



The identification and detection of psyllid vectors of '*Candidatus Liberibacter solanacearum*' in suction traps

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Outline

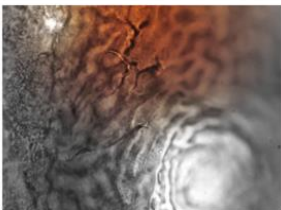
Science and Advice for Scottish Agriculture (SASA)

'*C. Liberibacter solanacearum*' (CaLsol) & psyllid vectors

Why Scotland is concerned

Resolving problems for vector identification

Developing diagnostic tools for psyllid vectors

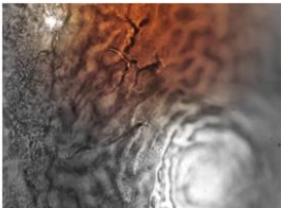


What we do at Science and Advice for Scottish Agriculture (SASA)

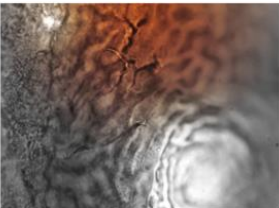
Part of the Scottish Government, based in Edinburgh with laboratories, glasshouses, quarantine, and experimental farm facilities.

Science and advice on agricultural/horticultural crops, plant health, food safety, and wildlife management/crime.

Statutory/regulatory work and scientific research.



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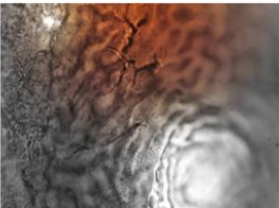


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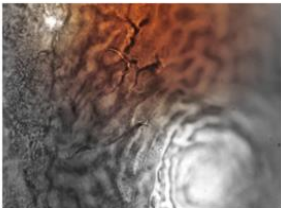
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Psyllid vectors of '*Candidatus Liberibacter solanacearum*'
Aim: Develop molecular diagnostic tools for identification.

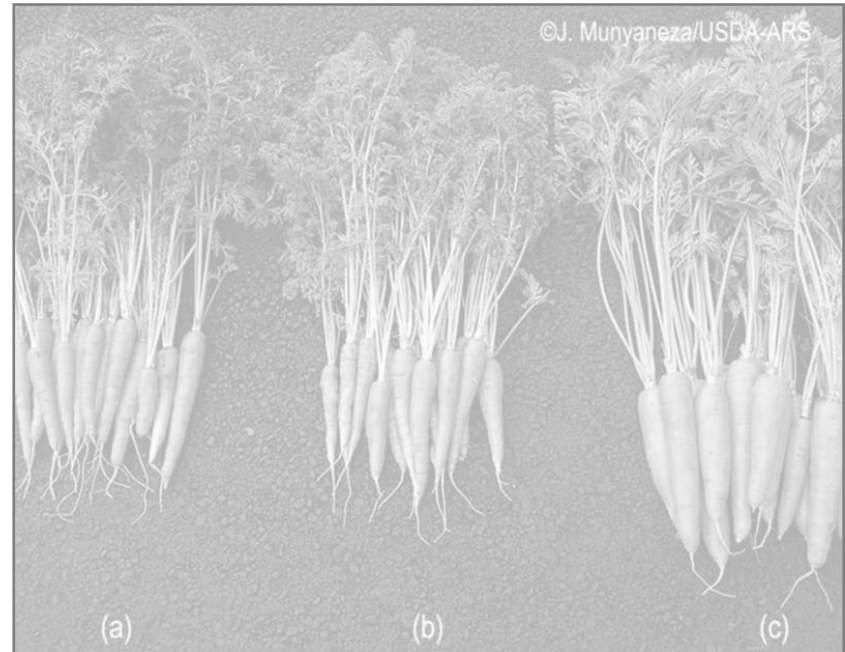


'*C. Liberibacter solanacearum*' (CaLsol)

Unculturable, phloem-limited bacterium



Zebra Chip Disease of Potato
Americas & NZ
Haplotypes A & B
EPPO A1 Quarantine Pest



Carrot & other apiaceous crops
Eurasia and Africa
Haplotypes C, D, E

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Psyllid vectors of CaLsol

Phloem-feeding insects in the Sternorrhyncha

Vector species:

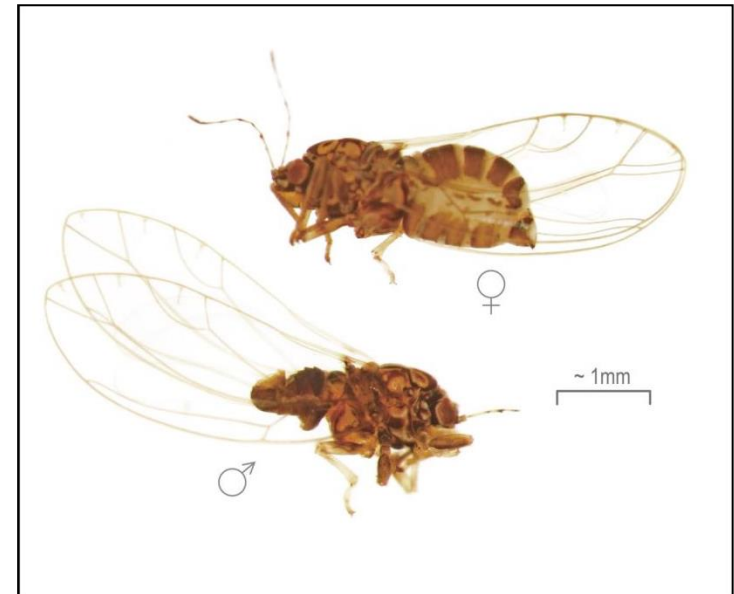
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- *Trioza apicalis*
- *Bactericera trigonica*

Identification can be problematic:

