



Invasive Ambrosia Beetle Conference
The Situation in California
August 12 - 14, 2012

Meeting sponsored by:


The Hofshi Foundation

University of California, Riverside

UC Center for Invasive Pest Research

The Huntington Botanical Gardens

The Los Angeles Arboretum



Invasive Ambrosia Beetle Conference
The Situation in California
August 12 - 14, 2012

Session 1

Setting the stage for further discussion



What's wrong with **ambrosia beetles** these days?



1) What we know

2) What we think we know

3) What we don't know

Jiri Hulcr

UF UNIVERSITY of
FLORIDA

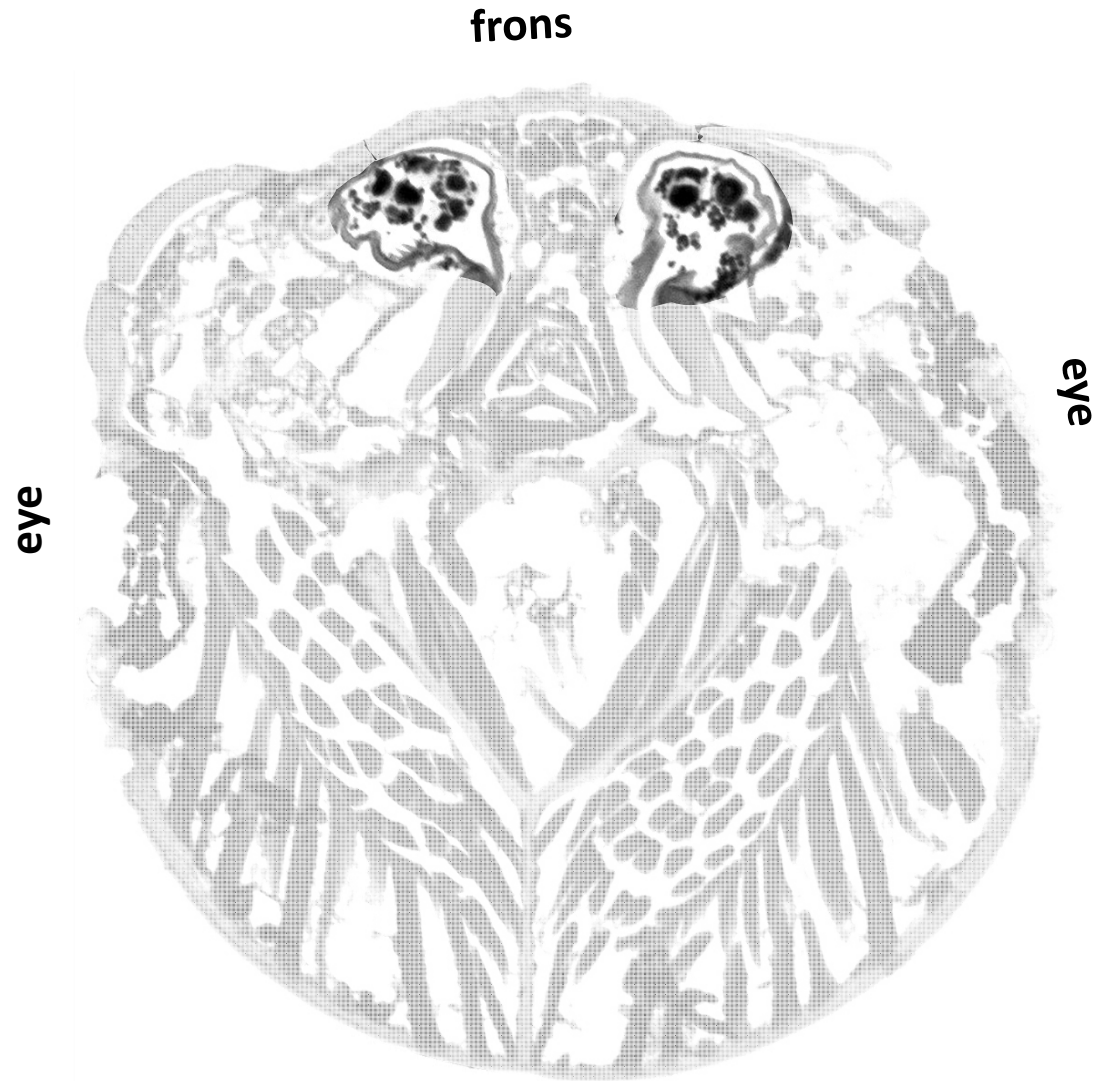
We all know that...

fungus farmers



We all know that...

fungus farmers • mycangia



We all know that...

