

# Population Genetic Structure of the invasive Plane Leaf- miner (*Phyllonorycter platani* STRG. 1870)

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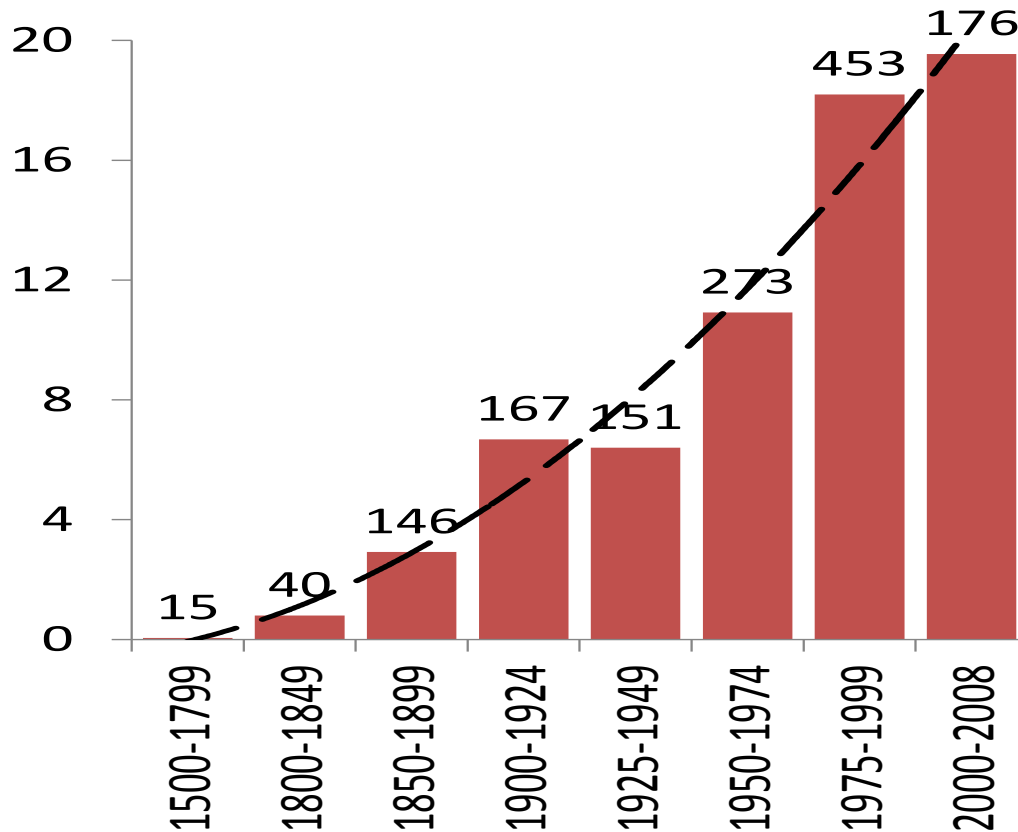
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# Overview

- Invasive insects on woody plants in Hungary
- Case study: *Phyllonorycter plantani*
  - Host plant distribution
  - Present distribution of *P. plantani* in Europe
  - Materials and methods
    - Sample collection, DNA analysis
  - Results
    - Genetic diversity and geographic patterns
- Comparison with other invasive insects
  - *Cameraria ohridella*
  - *Corythuca ciliata*
- Conclusions



# Invasive insects in Europe (Roques et al. 2008)



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# Invasive insects on woody plants (in Hungary/Hungarian)



## Inváziós rovarok fás növényeken



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# Case study: *Phyllonorycter plantani*



