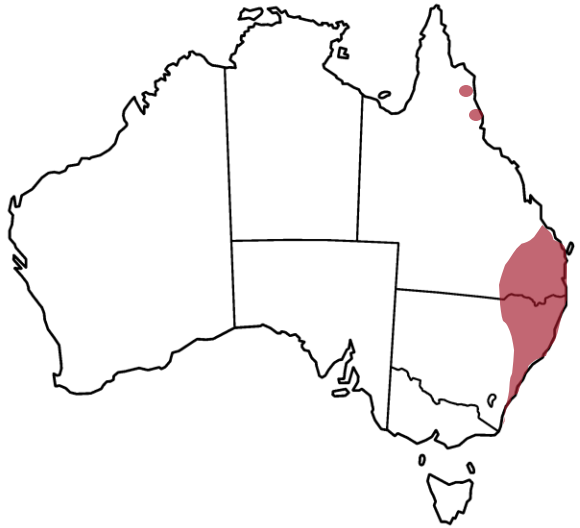


Males remove less pollen from their bodies during grooming

→ are more likely to carry pollen greater distances it further

Image and data: G. Brennan

Cryptic stingless bee species

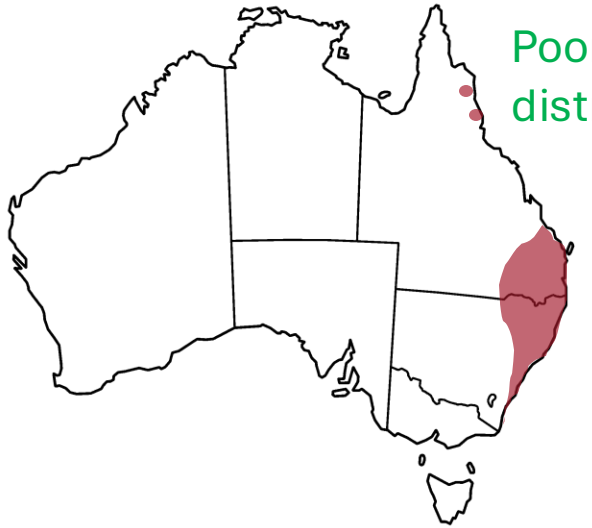


Tetragonula carbonaria

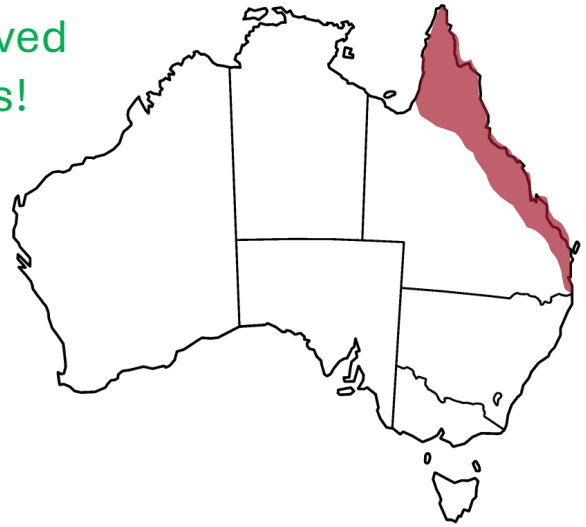
Tetragonula hockingsi

Bee Pics: T. Smith

Cryptic stingless bee species



Poorly resolved distributions!



