



UNIVERSITY OF  
GREENWICH

Natural Resources  
Institute



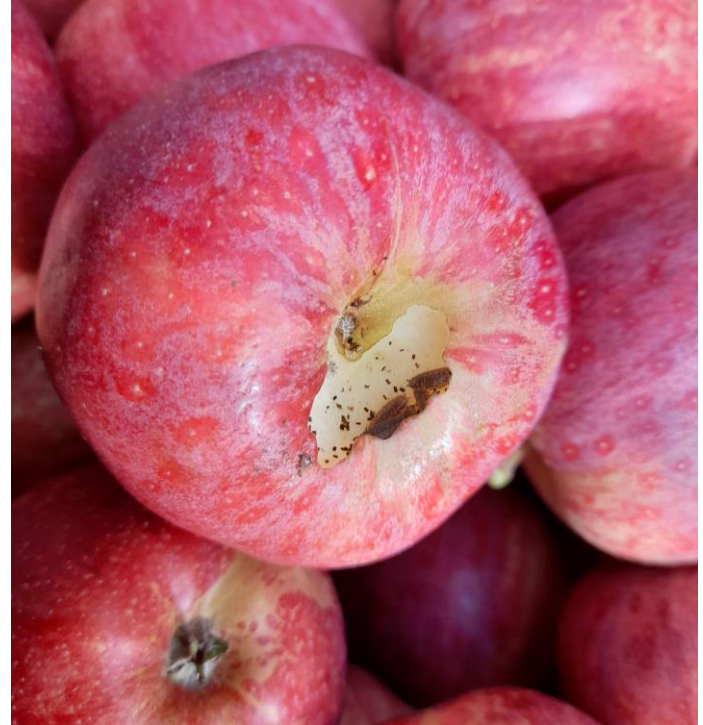
# Improving integrated pest and disease management in commercial apples and pears

31/01/24

[www.adas.uk](http://www.adas.uk)

# Project objectives

- Confirm grower problems with woodlice and investigate factors affecting incidence
- Identify species and confirm damage to fruit
- Literature review: biology, damage, IPM strategies and promising future research
- Communicate results to industry



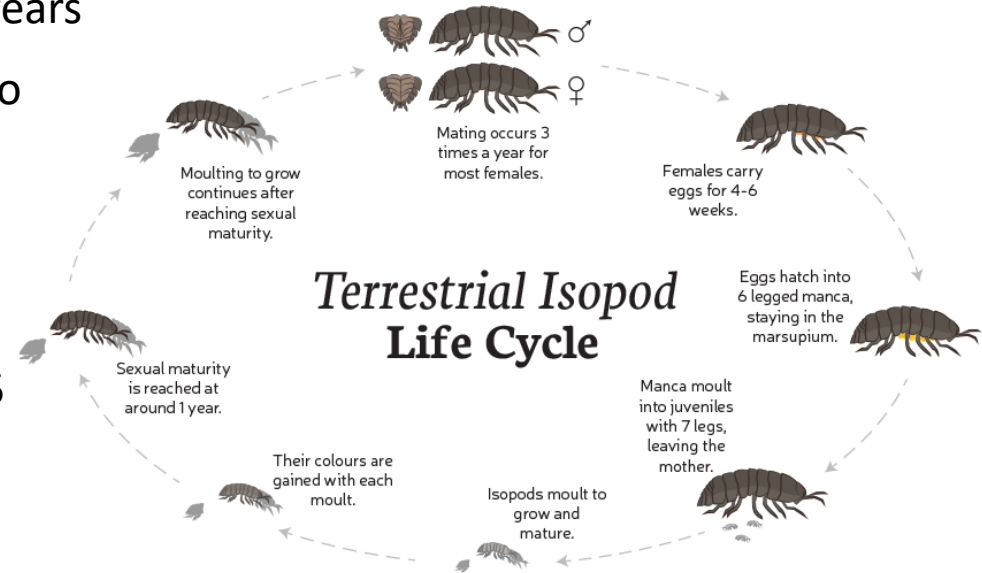
# Scope of project

- Woodlice generally beneficial - breakdown of organic matter
- Generally feed on dying or dead plant material. Can sometimes feed on living plant material
- In recent years - large numbers of woodlice in orchards
- Little known about woodlice as potential emerging pests