- *Trioza apicalis/anthrisci*
- *Bactericera trigonica/nigricornis/tremblayi*

Bactericera cockerelli

America, New Zealand and **Australia**



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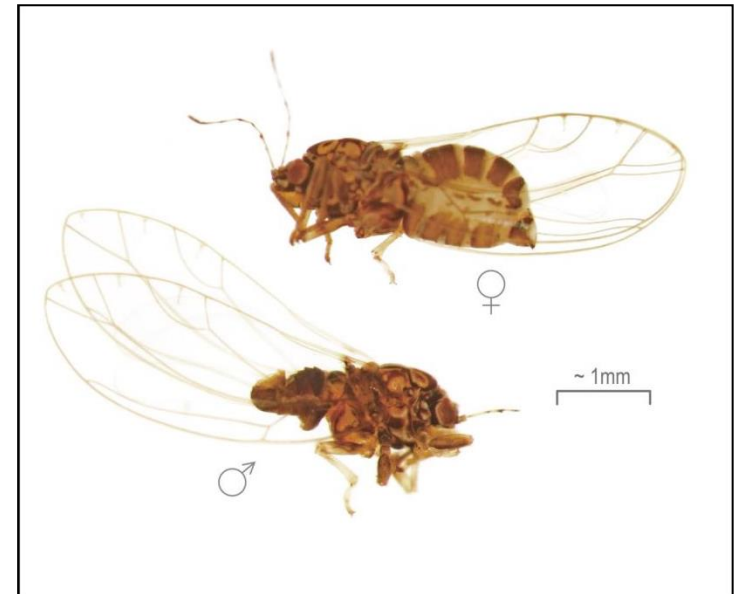
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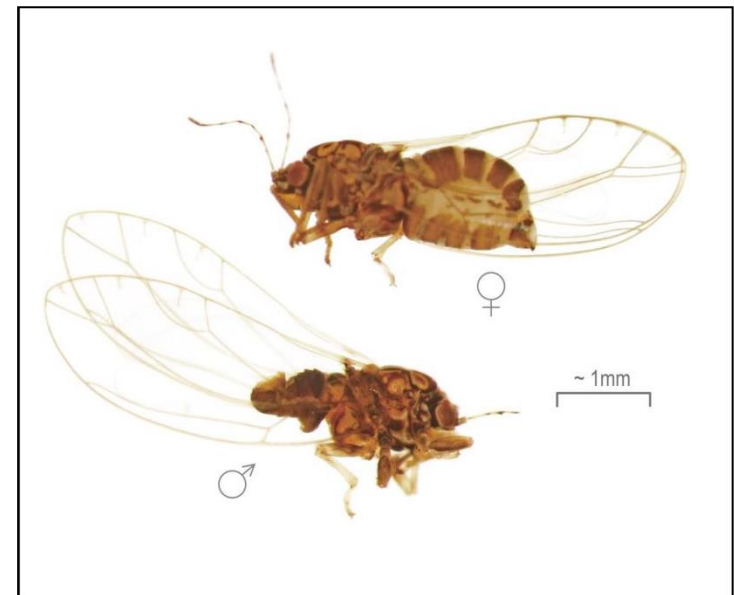
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Why CaLsol is of concern to Scotland



United Kingdom

Bacterium is **not** found in growing plants

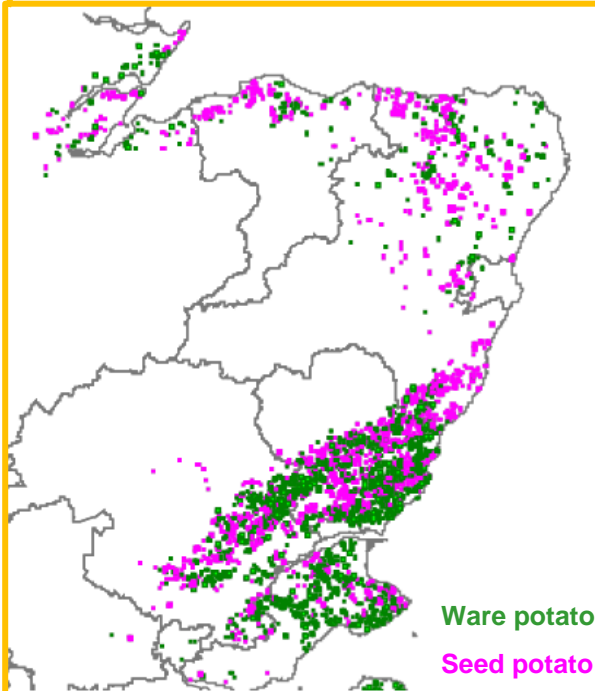
Vector, *Trioza apicalis*, is present in low numbers

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Scottish Seed Potato Industry