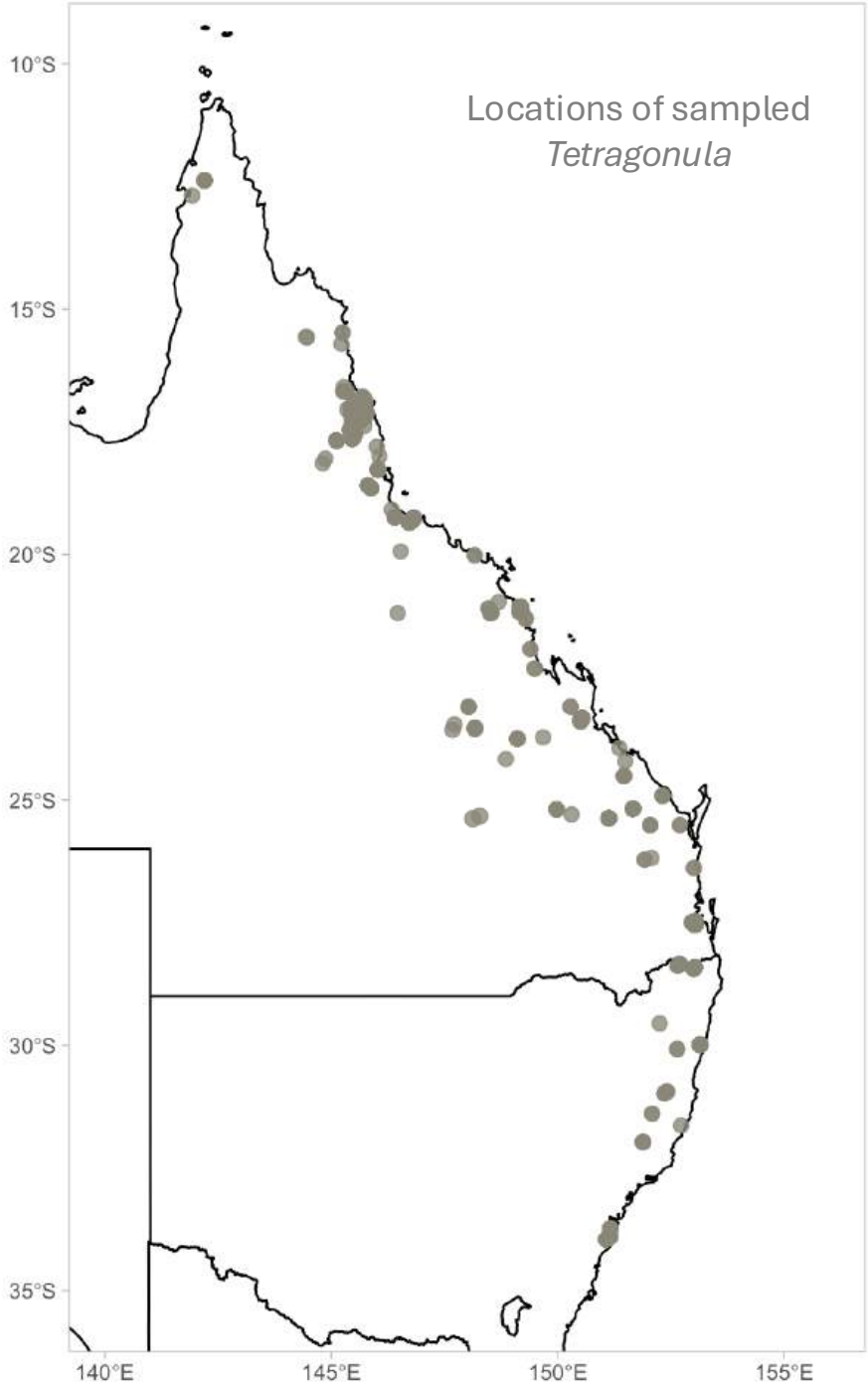
Tetragonula carbonaria

Tetragonula hockingsi

Bee Pics: T. Smith

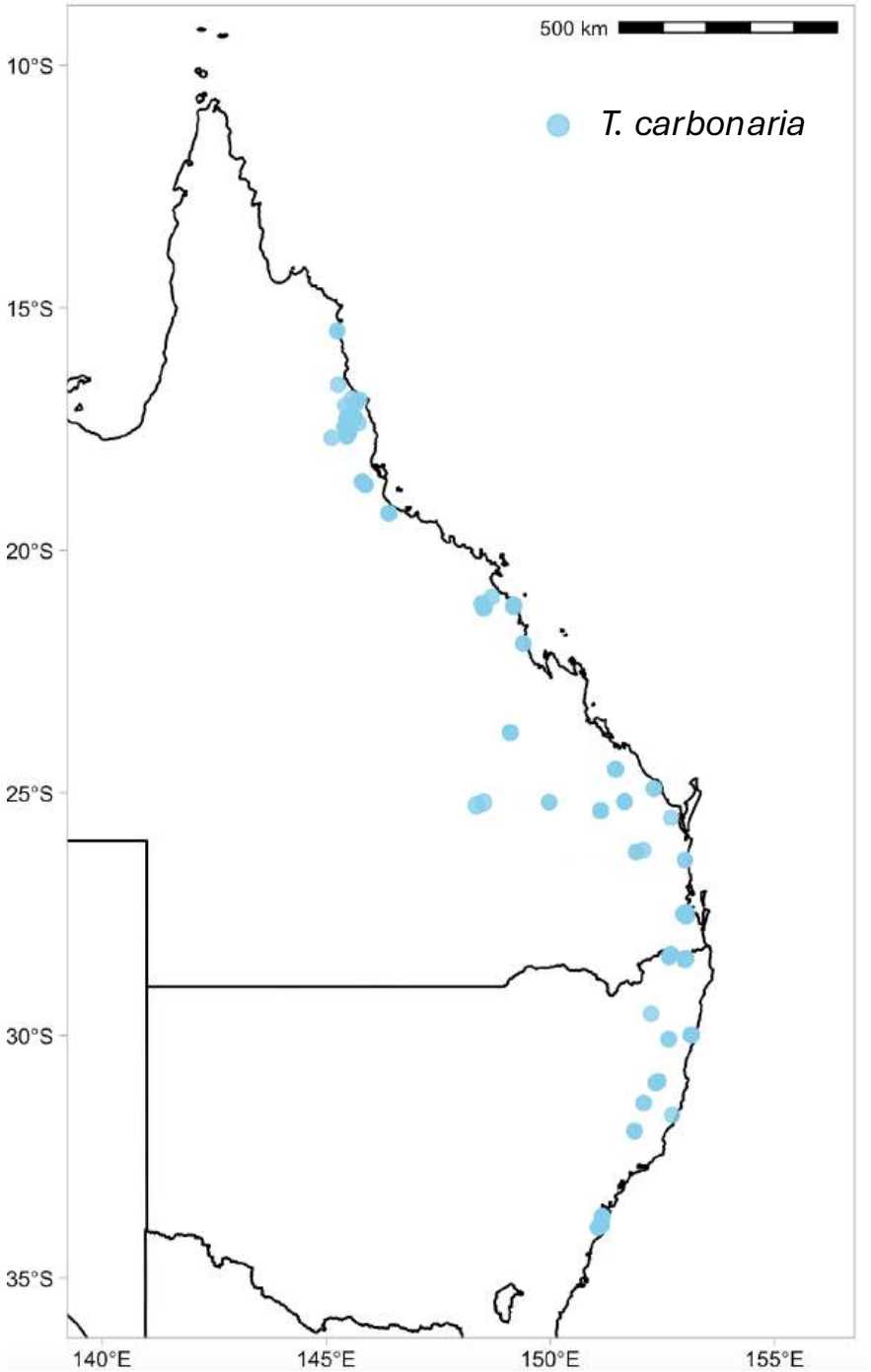
Which species occur where and why?

- >1200 *Tetragonula* samples 
- Flowers, natural nests and hives
- Species IDs using a “barcode gene”



T. carbonaria

- Coastal NSW & SE Queensland
- Mountain tops in Northern Queensland



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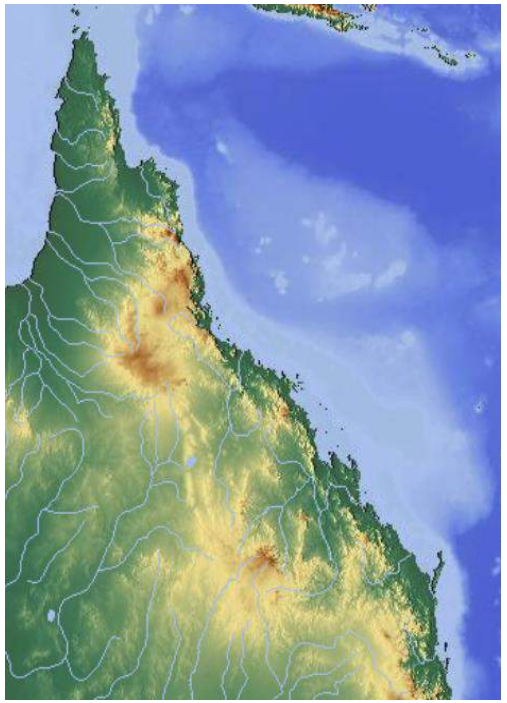
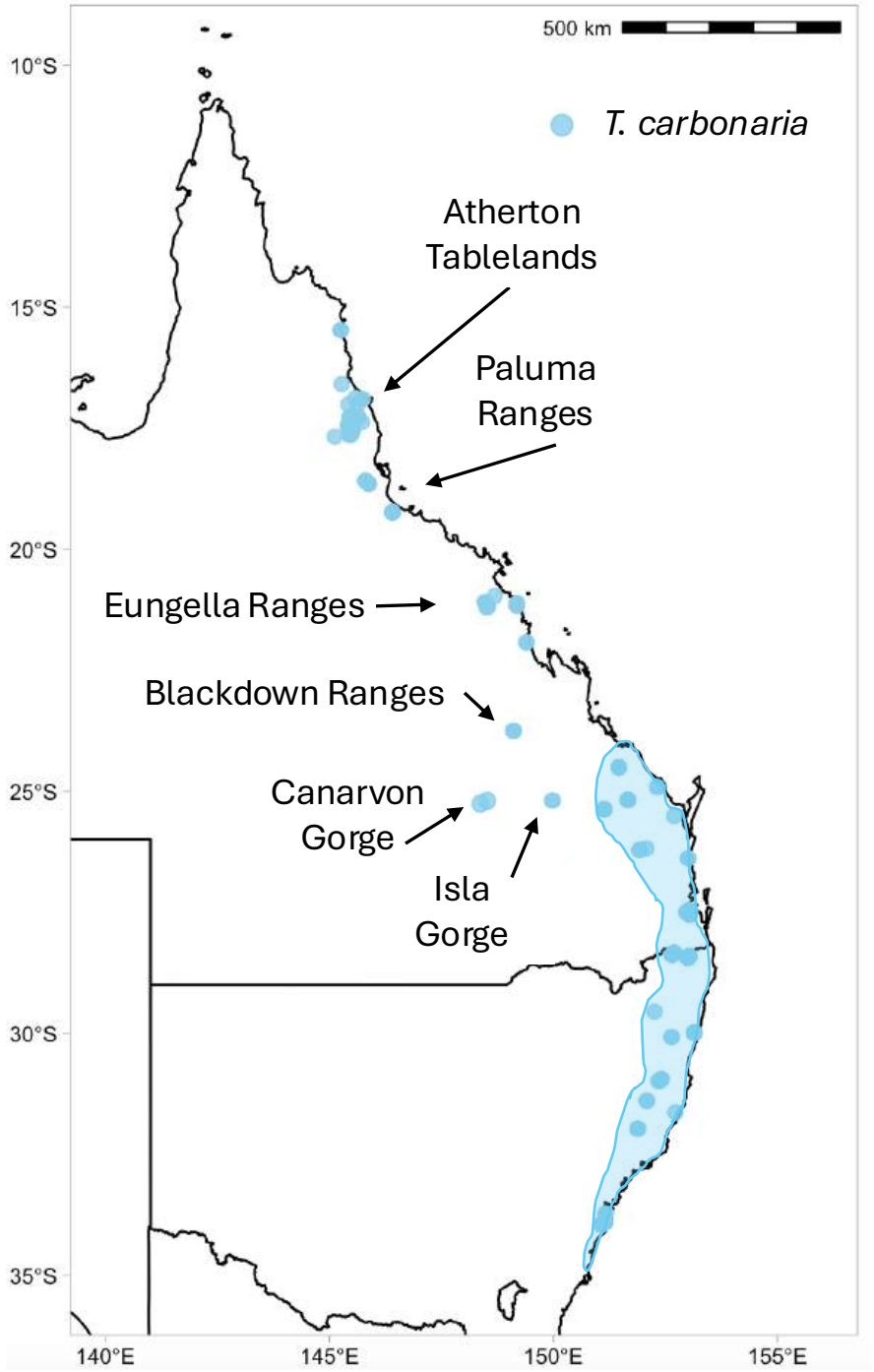
Great Dividing Range in QLD



