Drivers that influence PSHB infestation in Pecan orchards

Wilma Nel
Brett Hurley
Almuth Hammerbacher
Drake Slabbert

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
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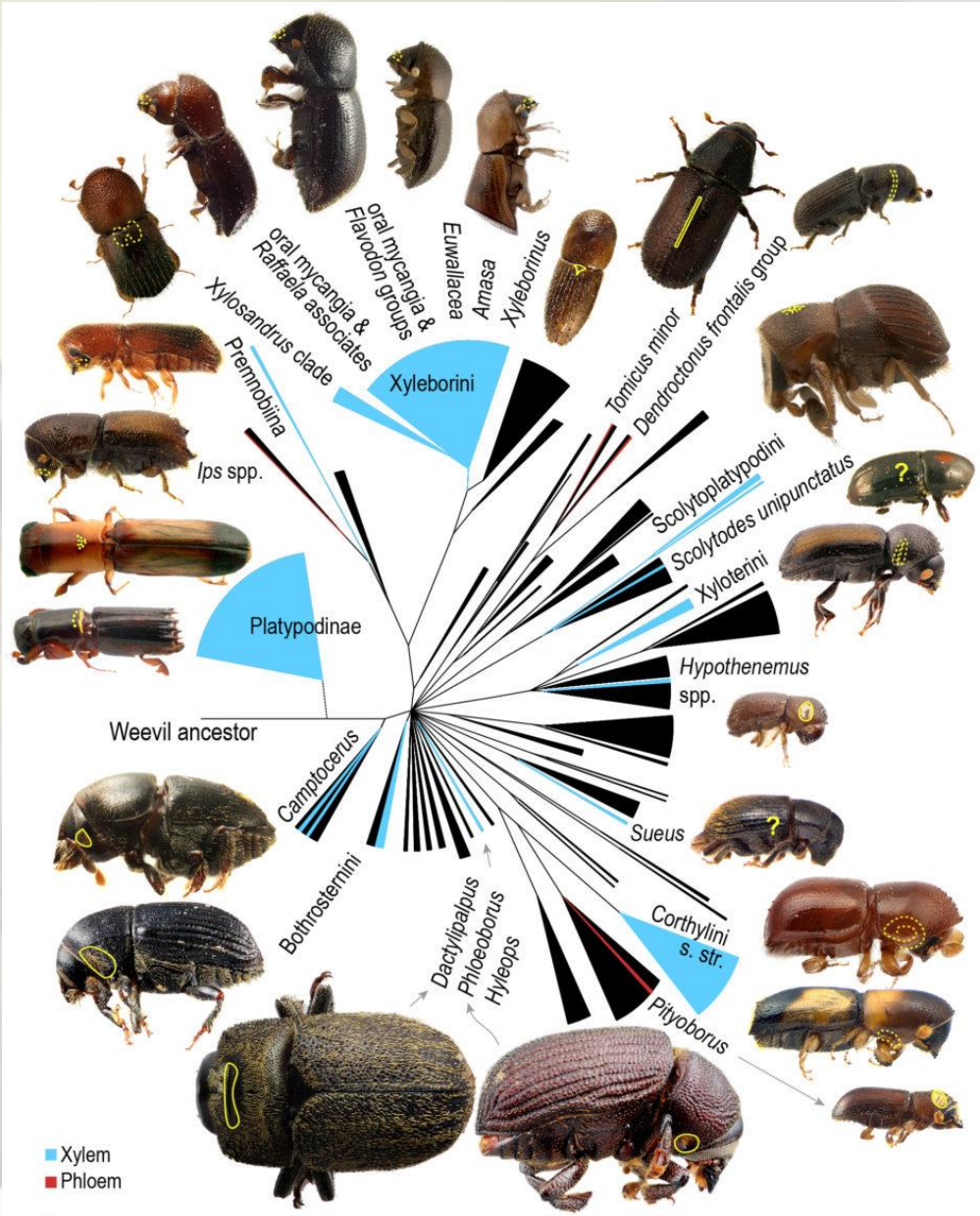
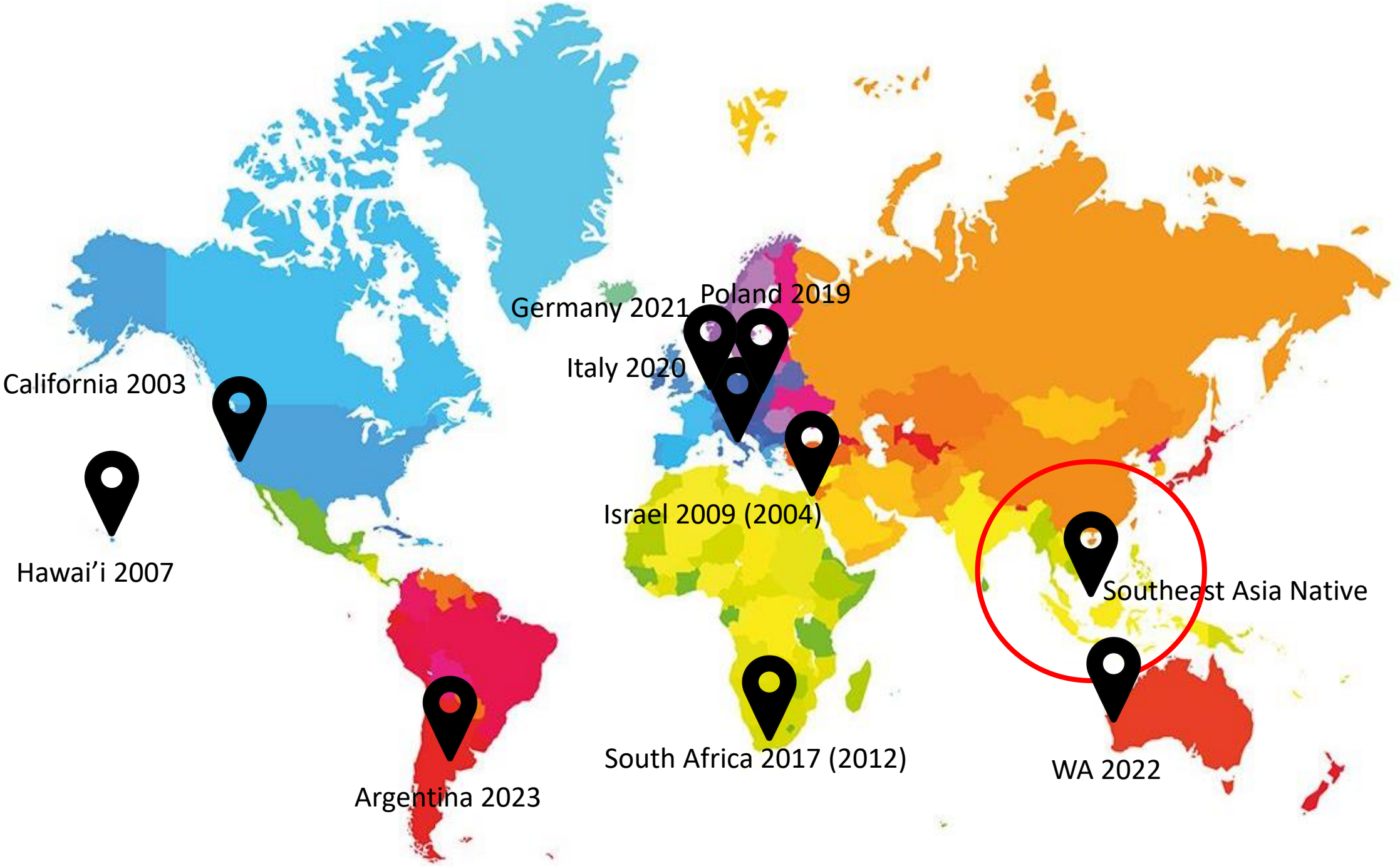
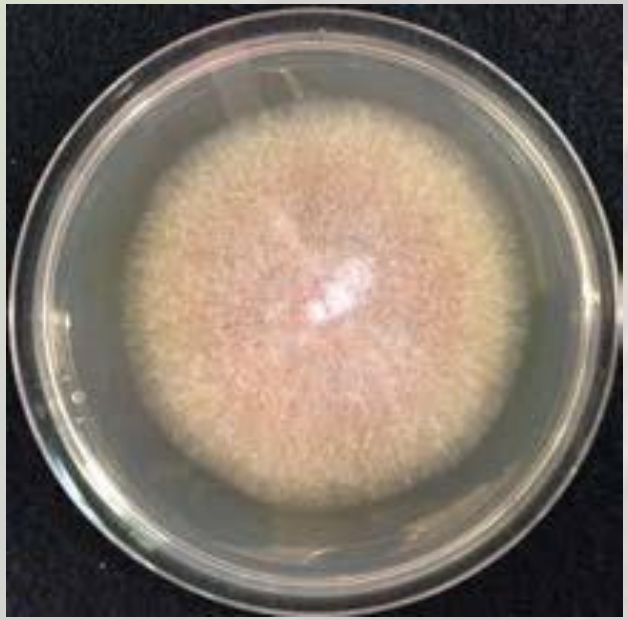
Hulcr and Stelinski 2017 doi: 10.1146/annurev-ento-031616-035105

