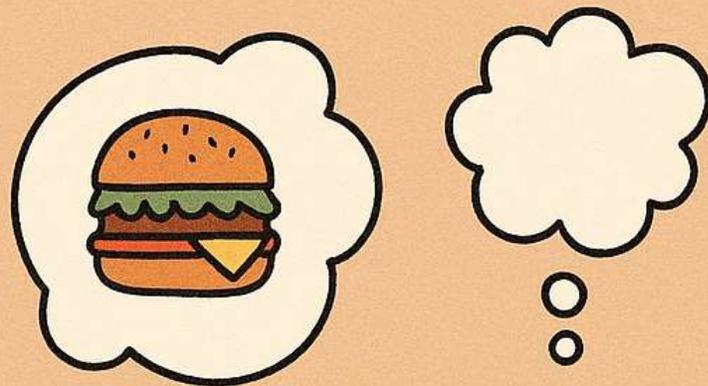
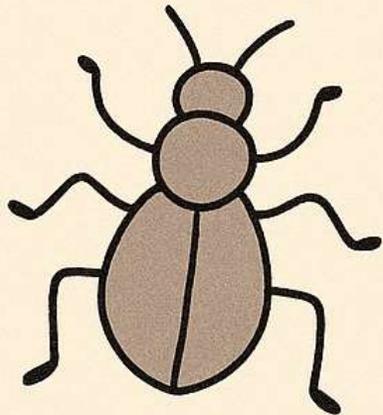


# Insect Ecology



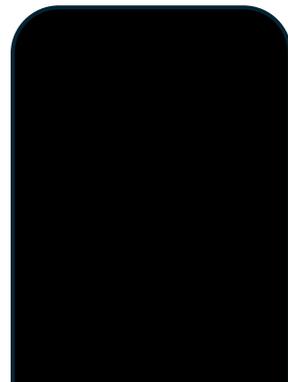
# Forest Pests Insects

where and how to find them

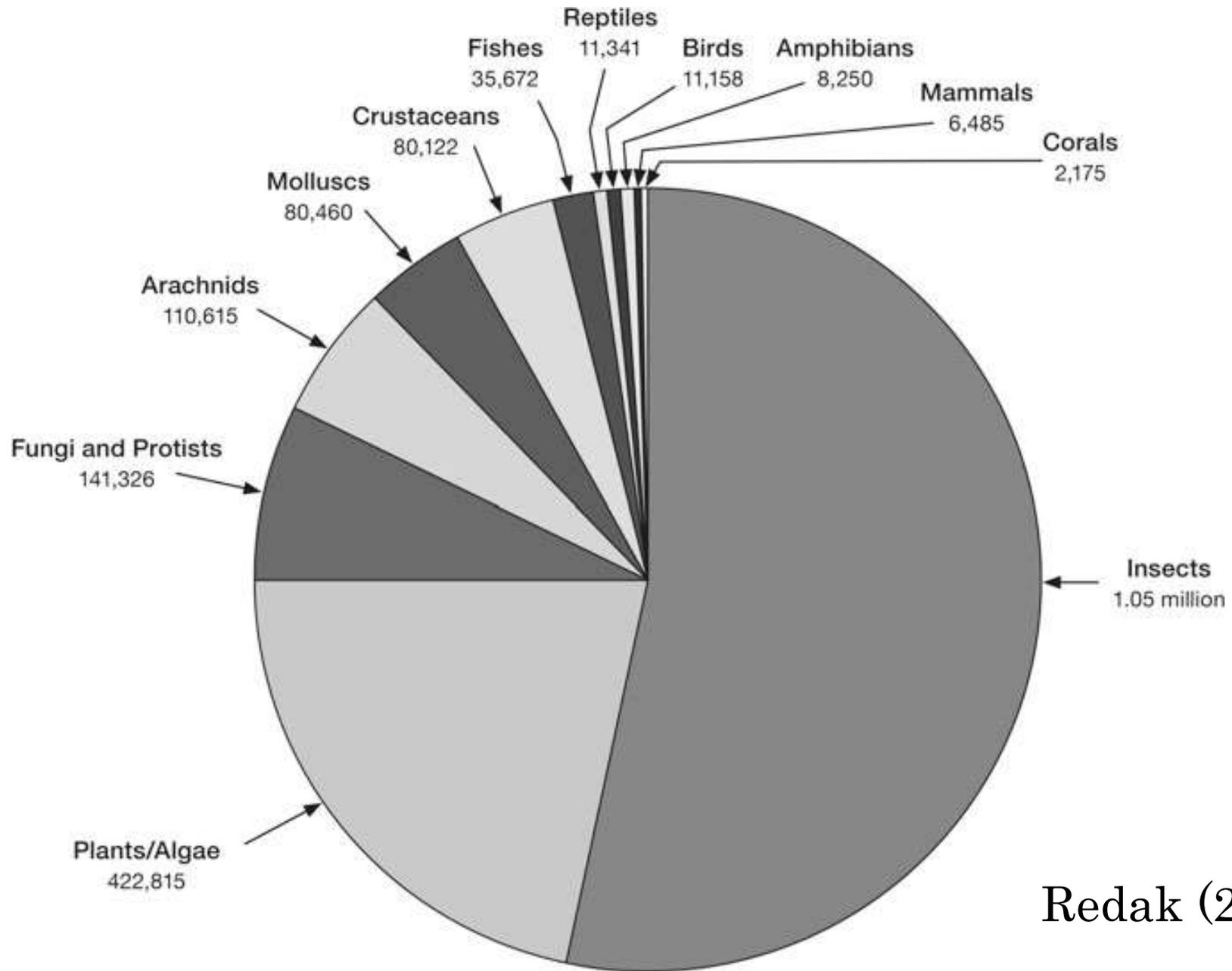
Kahraman İpekdal

Hacettepe University

[kipekdal@hacettepe.edu.tr](mailto:kipekdal@hacettepe.edu.tr)







Redak (2023)