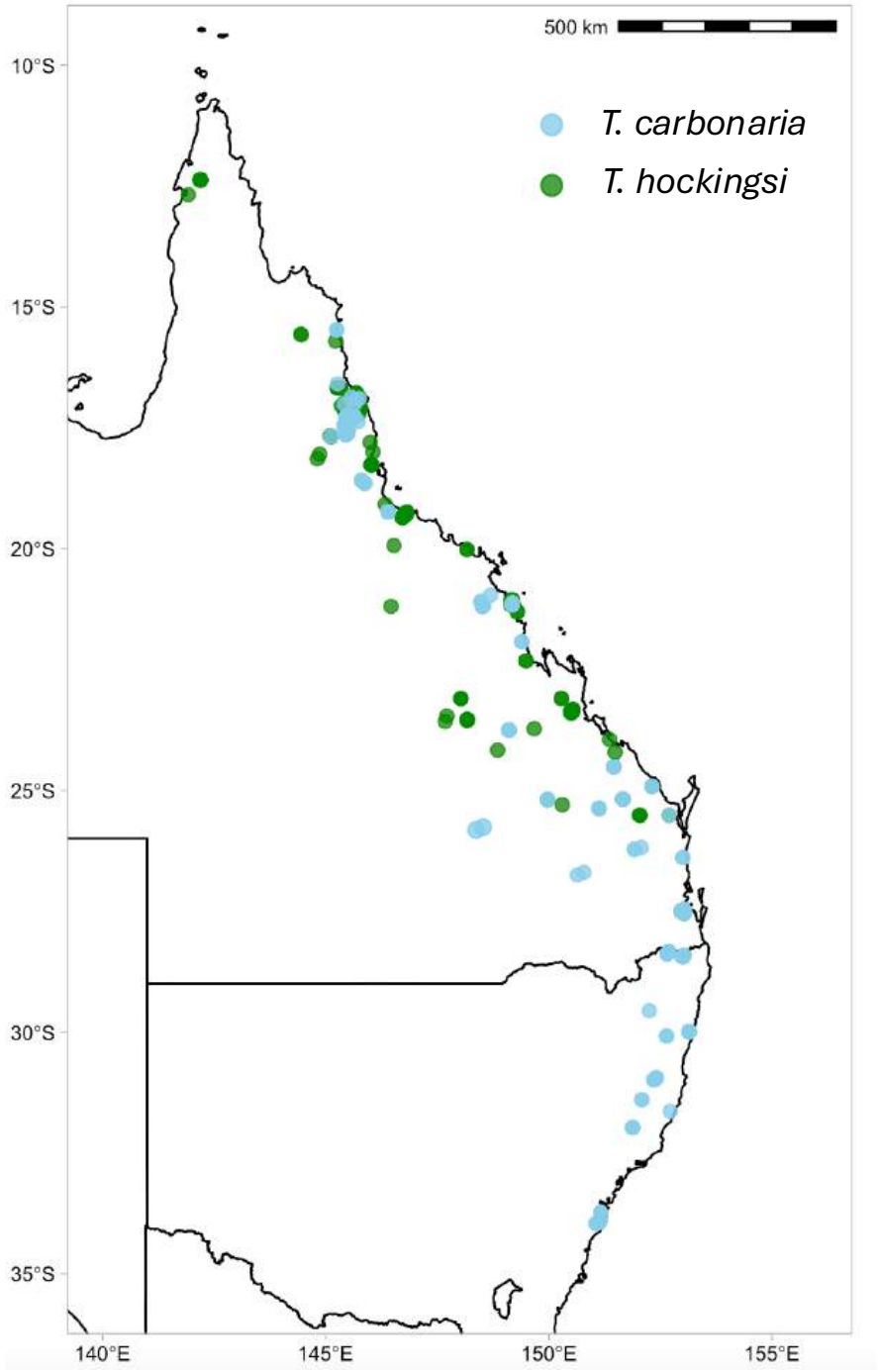


T. carbonaria

- Coastal NSW & SE Queensland
- Mountain tops in Northern Queensland

T. hockingsi

- Lowlands Queensland (mostly)



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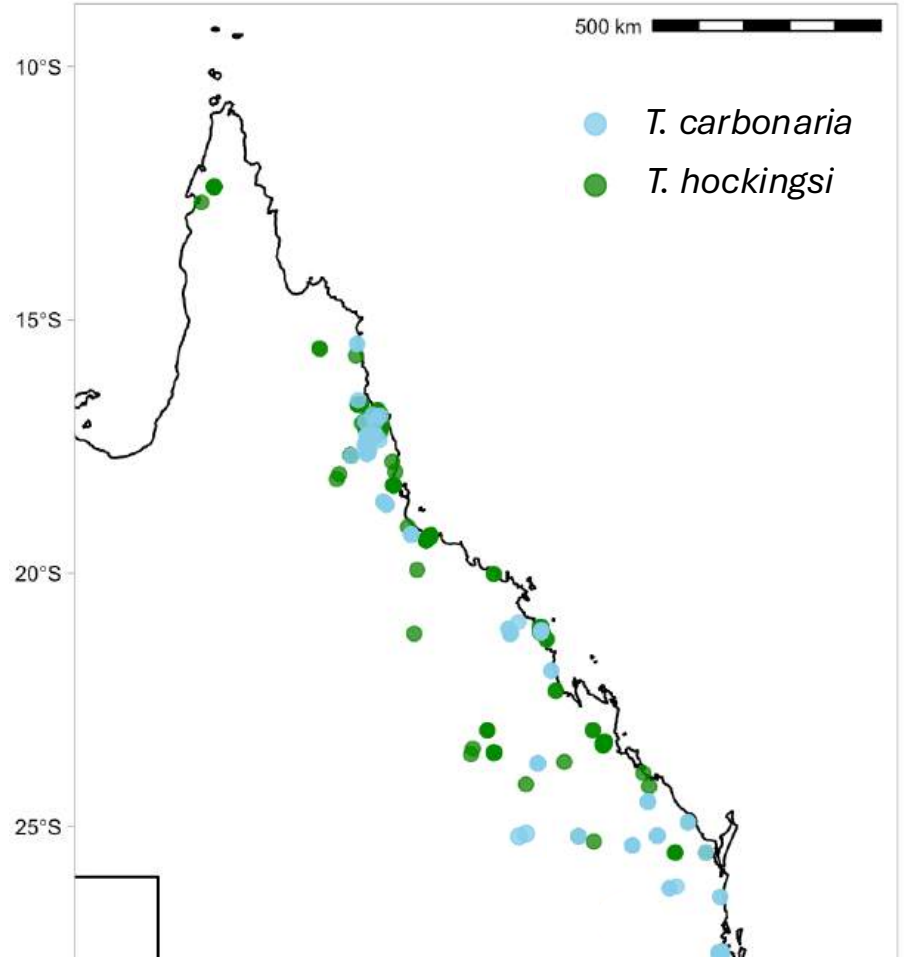
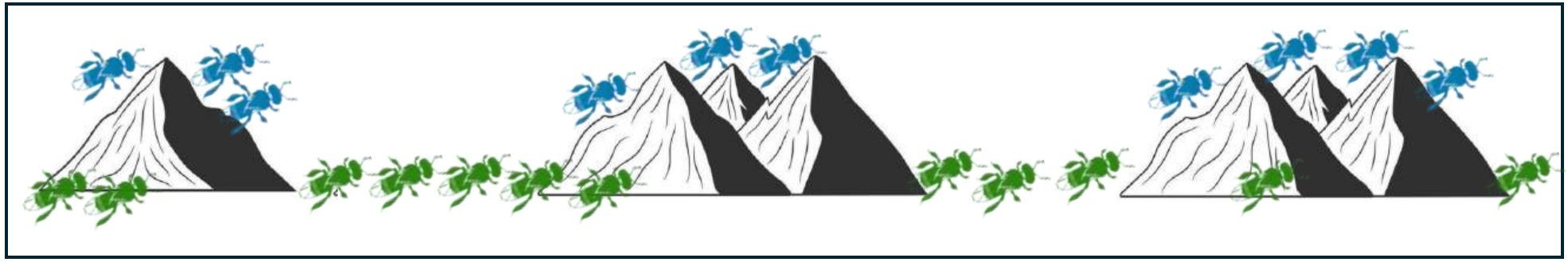
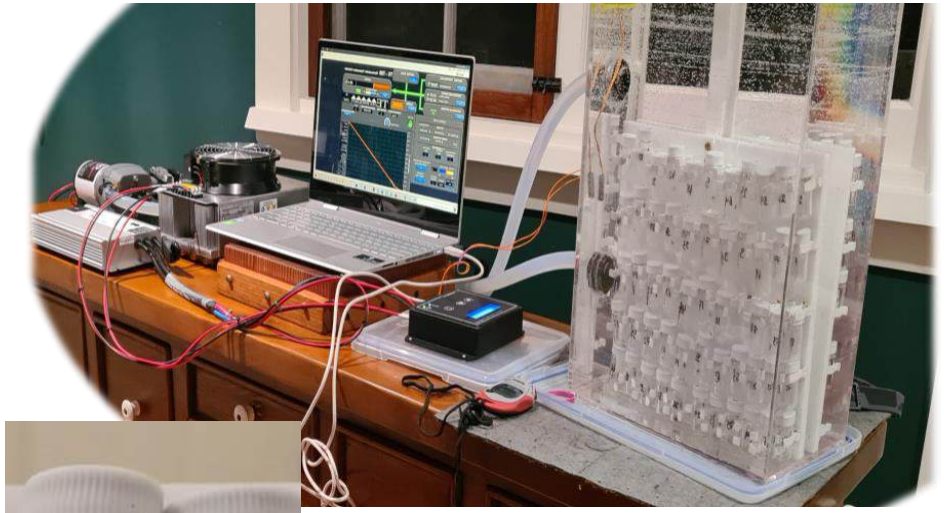