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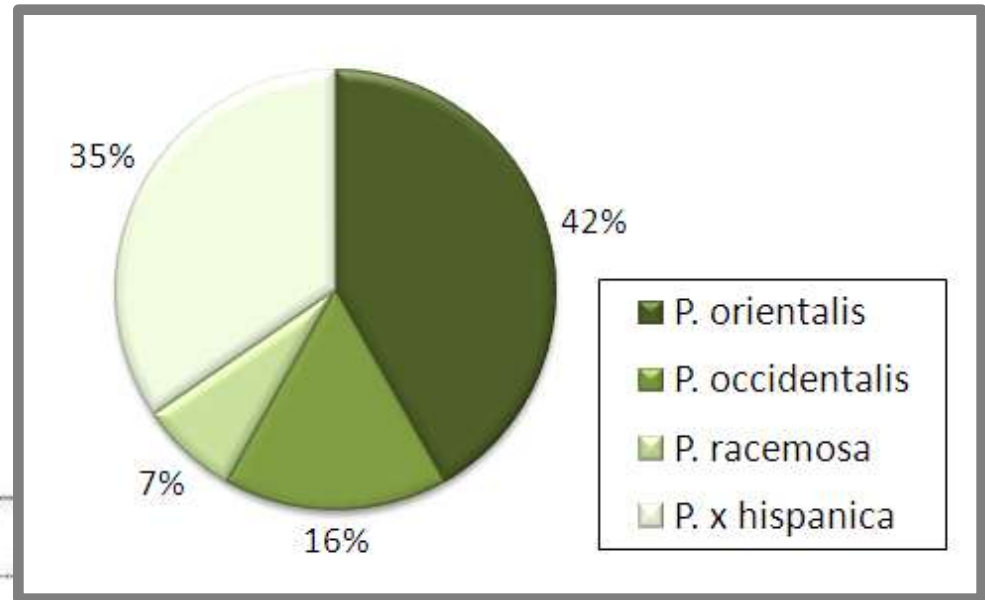
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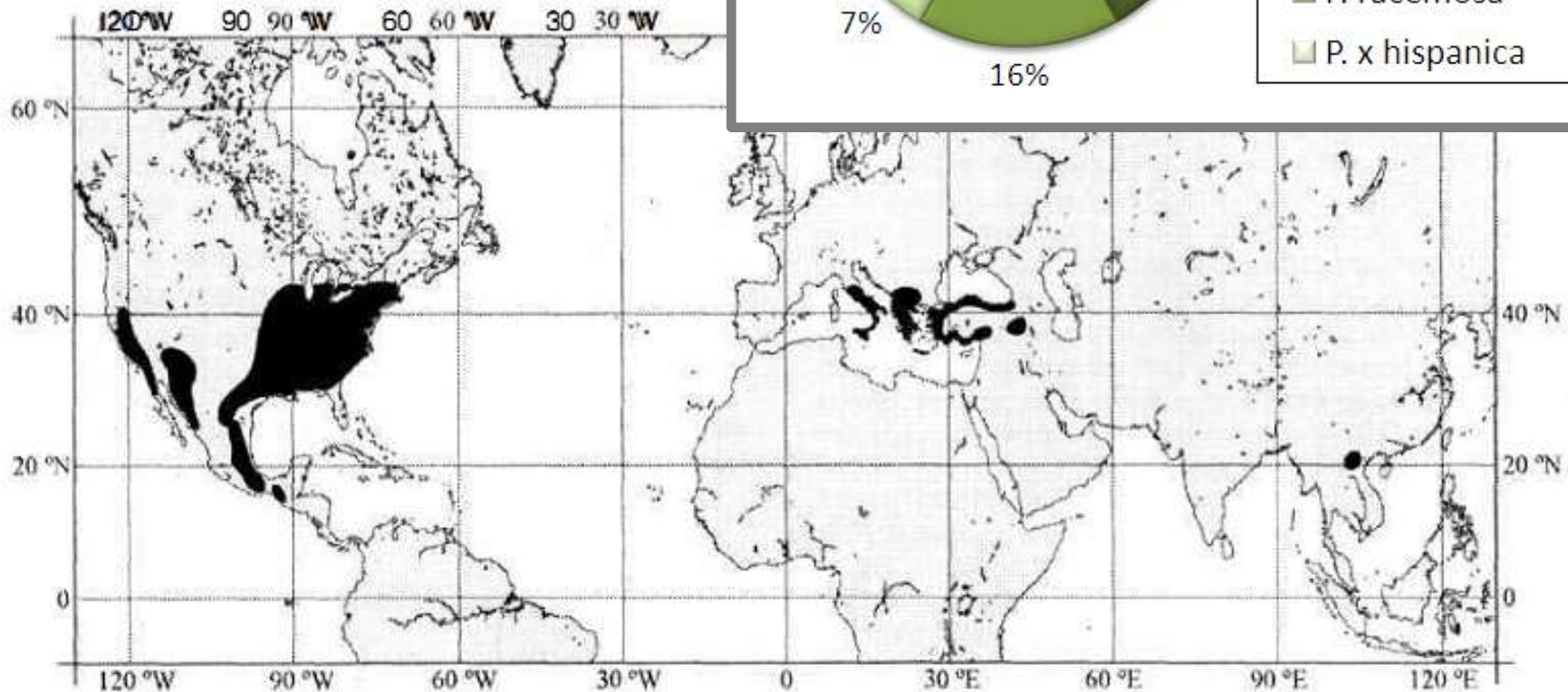


# Case study: *Phyllonorycter plantani*

- What do we know?
  - **The host range**



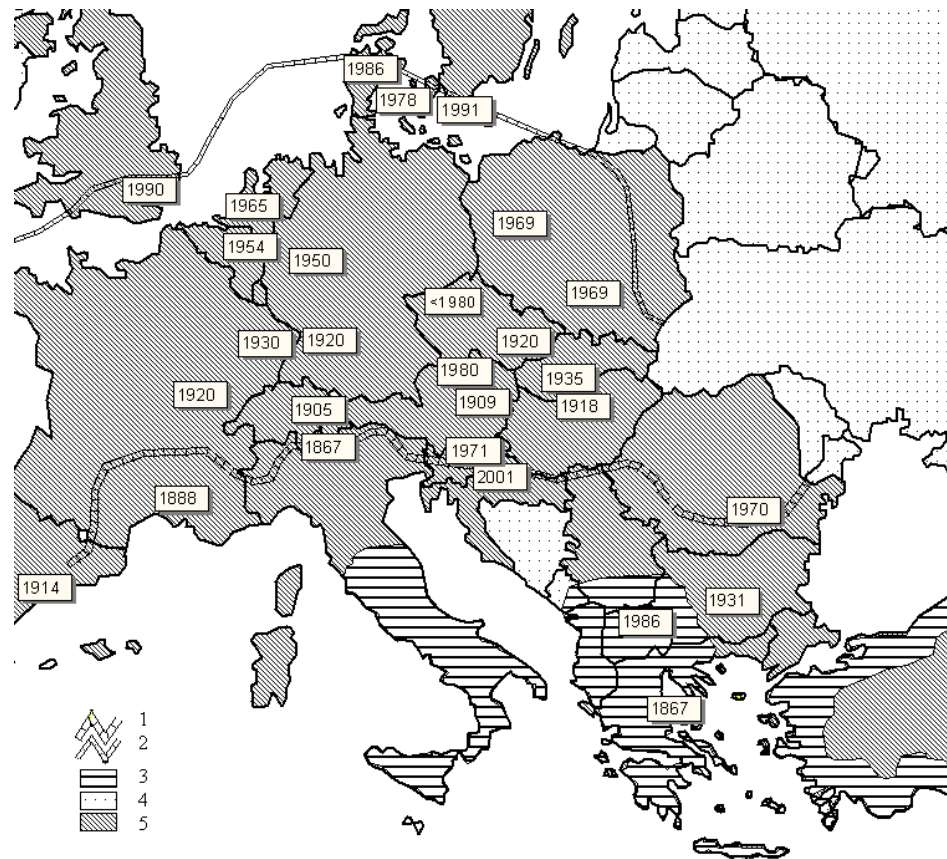
Feng et al. 2005



# Case study: *Phyllonorycter plantani*

- What do we know?
  - Present distribution
  - Approximate expansion history
  - Hungary: 1918

After Sefrova 2001



# Case study: *Phyllonorycter plantani*



- What we do NOT know?
  - The origin
  - The reason of the expansion
  - Genetic background
  - Future trends