# Woodlice biology/ behaviour

- Woodlice are Isopods - lifetime 1-5 years
- Terrestrial arthropods - susceptible to desiccation
- Regulate water loss e.g. Nocturnal, aggregation
- ~37 species of woodlice in the UK - 5 common (Hopkin, 1991)



<https://www.sansvertigo.com.au/blogs/resources/care-sheet-pill-bug>

# Woodlice biology/ behaviour

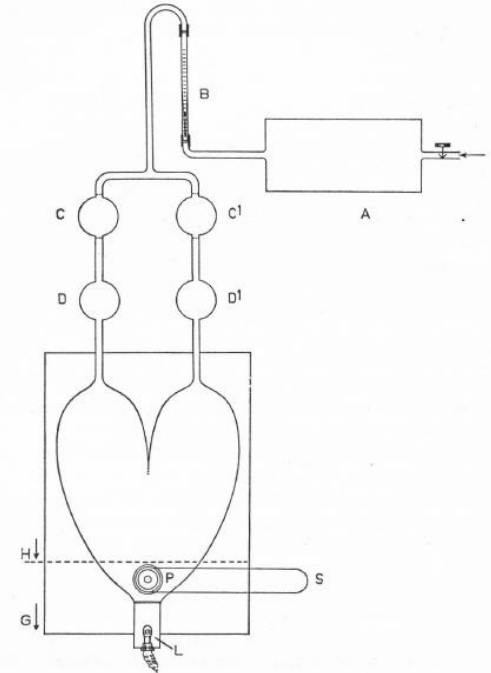
- Woodlice aggregate to form dense clusters - protects them from desiccation (Broly *et al.*, 2014)
- Even small aggregations reduce water loss
- Aggregation in woodlice is fast (Devigne *et al.*, 2011)
- Aggregation varies with woodlice species (Hassall *et al.*, 2010)
- Aggregation also varies within species (Caubet *et al.*, 2008)





# Olfactory attraction

- Woodlice attracted to faeces – suggested contains aggregation pheromone (Takeda, 1984)
- Other cuticular pheromones potentially important? (Devigne *et al.*, 2011)
- Woodlice attracted to same and other species (Kuenen and Nooteboom, 1963)
- Woodlice attracted/ repelled by certain chemicals (Fischbach, 1951; Friedlander, 1965)
- Bread dough attractive to *Armadillidium nasatum* (Goats, 1985)



Kuenen and Nooteboom, 1963

# Woodlice as pests

- Woodlice generally feed on dying or dead plant material
- Can also feed on living plant material
- Woodlice – can be pest in glasshouse e.g. tomatoes, aubergine, cucumbers
- Organic tomatoes – ferric phosphate slug pellets (Jacobson, 2010)
- Tunisia – pest of melon (Amari *et al.*, 2019)