Global reputation - High Health Quality

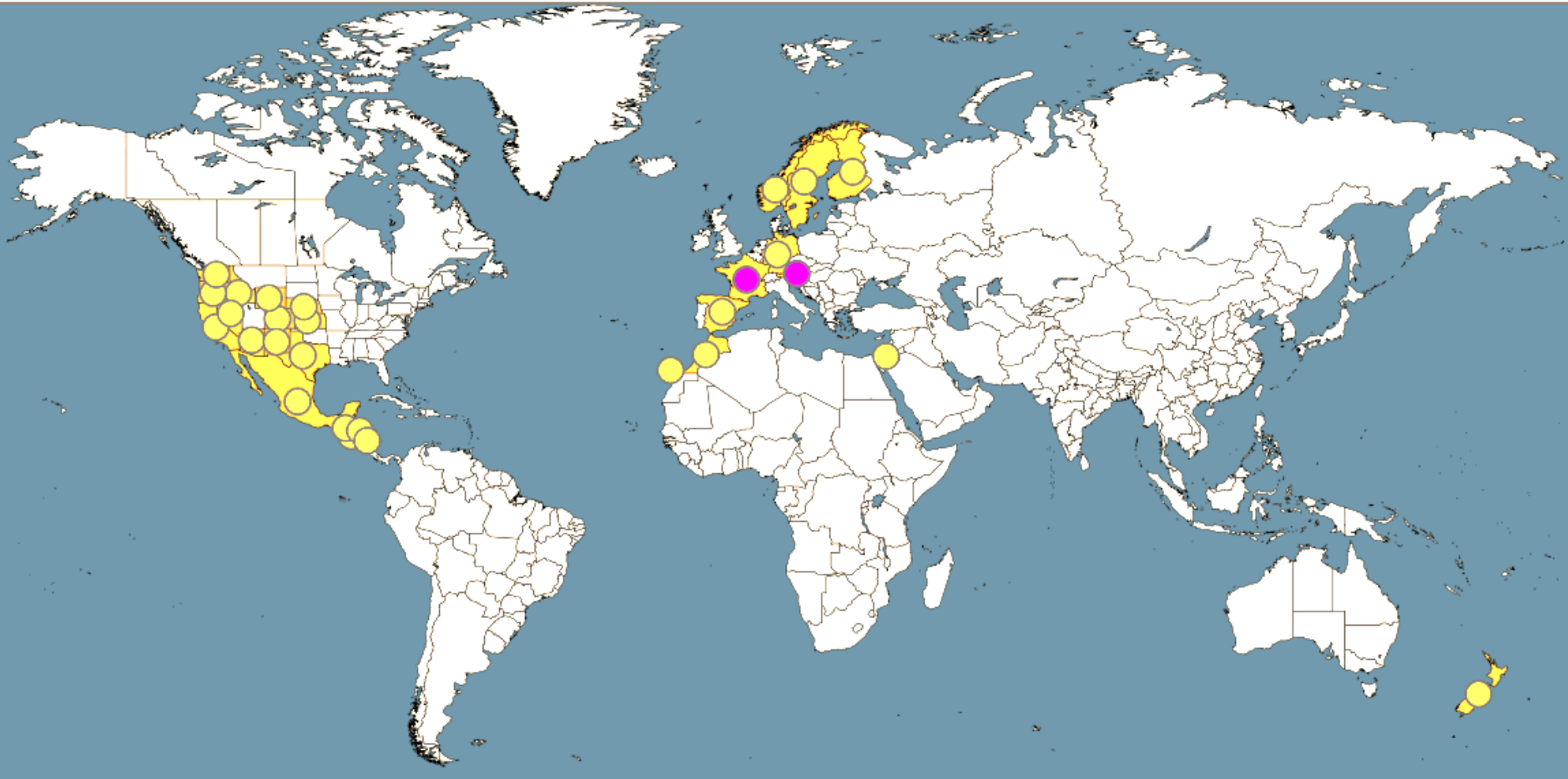
EU: 300,000t Outside EU: 90,000t

Potato grown in the same region as carrot

CaLsol present in carrot in rest of Europe

Crops infected with CaLsol

EPPO Global Database 2017

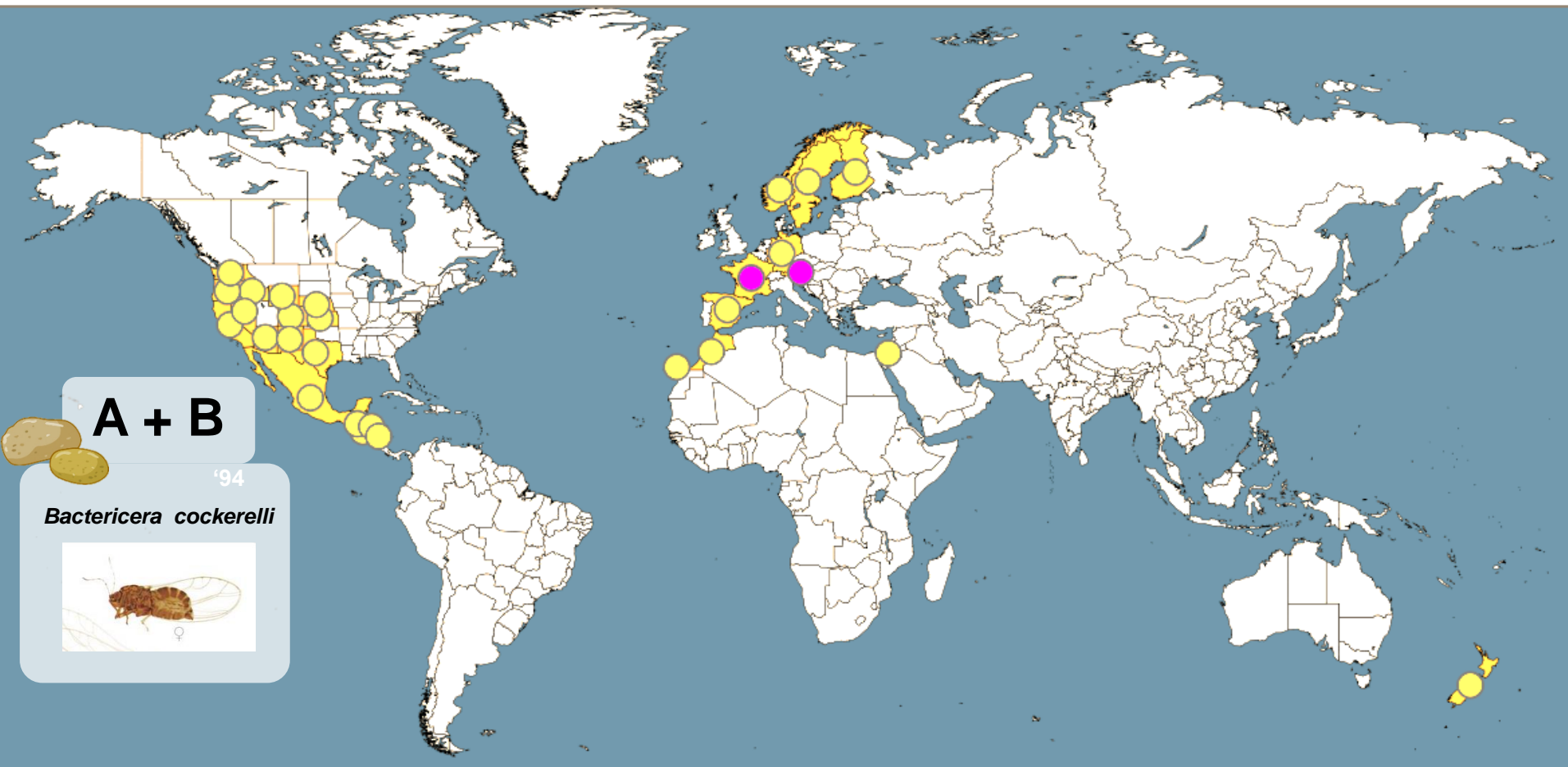