Bark and ambrosia beetles

>6 000 species
~220 species in South Africa
Between 1-5 mm in size
Pockets in their exoskeleton in which they vector symbiotic fungi




Germany 2021
Poland 2019
Italy 2020
California 2003
Hawai'i 2007
Israel 2009 (2004)
Southeast Asia Native
Argentina 2023
South Africa 2017 (2012)
WA 2022



Acacia mangium
Wattle

Ricinus comminus
Castor bean

161 tree species recorded to be affected in South Africa, 83 are reproductive hosts

Agricultural crops of concern

Avocado

Pecan and macadamia

Deciduous fruits

Jan Kempdorp 2017

- First detection of PSHB in pecan orchards globally
- 2018-2021 monitoring project
  - To determine the risk PSHB posed to pecan orchards
  - Outbreak was not expanding
  - Beetles were not detected reproducing in pecan trees
  - Fungal symbiont was determined not to be a serious threat
  - Recommendation: control source populations of reproductive hosts

(MSc study of Shawn Fell)

Ornamental amplifier hosts

Acer negundo
Box elder

Platanus x *acerifolia*
London Plane

Quercus robur
English oak

Photos: Trudy Paap

2022: PSHB detected reproducing in Pecan trees

Wilhelm de Beer

What happened?

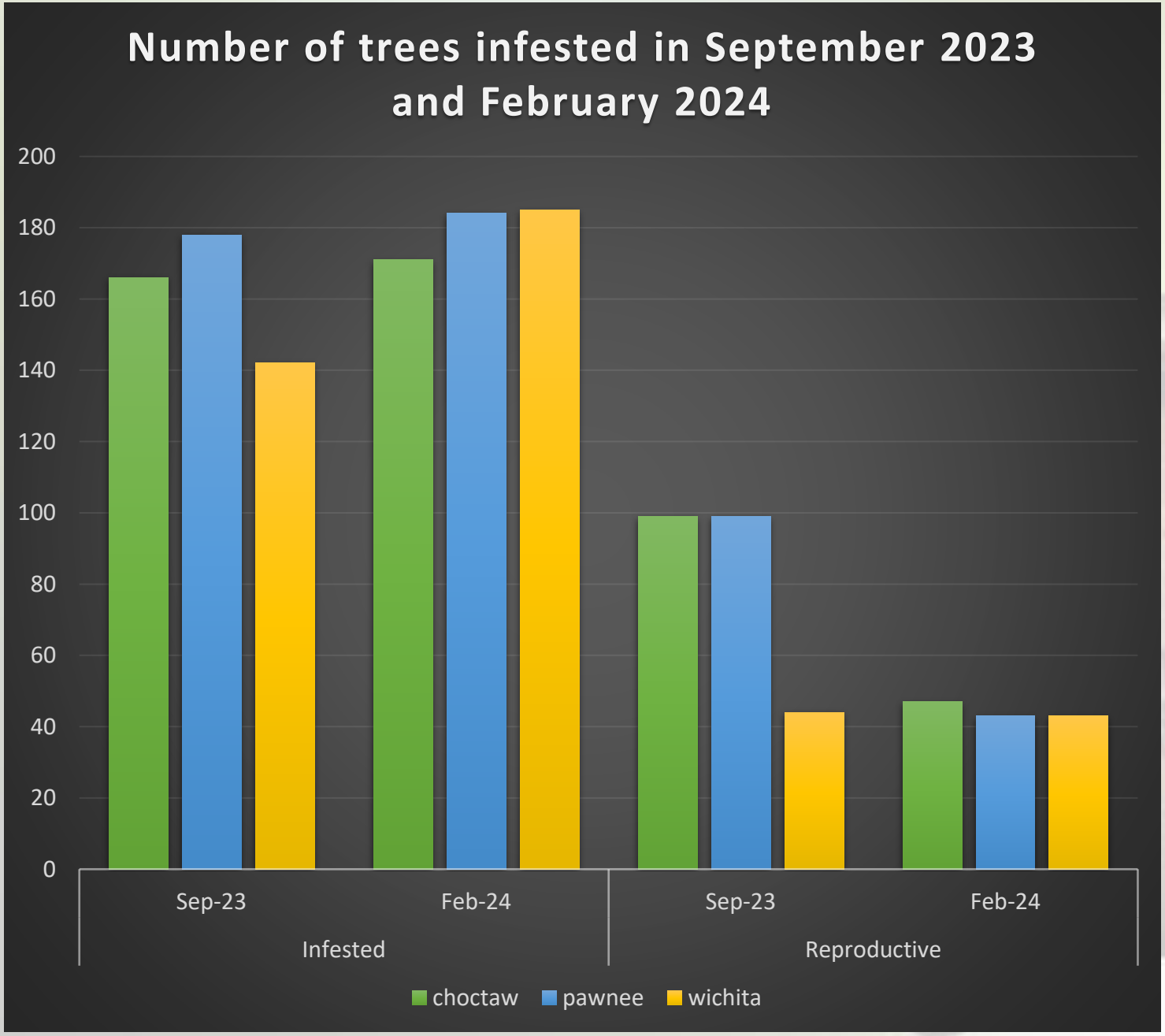
- Beetles?
  - Was a new haplotype of the beetle introduced?
    - Different haplotypes of the beetle vector different species of *Fusarium* fungi
    - Both the beetle haplotype and the fungus was still the same
- Orchard?
  - Older trees (above 15 years of age)
  - Selective light management was not practiced
    - Lower branches heavily shaded due to thick canopy
  - Stress of the branches lead to infestation