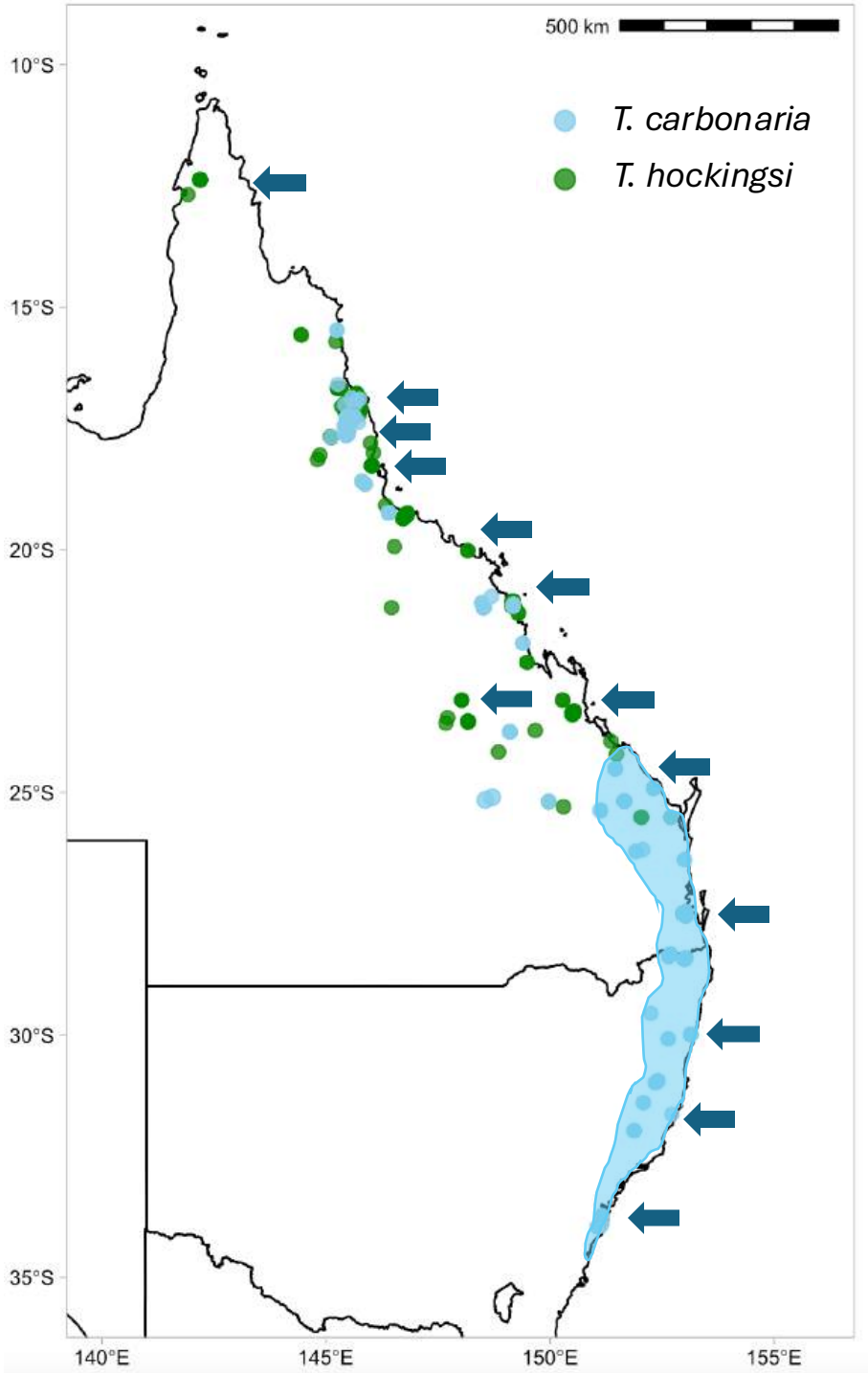


Cryptic climate specialists?