Legend: ● Present ● Transient

EPPO (2017)
<https://gd.eppo.int/taxon/LIBEPS/distribution>

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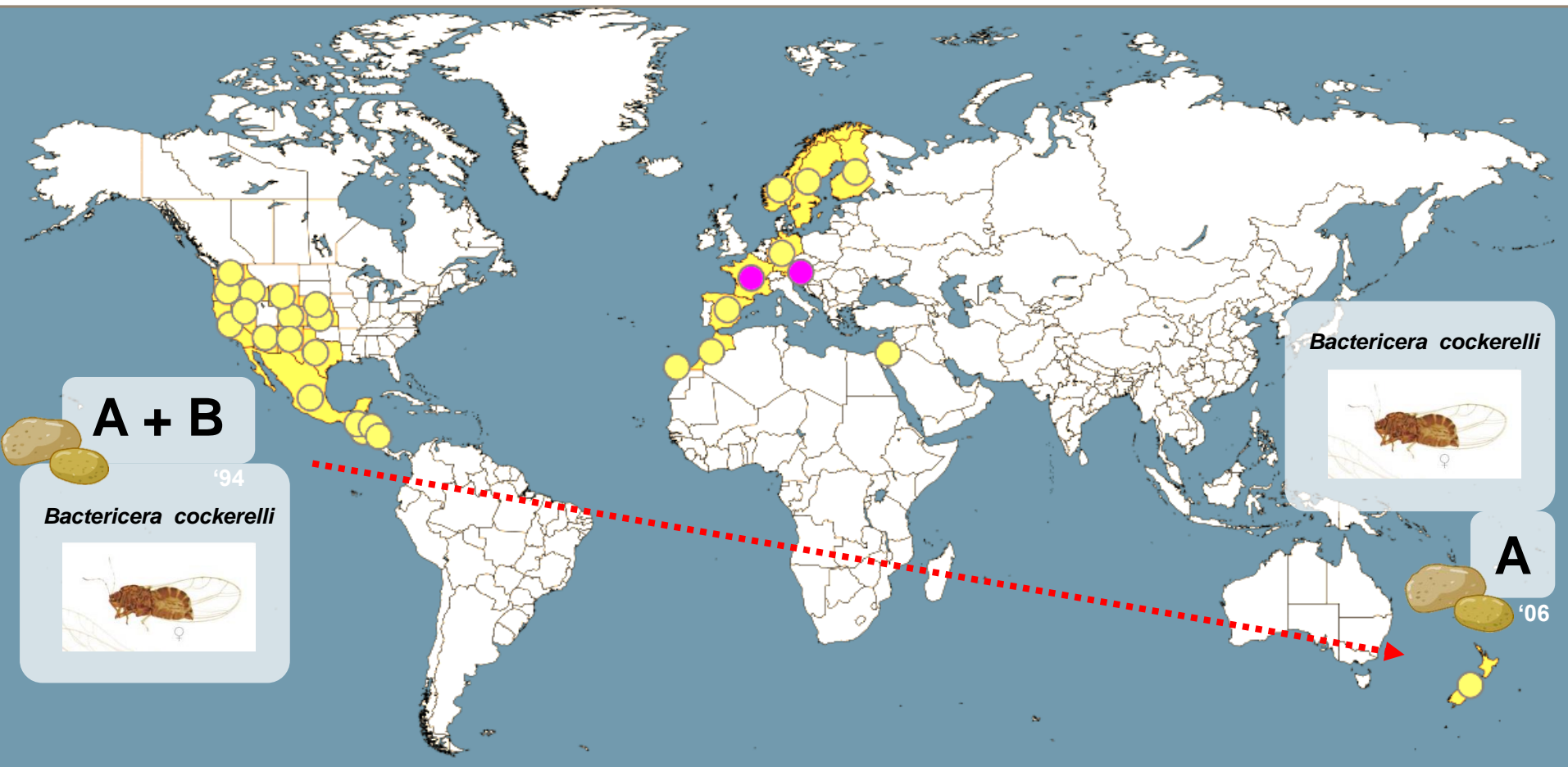


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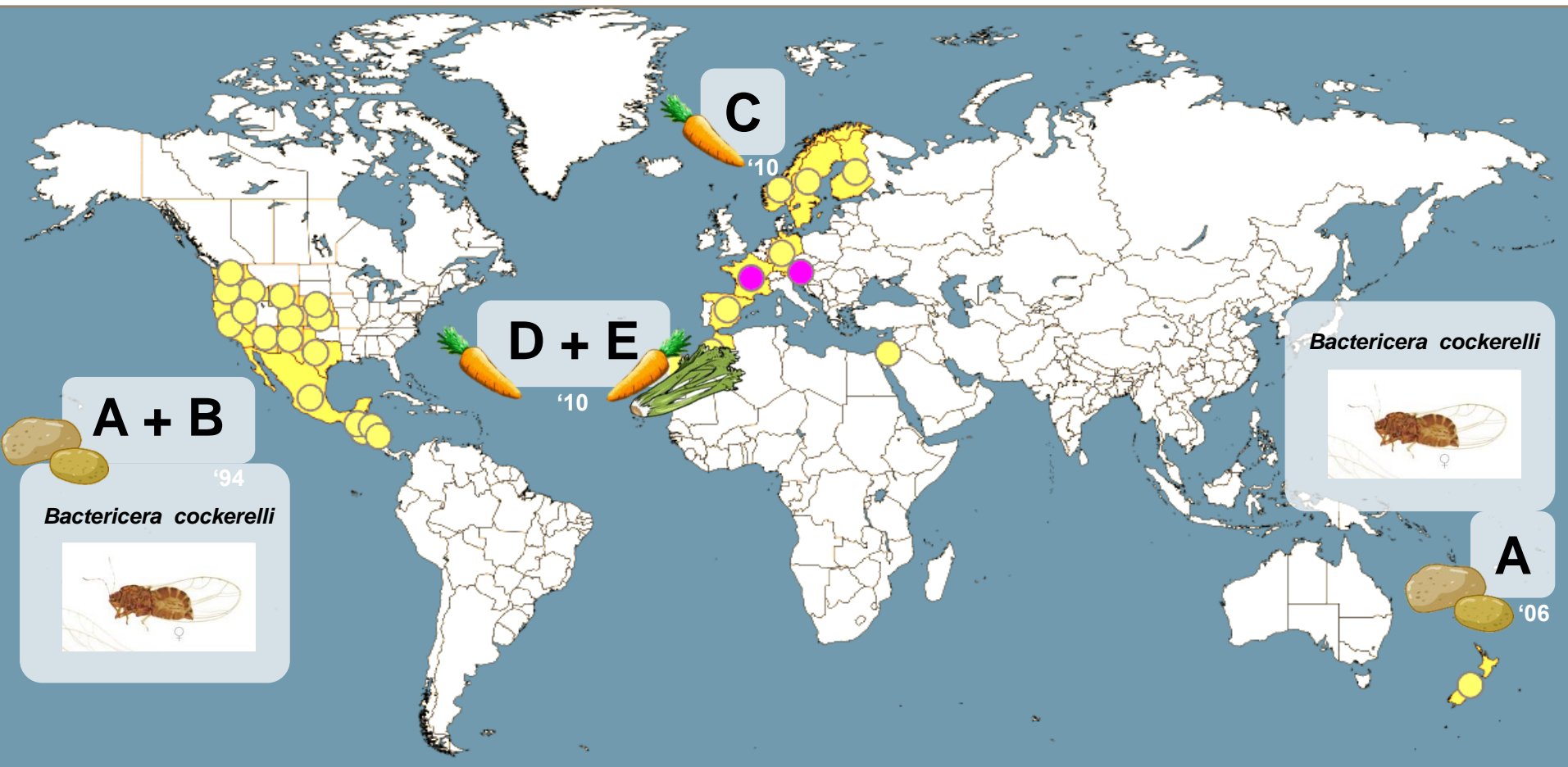