# What is a «pest insect»?

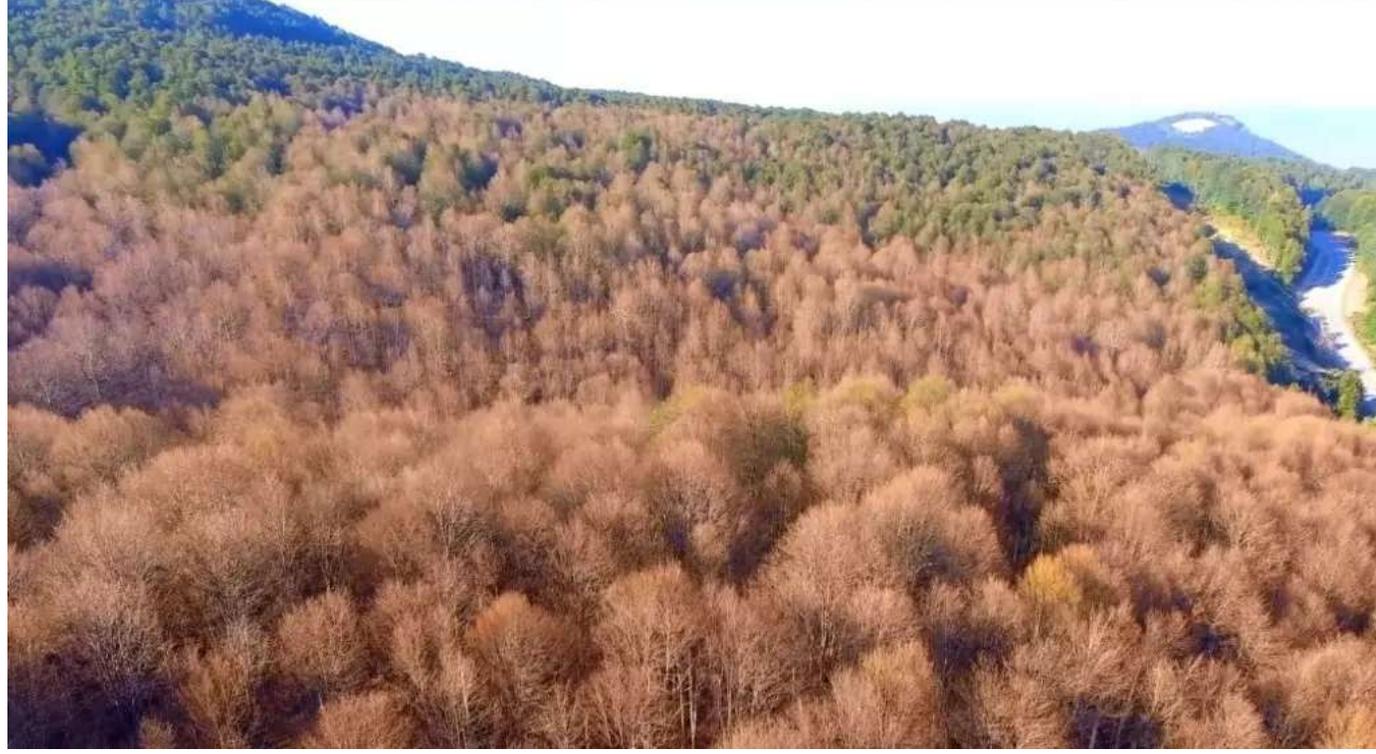
---

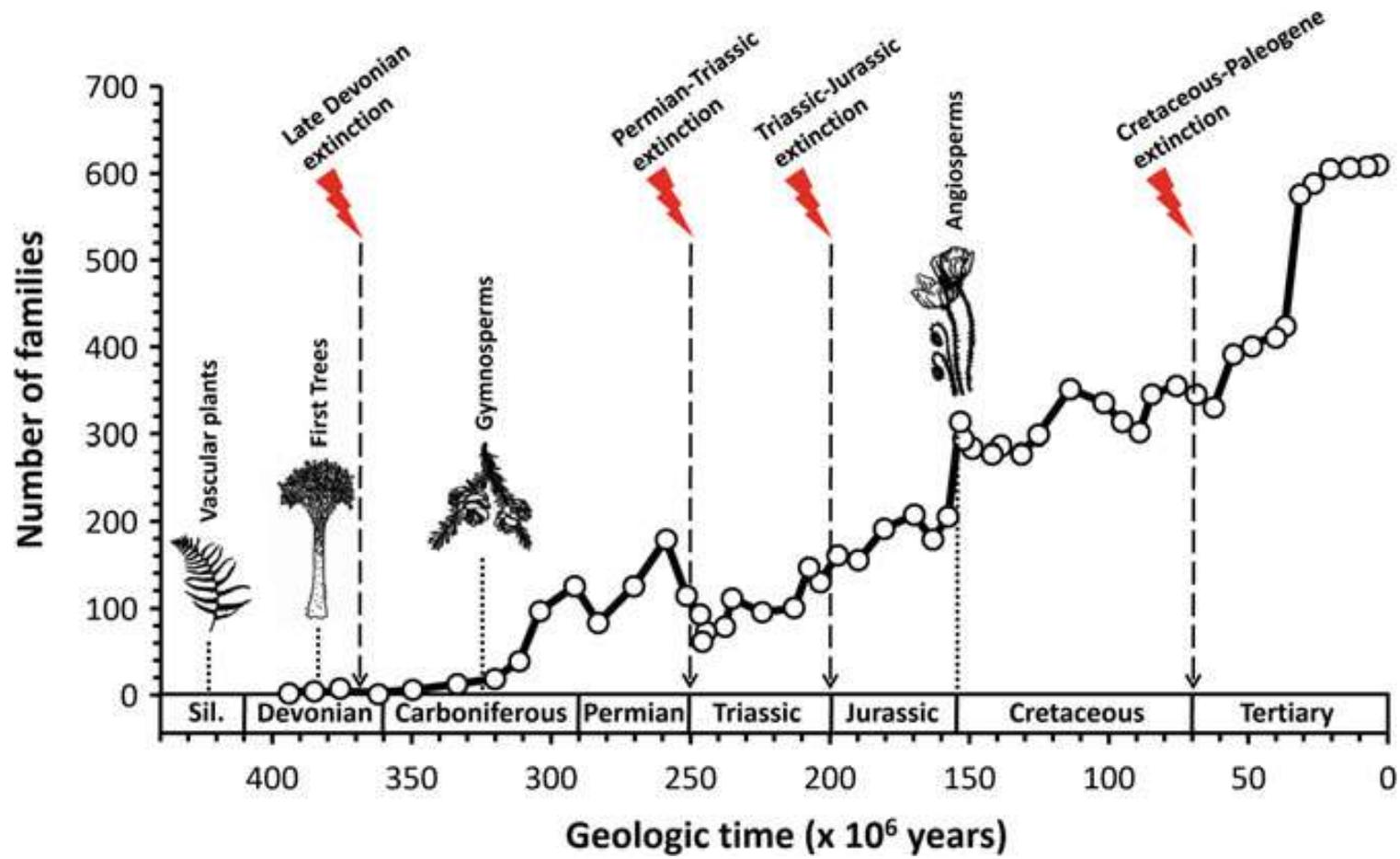
- Less than 1% of all known insect species are pests.
- Phytophagous insects are among the most destructive pests.



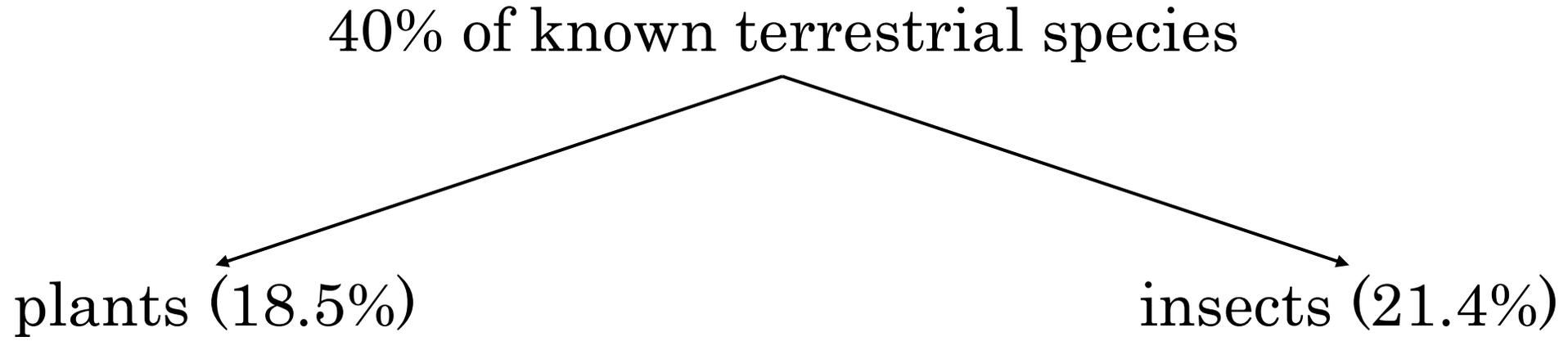
# What is a «pest insect»?

- Less than 1% of all known insect species are pests.
- Phytophagous insects are among the most destructive pests.

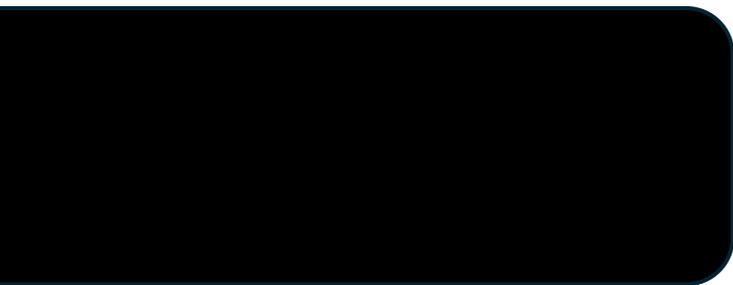




Hébert (2023)



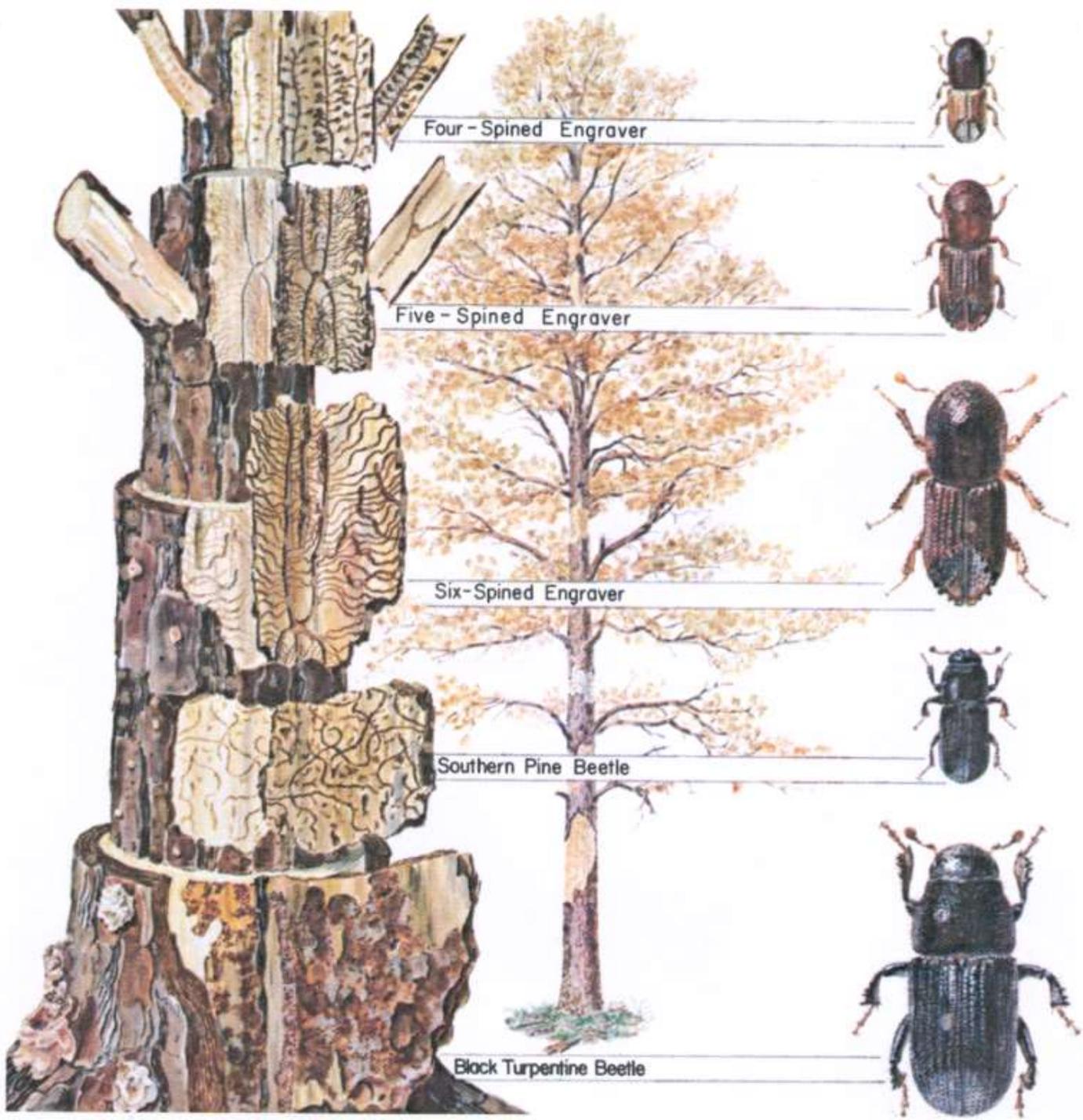
- One predacious or saprophagous insect species per phytophagous insect species
- Nearly 2 terrestrial species out of 3 depend on plants