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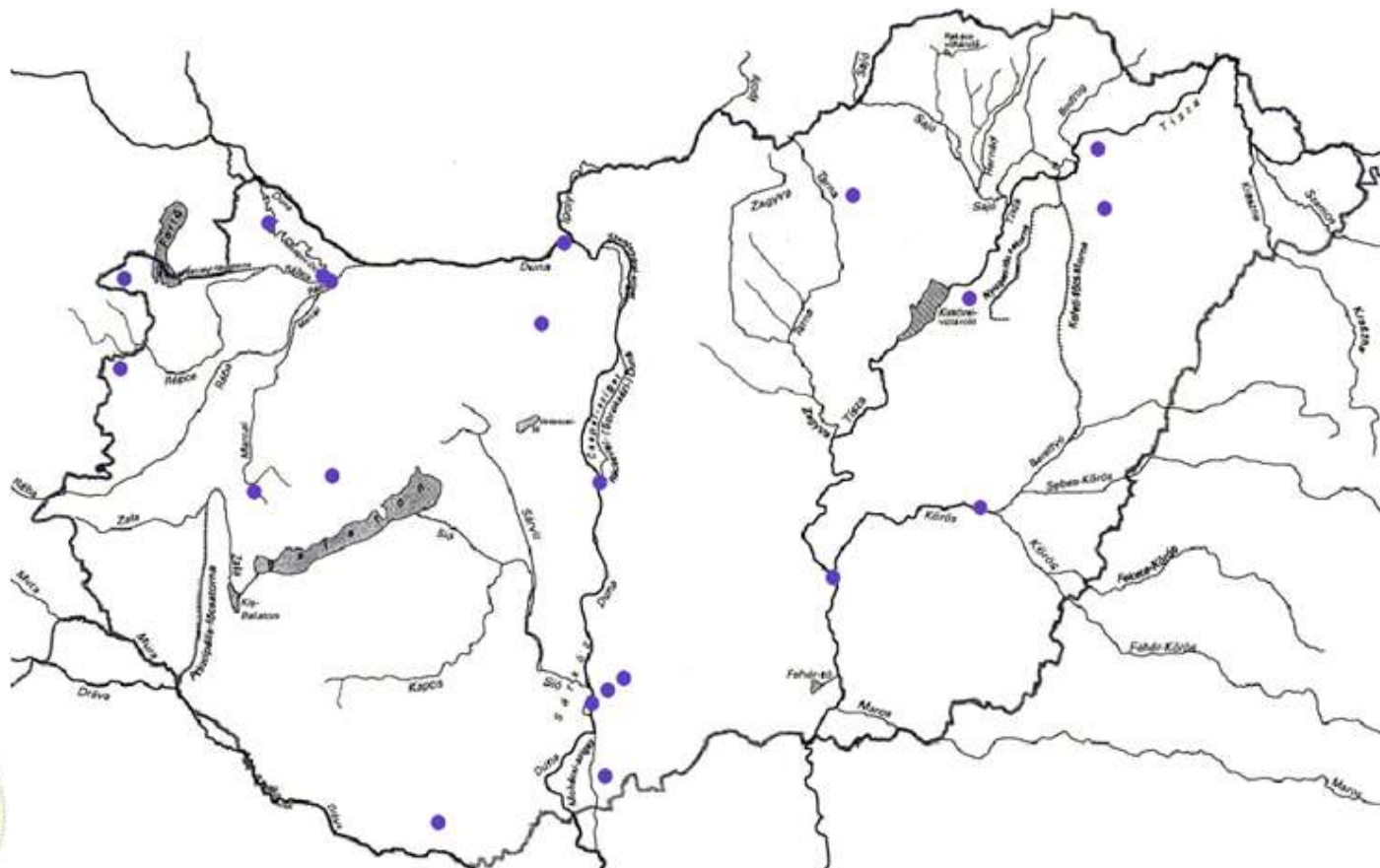


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# Case study: *Phyllonorycter plantani*

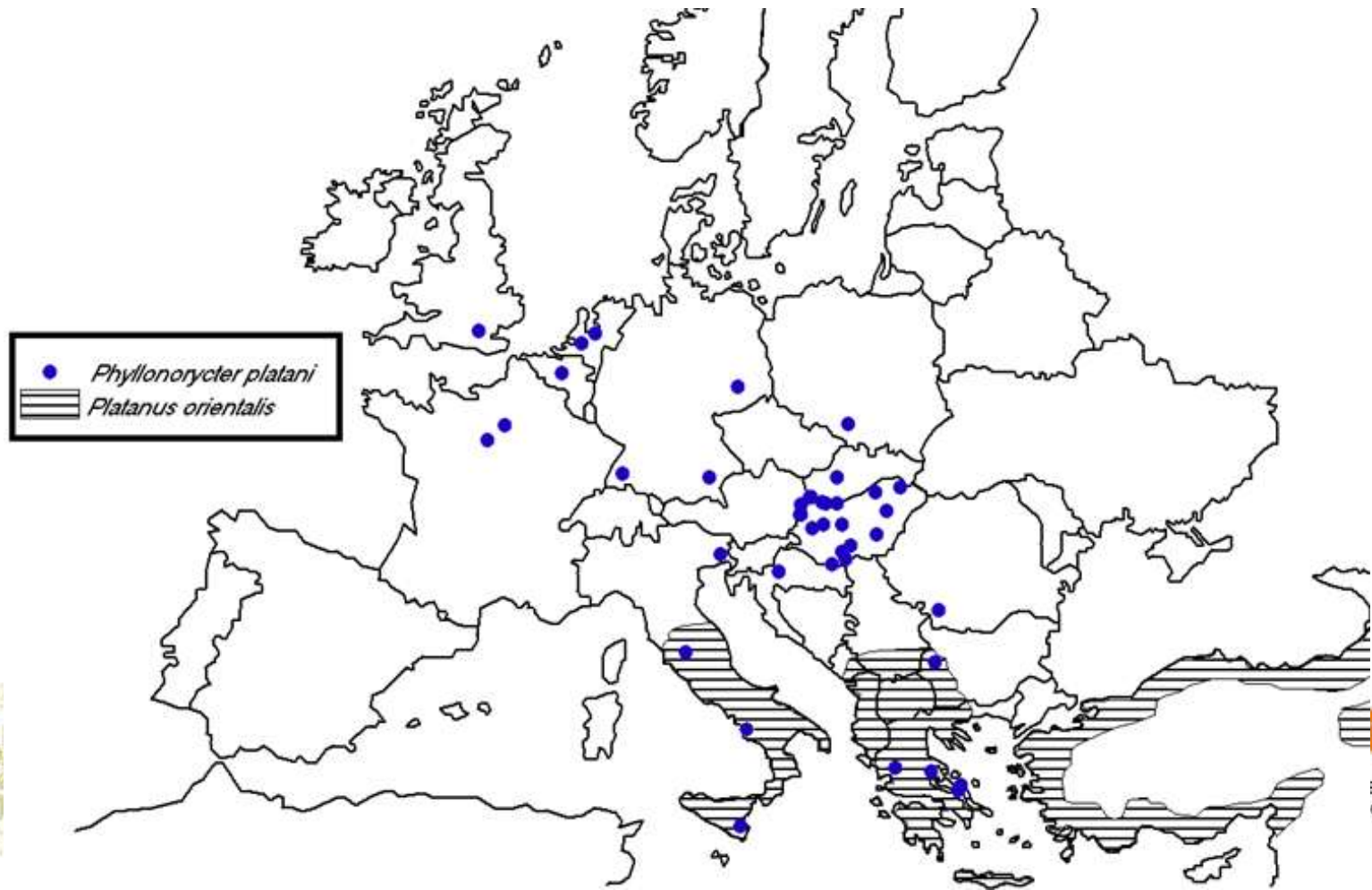
- Materials and Methods
  - Sampling - Hungary