Factors affecting PSHB reproduction

- Monitoring plot of 821 trees
  - 274 Wichita, 274 Choctaw, 273 Pawnee
  - Monitor for beetle attack and reproduction
- Light management
- Weather conditions (Data supplied by Dr. Nicky Taylor)
- Olfactory cues
  - Some varieties are more susceptible to attack than others.

- Dec 2023 – all reproductive branches removed from the orchard.

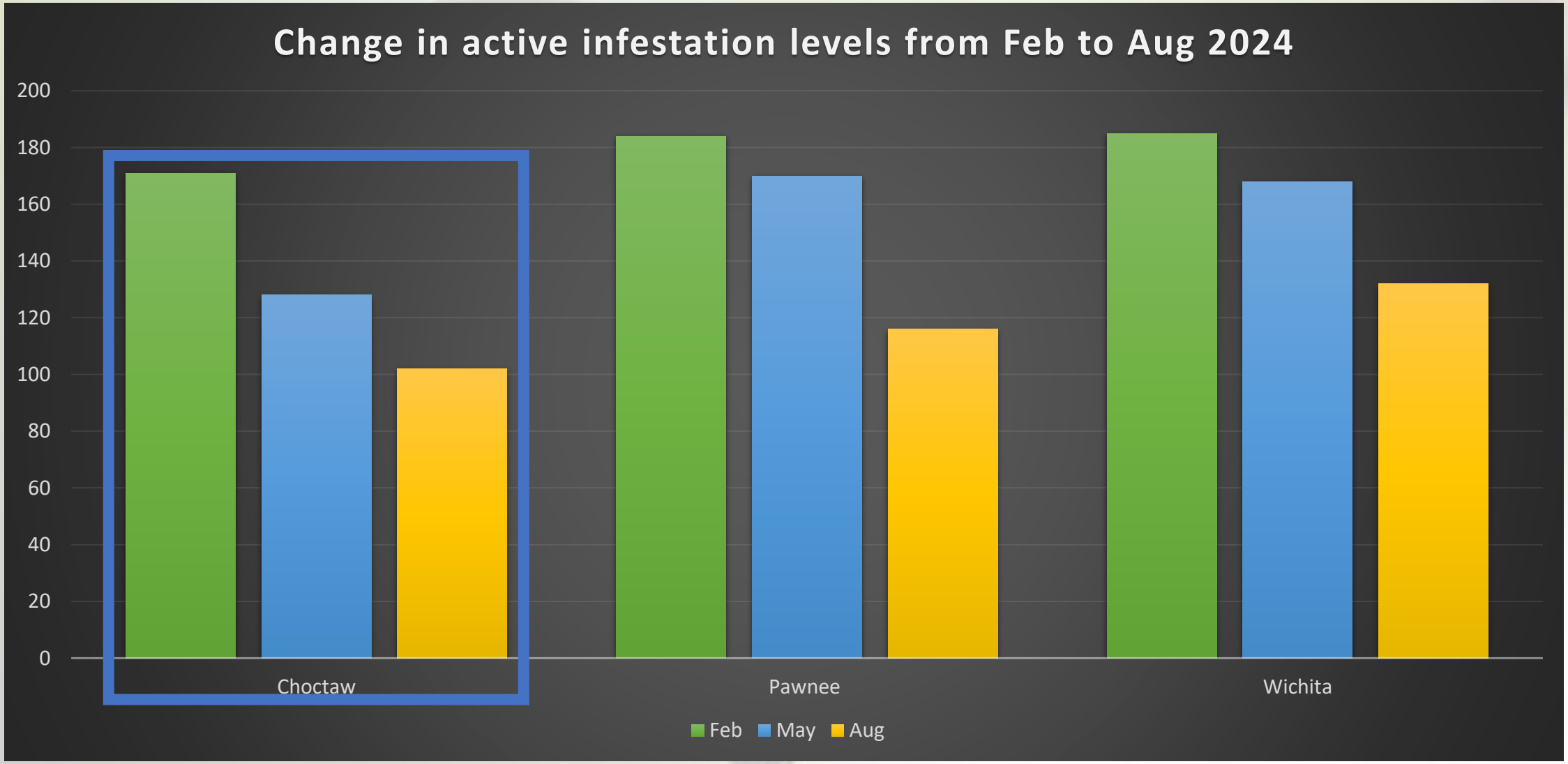
(MSc study of Drake Slabbert)