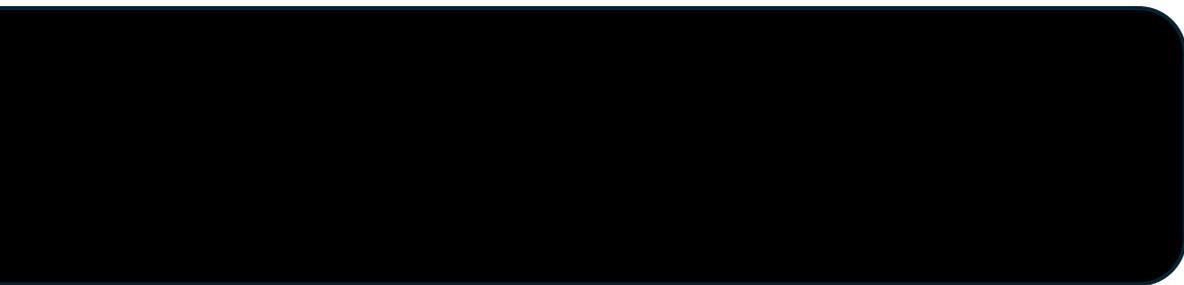


# Structural Heterogeneity of Forests and Individual Trees



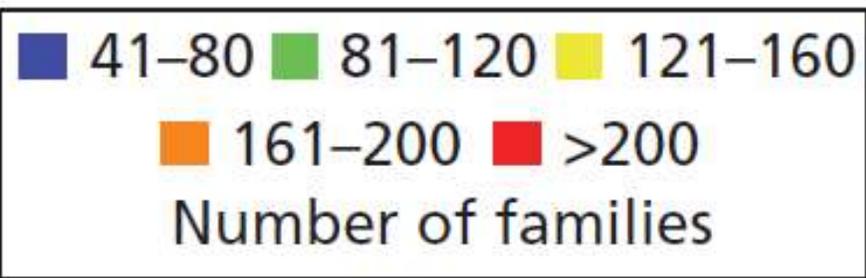
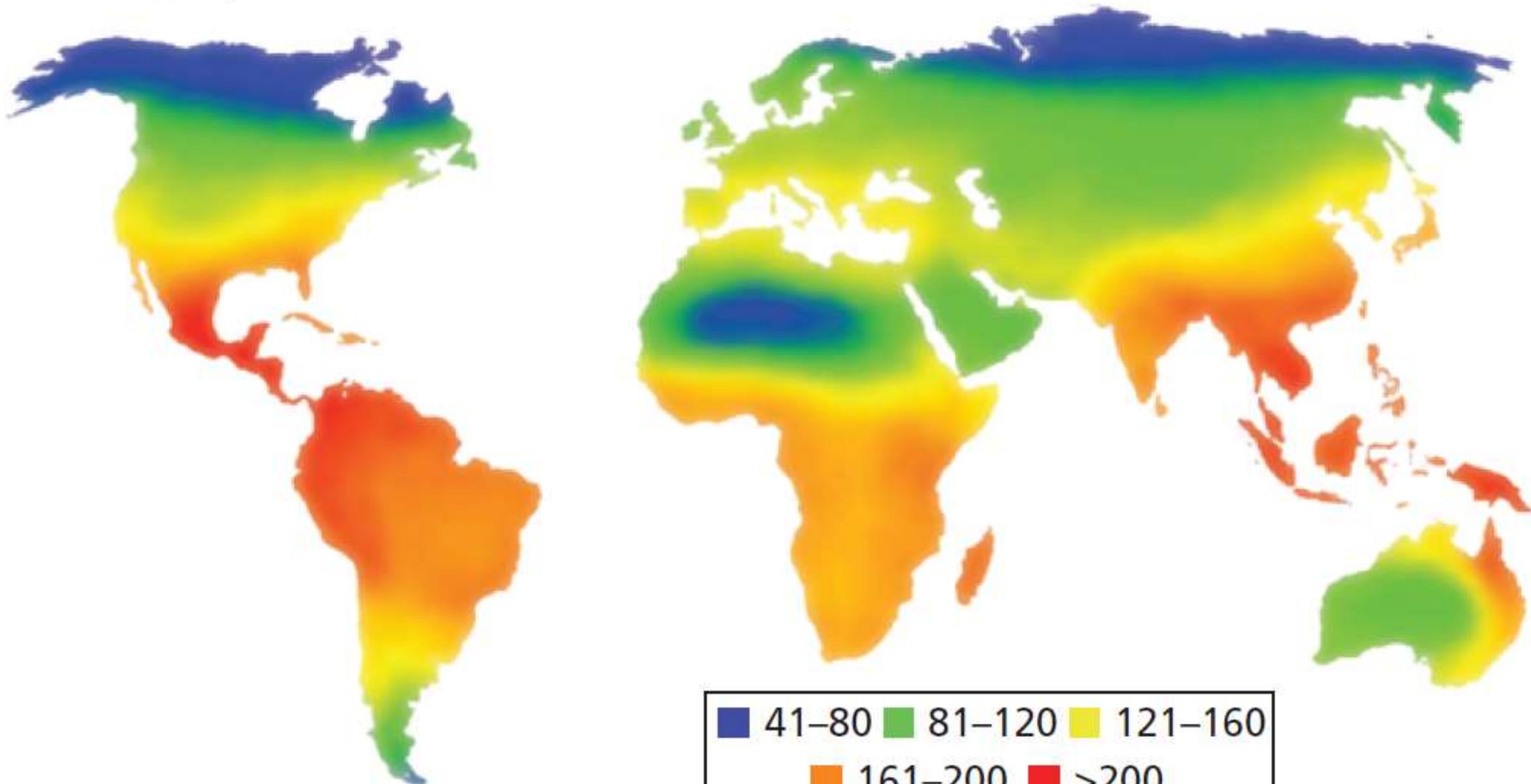






# Latitudinal Gradient of Insect Diversity

# Angiosperm families

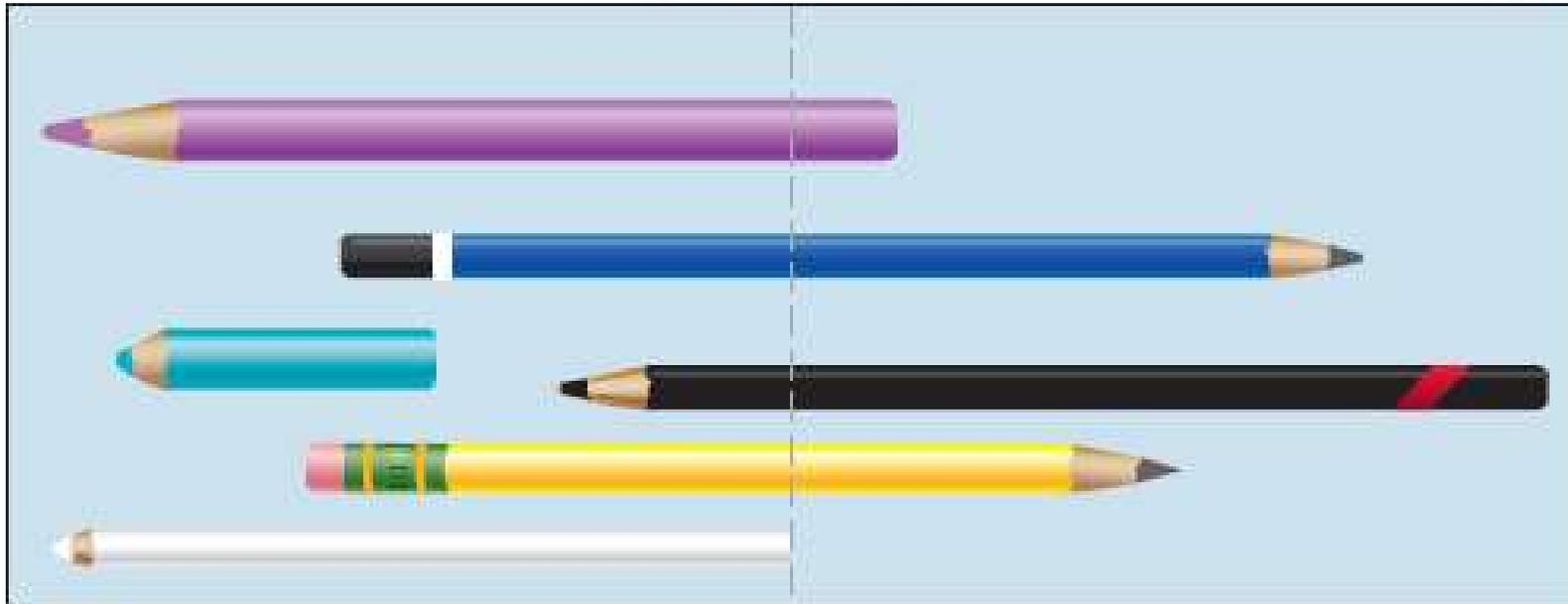


# Mid-domain effect

Distribution  
limit X

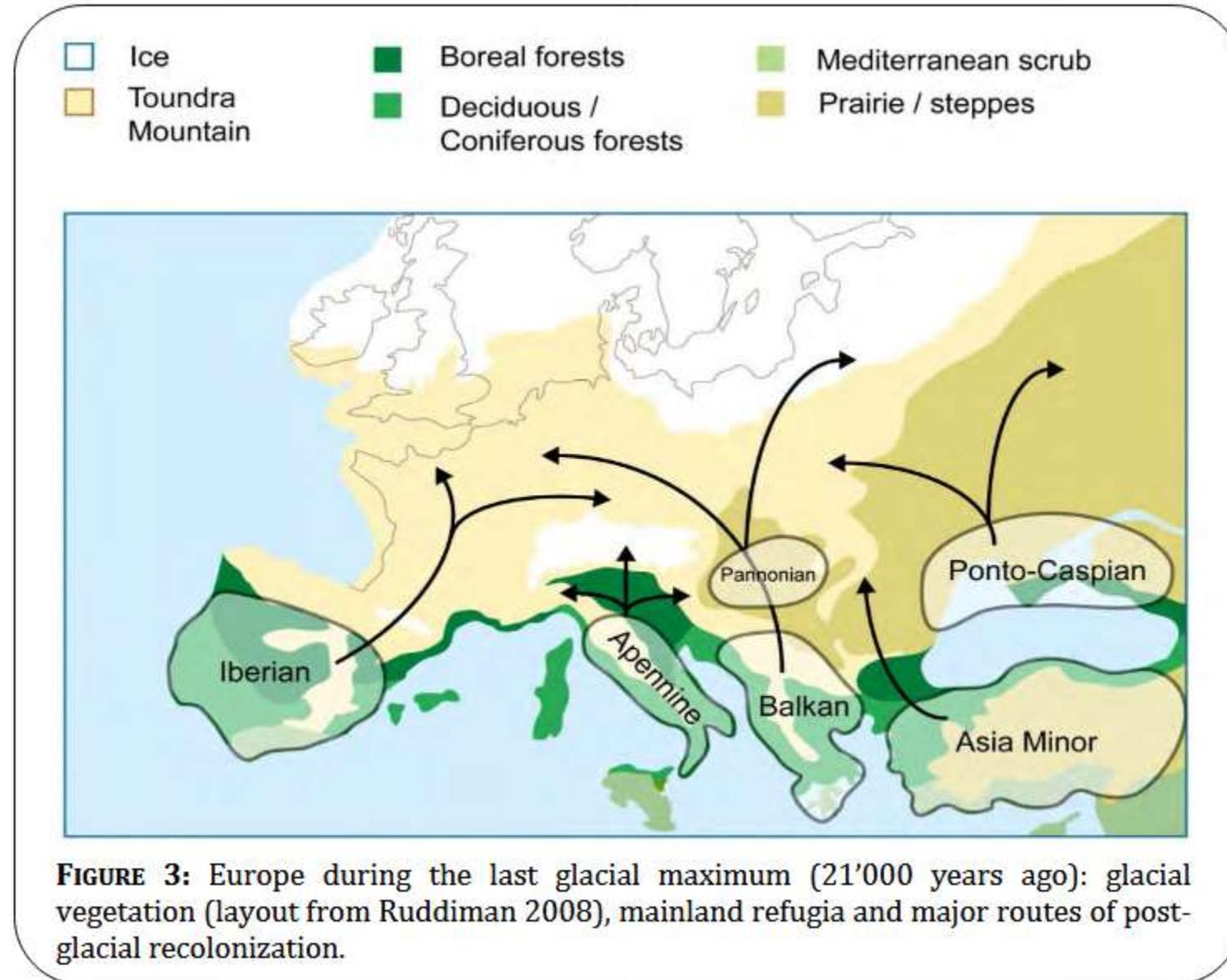
"Mid-domain"