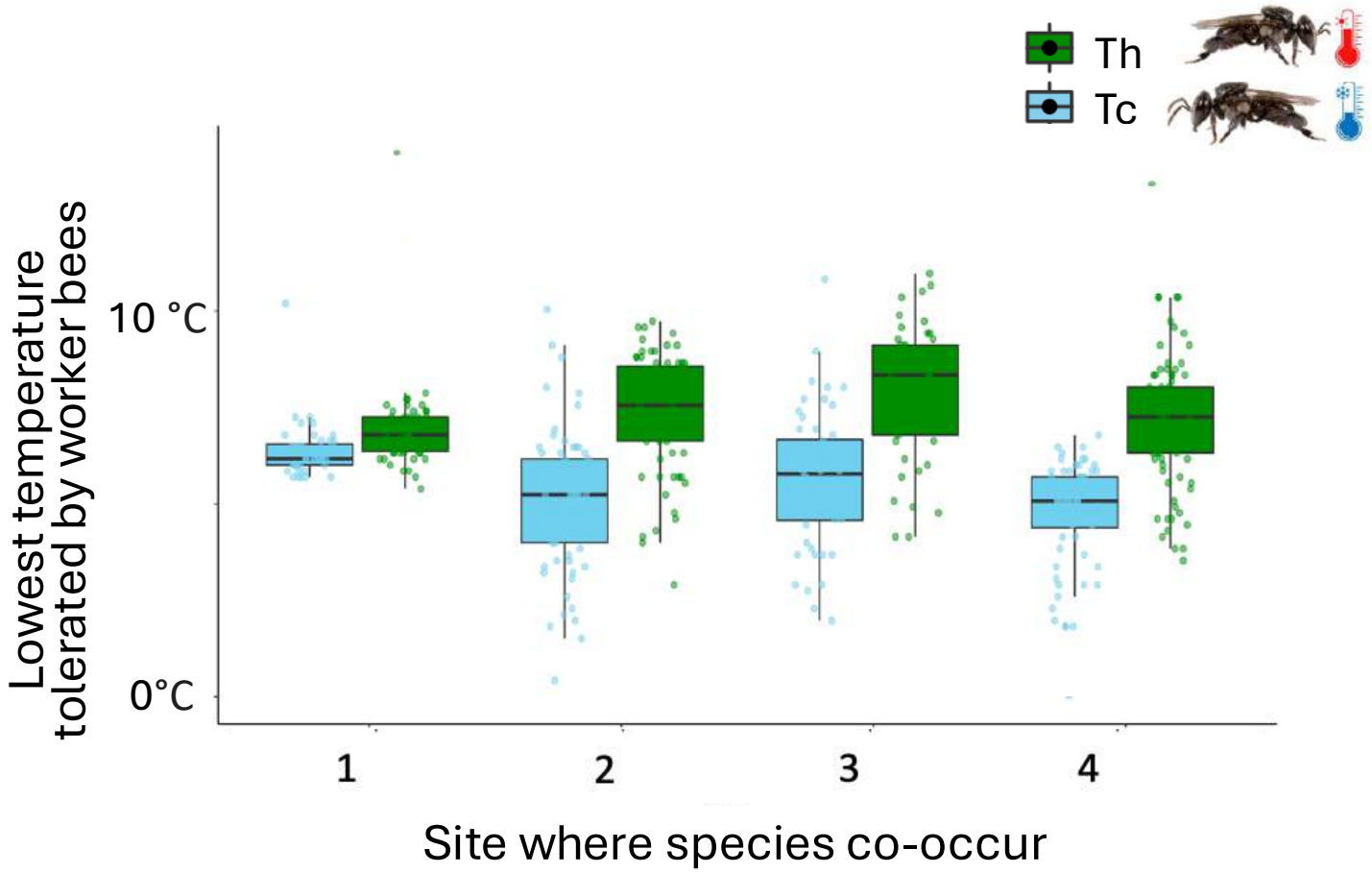
Inez Vlasich-Brennan



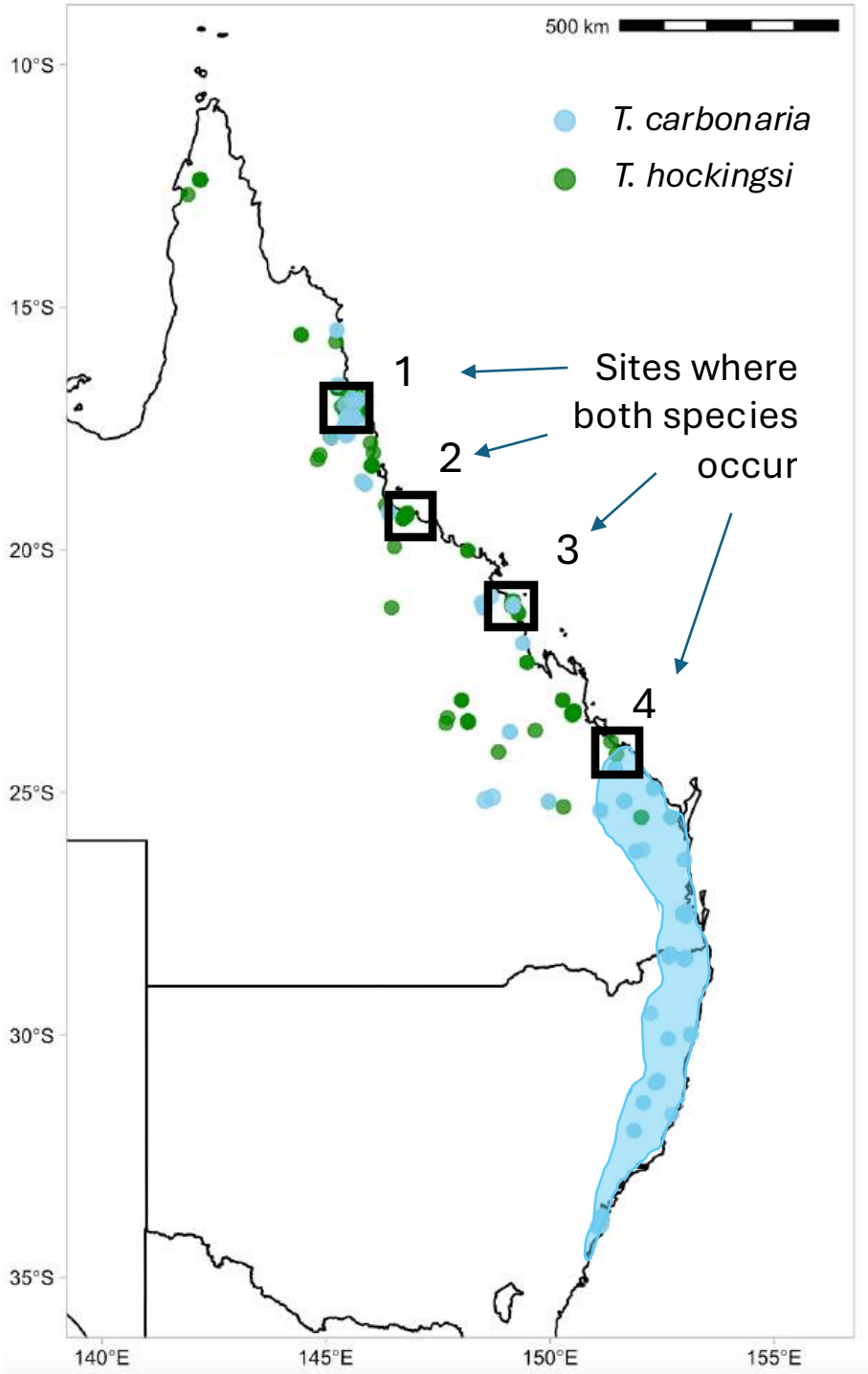
- Assayed thermal tolerance of *Tetragonula* across their East Coast ranges
- Included 4 sites where both species co-occur



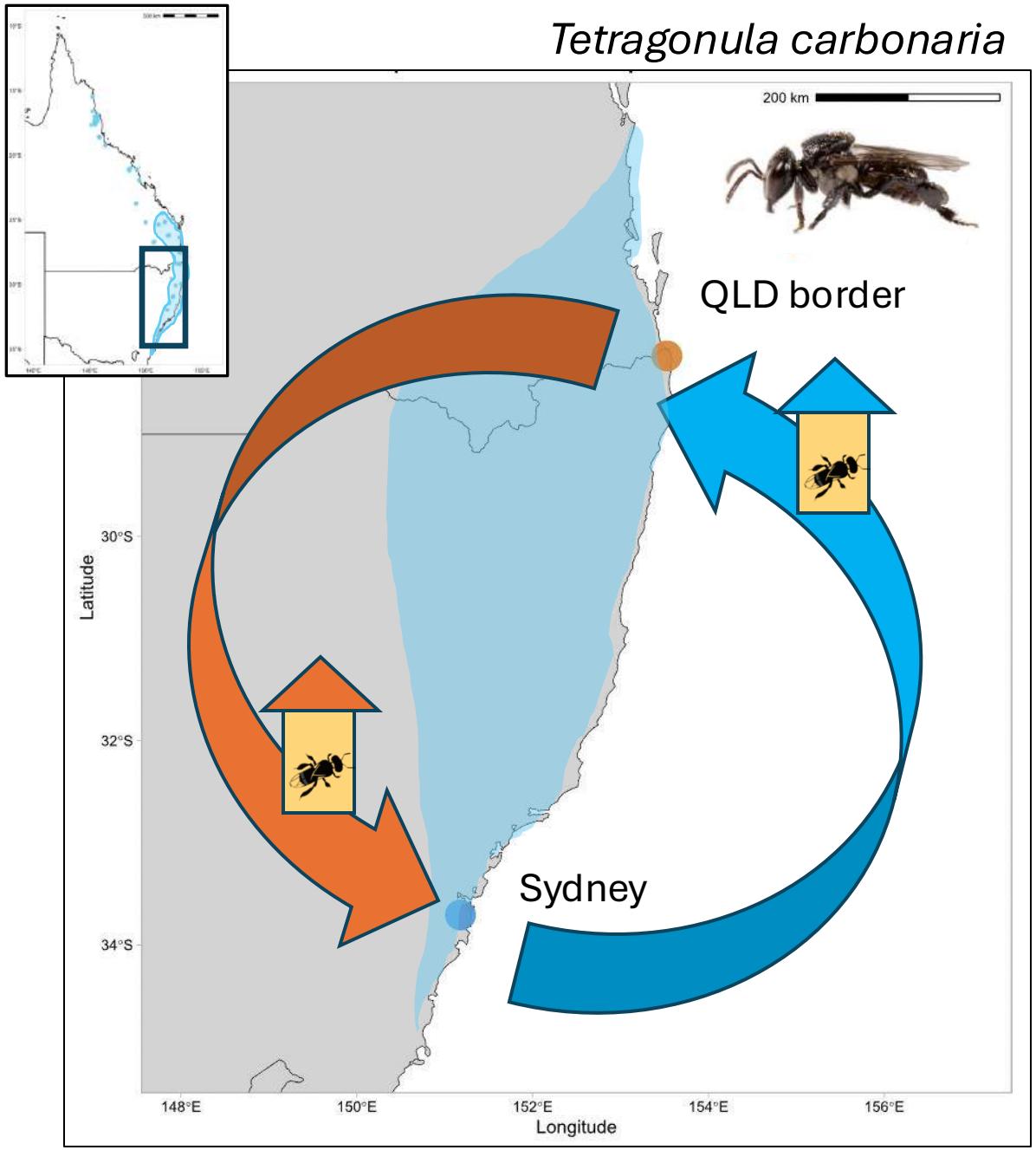
one species adapted to cooler, wetter climates and the other to warmer drier climates



➢ *T. carbonaria* more cold-tolerant than *T. hockingsi*



Tetragonula carbonaria



Inez Vlasich-Brennan

Within a species, bees also adapted to their local climate

Experiment:

- Compared heat and cold tolerance of bees originating from NSW/Queensland border versus Sydney
- 30 hives transplanted, 1 year period

Pests and diseases of honey bees are well known.....

....what about stingless bee pests?

'It's inevitable': Australian beekeepers brace for national spread of varroa mite

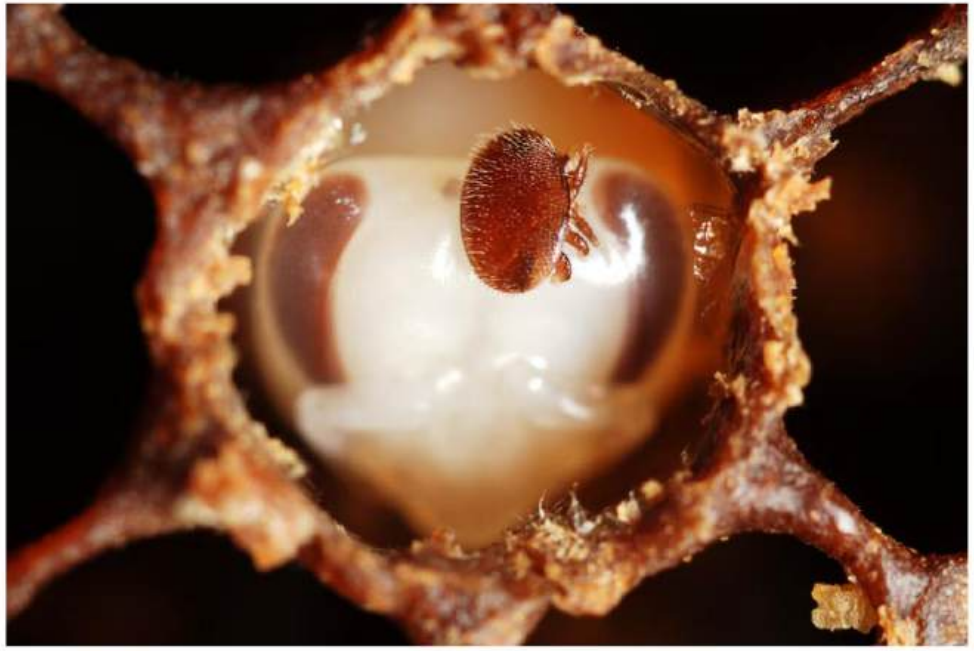
Varroa destructor mites were introduced to Australia two years ago and are expected to kill most wild European honeybees in the next five years

Varroa destructor mite detected in Queensland beehives for the first time

By Maddelin McCosker and Megan Hughes

ABC Rural | Beekeeping

Varroa mite has been found on four properties in Queensland. *(Supplied: Australian Honey Bee Industry Council)*