fungus farmers • mycangia • haplo-diploidy & inbreeding

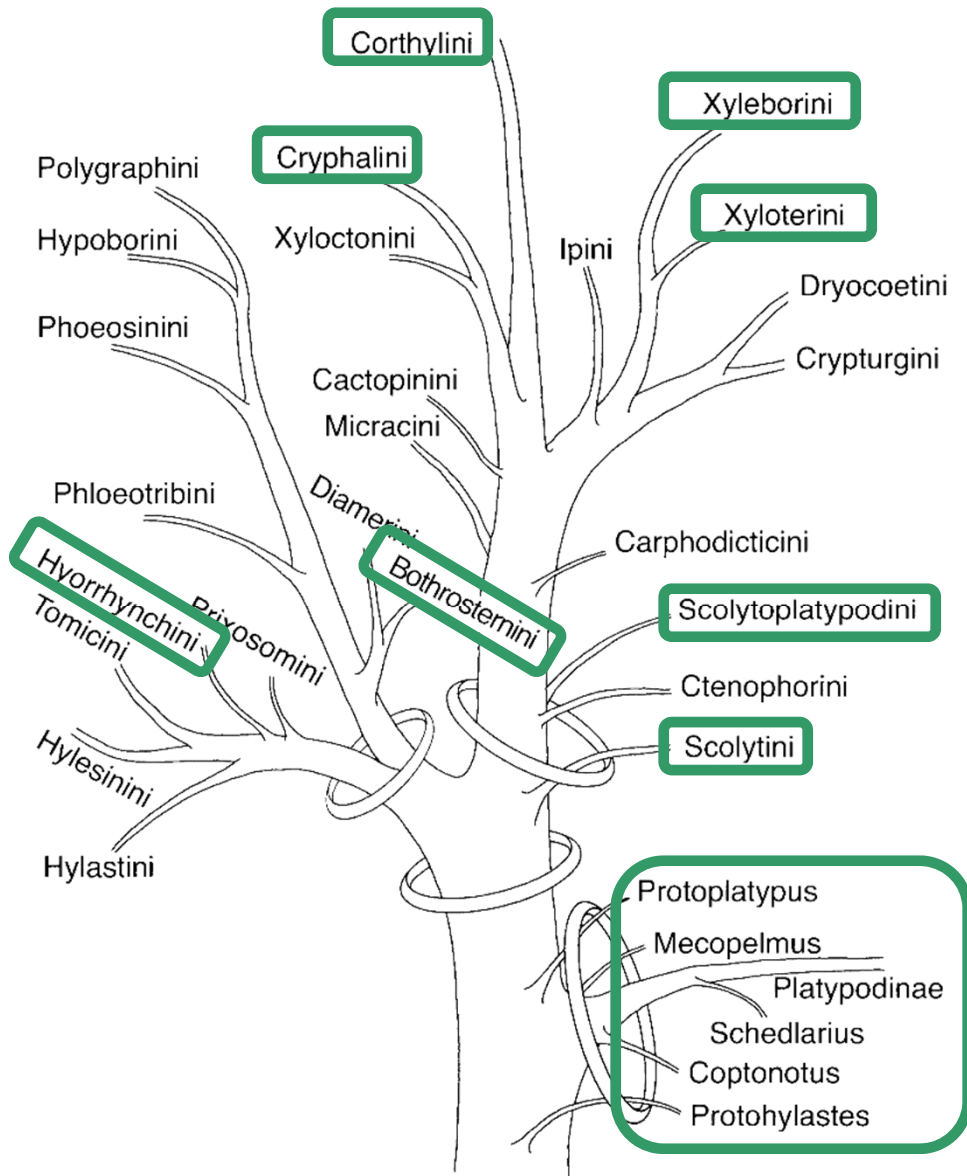


boy

girl

We all know that...