Distribution  
limit Y

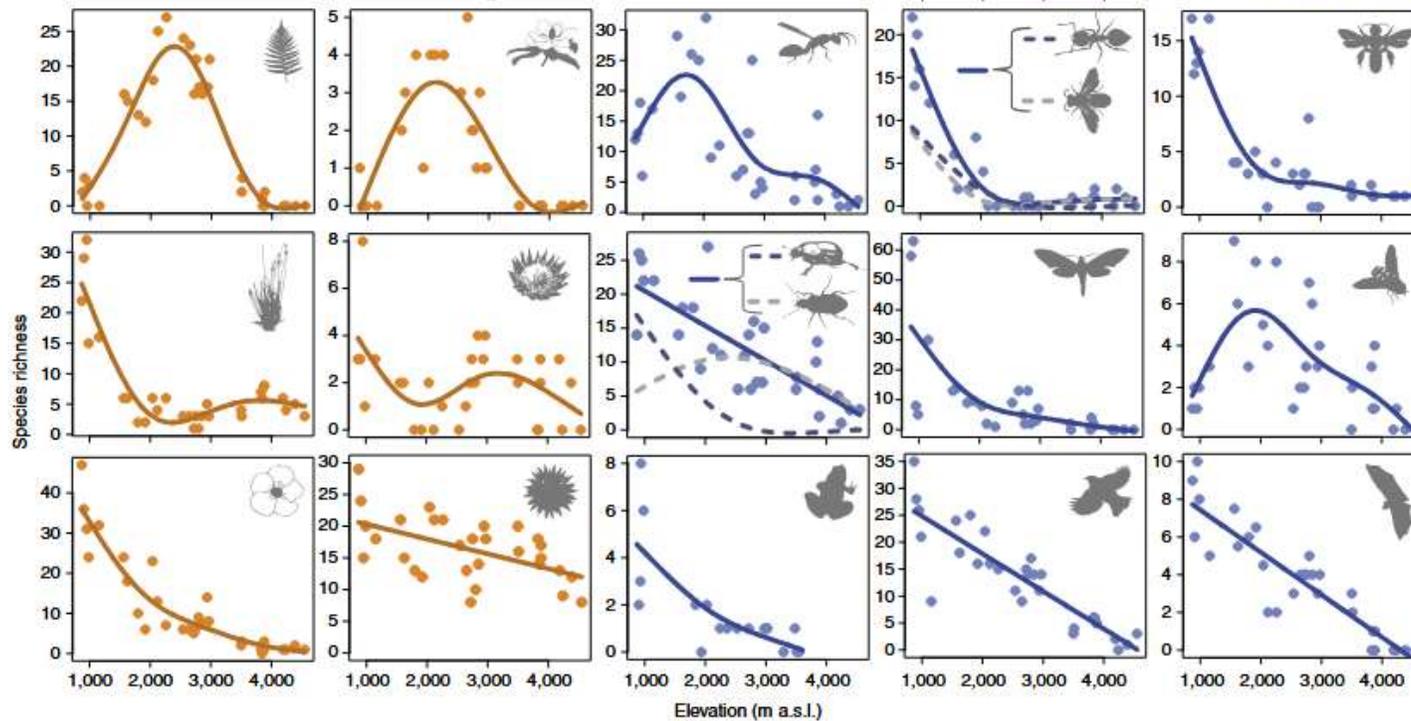
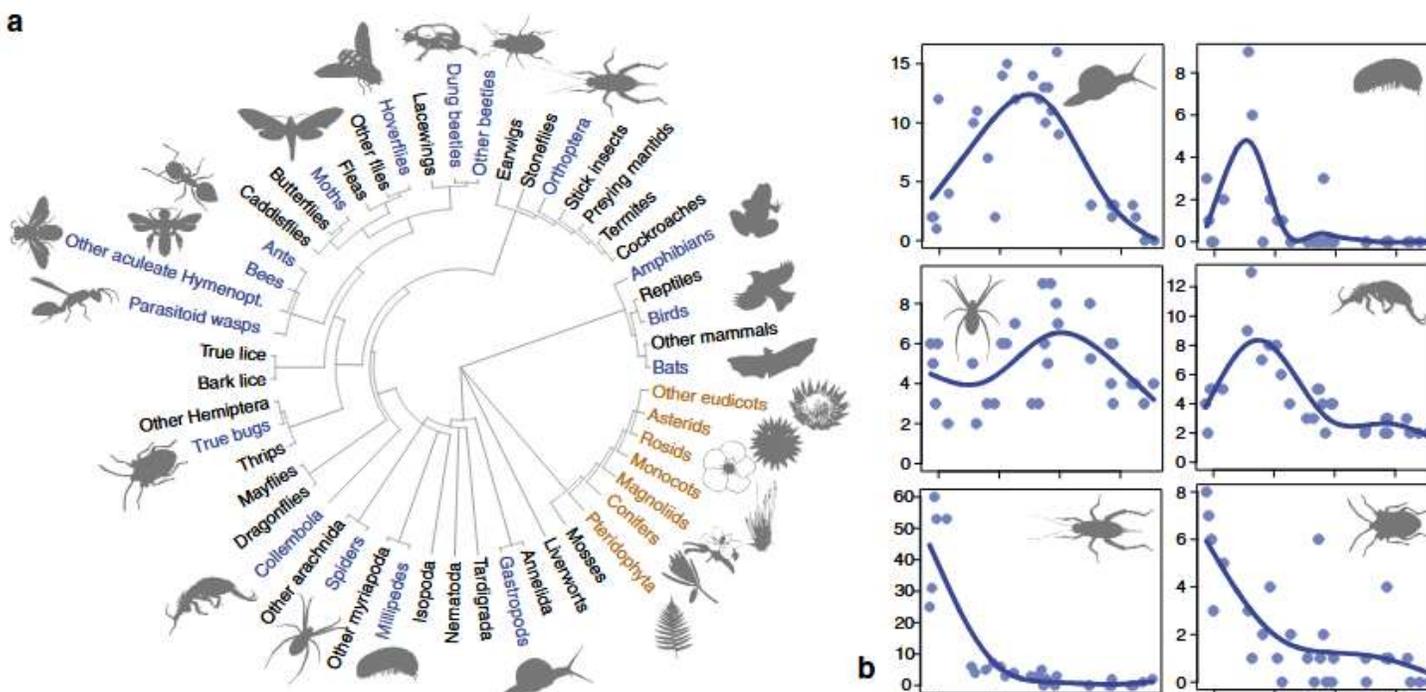


**southern richness - northern purity hypothesis**

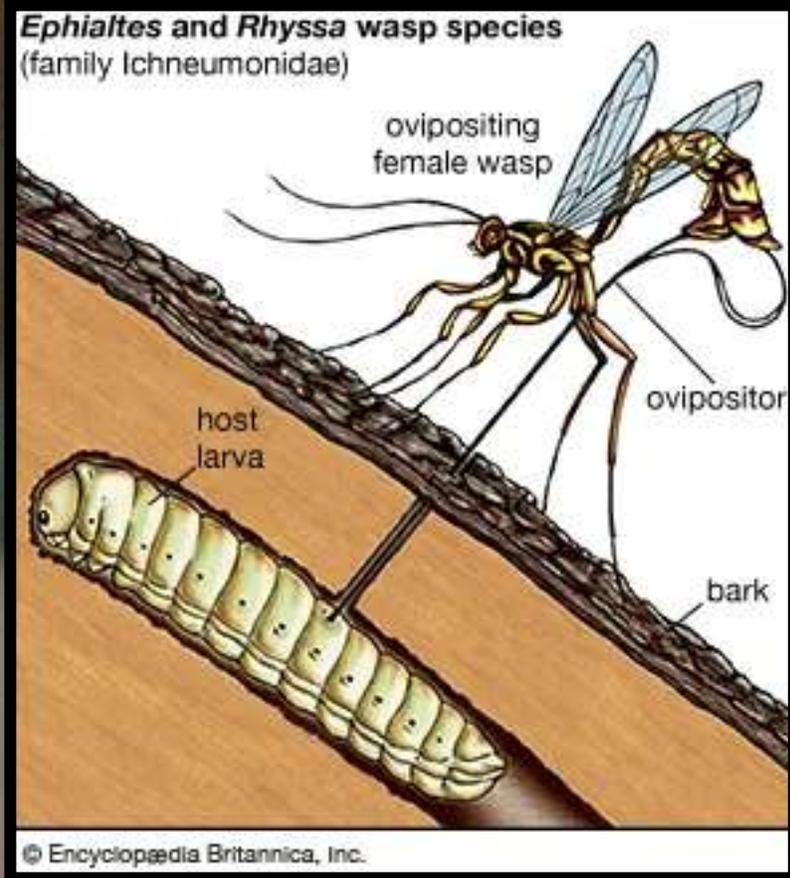
# southern richness - northern purity hypothesis

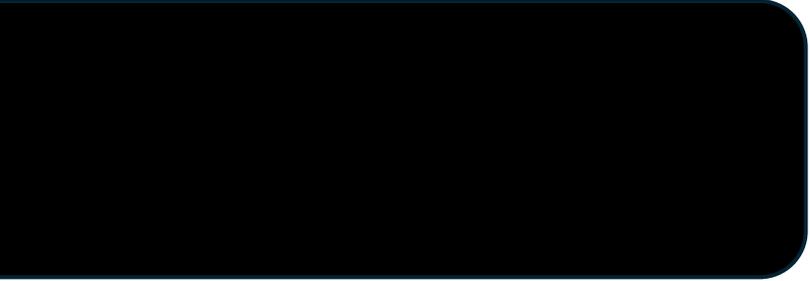


Dufresnes (2015)



Peters et al. (2016) Predictors of elevational biodiversity gradients change from single taxa to the multi-taxa community level. Nature Communications.