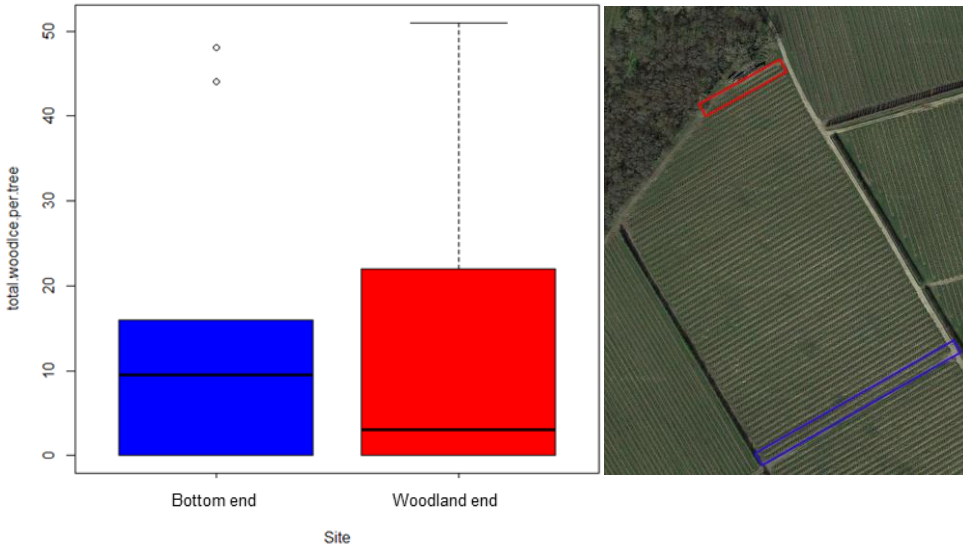
# Potential factors affecting incidence

- Climatic conditions:
  - Increased activity after rainfall
  - Dry conditions - causing woodlice to seek moisture?
  - Apple skin splitting?
- Environmental factors in orchards – soil type?
- Loss of actives – incidental control?
- Conventionally managed orchards - less isopods than organic (Paoletti and Hassall 1999; Paoletti and Cantarino 2002)



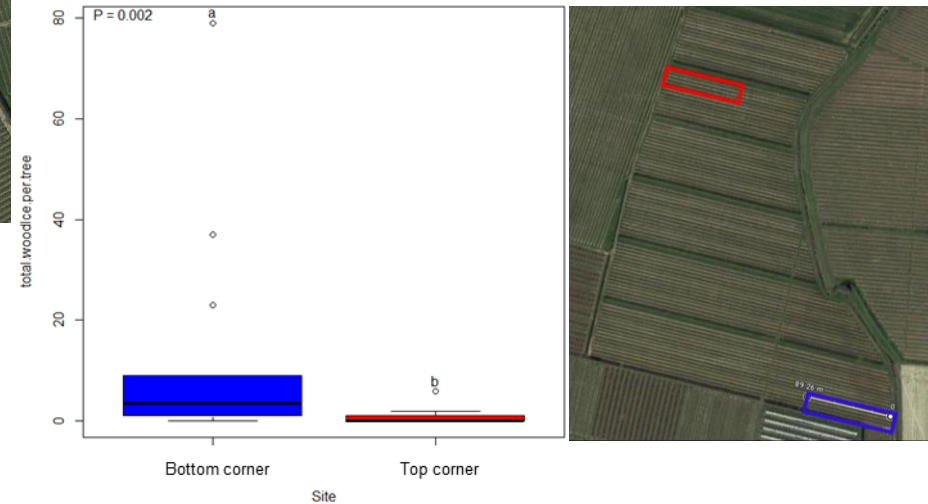


# Potential factors affecting incidence

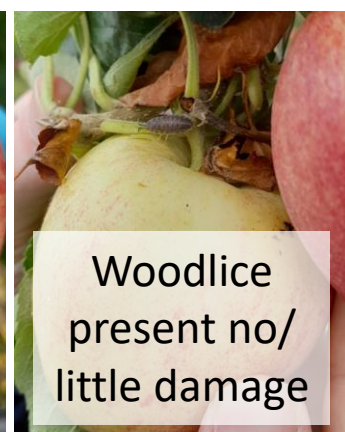
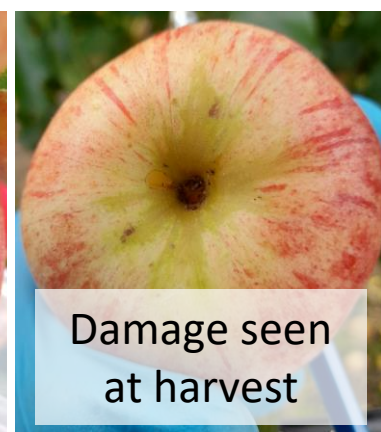
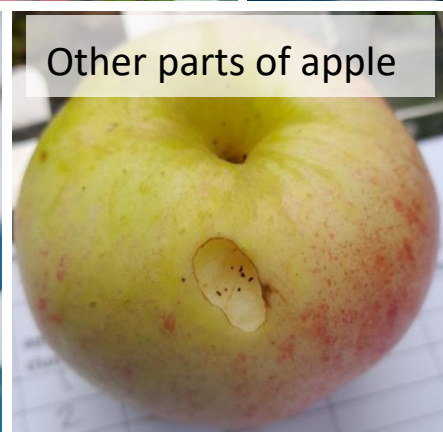
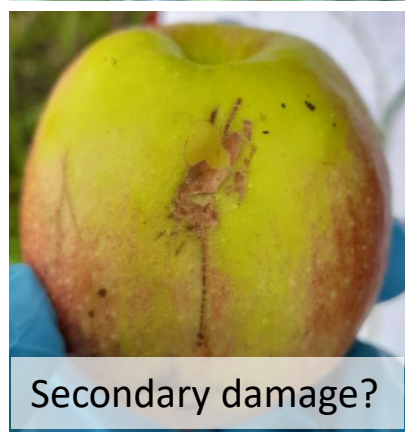