fungus farmers • mycangia • haplo-diploidy & inbreeding • diversity



**3,500 species
mostly tropical**

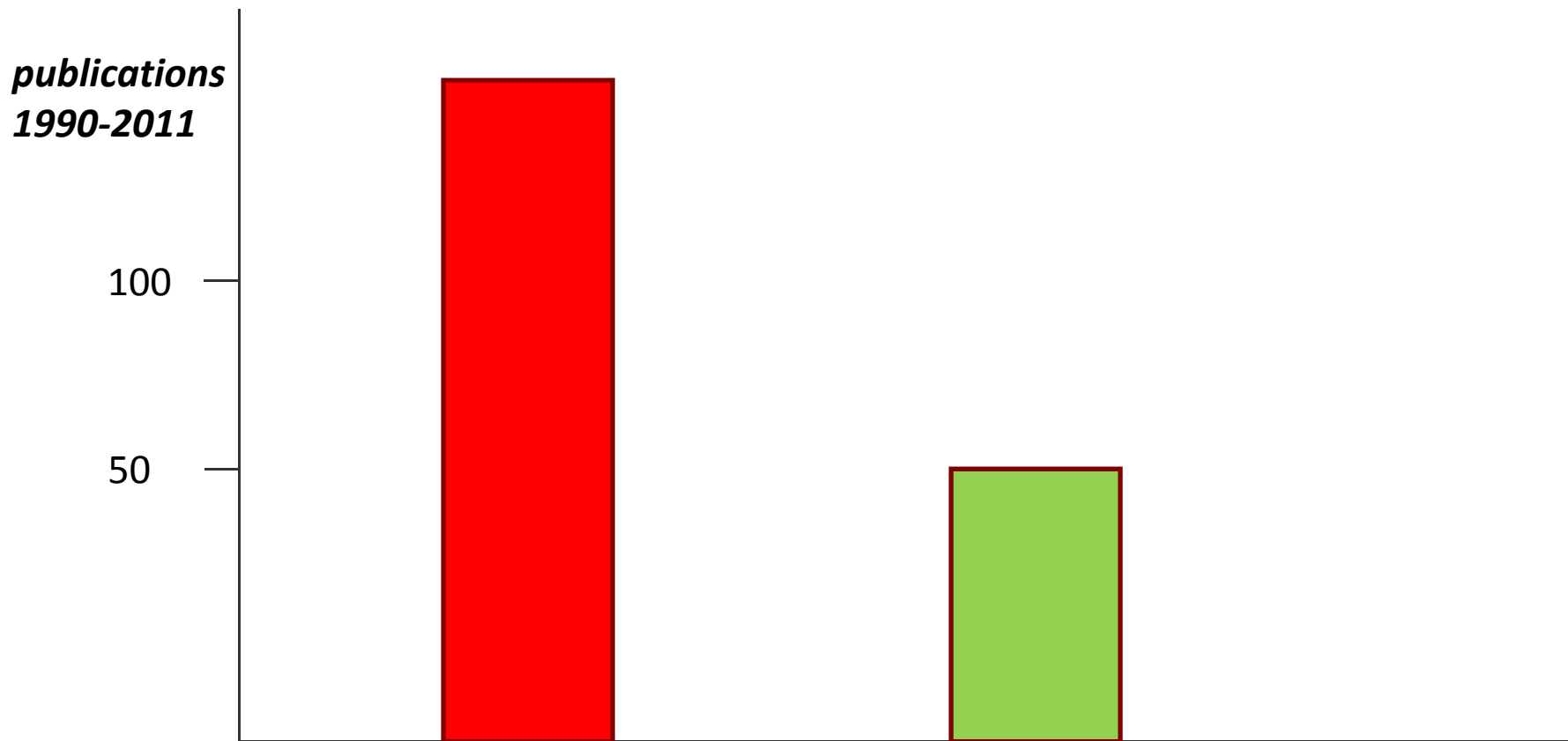
**11 times evolved,
never reversed**

We all know that...

fungus farmers • mycangia • haplo-diploidy & inbreeding • diversity • **most are harmless**

pests, invasive

general biology



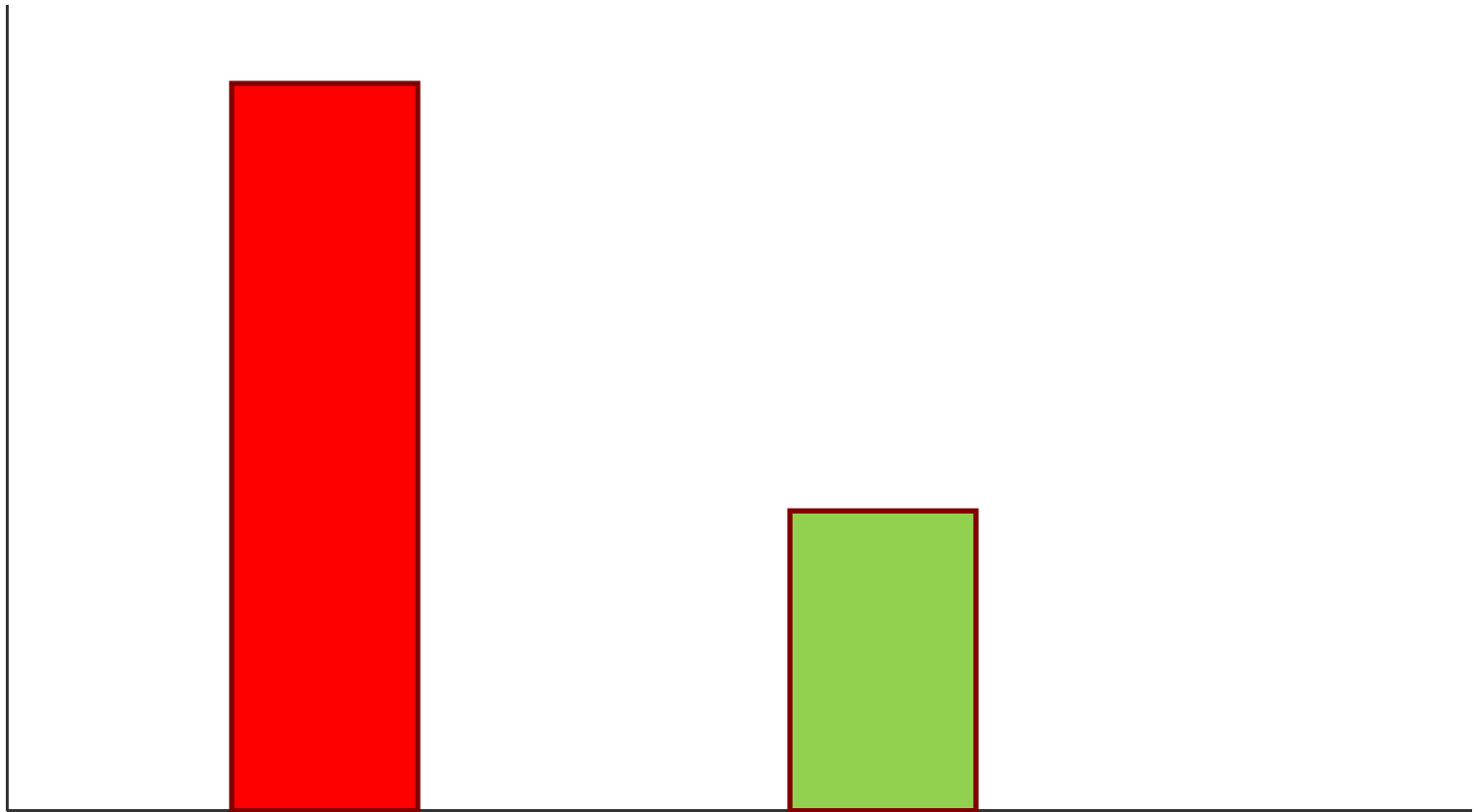
We all know that...