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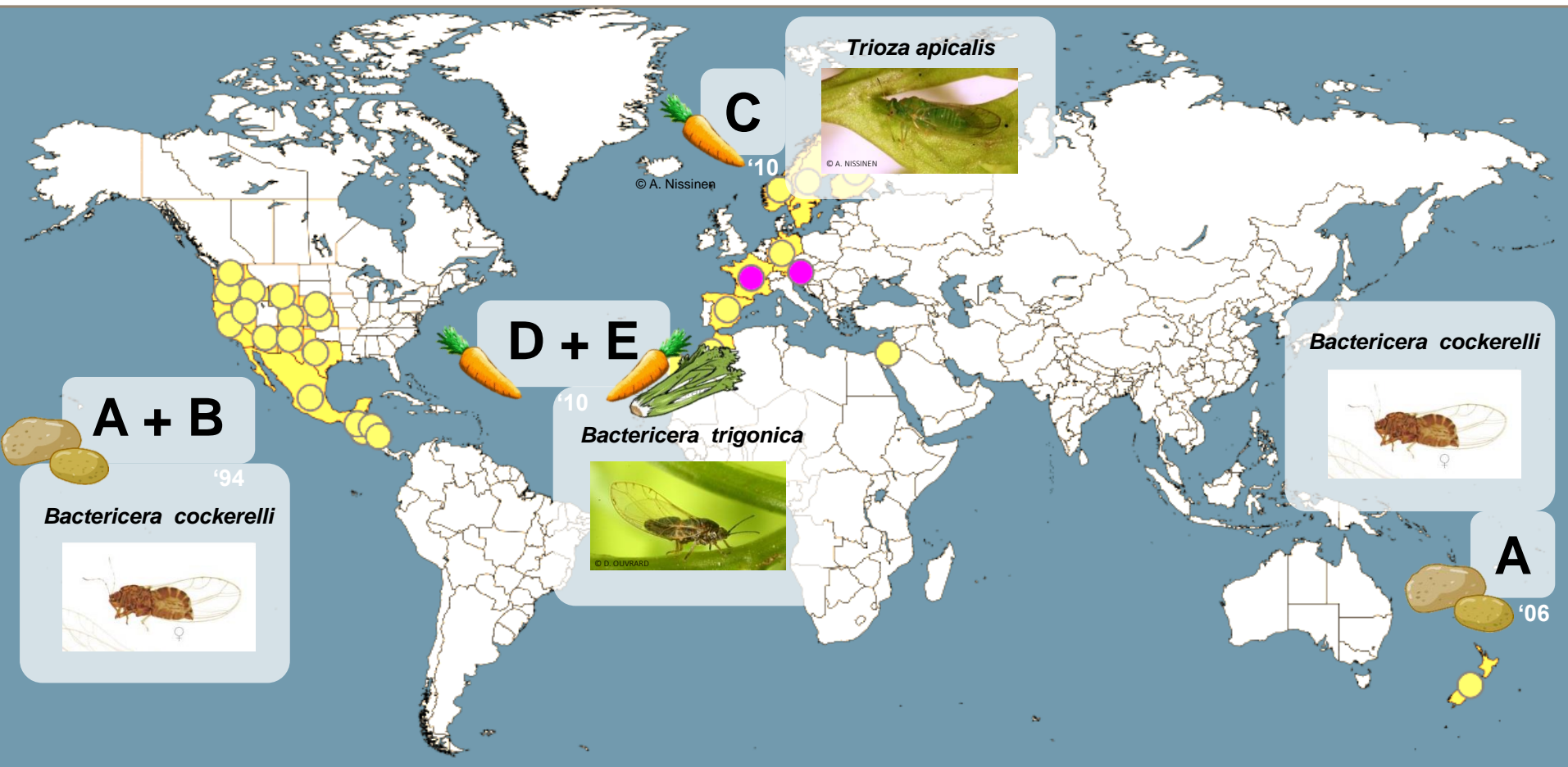


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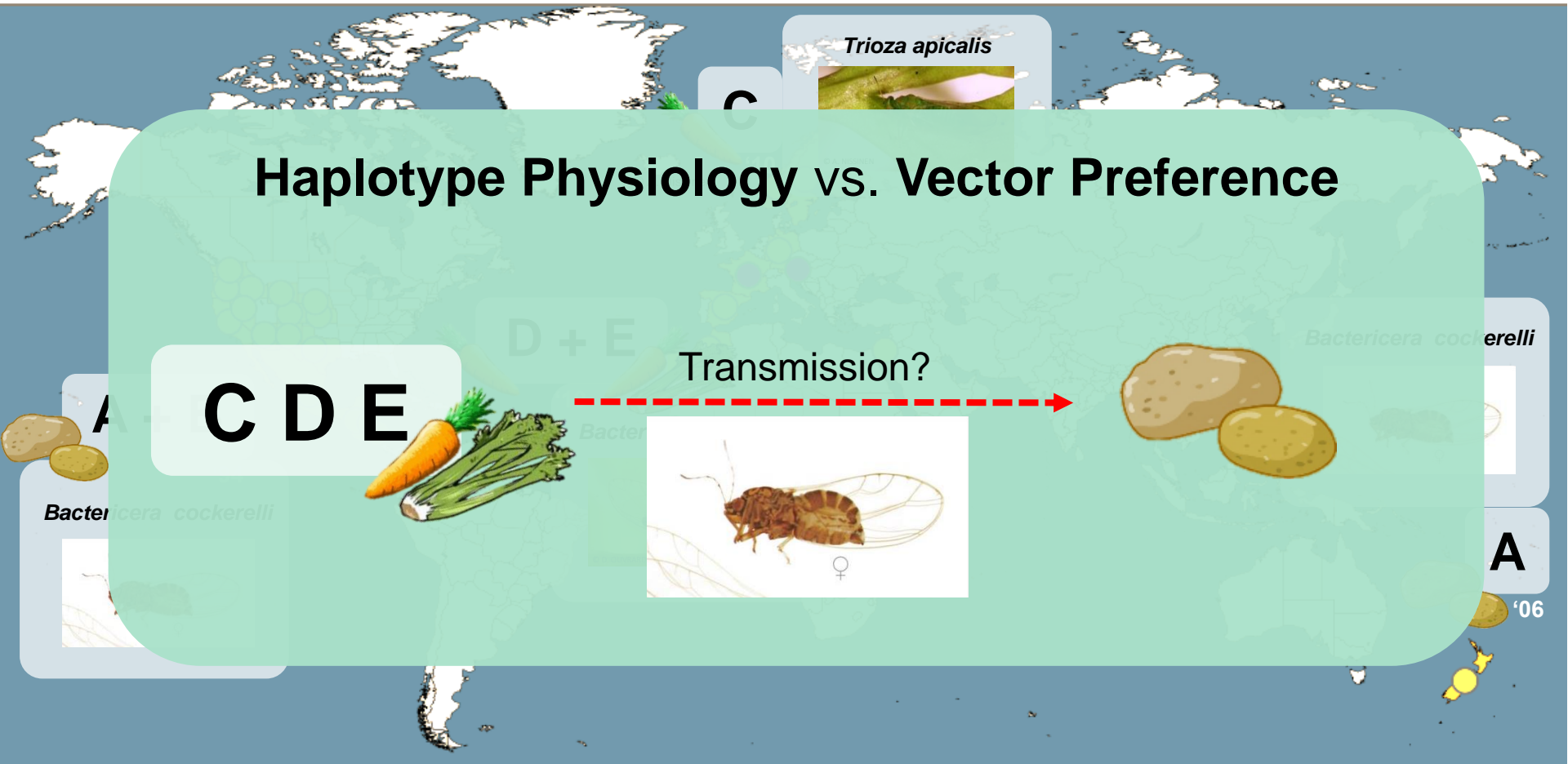
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Crops infected with CaLsol

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Haplotype Physiology vs. Vector Preference



C D E

Transmission?