- Woodlice incidence can be variable between and within orchards
- Not always the case

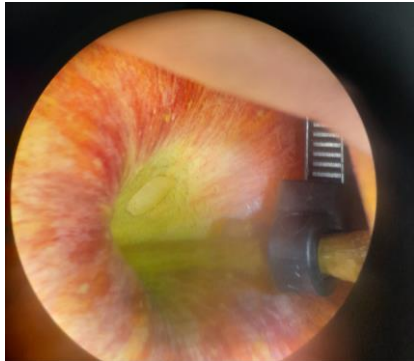
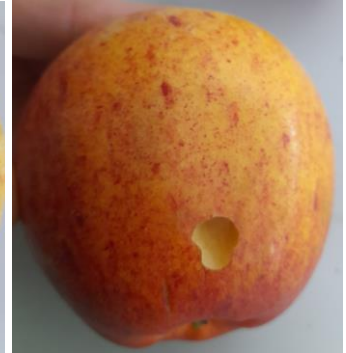
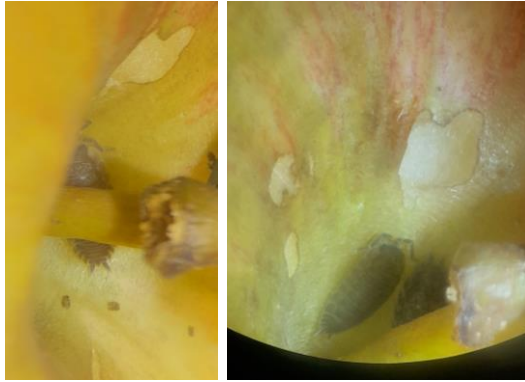
- Surrounding habitats effects?