fungus farmers • mycangia • haplo-diploidy & inbreeding • diversity • **most are harmless**

tree killers

dead wood colonizers

*species
diversity*



We all know that...

fungus farmers • mycangia • haplo-diploidy & inbreeding • diversity • **most are harmless**



We think we know...

Beetle identity • Fungus identity

We think we know...

Beetle identity • Fungus identity

Euwallacea fornicatus



We think we know...

Beetle identity • Fungus identity



India



Borneo

Israel & USA



We think we know...

Beetle identity • Fungus identity



global patchwork of populations with local adaptations

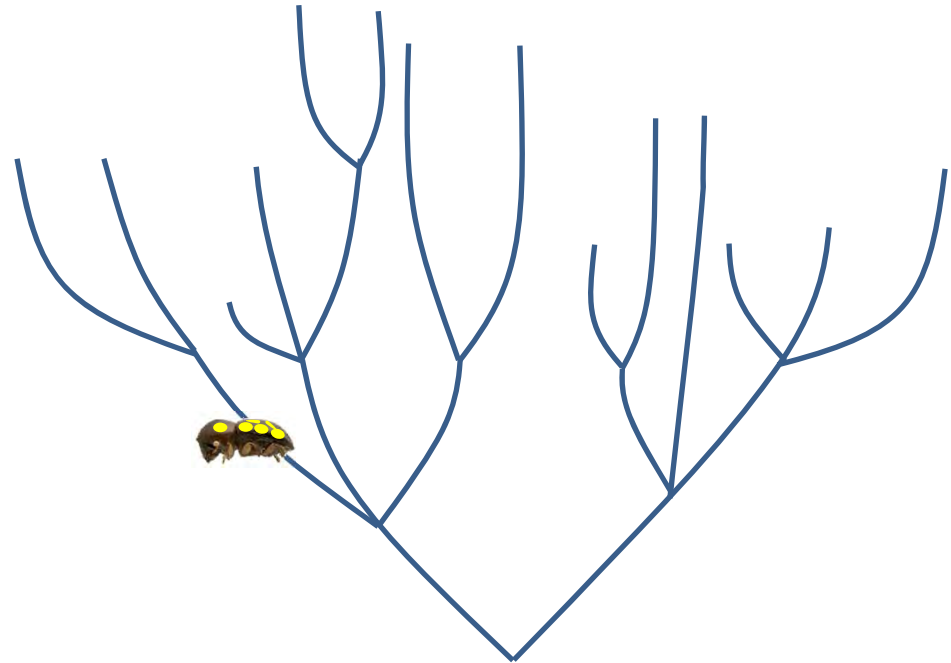
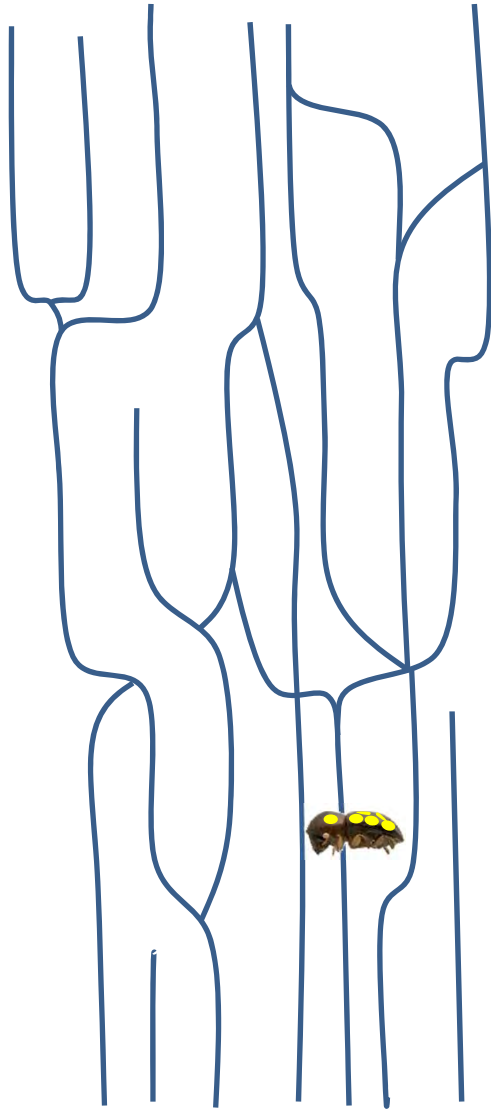
We think we know...