# Feeding Guilds of Insects Living in Forests



- Phytophagous
- Zoophagous
- Saprophagous





- **Phytophagous**
- Zoophagous
- Saprophagous





Order	Leaves or needles		Shoots or twigs		Woody tissues		Total
	Exposed feeder	Hidden feeder	Exposed feeder	Hidden feeder	Exposed feeder	Hidden feeder	
Coleoptera	5 <sup>a</sup>	2 <sup>a</sup>		3 <sup>g</sup>	2 <sup>g</sup>	16 <sup>b, c, d</sup>	28
Diptera		3 <sup>f</sup>					3
Hemiptera	1 <sup>e</sup>	5 <sup>e, f</sup>	2 <sup>e</sup>	5 <sup>e, f</sup>		6 <sup>e, f</sup>	19
Hymenoptera	13 <sup>a</sup>	3 <sup>a</sup>				1 <sup>d</sup>	17
Lepidoptera	17 <sup>a</sup>	23 <sup>a</sup>		4 <sup>g, h</sup>		1 <sup>d</sup>	45
Prostigmata	1 <sup>e</sup>	2 <sup>f</sup>					3
Thysanoptera	1 <sup>a</sup>						1
<b>Total</b>	<b>38</b>	<b>38</b>	<b>2</b>	<b>12</b>	<b>2</b>	<b>21</b>	<b>116</b>

Hébert et al. (2007)

# Phloeophagous & Xylophagous



*Ips sexdentatus*



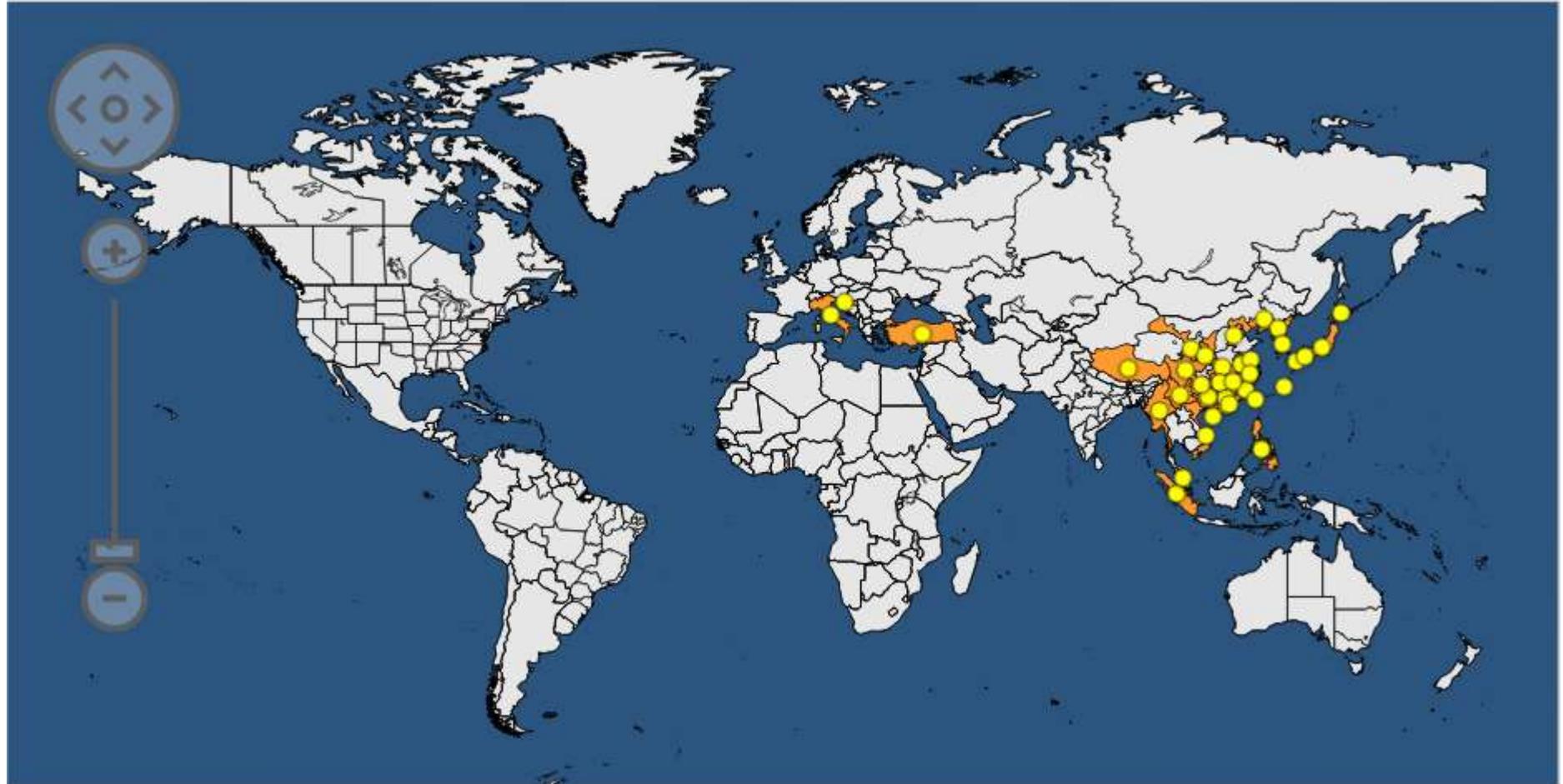
*Agrilus planipennis*



*Anoplophora chinensis*



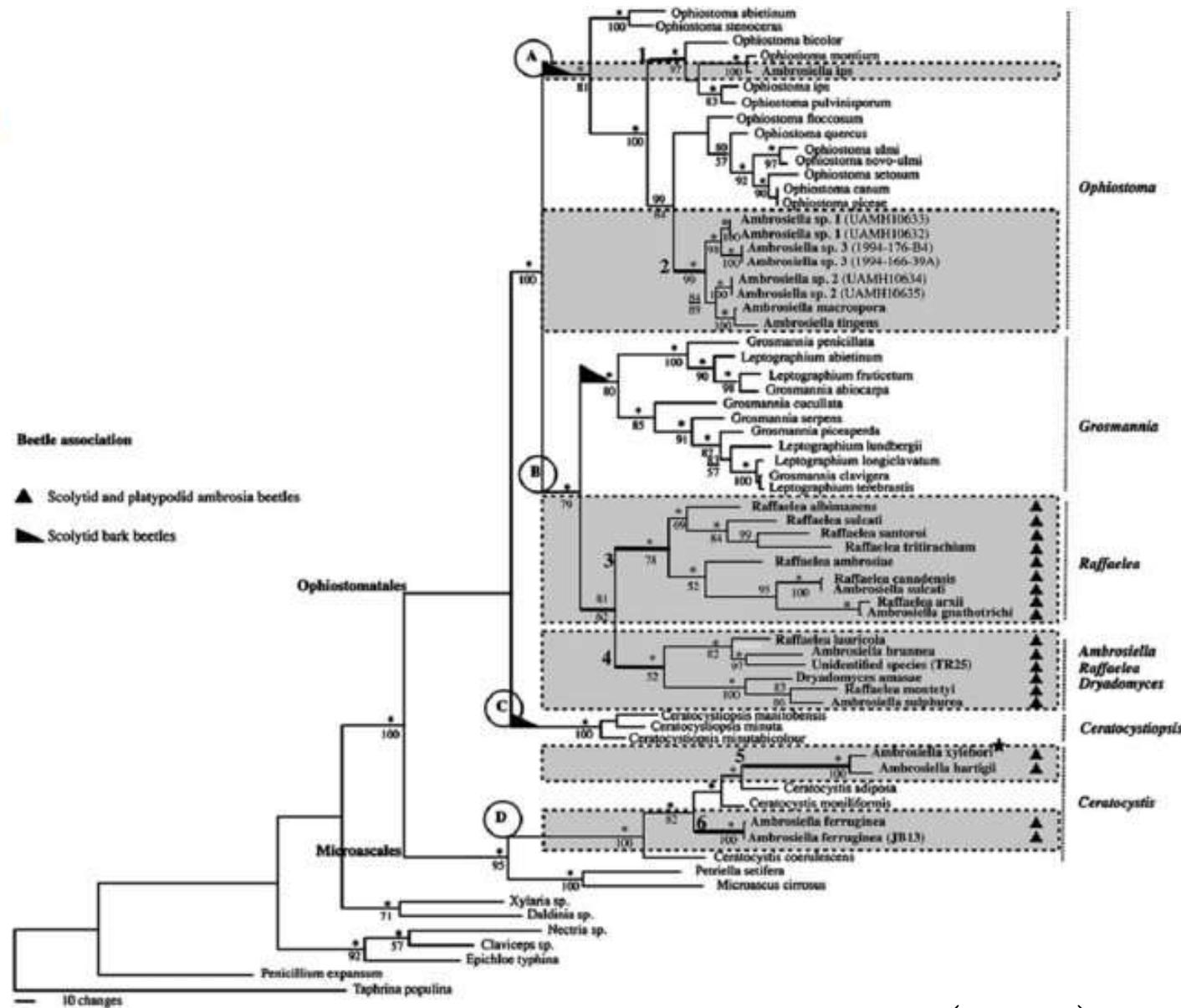
## Distribution of the citrus long horned beetle



FUN FACT  
Lousy borders!



*Xyleborus dispar*



Alamouti et al. (2009)

FUN FACT  
Ambrosia is  
gods' food!