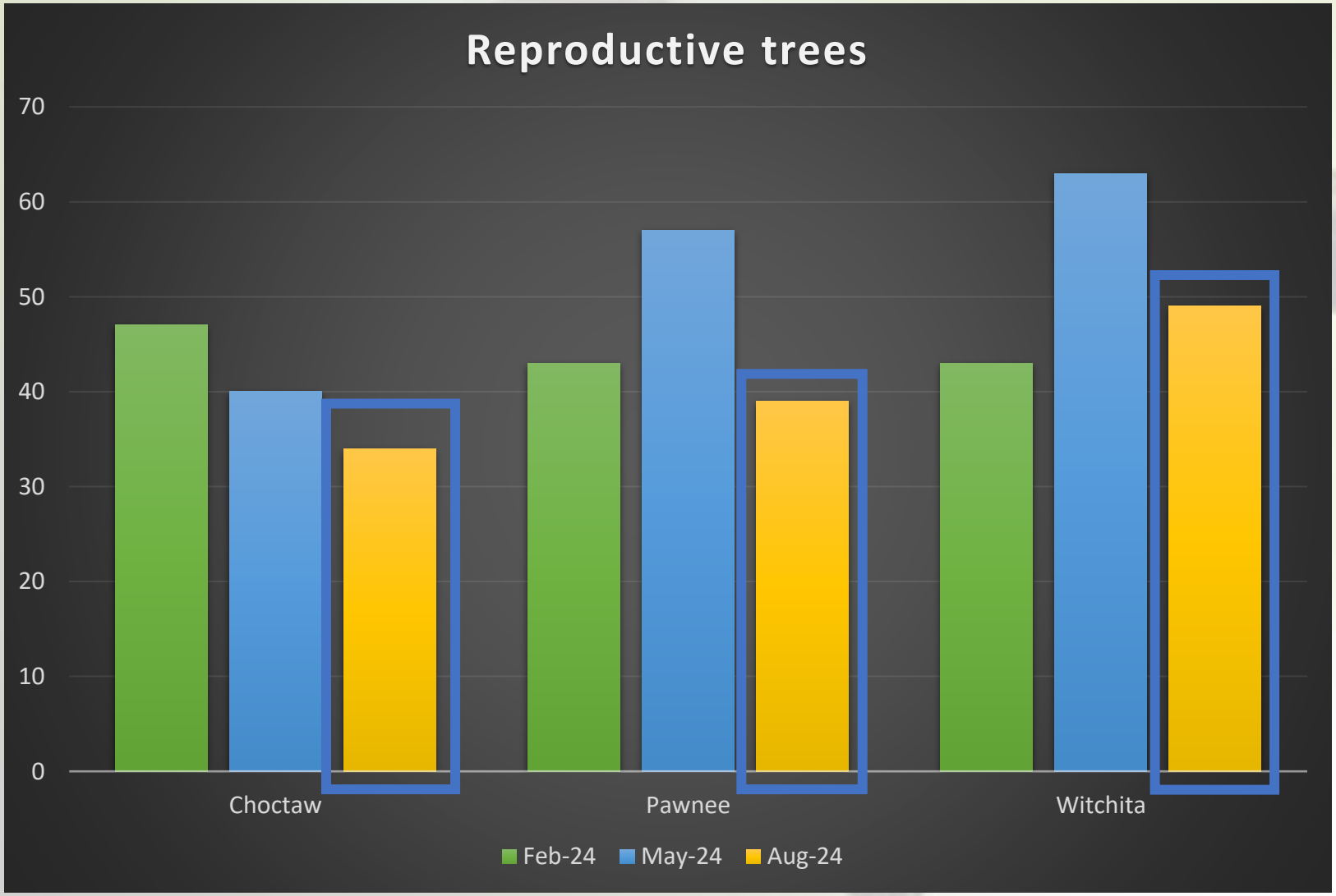
Levels of reproductive infestation went down but overall infestation levels remained the same

Remove branches that are not actively infested from survey i.e. branches that have not shown signs of activity for more than 3 monitoring cycles (~9-10 months)

