Psyllids and citrus in Australia

Michael Edwards
Francesco Martoni, Mark Blacket, Paul Cunningham, Brendan Rodoni

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Hobart, Tasmania

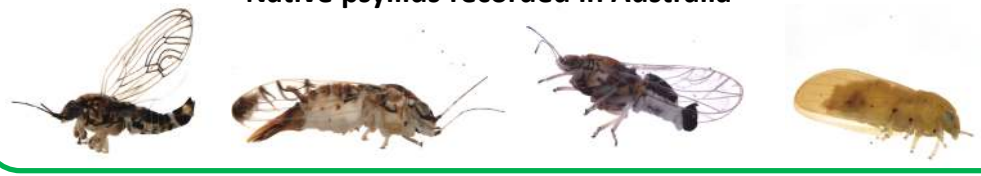
Introduction to psyllids (Hemiptera: Psylloidea) and their associated bacteria

~4000 species and 7 families

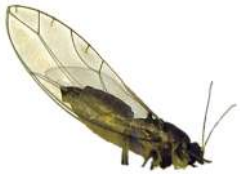
Hotspot with 6 families

FAMILIES IN AUSTRALIA
Aphalaridae Löw, 1879
Calophyidae Vondráček, 1957
Carsidaridae Crawford, 1911
Liviidae Löw, 1879
Psyllidae Latreille, 1807
Triozidae Löw, 1879

Native psyllids recorded in Australia



Can vector plant pathogenic *Candidatus* Liberibacter species - the causative agent of Huanglongbing (HLB) disease in citrus



African Citrus Psyllid (AfCP)
Image modified from S.P. van Vuuren – Citrus Research International

Asian Citrus Psyllid (ACP)
Image modified from S.P. van Vuuren – Citrus Research International

Exotic pest citrus psyllids
not present in Australia

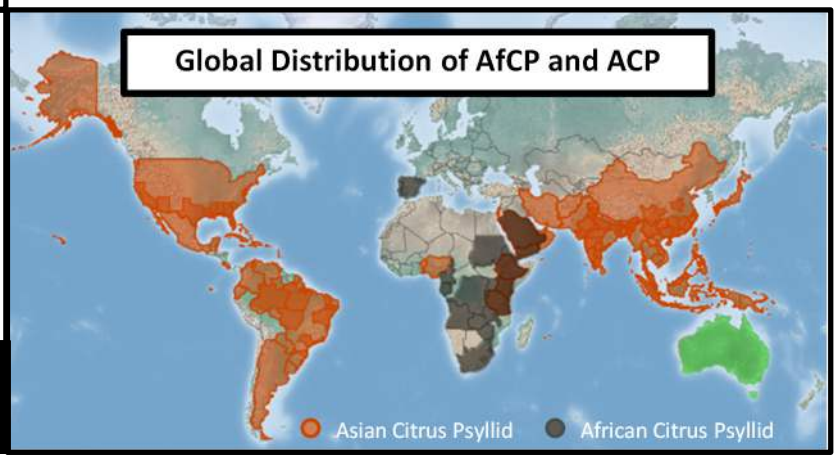


Image modified from CABI, 2024. CABI Compendium. Wallingford, UK: CAB International.