# Woodlice damage in apples



# Laboratory test 1





# Laboratory test 2



Start



1 week



2 weeks

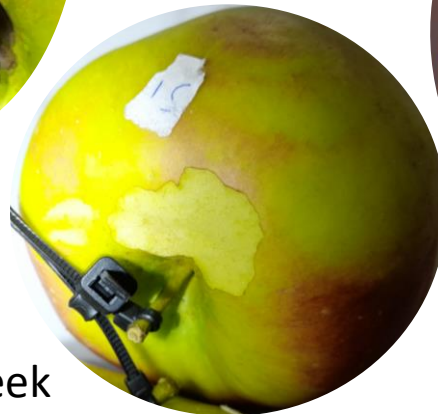
# Laboratory test 2



Start



5 days



1 week



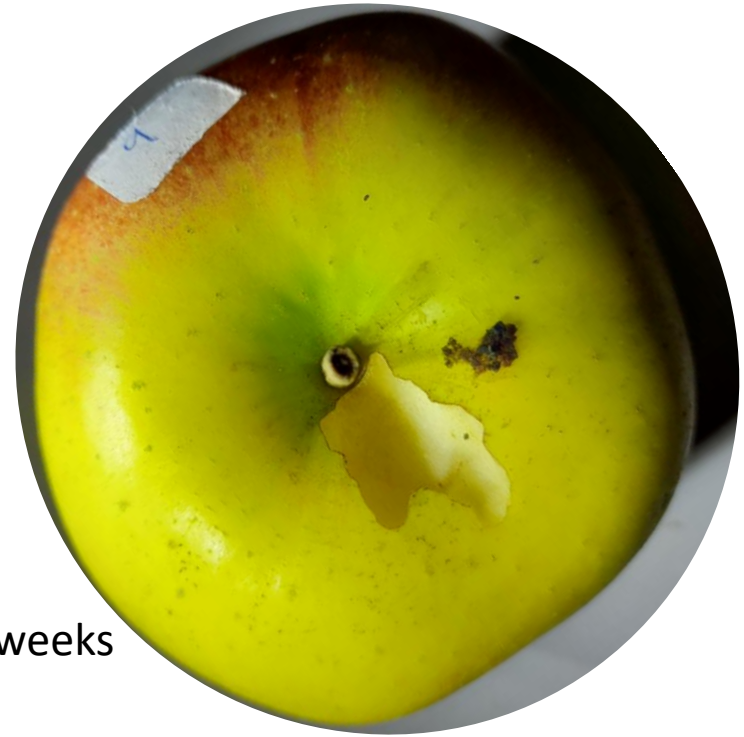
2 weeks



## Laboratory test 2

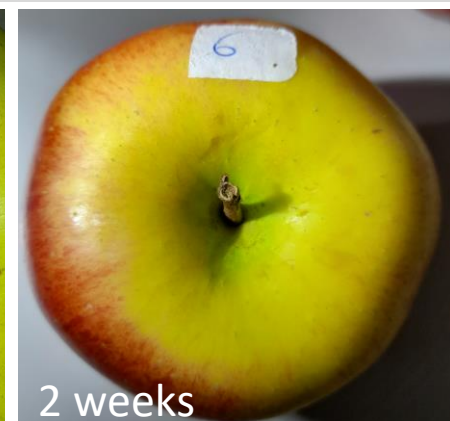
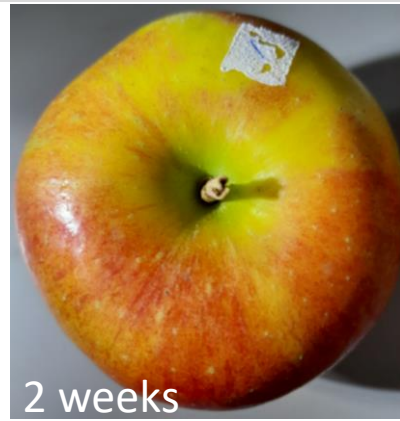


Start



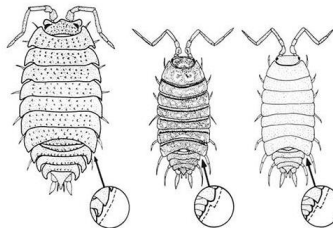
2 weeks

# Laboratory test 2



# Woodlice species present

- Woodlice collected from 10 orchards currently identified
  - All *Porcellio scaber* (Common rough woodlouse) – common UK species (Hopkin, 1991)
- More individuals from samples to ID
- Species vary
  - Desiccation tolerance
  - Aggregation - linked