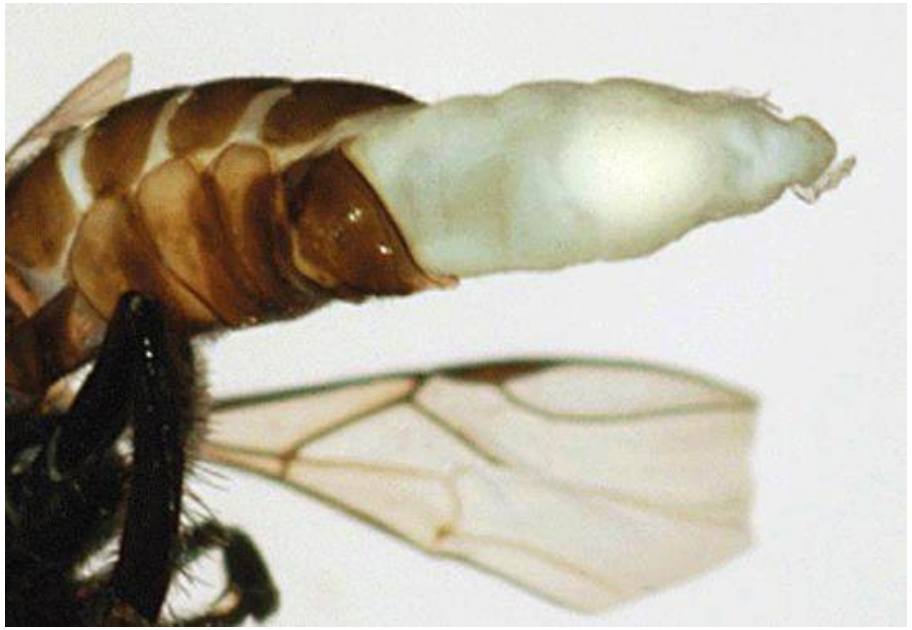
A female Varroa destructor mite on the head of its host, a bee pupa. *(Supplied: Gilles San Martin)*

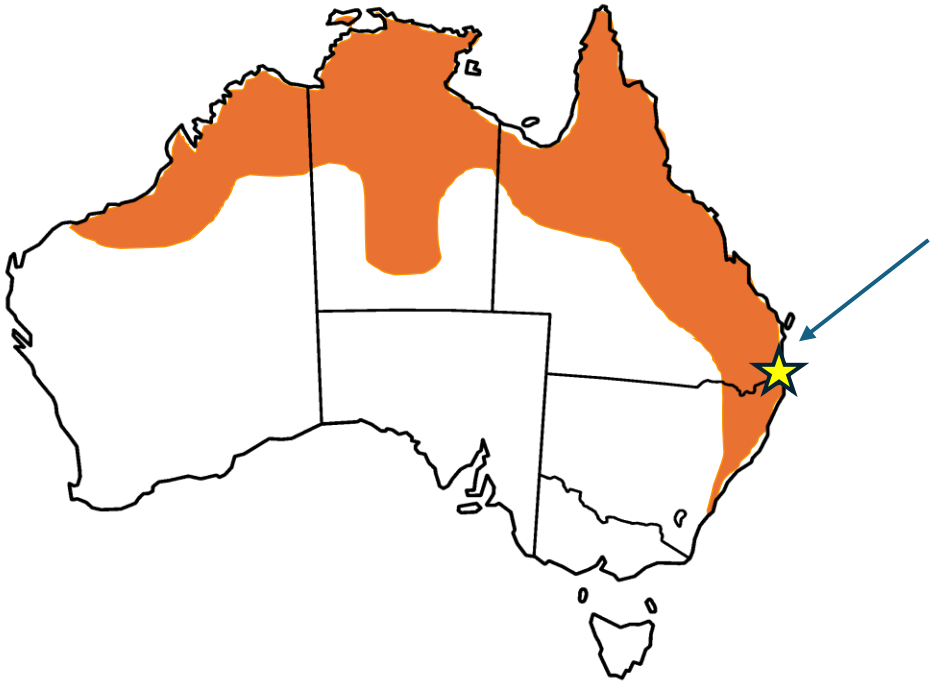
Syntretus (braconid wasp)

- parasitoid of Australia stingless bees

- Lays eggs into the abdomens of foraging workers
- Wasp larva emerges, killing host bee, pupates in soil

Syntretus (braconid wasp)





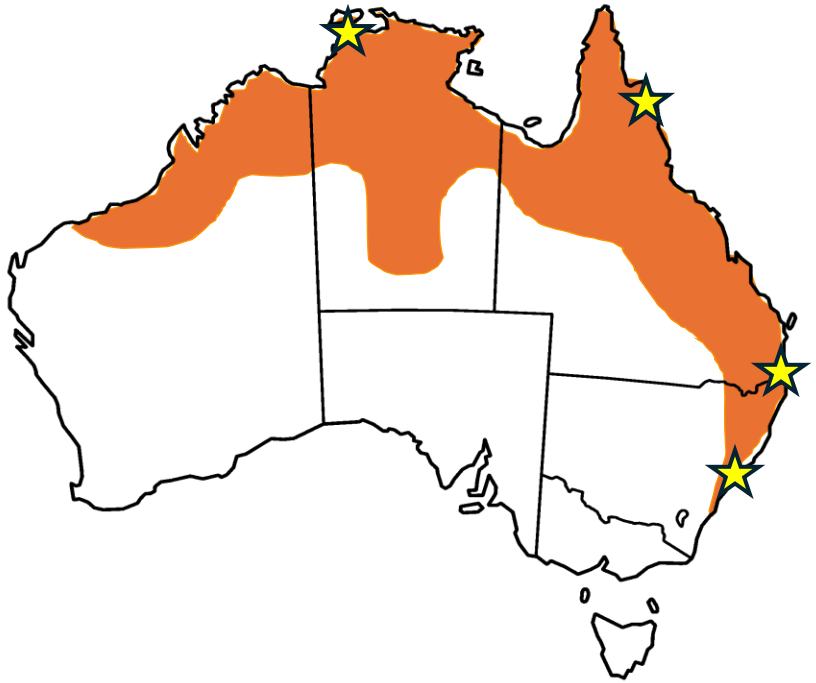
First described:
Brisbane, 2006

Austral Entomology

A new species of *Syntretus* Foerster (Hymenoptera: Braconidae: Euphorinae), a parasitoid of the stingless bee *Trigona carbonaria* Smith (Hymenoptera: Apidae: Meliponinae)

Syntretus (braconid wasp)

- not rare, just secretive!



Likely co-occurs with Tetragonula across the bee's range

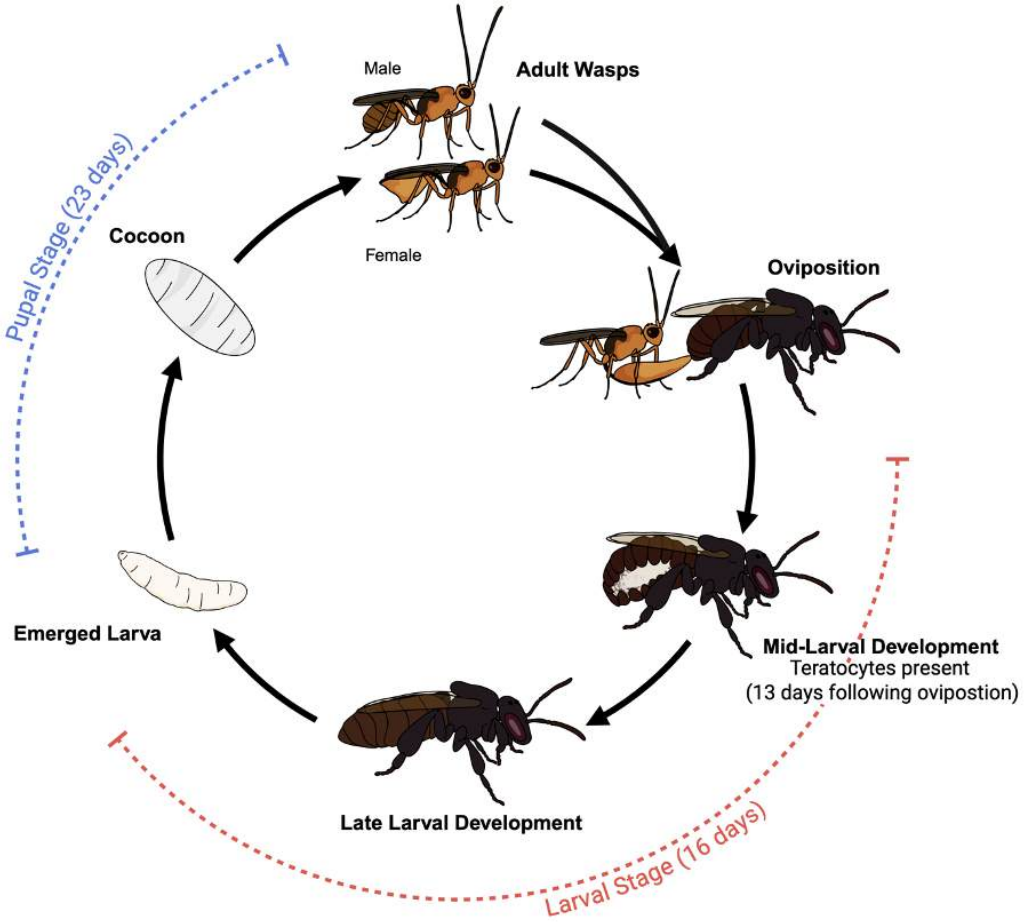
Region	Colonies Sampled	Foragers Sampled (n)	Larvae Found (n)	% Infected Foragers	
				Average (± s.e.)	Range
Far North Queensland	99	4600	60	2.46 ± 1.05	0 – 22.7%
South-East Queensland	529	36301	356	1.08 ± 0.22%	0 – 83.3%
New South Wales	328	27557	528	2.13 ± 0.38%	0 – 66.7%
Total	***966***	***68466***	***952***	***2.09 ± 0.31%***	***0 - 83.3%***

Honours student Reilly Seet

Syntretus (braconid wasp)

- infected foragers cease foraging after a few days

  (great for the wasp larva, bad for the bees!)