No native Australian psyllids have been recorded to feed on citrus

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Aims & objectives

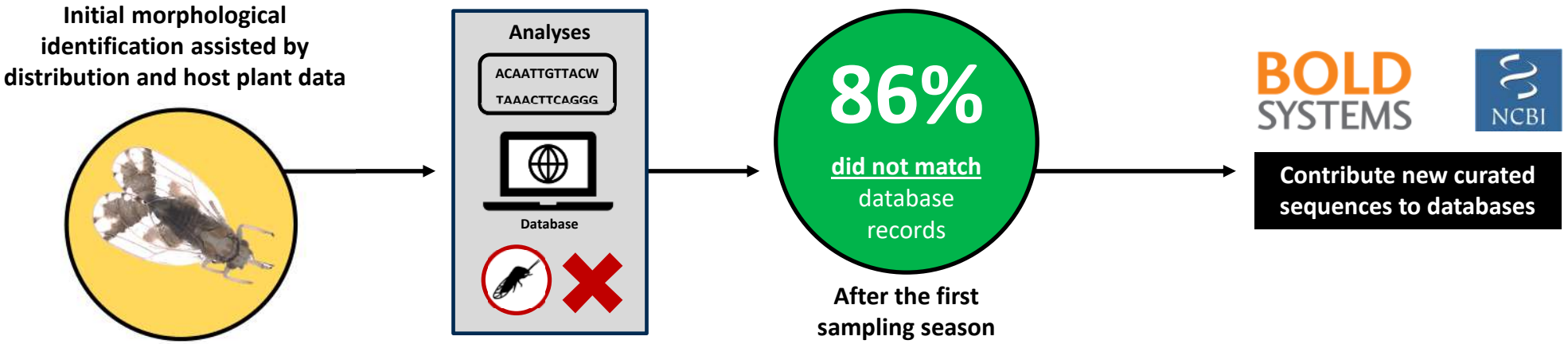
Project aim

Improve Australia's biosecurity preparedness towards exotic psyllids by assessing the native diversity of psyllids in and around citrus orchards in eastern Australia

Project objectives

a) Use an Integrative Taxonomy approach to assess psyllid diversity and improve genetic database records

b) Compare collection methods



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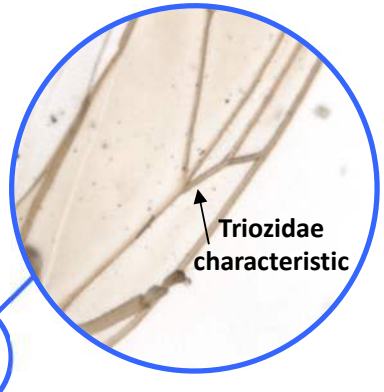
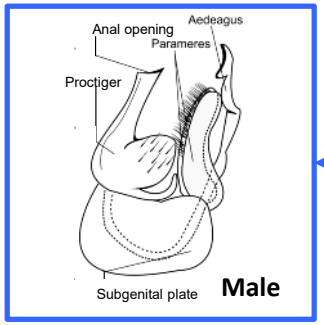
Integrative Taxonomy approach to psyllid identification

- **Morphological examinations**
- **Ecological and distribution data (i.e., host plant information)**
- **Non-destructive COI barcoding of psyllids**