February 2024 to August 2024



Reproductive PSHB infestation levels



- **Large amount of break out seen after harvesting**

Conclusions

- Once PSHB has started reproducing within an orchard, it is nearly impossible to eradicate
- PSHB behaviour is influenced by many factors
- Management of an orchard to manipulate beetle behaviour can help control population levels and their overall in effect on yield
- Need a proper understanding what drives this behaviour to be able to manipulate it and minimize the effect of the beetles
- Management strategies should also not impact yield production or quality

Acknowledgements

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tpcp

Navorsing vir die Biologiese Beheer van die Stompkopkewer

D. Saccaggi

Stellenbosch UNIVERSITY IYUNIVESITHI UNIVERSITEIT

AGRISCIENCES EYENZULULWAZI NGEZOLIMO AGRIWETENSKAPPE

Steffan Hansen, Davina Saccaggi* en *Francois Roets

SAPPA

Inleiding

- Stompkopkewer (*Euwallacea fornicatus*) is n baskewer van Suidoos Asie

iNaturalist

- ’n ‘Ambrosia’ kewer -> Naby assosiasie met n swam, waarmee dit ‘boer’ en waarop dit voed

- *Fusarium euwallaceae* -> Hoof ambrosia swam. Veroorsaak saam met kewer skade aan bome se watervervoer sisteem.

Inleiding

Uitdagings met beheer

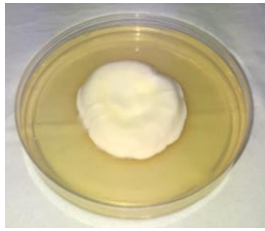
- Kewer diep in tonnels in hout

- Vreet uitsluitlik swam

- **Dus is traditionele chemiese beheer gewoonlik onprakties**

Biologiese beheer?

- Kan **entomopatogeniese swamme** soos *Beauveria bassiana* gebruik, wat kewer aanval



- Kan **swamdodende swamme**, soos *Trichoderma*, gebruik om die *Fusarium* aan te val.

- **Grootste uitdaging bly hoe om enige beheer agent tot by kewers/tonnels te kry**

- En hoe reageer biobeheer agente in tonnels?

Navorsingsprojek

- Drie jaar navorsingsprojek aan die Universiteit van Stellenbosch
- Befonds deur SAPPA, SAMAC en Hortgro Science
- Onder leiding van Prof Francois Roets
- Werk saam met myt kundiges en plantpatologie dept.

HORTGRO
Growing Fruit IQ

SAPPA

SAMAC
Macadamias South Africa NPC

Navorsingsprojek

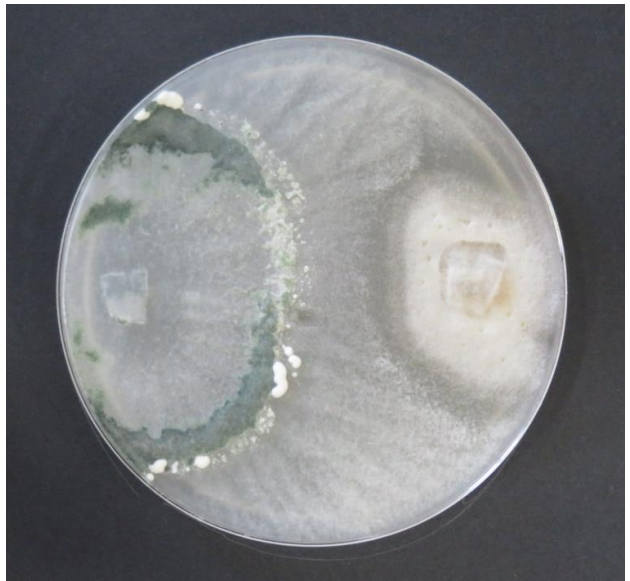
- **Ons benader probleem van twee kante af:**

1) Fundamentele laboratorium navorsing oor interaksie van ***Beauveria bassiana*** en ***Trichoderma atroviridae*** met *Fusarium* (en ander ambrosia swamme), mekaar, en kewers

2) Gebruik van **myte** wat met kewer assosieer om bogenoemde agente **tot by kewers/tonnels te dra**

Interaksies

- 1. Kompetisie studies van *B. bassiana* en *T. atroviridae*, twee wyd gebruikte biobeheer agente, teen
  - *Fusarium euwallaceae*
  - *Graphium euwallaceae*
  - *Paracremonium sp.*
  - *Phaecremonium minimum*
  - Teen mekaar



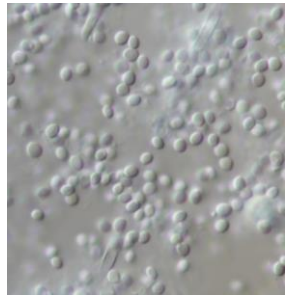
Interaksies

- Kry idee van hoe hierdie swamme in natuurlike habitate met mekaar interaksies sal he.
- **Eerste stap om te kyk of die biobeheer agente kans staan om te werk in veld**

- 2) Toets of *B. bassiana* en *T. atroviridae* kewer getalle beheer onder laboratorium omstandighede

Myte as Vervoer van Biobeheer Agente

- Baskewers gewoonlik met n paar spesies myte assosieer
- Hierdie gebruik die kewers as vervoer, en is predatore, parasiete of **swamvoeders** in kewer tonnels
- Verskeie klein diertjies (bye, erdvlooie, roofmyte) kan gebruik word om biobeheer swam spore tot by n teiken pes/habitat te dra.