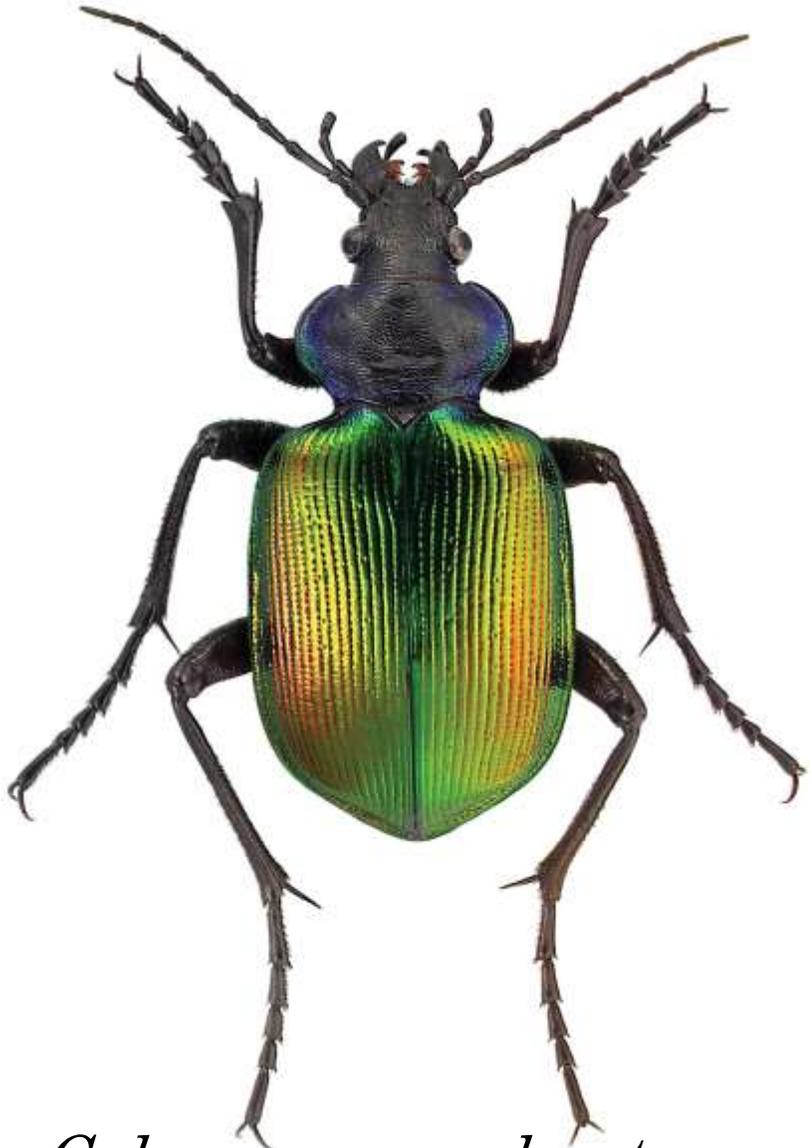




- Phytophagous
- Zoophagous
- Saprophagous



# Predator, Parasite & Parasitoid



*Calosoma sycophanta*



*Aedes albopictus*



*Torymus sinensis*



- Phytophagous
- Zoophagous
- Saprophagous



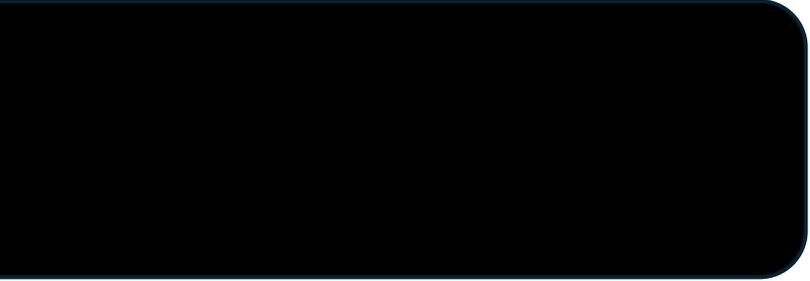
Detritivorous, Saproxylophagous, Fungivorous, Mycetophagous,  
Necrophagous & Coprophagous or Scatophagous