GENERA AND FAMILIES OF PSYLLIDS IN AUSTRALIA

Anoeconeossa
Family: Aphalaridae
QLD 2023, M. Edwards

Anomalopsylla
Family: Aphalaridae
NSW 2023, M. Edwards

Cecidopsylla
Family: Aphalaridae
NSW 2023, M. Edwards

Colophorina
Family: Psyllidae
NSW 2023, M. Edwards

Protyora
Family: Carsidaridae
QLD 2023, M. Edwards

Undescribed genus
Family: Triozidae
VIC 2023, M. Edwards

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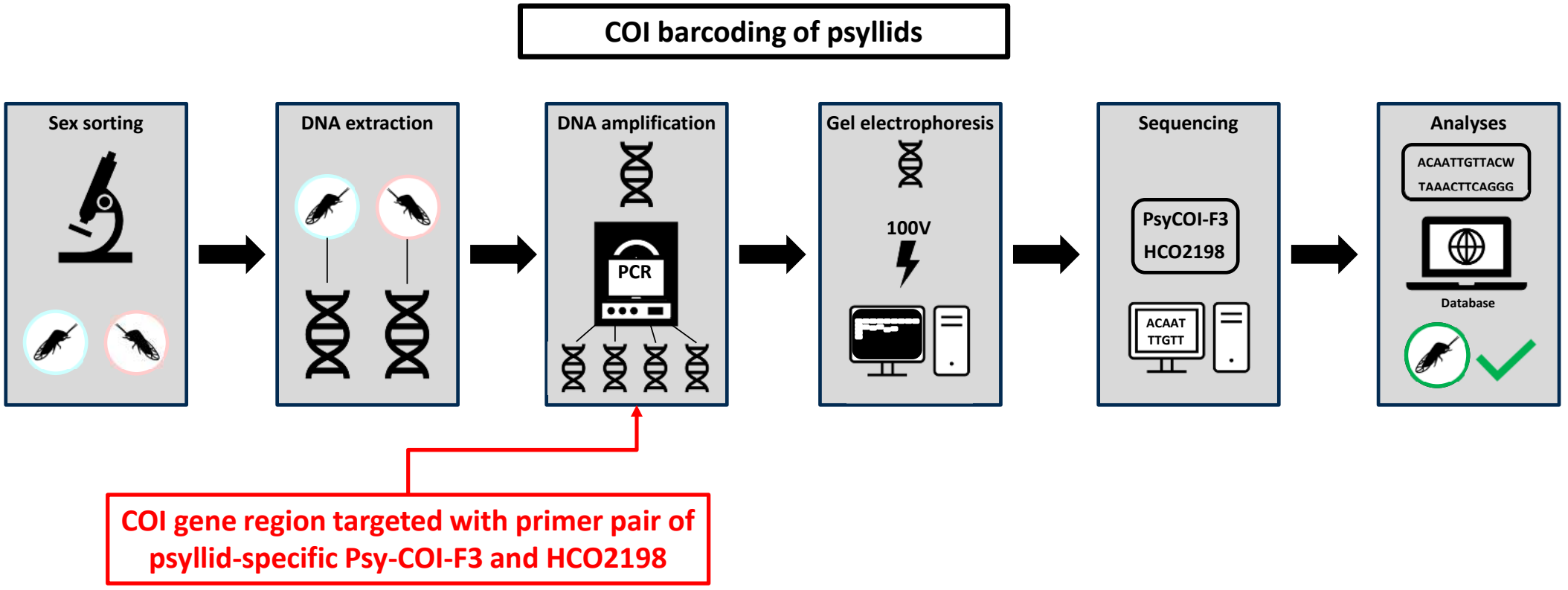
Integrative Taxonomy approach to psyllid identification



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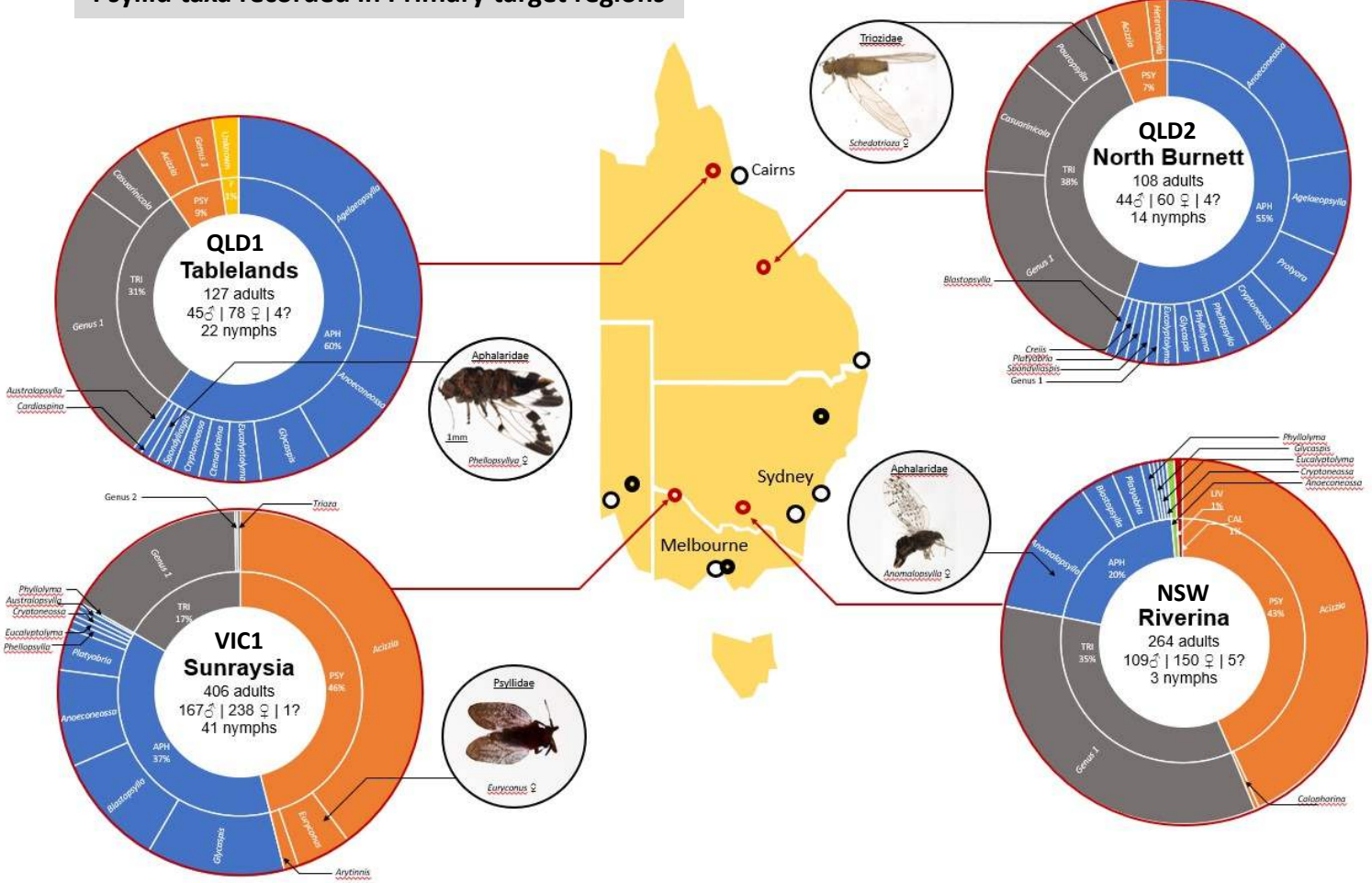
Overall results: First season of biodiversity by morphology