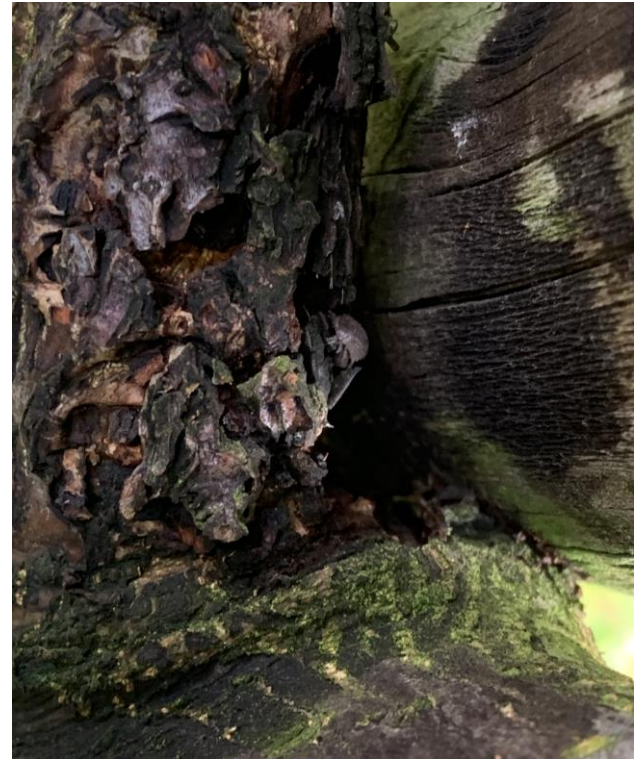


Hopkins, 1991

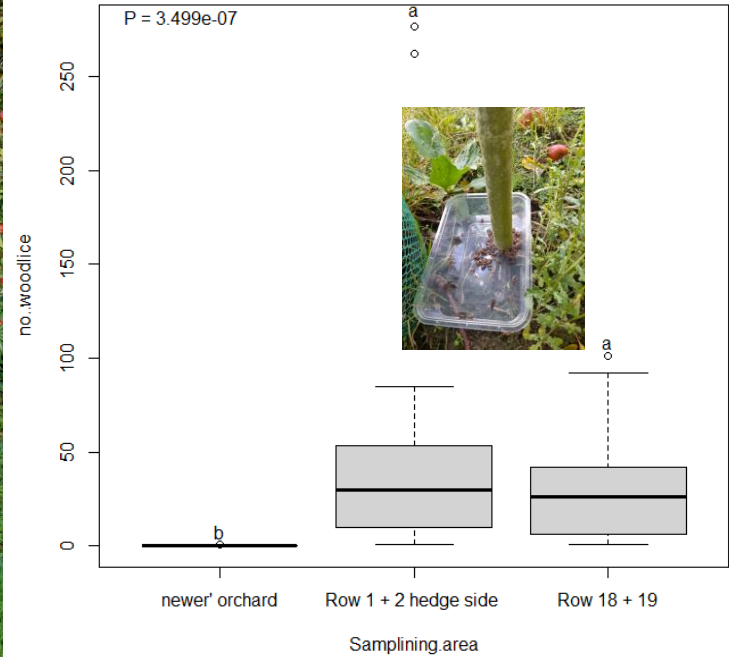




# Location in orchards



# Location in orchards





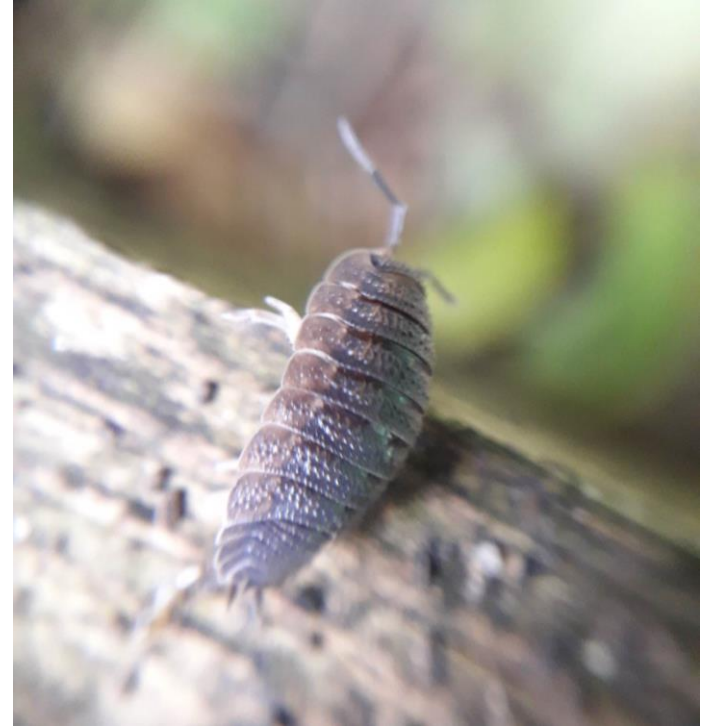
# Preliminary conclusions

- Woodlice are damaging marketable fruit
- Clusters important – humid environment?
- Damage reported worse later in the season
  - Worse on short stalked varieties?
- Distribution – driving factors as of yet unclear
- One species causing damage
  - Always the same? Change regions or seasons?



# Future research?

- Biology in orchards
- IPM strategies e.g.
  - Refuges, attractant + repellants?
  - Nematodes?
  - Ferric phosphate?





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# Thank you. Any questions?

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Apple Grower survey



Short survey ~5 mins

- Aim: to get idea how widespread damage is
- Please complete even if do not have woodlice damage!

<https://forms.office.com/e/RGuL9qTVPL>