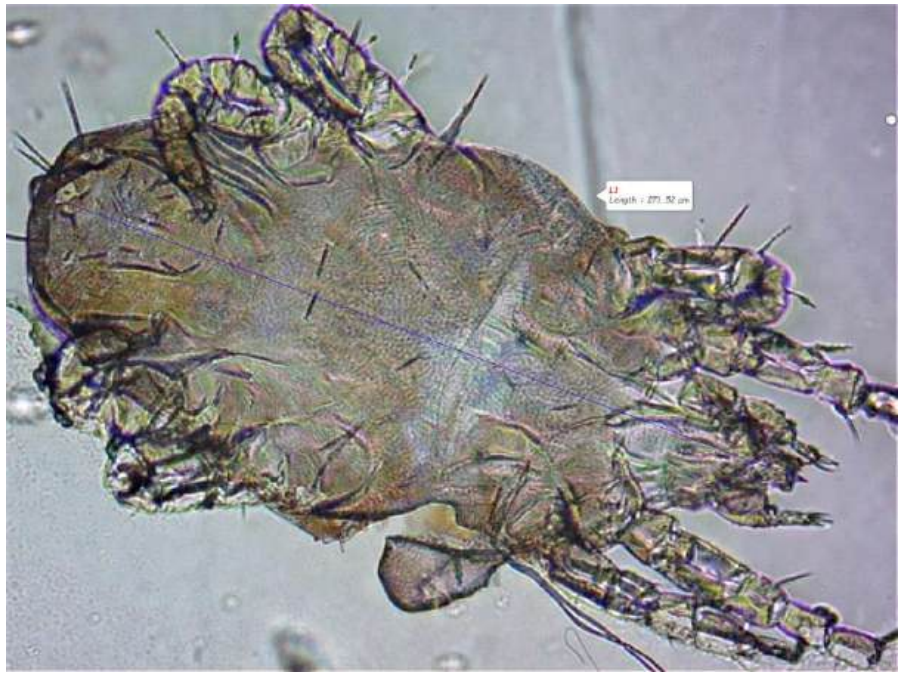


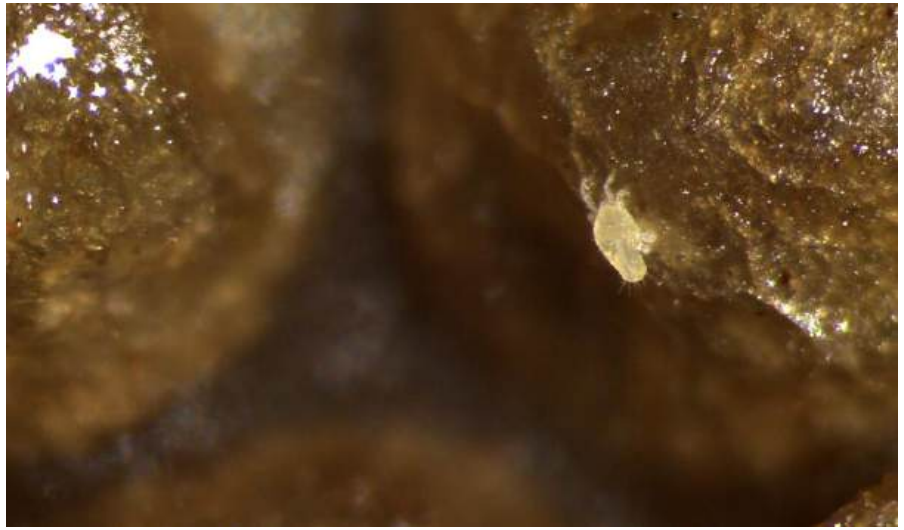
Honours student Reilly Seet experimentally exposing bees to wasps to understand changes in the behvaiour of infected bees

A tiny mite that lives inside brood cells

- *Proctotydaeus furnarius* (Owen Seeman, QLD Museum)
- Harmless? beneficial? cleans fungi from the cells?

Video: Ana Labiaga (USYD)





Images: Genevieve law (USYD)

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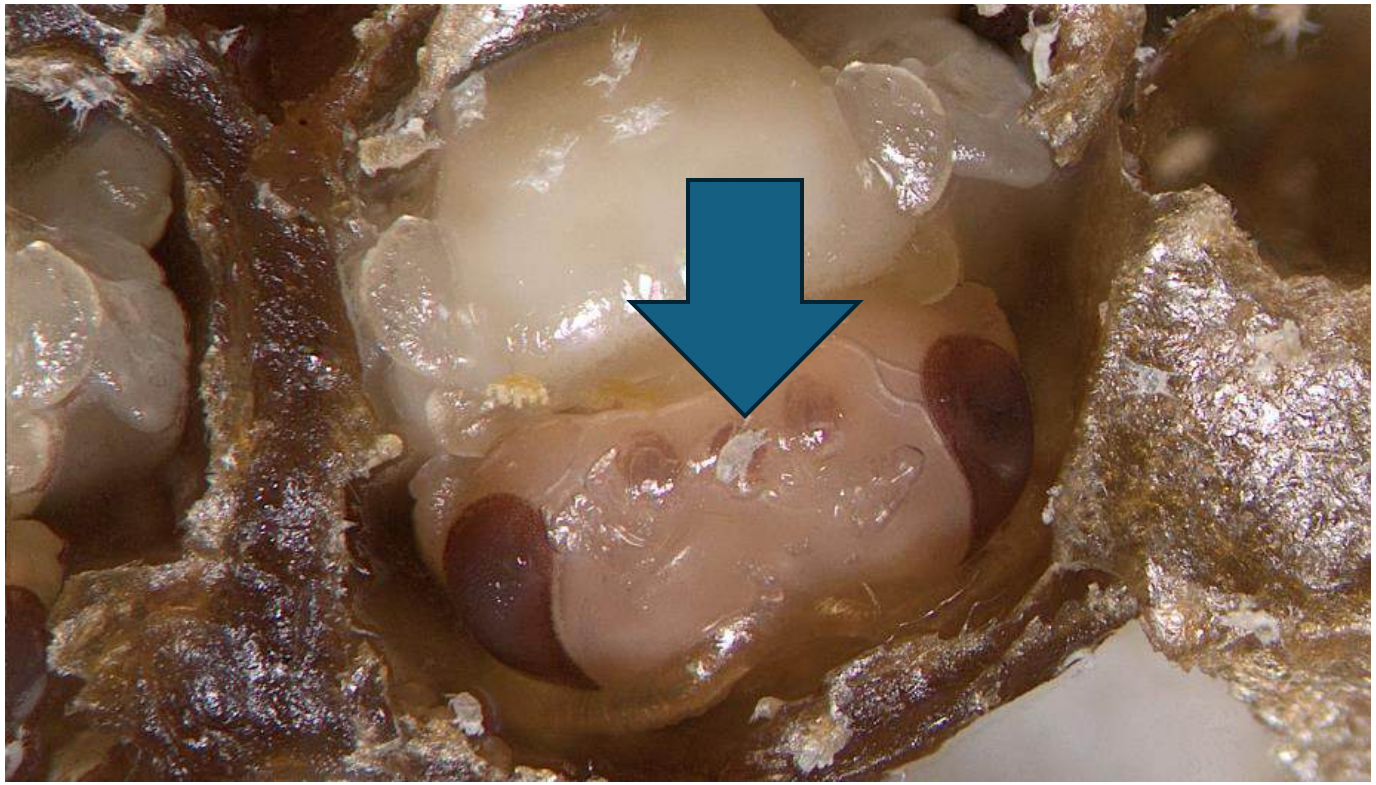
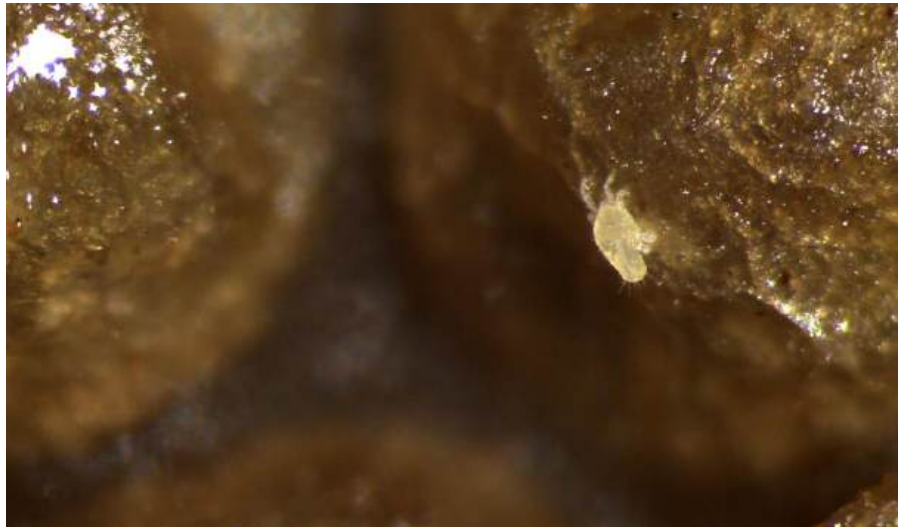


Is this mite the cleaner wrasse of the bee world?