Psyllid taxa recorded in Primary target regions



565 populations of psyllid

>2500 individual adult psyllids

5 families known in Australia

FAMILIES RECORDED

- Aphalaridae (APH)
- Carsidaridae (CAR)
- Liviidae (LIV)
- Psyllidae (PSY)
- Triozidae (TRI)
- Unknown (?)

Asian Citrus Psyllid (ACP)
Family: Psyllidae

African Citrus Psyllid (AfCP)
Family: Triozidae

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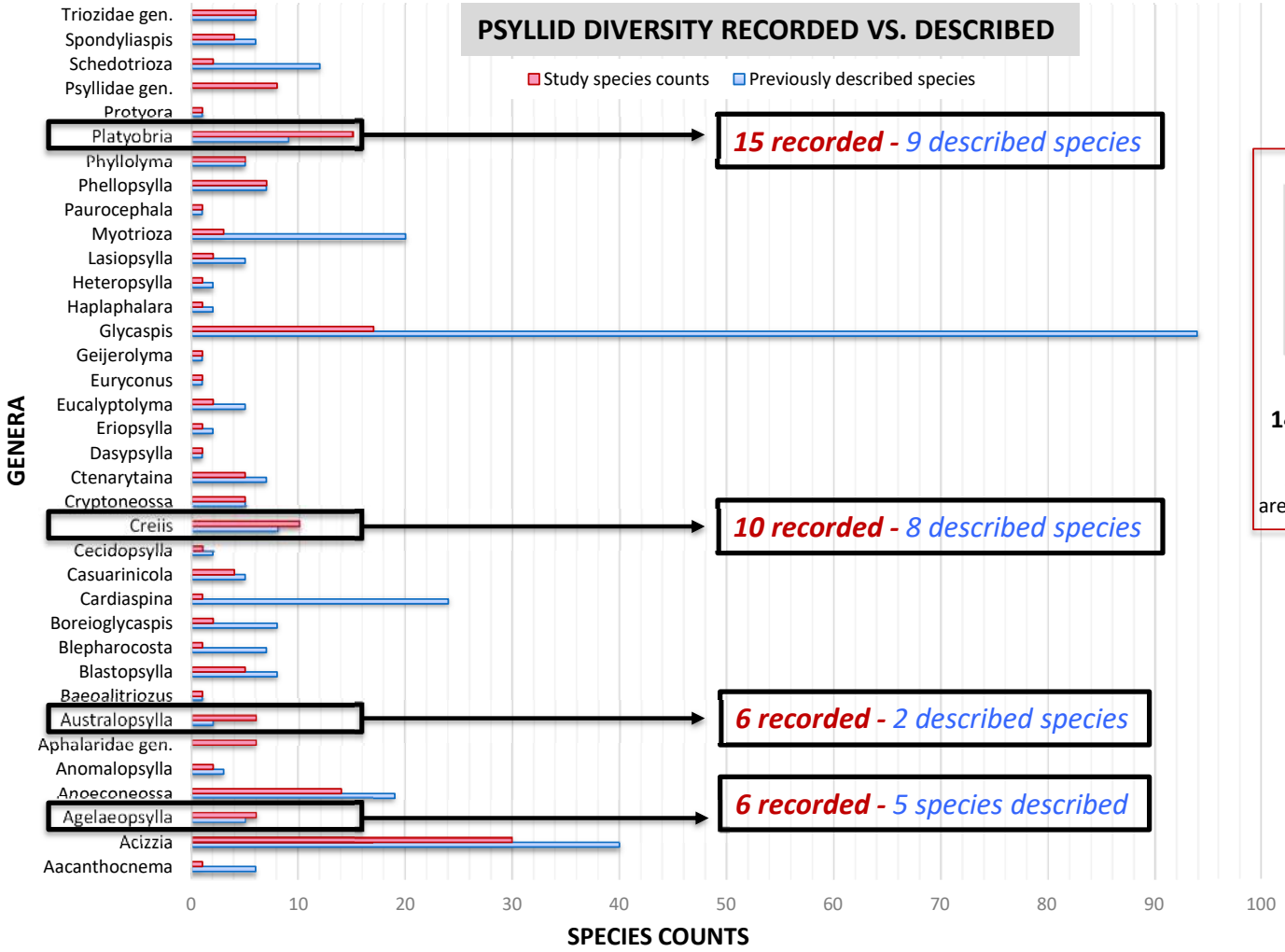
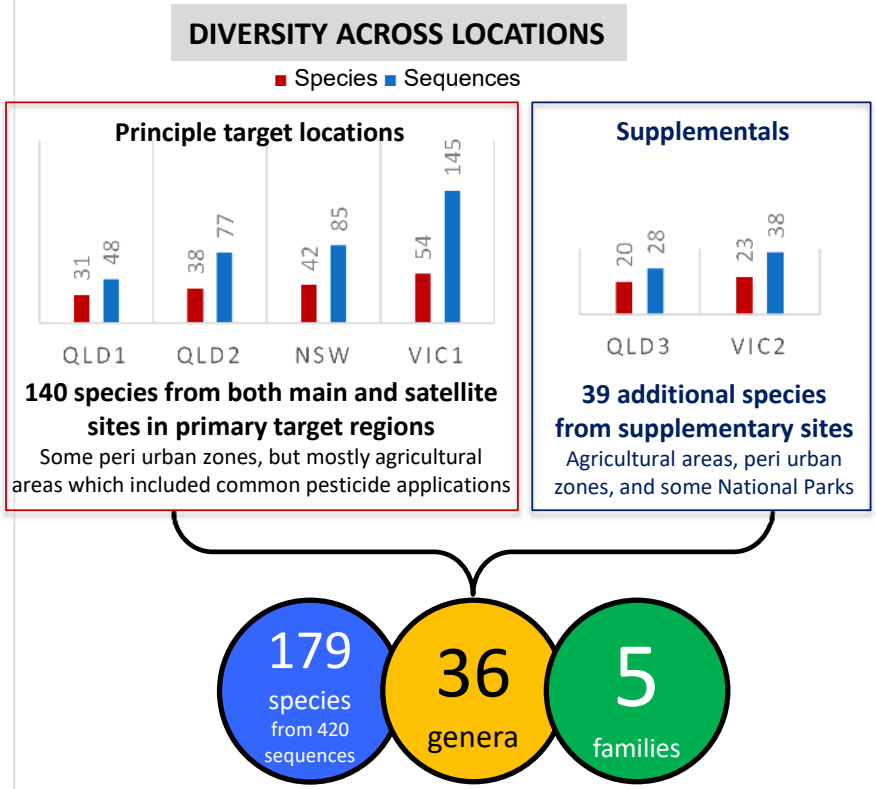
Overall results: Biodiversity from two collection seasons after COI barcoding