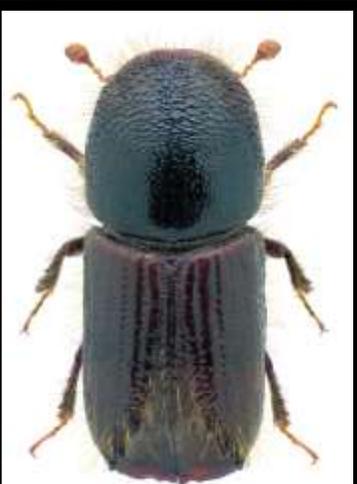
*Forficula auricularia*

*Ampedus elegantulus*

*Lucanus cervus*



# Population Dynamics of Forest Insects



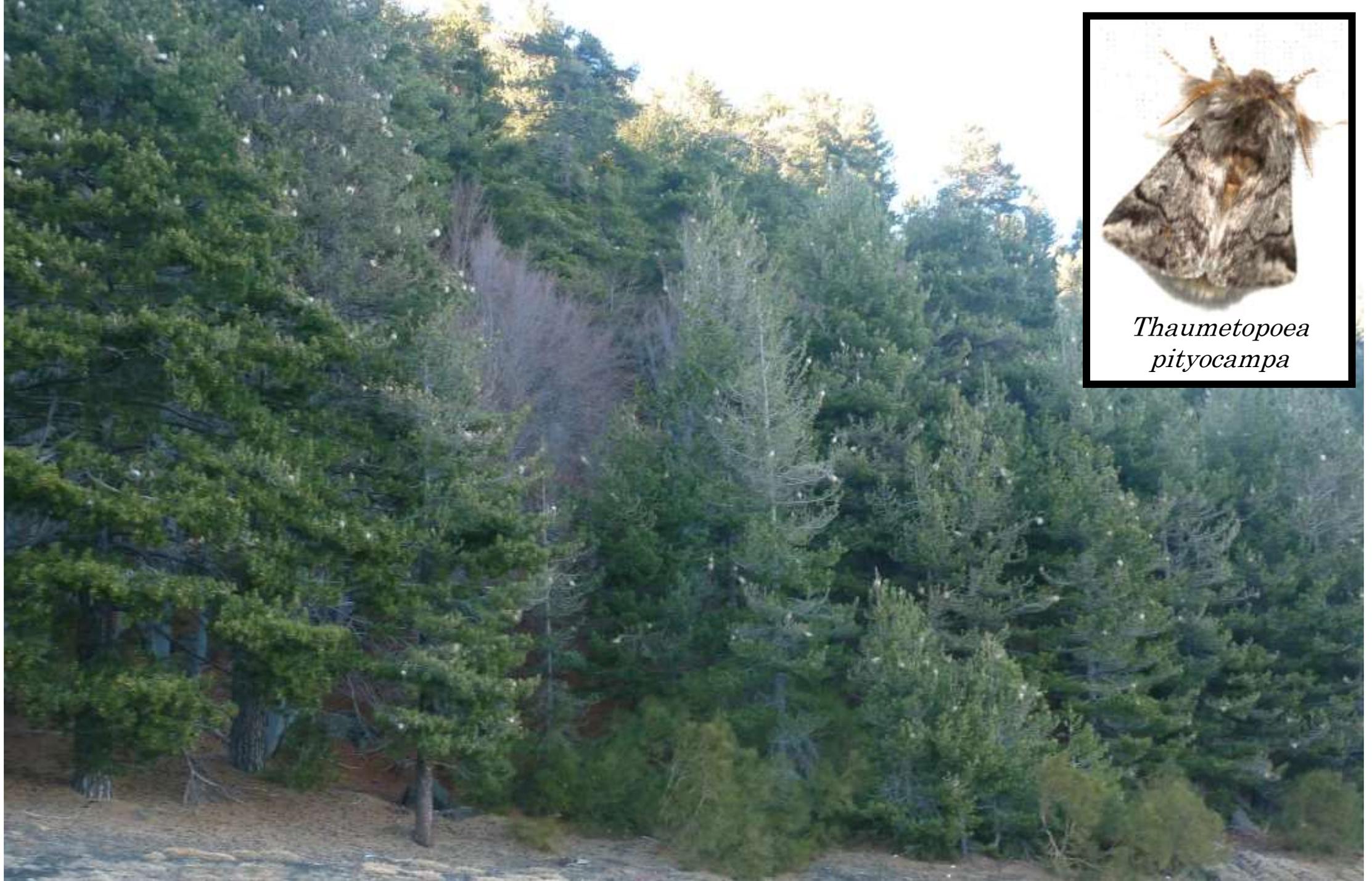
*Ips typographus*





*Dendroctonus  
ponderosae*





*Thaumetopoea  
pityocampa*



*Calliteara pudibunda*

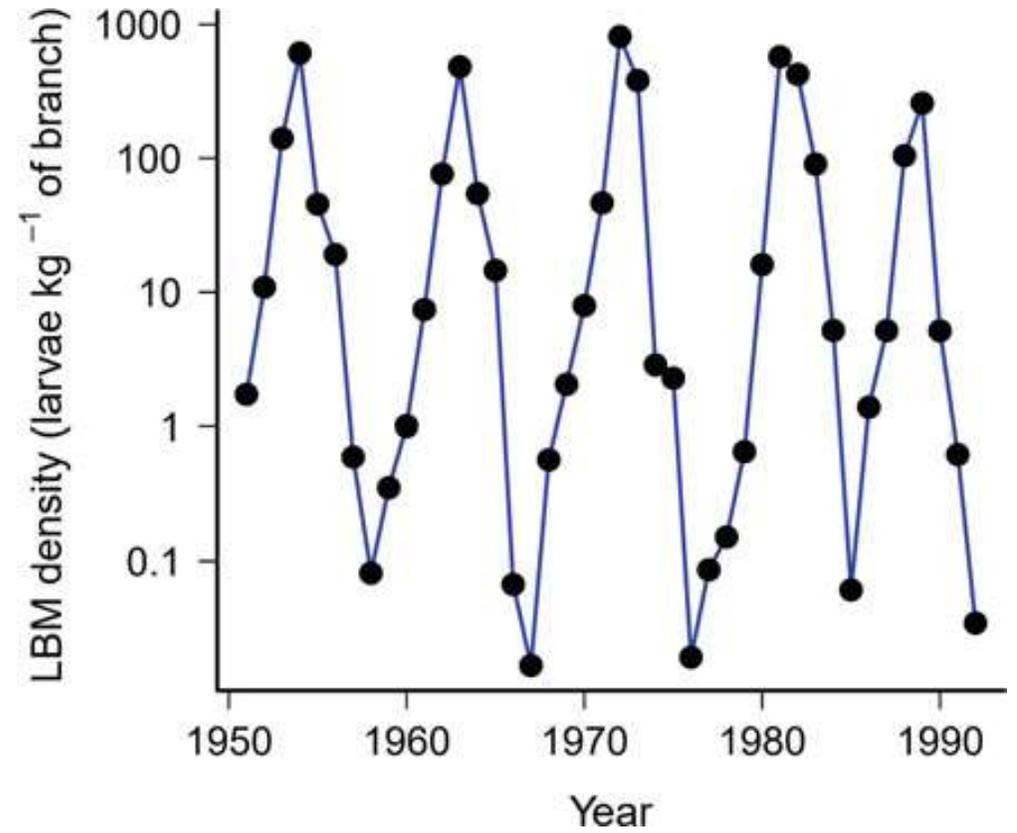






*Zeiraphera diniana*



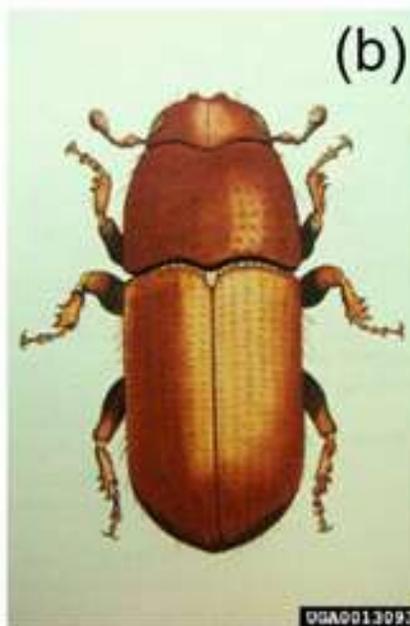
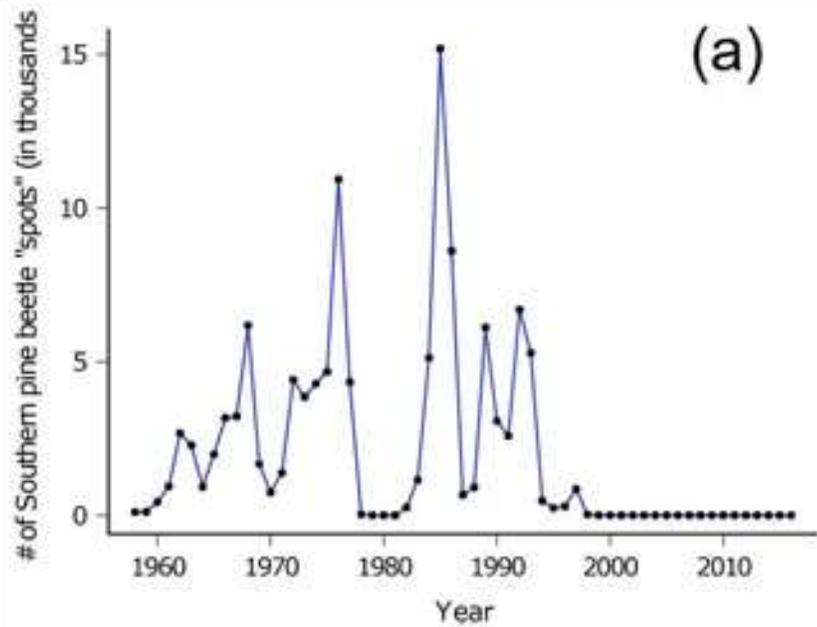


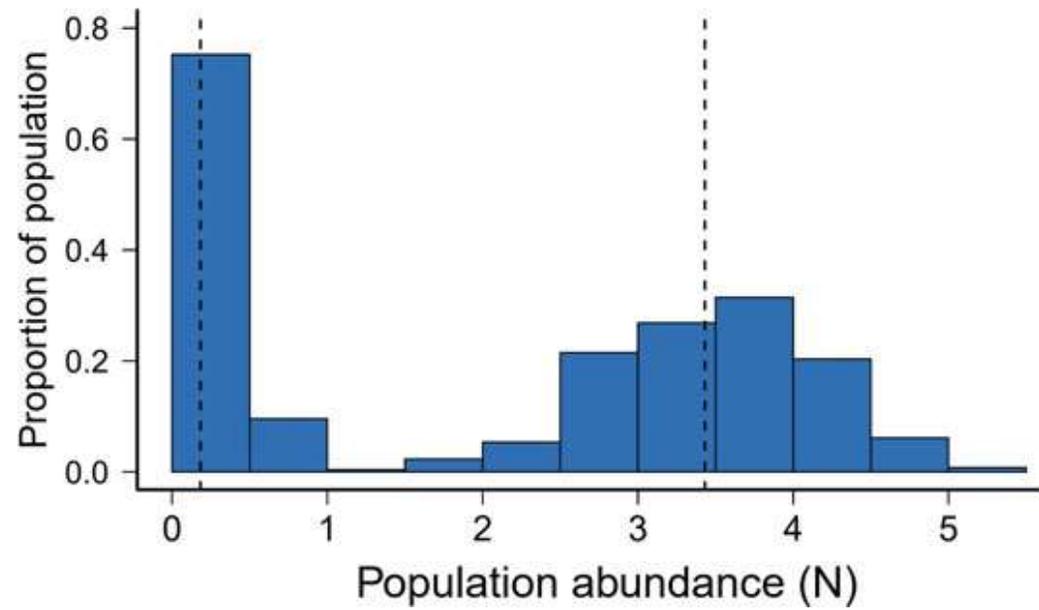
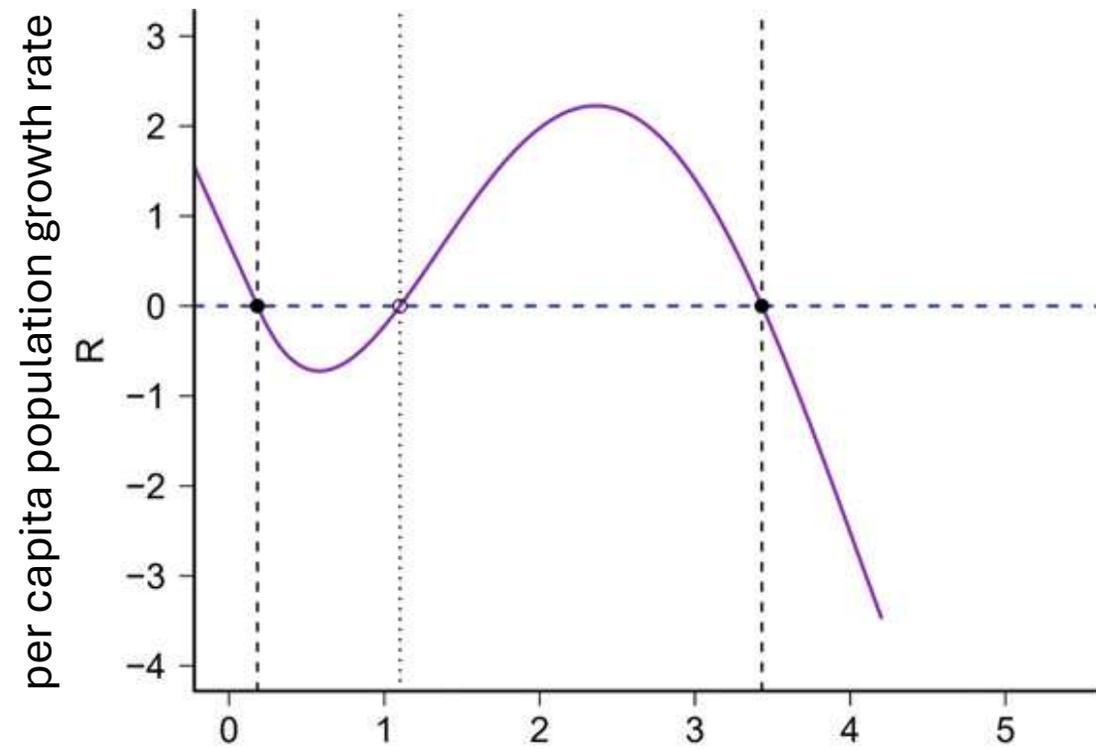
Turchin (2003)



*Orthotomicus  
erosus*

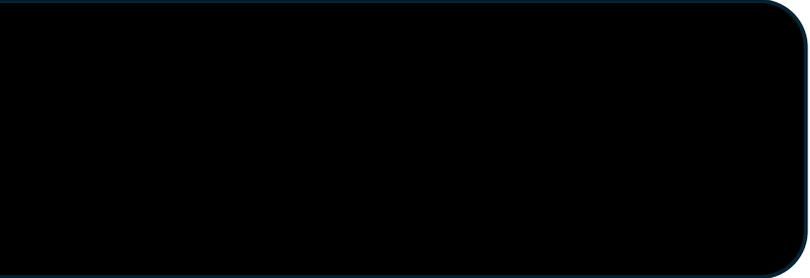












# Monitoring and Surveillance of Forest Insects



Monitoring is undertaken to

- i. obtain information on the presence or abundance
- ii. study phenology
- iii. predict pest population size, spread and damage
- iv. determine if pest management is required