● *Phyllonorycter plantani*

# Case study: *Phyllonorycter platani*

- Materials and Methods
  - Sampling - Europe





# Case study: *Phyllonorycter plantani*



- Results: altogether 15 haplotypes (HTs), 2.7% divergence

	29	226	257	271	277	292	295	325	355	358	370	431	448	451	505	517	583	625	673	796	802	820	853	913	934	967	1012	1015	1033	1159	1163	1168	1213	1219	1240	1271	
HT1	C	T	A	G	A	A	C	A	T	A	A	G	C	A	A	T	G	G	T	T	T	T	T	A	A	G	T	C	T	G	G	T	T	A	C	A	
HT3								G																													
HT5															G																						
HT6																G																					
HT2																													A								
HT7																G												T									
HT4											G																										
HT8																						C															
HT9		C																				C															
HT10													T											G													
HT11											G																										
HT12												A																									
HT13	T	C	G	A	G	C	T		A	G				G			A	T				C	C	C		G	A	C	T	A		A	A	A	G	T	T
HT15	T	C	G	A	G	C	T		A	G				G			A	T	C			C	C	C		G	A	C	T	C		A	A	A	G	T	T
HT14	T	C	G	A	G	C	T		A	G				G			A	T				C	C	C		G	A	C	T	C		A	A	A	G	T	T



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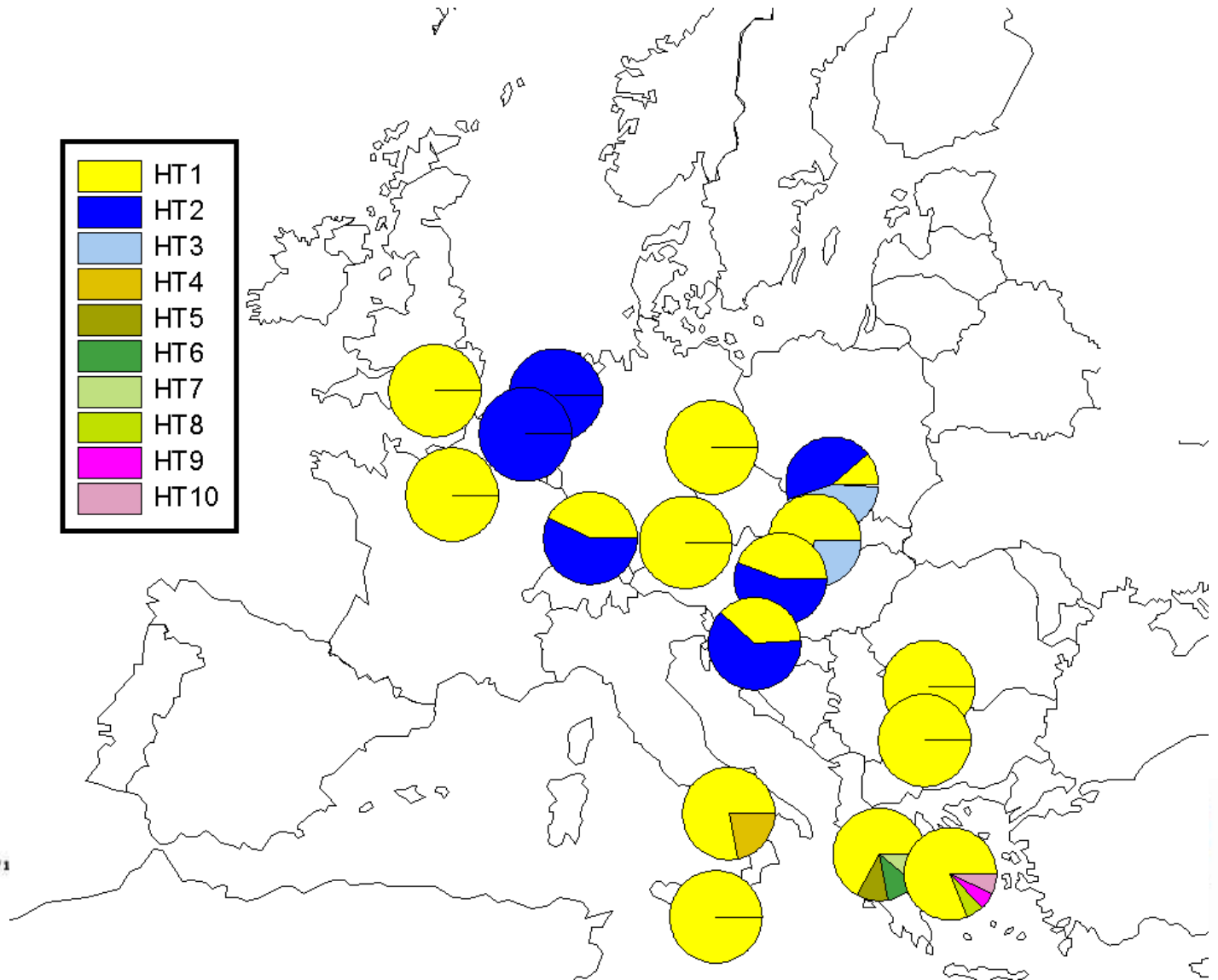
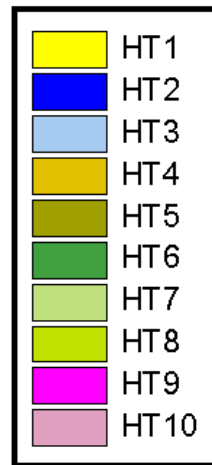
# Case study: *Phyllonorycter plantani*