Legend: ● Present ● Transient

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Research focus

Keeping *Bactericera cockerelli* out of Scotland

Identifying native species that may be potential vectors if CaLsol were introduced

A reliable identification and surveillance method for psyllids

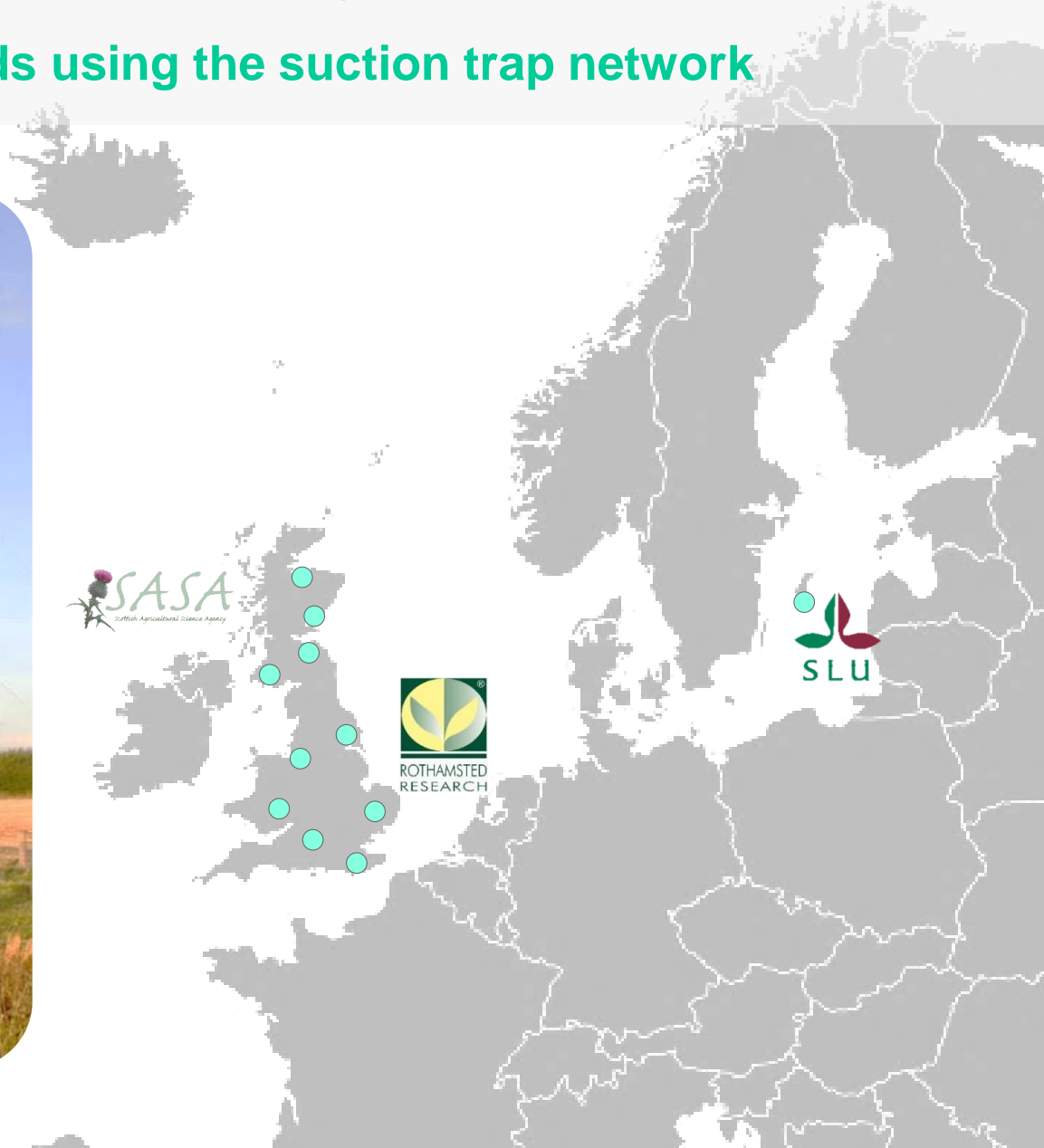
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Monitoring psyllids using the suction trap network



Monitoring psyllids using the suction trap network



Monitoring psyllids using the suction trap network

2000 specimens

52 species

- Migration patterns
- New Species
- *Trioza apicalis* - UK
- Possible monitoring system for vector surveillance



ROTHAMSTED
RESEARCH

SLU


PonTE
Pest Organisms
Threatening Europe

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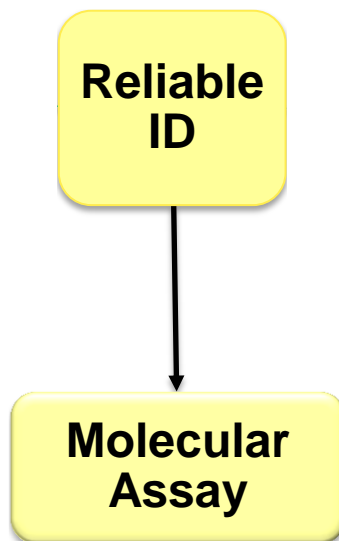