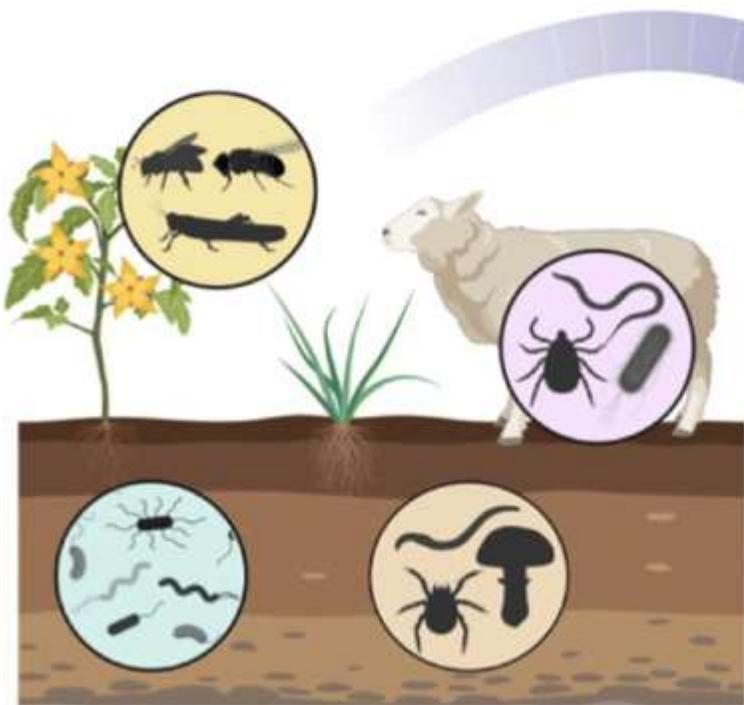




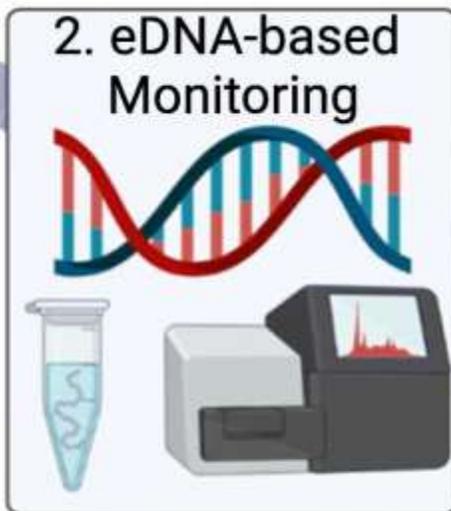
*Thaumetopoea  
processionea*



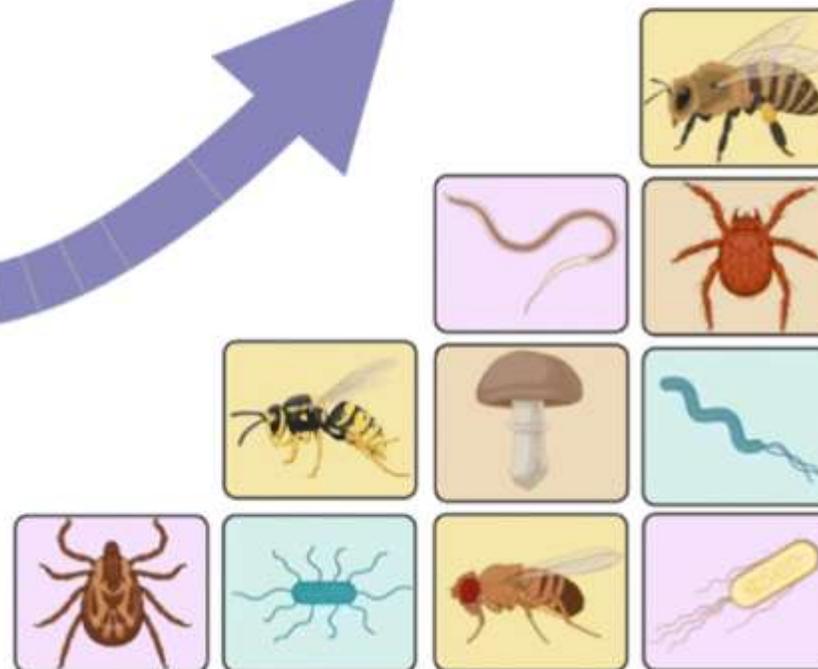
### 1. Agricultural Microcosms



### 2. eDNA-based Monitoring



### 3. Taxonomic Identifications

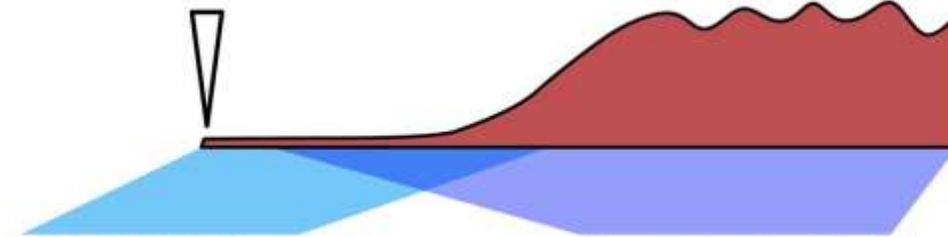




## Citizen science for Invasive Alien Species



Introduction → Establishment



**Well used for**

- ✓ early detection
- ✓ mapping spread

**More potential to**

- ↑ evaluate impacts
- ↑ and management



### Challenges



accuracy of data points

uneven spatial coverage

**Co-design**

→ to grow its potential

# IF YOU FIND ONE OF THESE IN YOUR GARDEN:



## CATCH IT. CALL US.

EXOTIC PEST & DISEASE HOTLINE **0800 80 99 66**

The brown marmorated stink bug can ruin gardens and infest your home.  
They're also a major threat to our primary industries and environment.  
If you find one: Catch it. Call us.

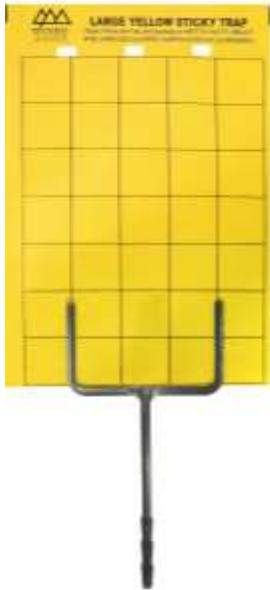


Ministry for Primary Industries  
Manatū Ahu Matua

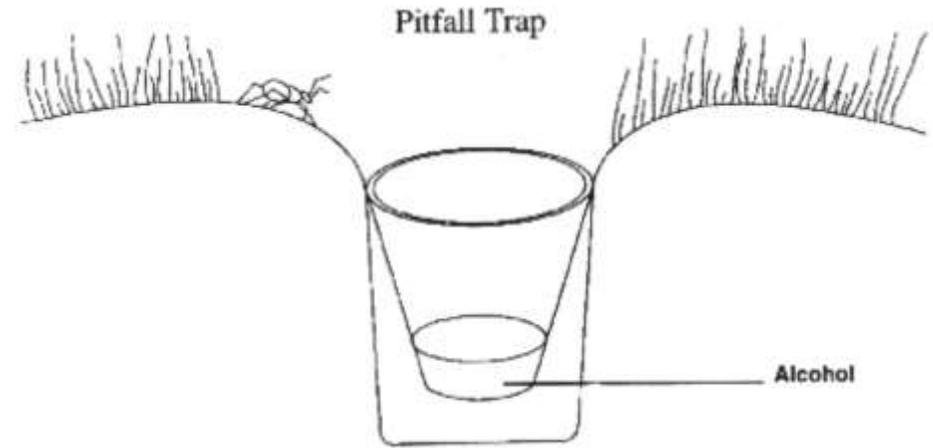


New Zealand Government

# Insect Monitoring Using Traps



# Passive Traps



# Passive Traps

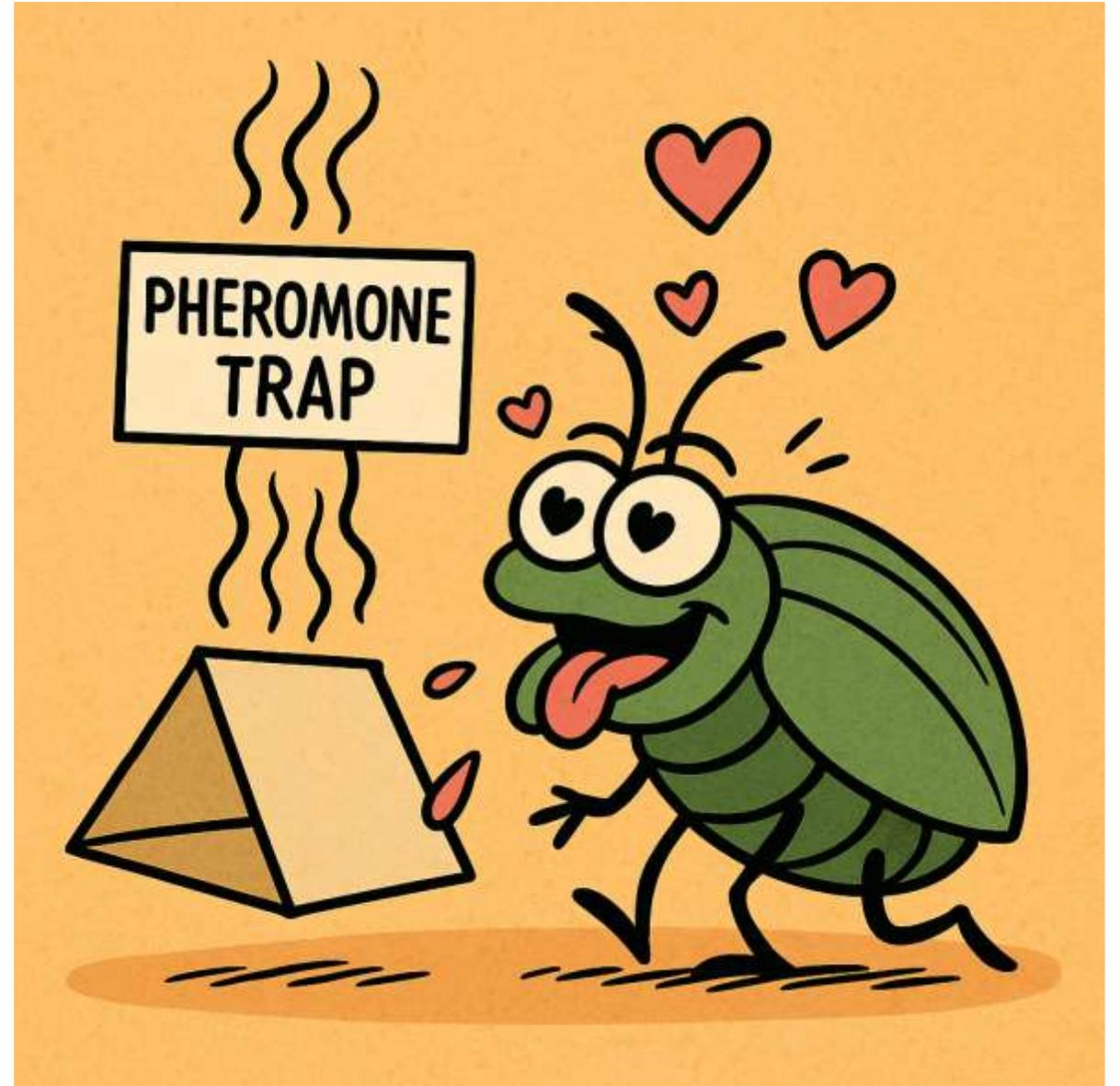




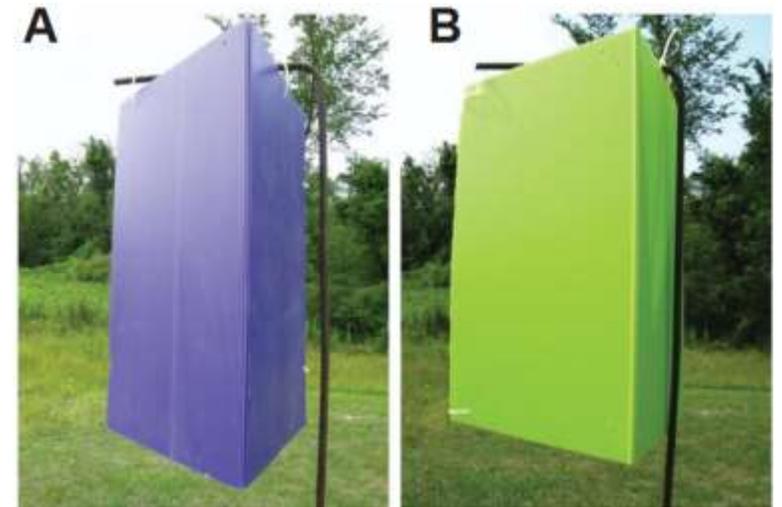
# Passive Traps

Malaise trap

# Attraction Traps



# Attraction of Insects by Light or Color



# Attraction of Insects by Pheromones and Host Plant Volatiles (Kairomones)



Multiple-funnel (Lindgren) trap



Theysohn slot-trap