Myte as Vervoer van Biobeheer Agente

Myte Versamel

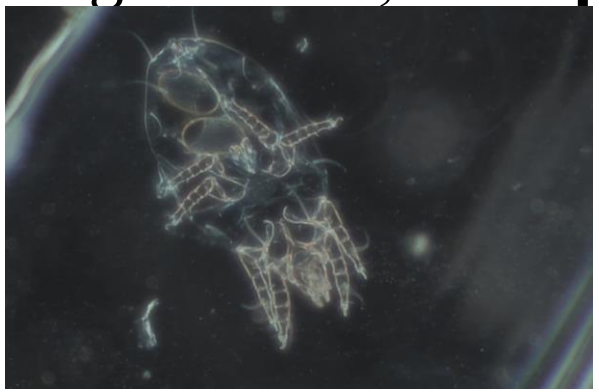
- Ons het 6-9 myte identifiseer op stompkop/ander ambrosia kewers (SA en Vietnam)

- Drie van hierdie is **swamvoeders**, en kan maklik op groot skaal in laboratorium aangeteel word
  - Moontlik op/saam met die biobeheer swamme, wat koste spaar

Myte Versamel

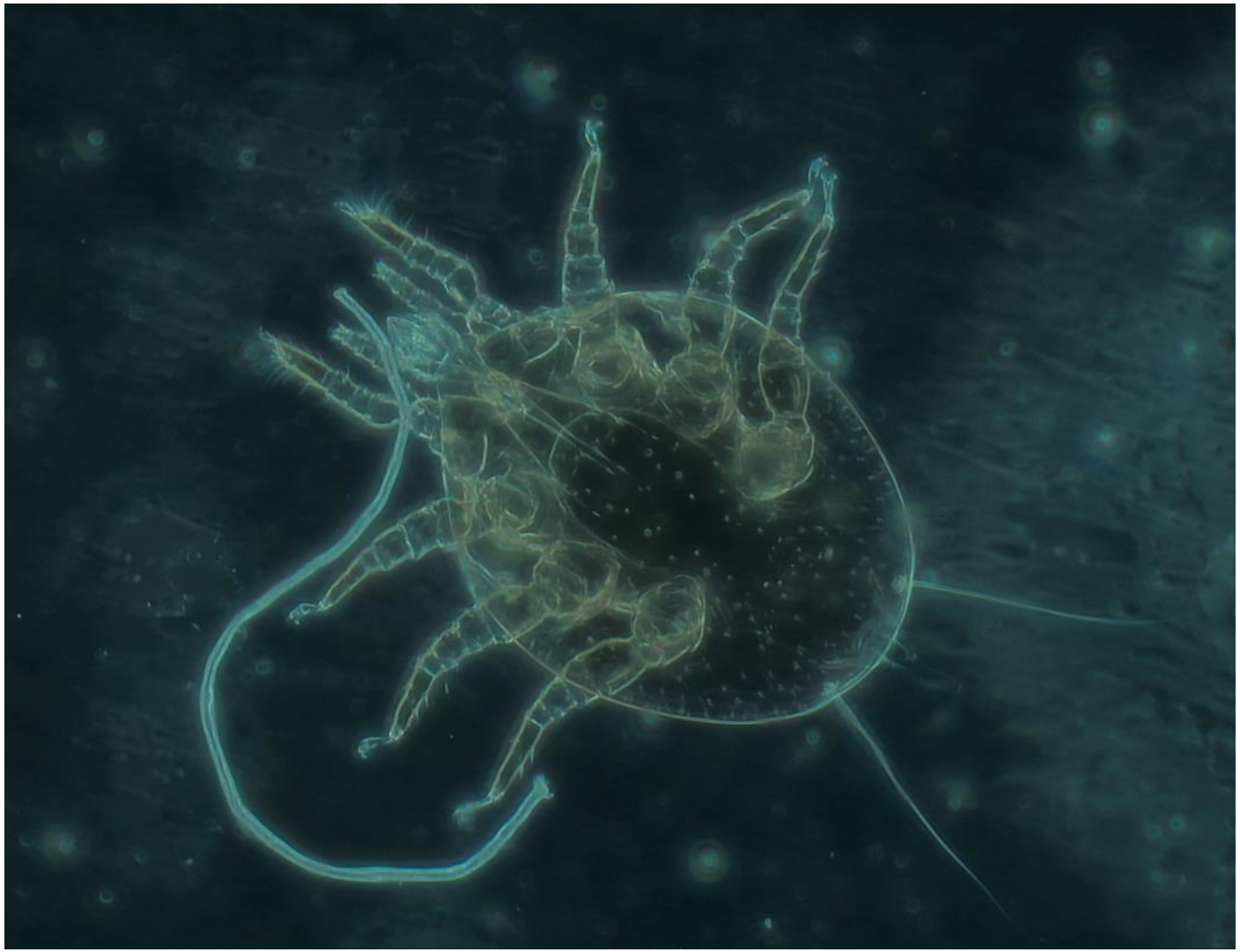
Myt Identifikasie

- Een van ons spesies is *Histiogaster* cf. *arbosignis*, n myt wat wêreldwyd met houtborende insekte assosieer
  - Vorm n geharde verspreidingsstadium, of '**hipopus**'



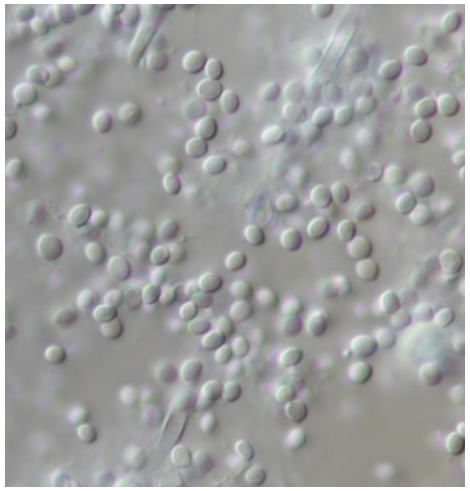
- Ook twee *Trichouropoda* spesies -> staan bekend as besie-myte
  - Groot, aktief.