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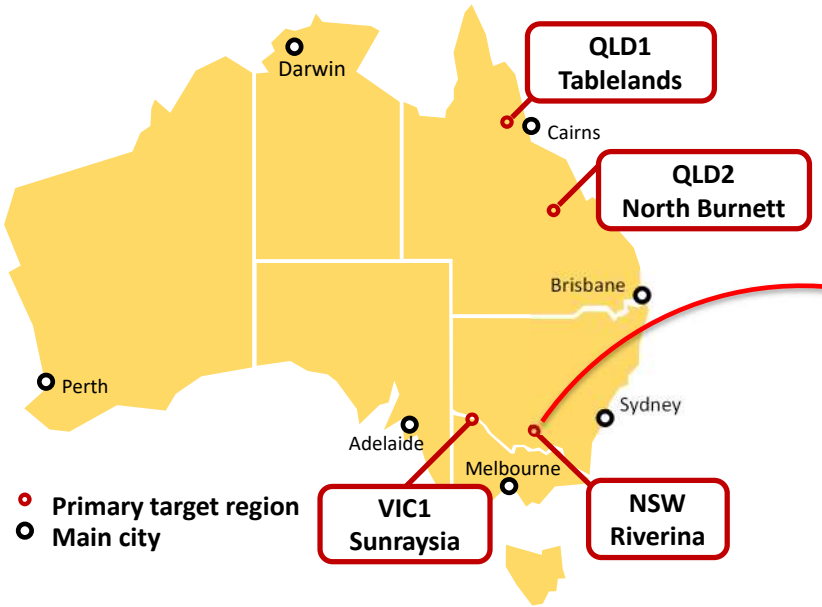
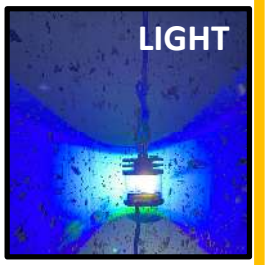
Trap comparison experimental design

Study design for collecting psyllids



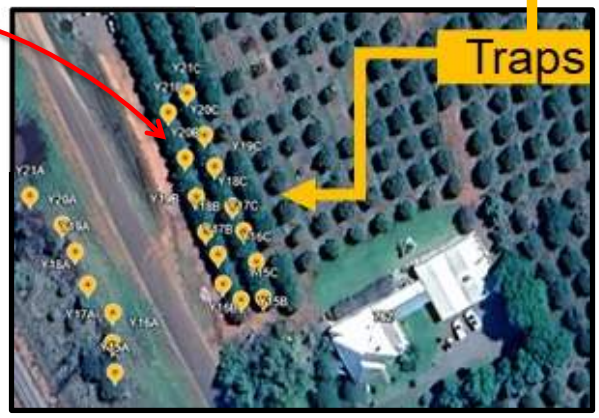
3-hour sessions



2 events per trip

7-day deployment

7-day deployment



Pan and yellow sticky traps (YSTs) deployed in a grid-like pattern within 2 metres of each other