Beetle identity • Fungus identity

“normal” outcrossing species

inbred population

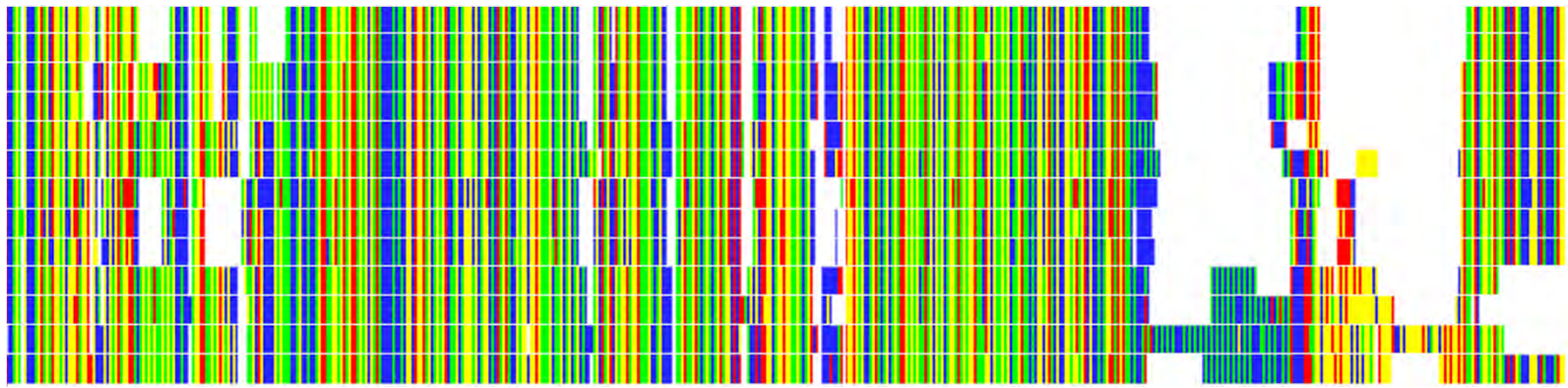
time →



huge DNA sequence divergence

Xyleborini 28S

- X. morigerus
- X. morigerus2
- X. rotundicollis
- X. rotundicollis2
- Anisandrus hirtus
- Anisandrus dispar
- Xylosandrus ater
- C. pseudosuturalis
- Cnestus bimaculatus
- Anisandrus sayi
- Anisandrus obesus
- Xylosandrus ursa
- Xylosandrus ursinus



152 bp

microsatelite ?

huge DNA sequence divergence

<i>% divergence</i>	COI	28S
USA vs. Madagascar	10.94	0.13
USA vs. Thailand	10.09	0.13
Madagascar vs. Thailand	4.4	0.0



granulated ambrosia beetle,
Dole et al. 2009

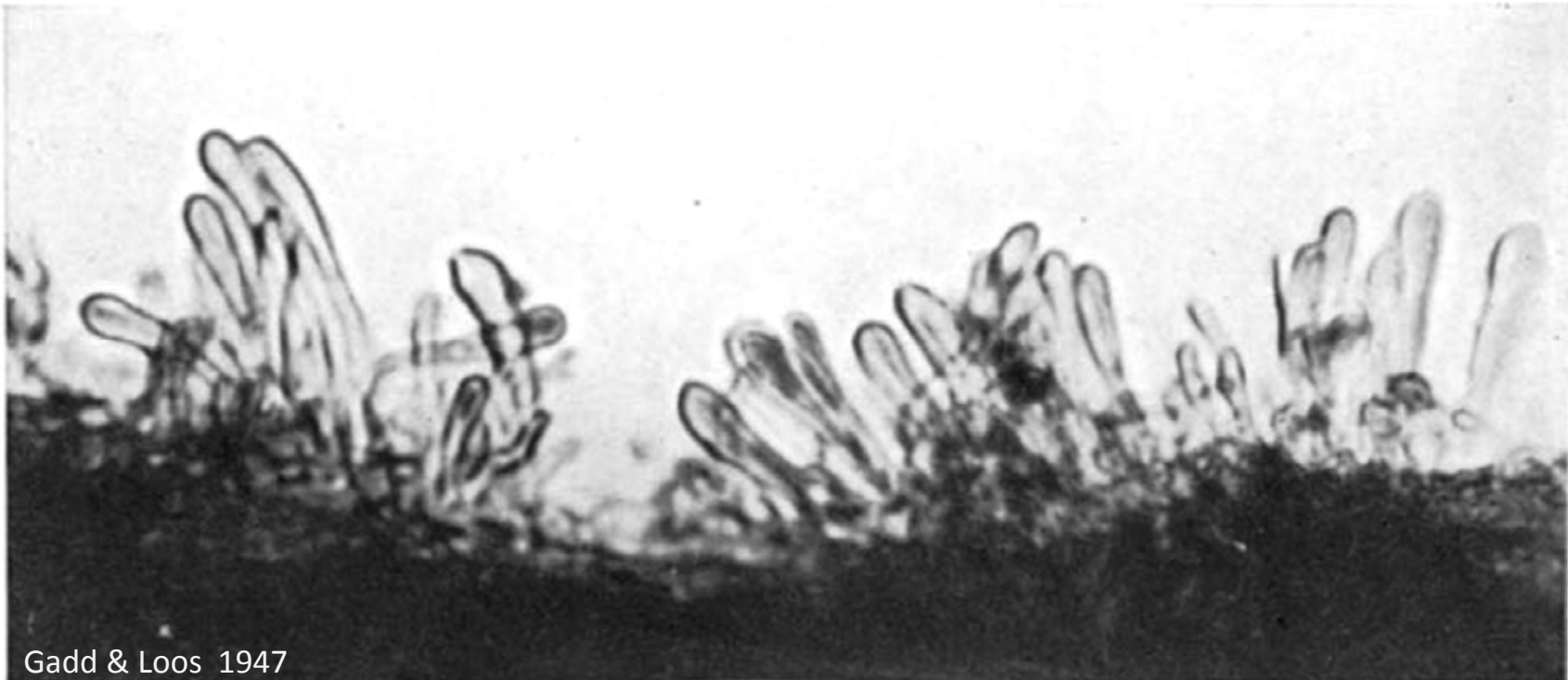
We think we know...