- Results: Europe: 10 HTs, America: 3 (2 unique) HTs, Asia 3 (all unique) HTs

		szum	HT1	HT2	HT3	HT4	HT5	HT6	HT7	HT8	HT9	HT10	HT11	HT12	HT13	HT14	HT15
London	United Kingdom	10	10														
Brussel	Belgium	4		4													
Rotterdam	Netherlands	4		4													
Suevres	France	9	9														
Freising	Germany	8	8														
Freiburg	Germany	7	3	4													
Dresden	Germany	10	10														
Katowitz	Poland	9	1	4	4												
Nitra	Slovakia	8	5		2												
Sopron	Hungary	9	4	5													
Zagreb	Croatia	8	3	5													
Craiova	Romania	5	5														
Sofia	Bulgaria	8	8														
Pantalica	Italy	9	7			2											
Pompei	Italy	8	8														
Kastraki	Greece	9	6				1	1	1								
Evia Island (East)	Greece	7	6							1							
Evia Island (West)	Greece	9	7								1	1					
Montgomery	USA	6	4										1	1			
Telavi	Georgia	10													7	2	1
Samarkand	Uzbekistan	10													10		

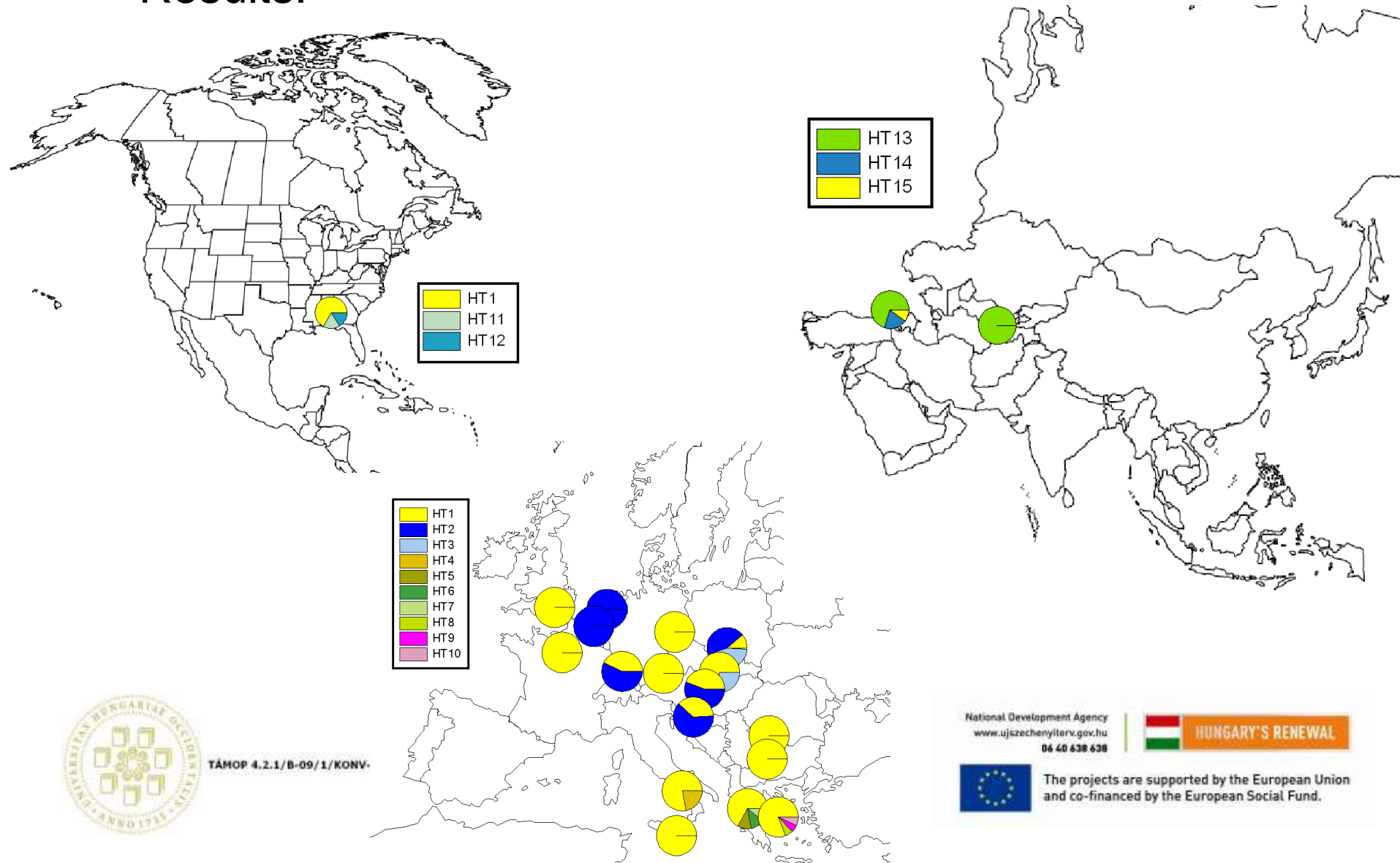
# Case study: *Phyllonorycter plantani*

- Results:



# Case study: *Phyllonorycter plantani*

- Results:



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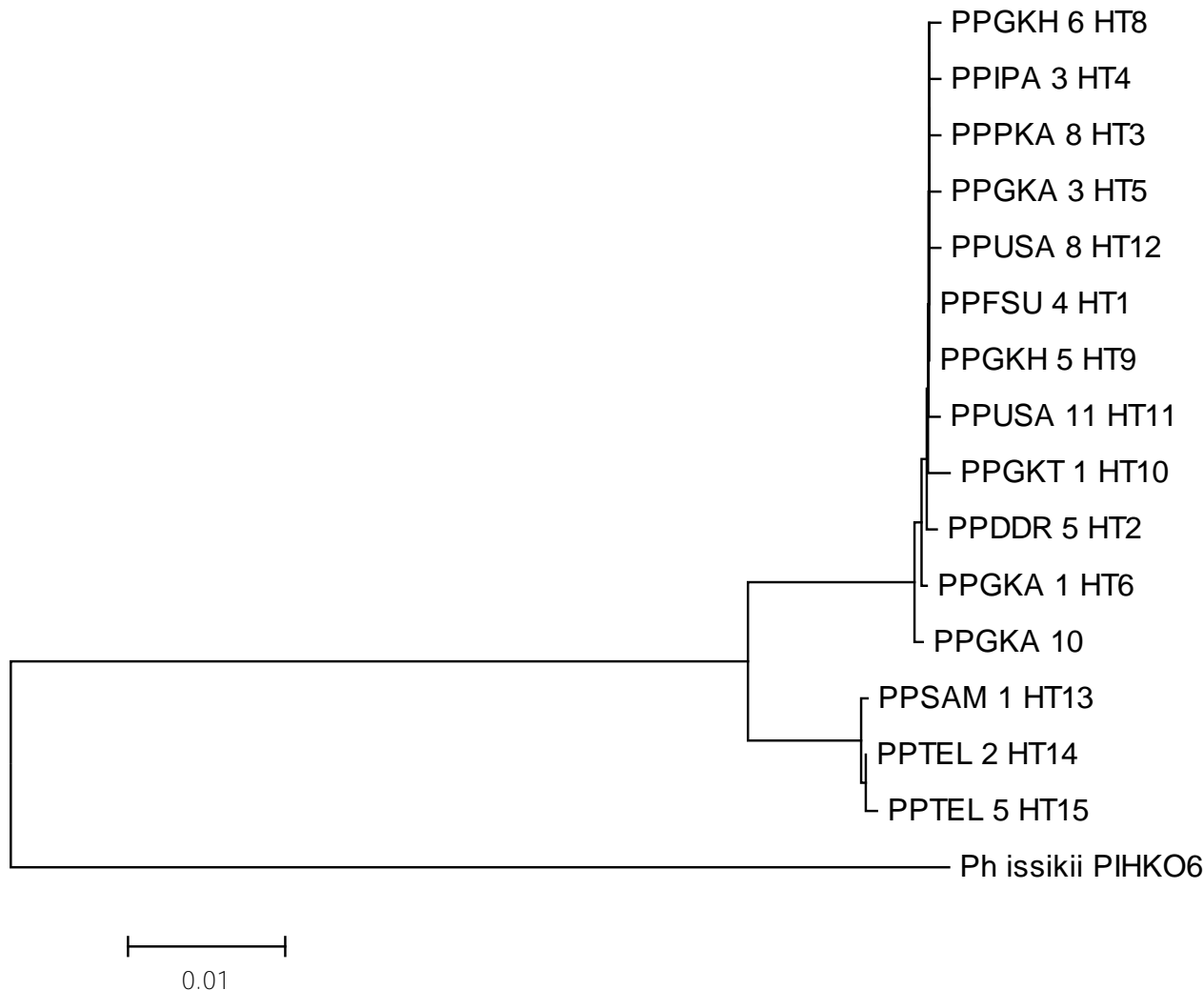
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# Case study: *Phyllonorycter plantani*

- Results: Haplotype topology





## Comparison with other invasive insects

- Horse chestnut leaf miner - *Cameraria ohridella*
  - Description (first found): 1986, Location: Ohrid lake (MC, AL, GR)
  - Host: horse chestnut (and Acer spp.)
  - Rapid expansion
  - Limited number of natural enemies
  - Origin first unknown



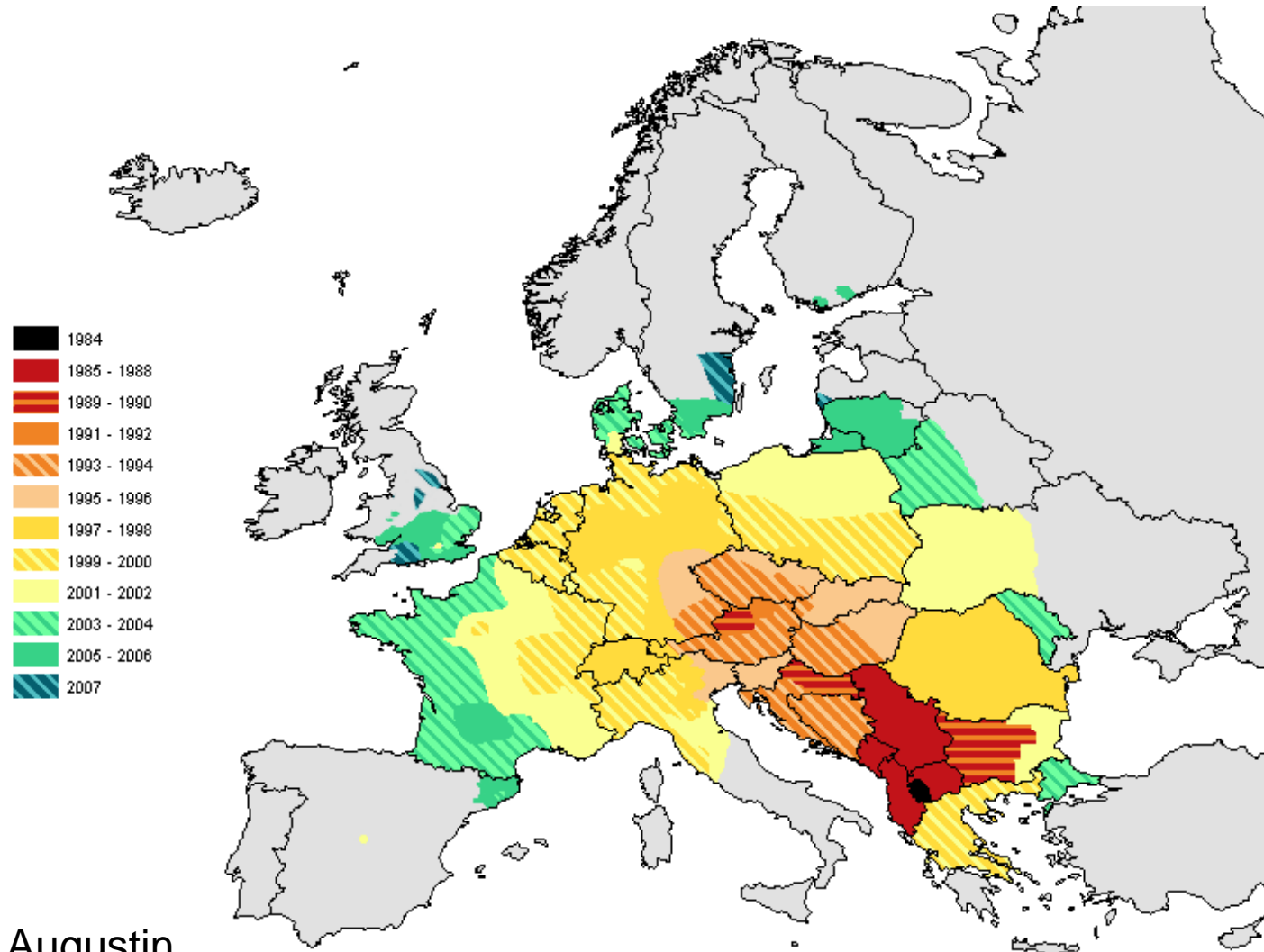
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# Comparison with other invasive insects