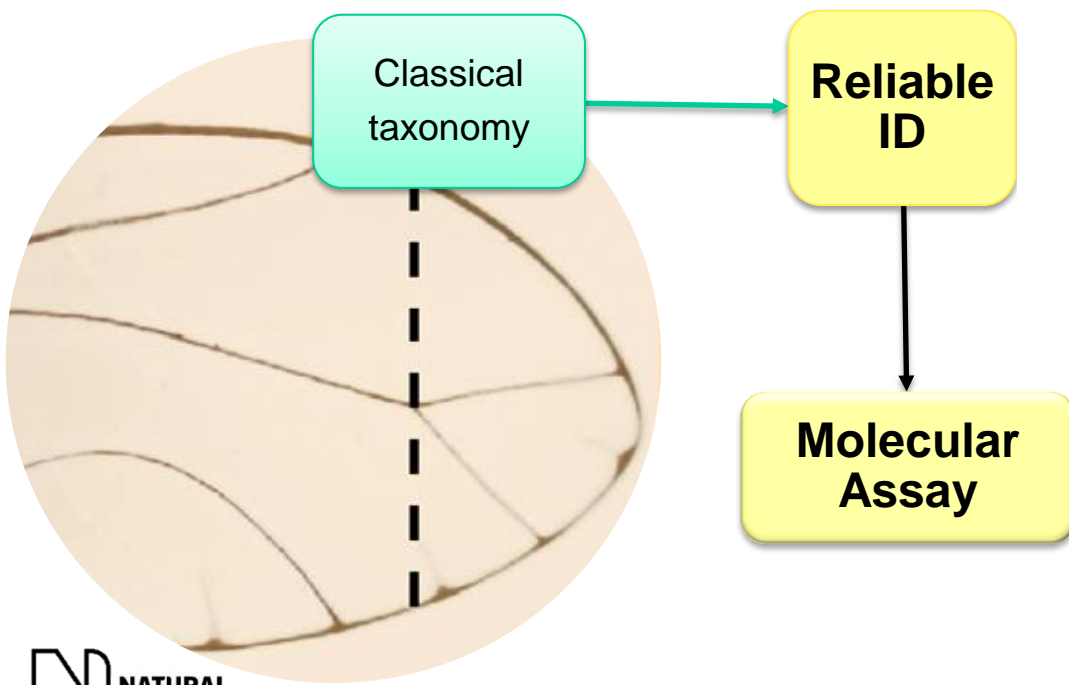
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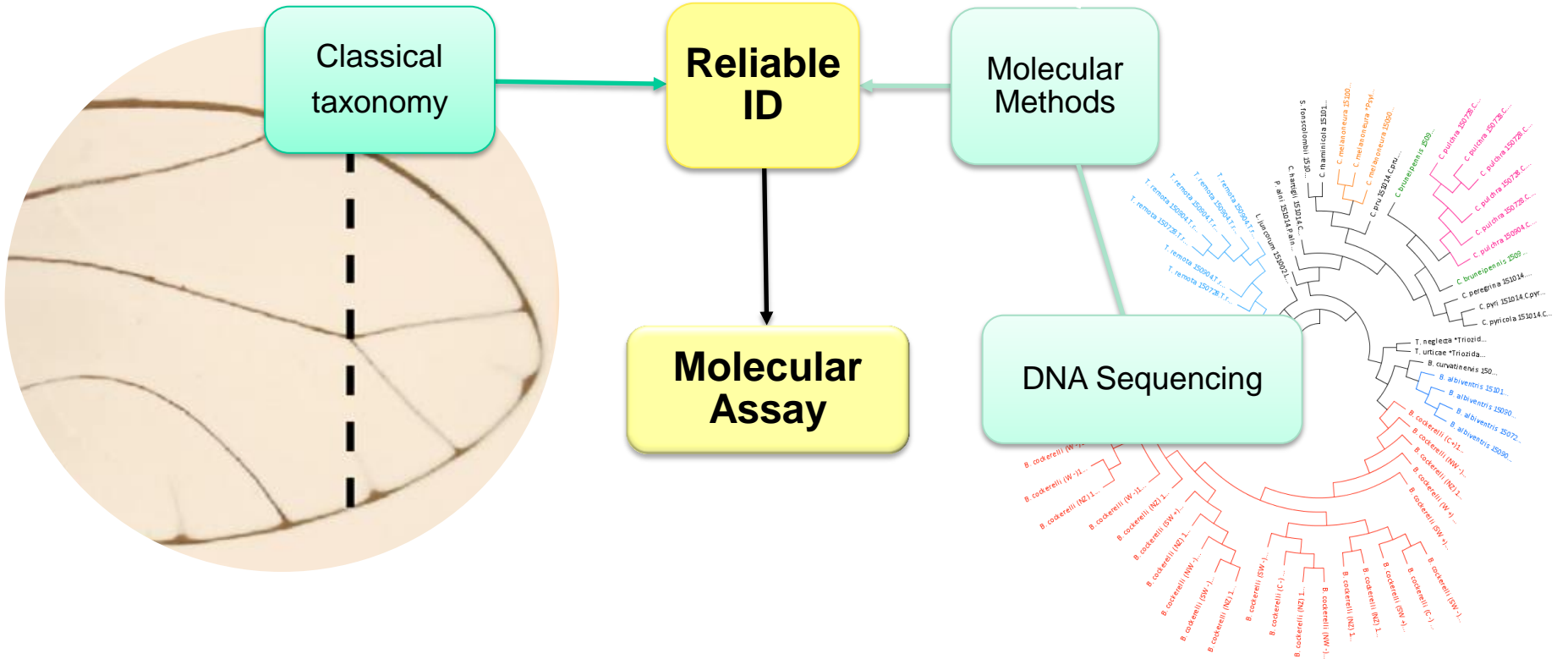
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Voucher specimen

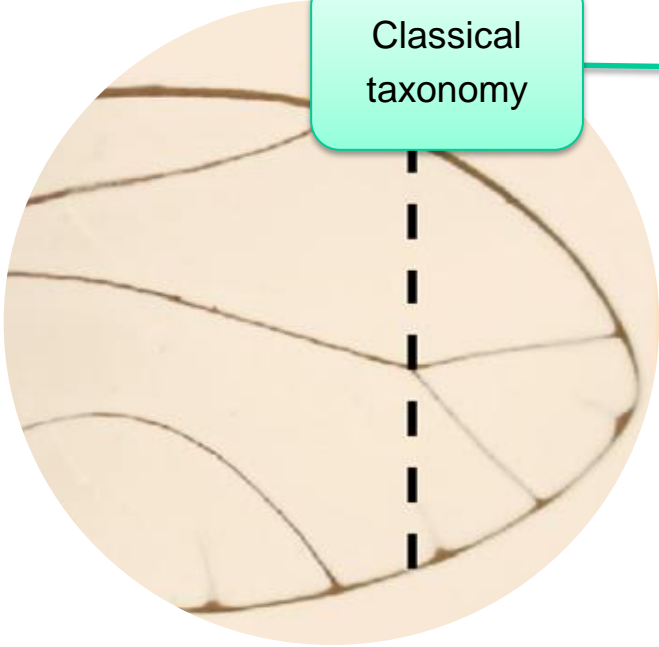
Non-destructive DNA extraction



Classical taxonomy

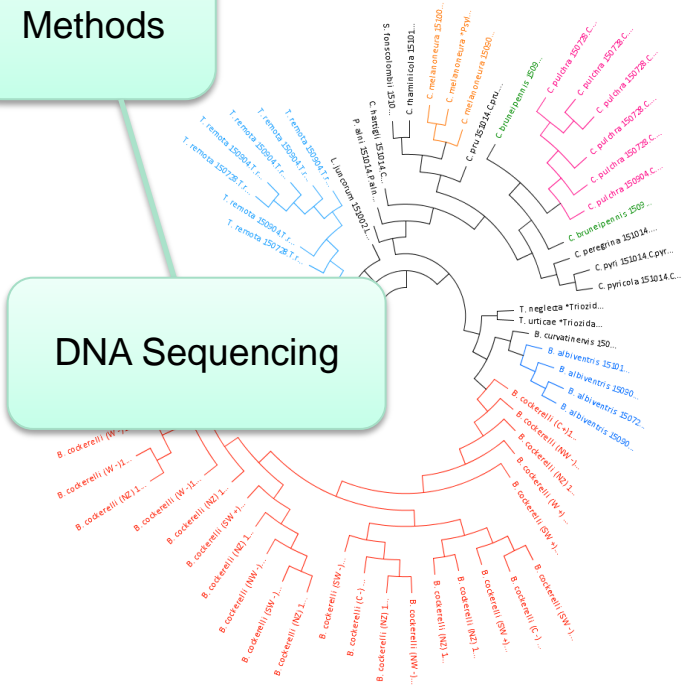
Reliable ID

Molecular Methods



Molecular Assay

DNA Sequencing



Real-time PCR TaqMan assay for *Bactericera cockerelli*

52 non-target (14 US species)