Beetle identity • Fungus identity

We think we know...

Beetle identity • **Fungus identity**

Fusarium ambrosium



Gadd & Loos 1947

We think we know...

Beetle identity • **Fungus identity**

Fusarium ambrosium

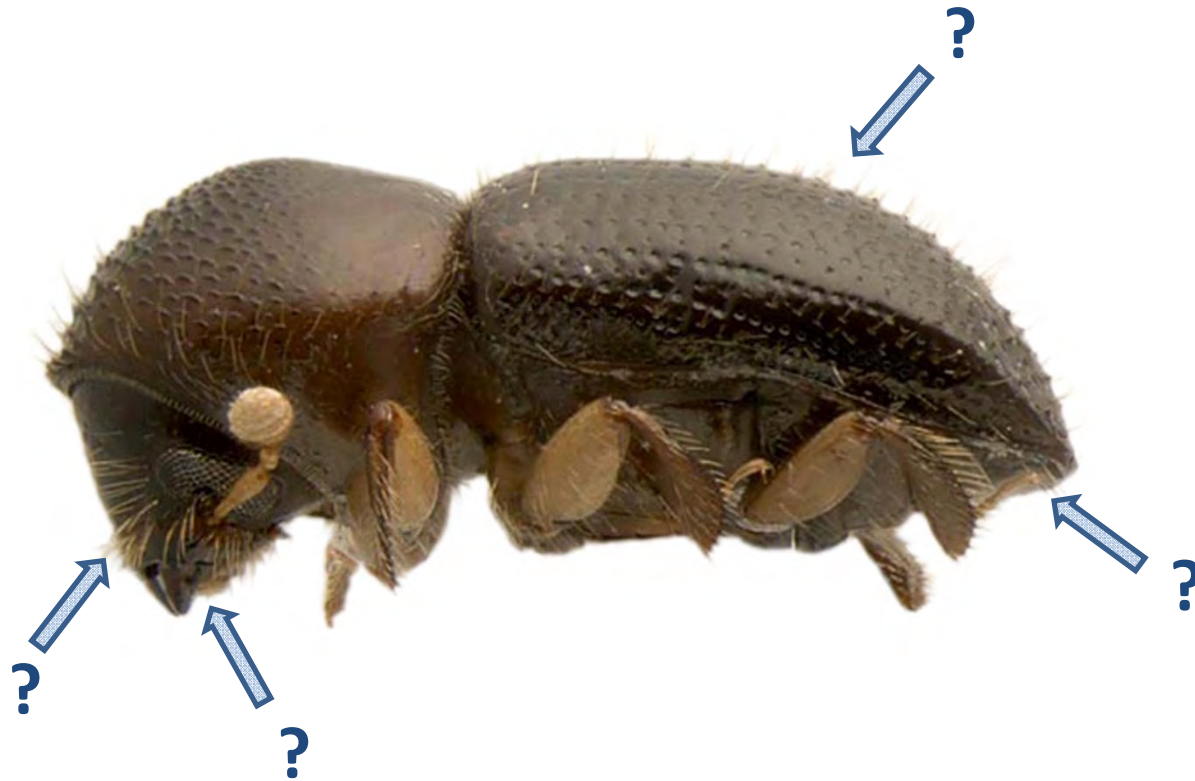
Hulcr & Cognato 2009

Euwallacea fornicatus from Papua New Guinea: **100% *Ceratocystis* aff. sp.**

We think we know...

Beetle identity • **Fungus identity**

Fusarium ambrosium



We think we know...