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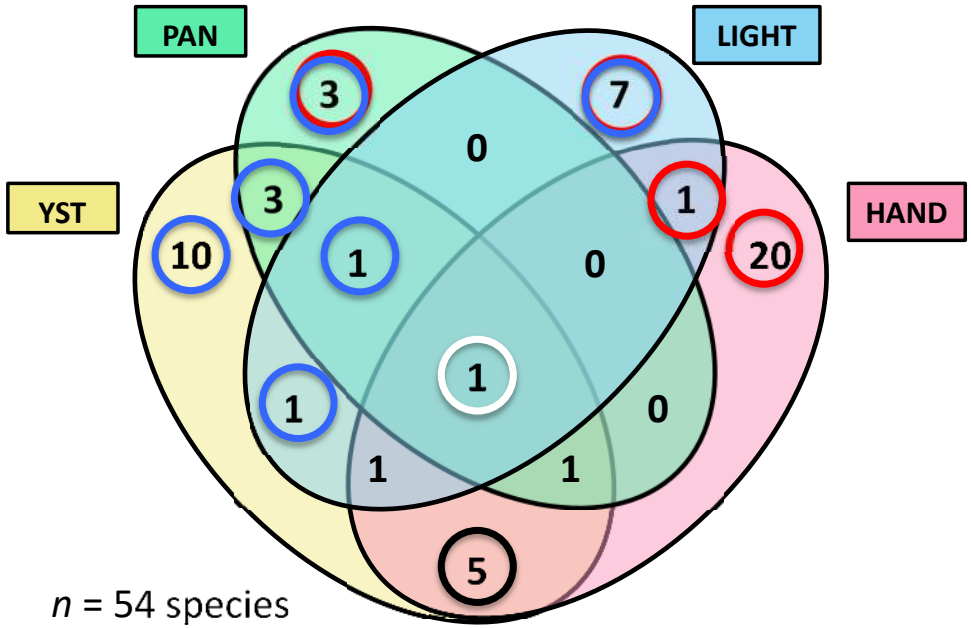
Experiment results: Comparing collection methods

COLLECTION METHODS IN MAIN SITES



n = 54 species
(excludes satellite sites)

SPECIES FROM MAIN SITES

LOCATION	TOTAL SPECIES	YST	PAN	LIGHT	HAND	>1 METHOD
QLD1 (Tablelands)	5	4	1	0	1	1
QLD2 (North Burnett)	18	4	4	4	8	2
NSW (Riverina)	12	4	0	1	9	2
VIC1 (Sunraysia)	19	10	4	7	11	7

Species composition: HAND = 53.7%; LIGHT = 22.2%; PAN = 16.6%; YST = 40.7%;

One species recorded using all collection methods

5 species recorded from both hand collection and YSTs

YST alone could have missed 31 species (~57%)

Hand sampling alone could have missed 25 species (~46%)

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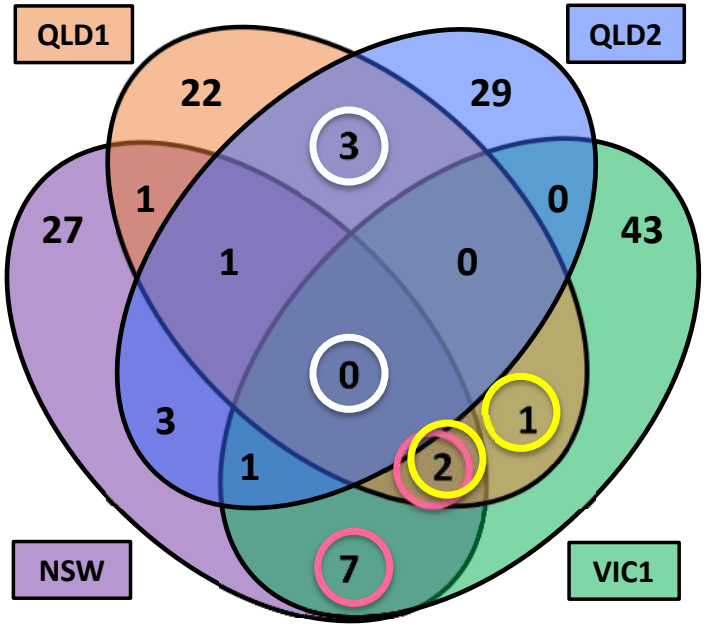
Experiment Results: Locations and diversity

SPECIES COMPOSITION ACROSS PRIMARY REGIONS



n = 140

(includes main and satellite sites)