  - Versprei op kewers in spesiale nymf stadium

Myt Identifikasie



Volgende Stappe...

- Kan *Histiogaster* en besie-myte op biobeheer swamme aangeteel word?

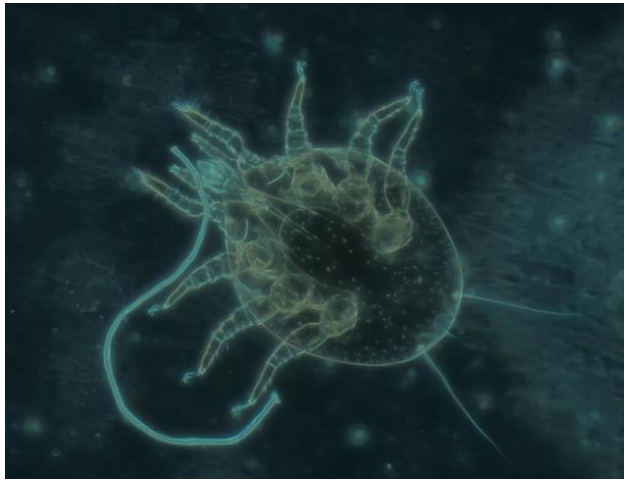


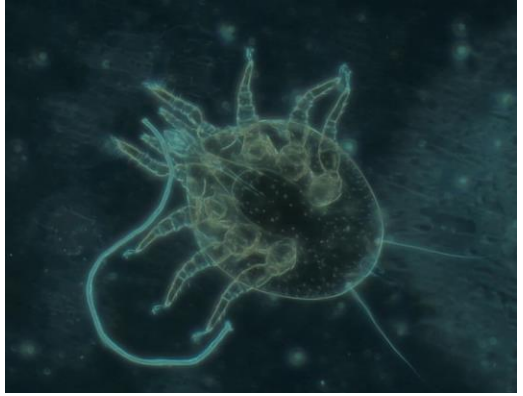
- Hoeveel biobeheer swam spore kan n myt dra?
  - Inwendig en/of uitwendig
- Kan myte biobeheer swamme tot in kewer kolonies dra?

- *Hoe pas ons toe in veld?

Bedankings

- **Drie befondsingsliggame** en **personeel medewerkers**
- **A. Smit, N. Palmen**: navorsingsassistente
- **E. Uekermann, P. Klimov, W. Knee**: Myt identifikasies
- **L. Mostert**: Plantpatologie meewerker
- **M. Berto, D. Carillo**: Algemene raad





Dankie! Enige vrae?

shansen@sun.ac.za