Assay detection limit

DNA from one specimen

- 1:10,000 dilution



Cloned DNA

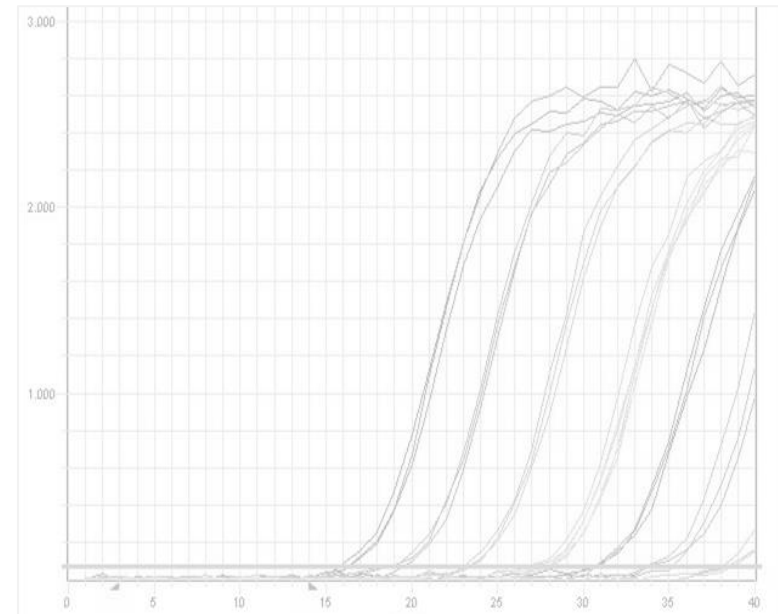
- 50 copies of target DNA reliably

Bulk extraction

- 1:100 *B. cockerelli* DNA + arthropod bulk extraction



Assay dilution series



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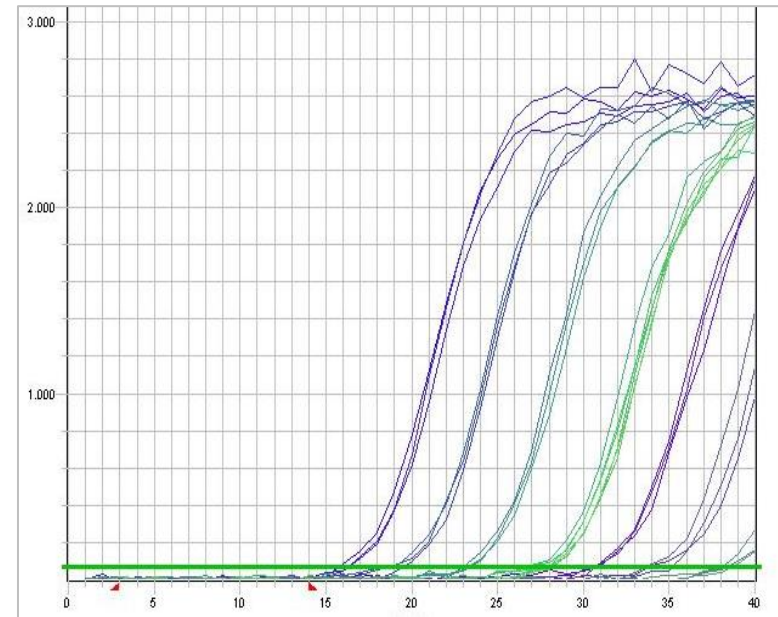
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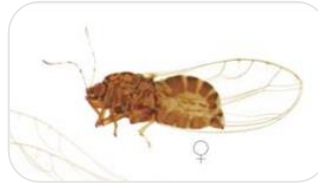
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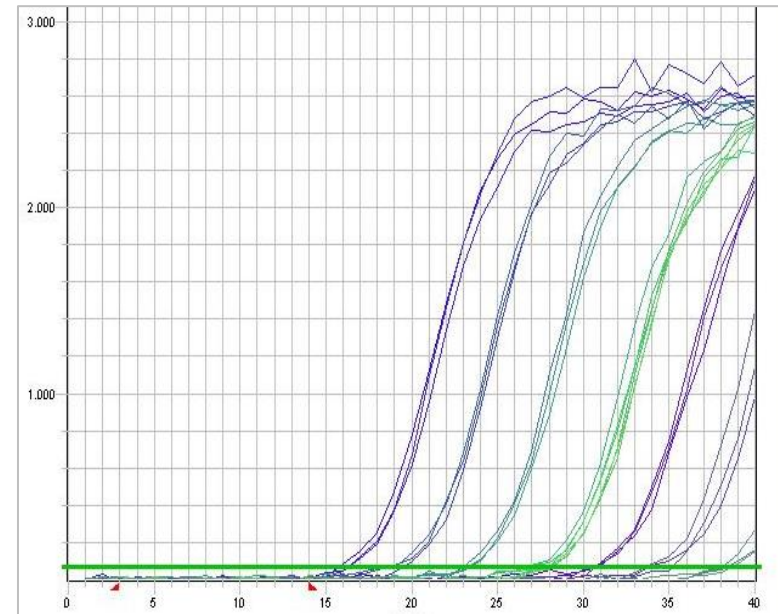
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Outcomes



A rapid, robust, sensitive assay

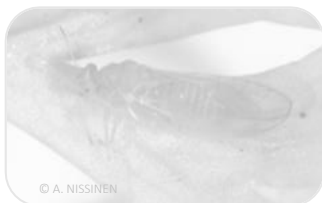
- Interceptions
- Outbreaks

Assays for other vectors

- *Trioza apicalis*
- *Bactericera trigonica*

Suction trap network

- Potential surveillance system used together with assay
- Better understanding of psyllid fauna in Britain



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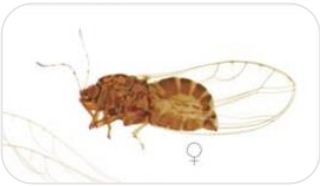
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Thank you for listening

Acknowledgements

C. Jeffries, Y Arnsdorf, R. Cairns, J. Munyaneza, K. Swisher, A. Jensen, A. Nissinen, O. Bahar, A. Fereres, A. Antonilez-Delgado, D. Percy, S. Halbert, S. Bulman.

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