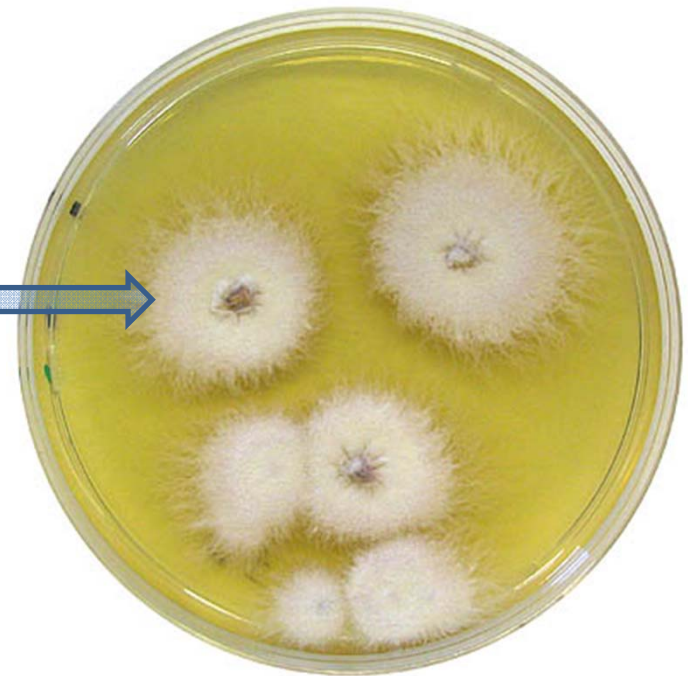
Beetle identity • Fungus identity

Kessler, 1974

Xylosandrus germanus carries
Fusarium lateritium which causes
cankers on nursery walnuts

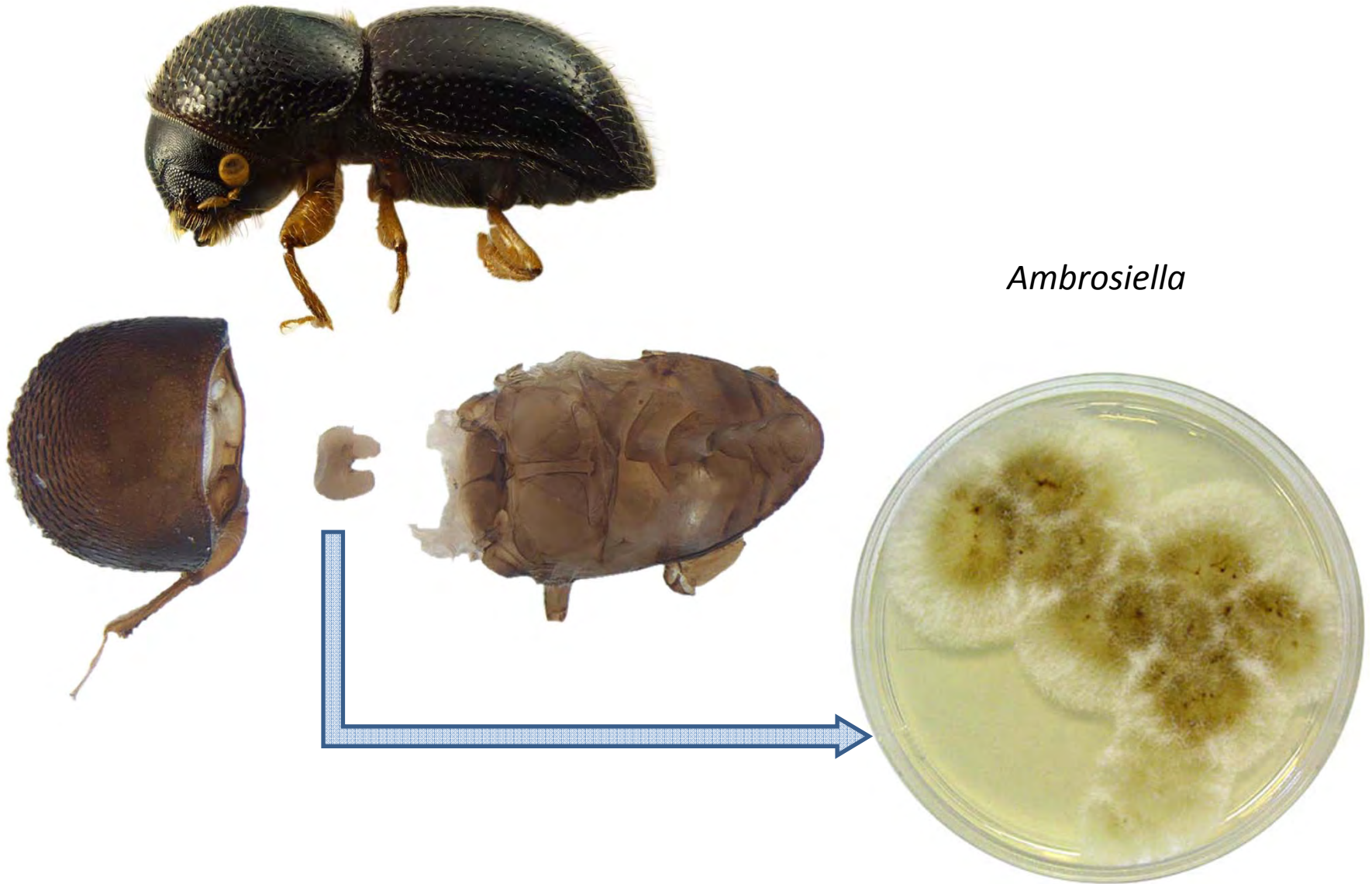


Fusarium



We think we know...