SPECIES IN PRIMARY REGIONS

● *Main site* ● *Satellite sites*

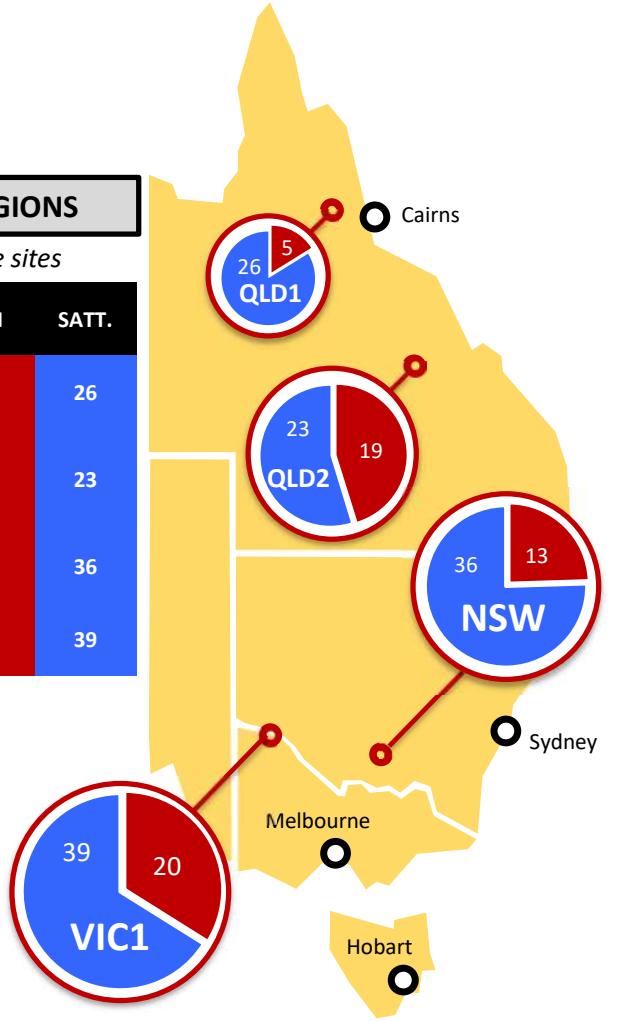
LOCATION	TOTAL SPP.	MAIN	SATT.
QLD1 (Tablelands)	30	5	26
QLD2 (North Burnett)	37	19	23
NSW (Riverina)	43	13	36
VIC1 (Sunraysia)	54	20	39

Three recorded in both QLD1 and QLD2

No species were recorded in all sites

Same species recorded in nearby sites

Same species recorded in distant sites



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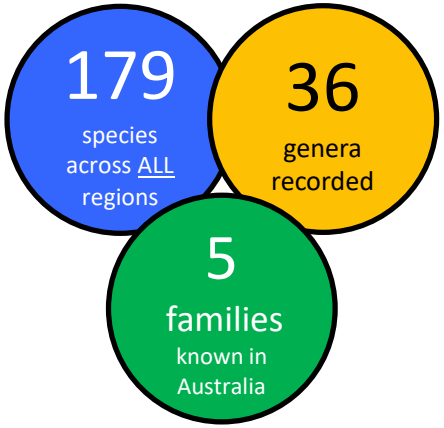
Summary

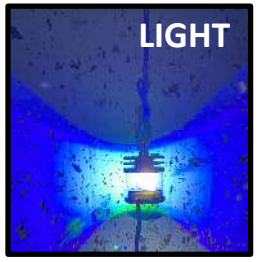
OBJECTIVE 1 - BIODIVERSITY

- Diversity recorded so far is 179 species from 36 genera and 5 families
- Approximately 86% of species did NOT match sequences on genetic databases to species level
- **For several genera, we have recorded a high number of undescribed species suggesting the number of psyllid taxa present in Australia is higher than what is currently recorded**



OBJECTIVE 2 – TRAP COMPARISON

- The best approach to capture the most diversity is to integrate collection techniques, which could be suitable for researchers
- The most 'practical' approach to collect psyllids for growers would involve a combination of hand collecting and YSTs



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Next steps of the project

16S metabarcoding of psyllids to reveal bacterial compositions

Improve the reference sequence databases !

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Thank you

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Image adapted from Plant Health Australia (PHA), 2014. *Biosecurity manual for citrus producers.*

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Citrus Australia

Plant Health AUSTRALIA

Michael Edwards
psyllid seeker
michael.l.edwards@agriculture.vic.gov.au

Feel free to contact me with any questions

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