Images: Charlotte Ling (USYD)

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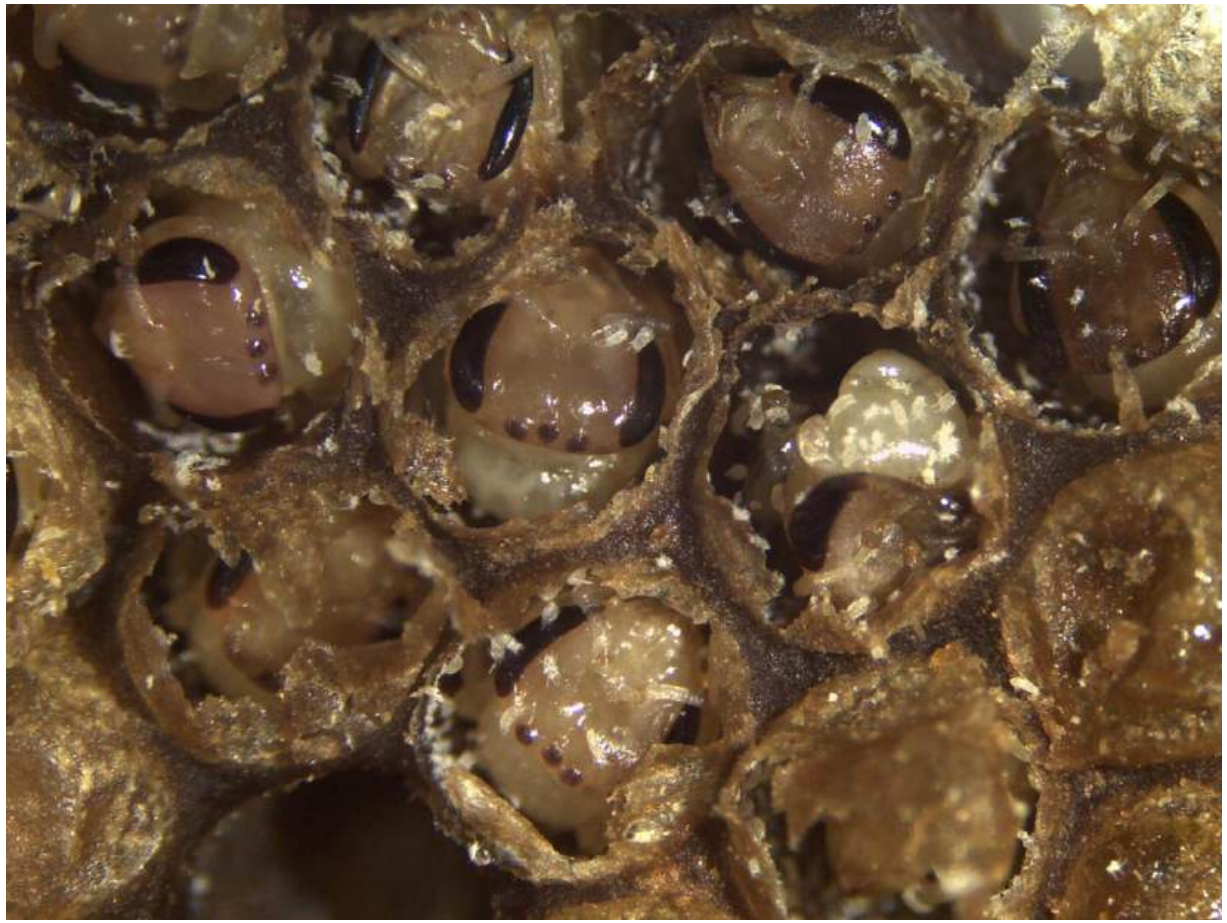
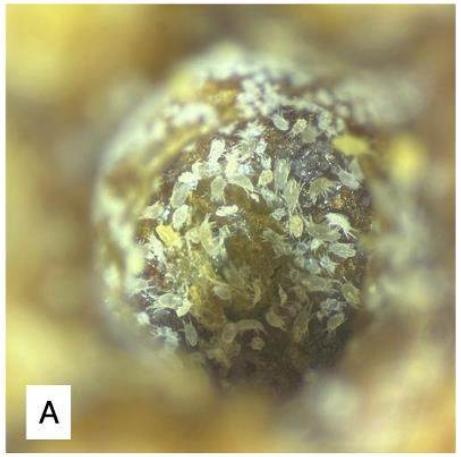
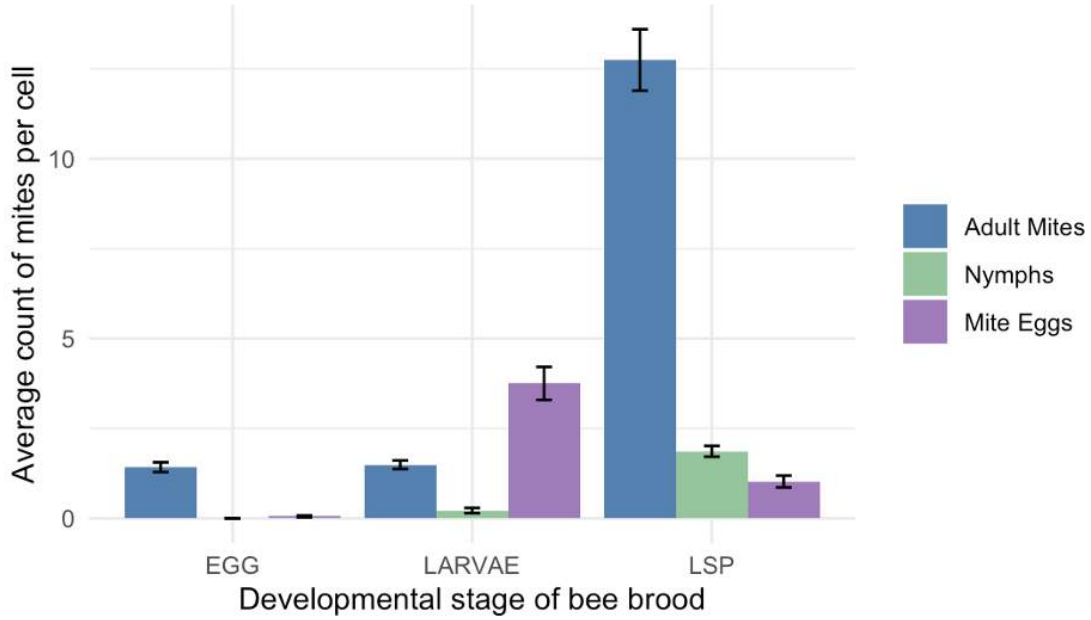


Photos and data: Charlotte Ling (USYD)





Mites breed inside the brood cells/pupal cocoons

Australia’s amazing stingless bees

- much more still to learn about their behaviour, ecology, distributions and interactions with other organisms

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- citizen scientists and bee-keepers can contribute to new knowledge with observations, samples – This includes you!

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- end goal: a future where we can keep, conserve and protect these little bees for the benefit of our natural ecosystems and ourselves

Australia's amazing stingless bees

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- end goal: a future where we can keep, conserve and protect these little bees for the benefit of our natural ecosystems and ourselves

- Keen to hear more bee science and see the bees of North Queensland?
  - Australian Native Bee Conference 2026: July 31st- August 1st, Cairns.

Acknowledgements

USYD BEE Lab

https://bee-lab.sydney.edu.au/








Reilly Seet **Inez Vlasich-Brennan** **Matt Keir (QUT)** **Estella Xia** **Francisco Garcia Bulle Bueno** **Genevieve Law** **Georgie Brennan** **Charlotte Ling**

And many collaborators including: Tim Heard, Dean Haley, Carrie Hauxwell, Owen Seeman, Matt Shaw, Alex Austin, Vanessa Kellerman, Carmen Da Silva, Ben Oldroyd, the stingless beekeepers of QLD and NSW.

Thanks also to the many talented photographers whose images appeared in this talk