Beetle identity • **Fungus identity**



Ambrosiella

What nobody knows...

Primary or secondary? • Disease future • What to do?

What nobody knows...

Primary or secondary? • Disease future • What to do?

Beetle and fungus are indiscriminate tree killers.

vs.

Beetle and fungus only go to stressed/predisposed trees.

What nobody knows...



What nobody knows...



What nobody knows...



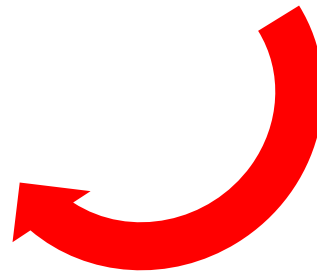
What nobody knows...

Primary or secondary? • Disease future • What to do?

local damage



watered



More beetles nibble more!

What nobody knows...

Primary or secondary? • Disease future • What to do?

local damage



Dendroctonus



What nobody knows...

Primary or secondary? • Disease future • What to do?

Depends on the population pressure!

What nobody knows...

Primary or secondary? • Disease future • What to do?

Different systems have different outcomes

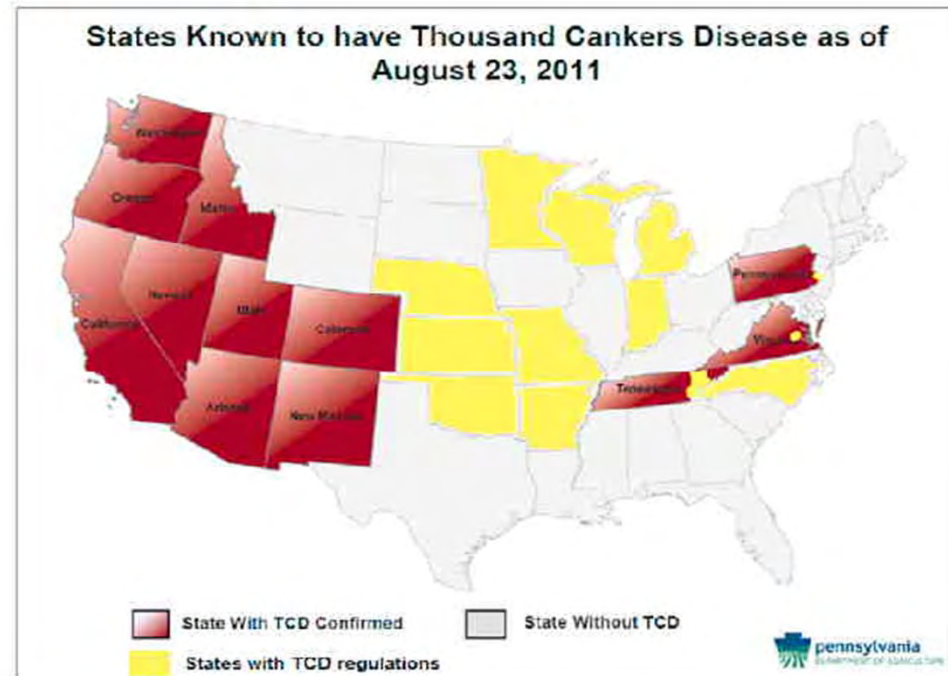
Laurel wilt
virulent fungus

Thousand cankers
both fungus and beetle

Ips beetles
fungus unimportant



Fungus not virulent, but...



What nobody knows...

Primary or secondary? • Disease future • What to do?



Bad news

Kills trees that may otherwise survive

Dead wood very contagious

Neglect → spread → EXPLOSION

Good news

Explosion preventable!

No reservoir in dead trees

“Nibbling” doesn’t breed the vector

What nobody knows...

Primary or secondary? • Disease future • **What to do?**

Start solving basic problems:

Tell people we have a problem!

Don't move infested wood - contagious

Attractants? *Progress made on the redbay ambrosia beetle*

Focus on beetle-breeding wood

- solarization?
- chipping?
- tarp over?
- use as a trap?

New practices

- don't overwater
- disposal of attacked hosts & pruning
- preventative trap-out
- preventative injections



CONCLUSIONS



Species identity

- *E. fornicatus* is a global **patchwork of variants**, not a “species”
- What is *Fusarium ambrosium*?

Disease dynamics

- Will explode if neglected
- Need to pay attention to BOTH the beetle and the fungus
- Definition of “host” – nibbling doesn’t lead to reproduction

What to do?

- get tips from research on other beetles & fungi
- start with a few simple solution-oriented tests
- make noise!

Thank you!