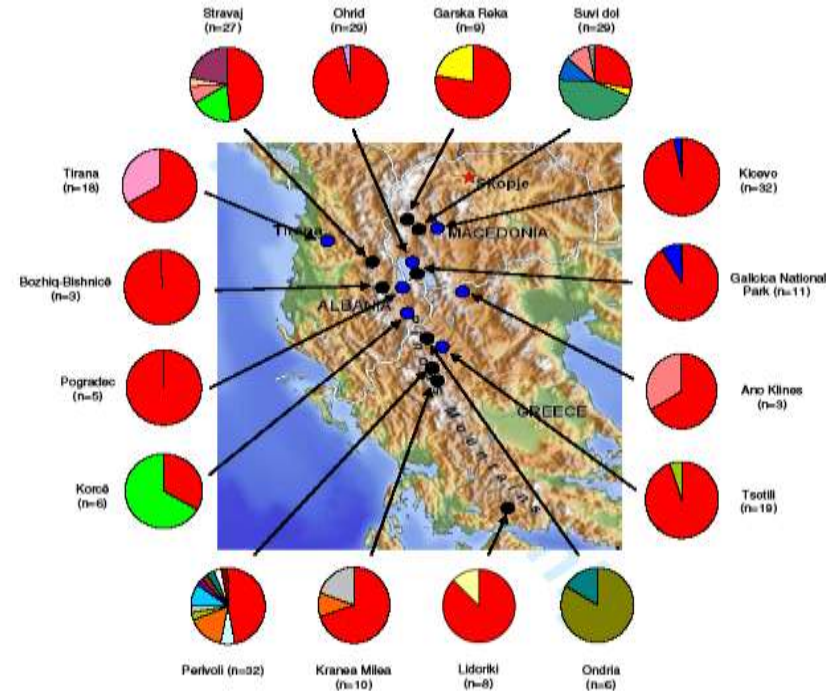
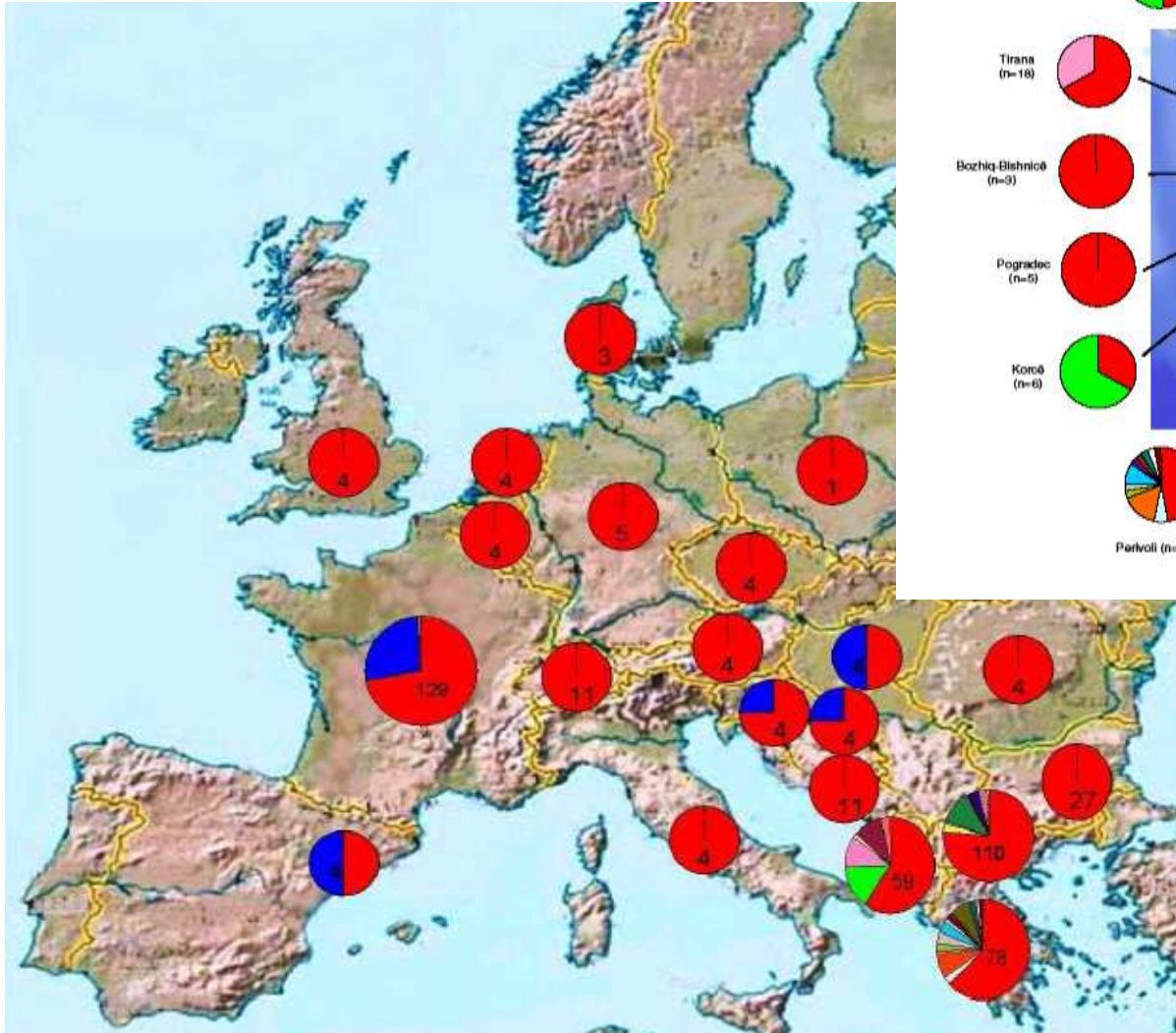
- Rapid expansion:



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# Comparison with other invasive insects

- Genetic background:



Valade et al 2009 Mol. Ecol.

# Comparison with other invasive insects

- Sycamore lace bug - *Corythuca ciliata*
  - Description: 1832
  - Origin: North-America
  - First found in Europe: Italy, 1964
  - First found in Hungary: 1976
  - Hosts: see table
  - Present distribution: N-America, Europe, Russia, China, Japan, Australia
  - Rapid expansion
  - Limited number of natural enemies

Host plants:
<i>Platanus x hybrida</i>
<i>Platanus occidentalis</i>
<i>Platanus orientalis</i>
<i>Carya ovata</i>
<i>Juglans regia</i>
<i>Carya illinoensis</i>
<i>Chamaedapne sp.</i>
<i>Fraxinus sp.</i>
<i>Carya ovata</i>
<i>Brossunetia papyrifera</i>
<i>Quercus laurifolia</i>
<i>Liquidambar sytraciflua</i>



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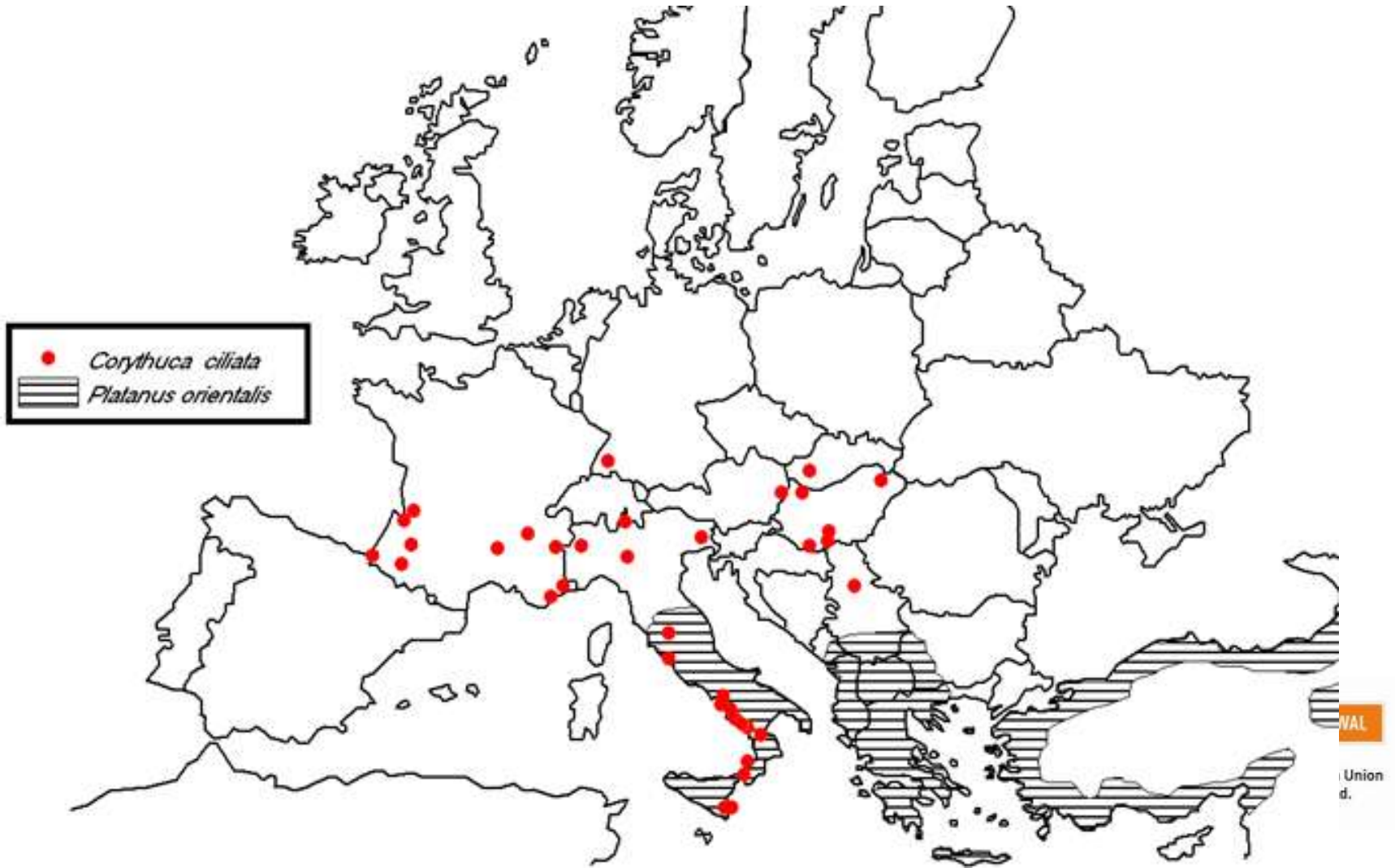
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# Comparison with other invasive insects

- Sycamore lace bug - *Corythuca ciliata*



# Conclusions

- Invasive alien species are major threats for woody plants in Hungary
- Genetic methods can help:
  - To trace the origin of a species
  - To reconstruct colonisation routes
  - To identify insect species (barcoding!)
  - To describe genetic variations
- All you need: SAMPLES and GENETIC data!
- Genetic tools and methods are improving very quickly
  - Who knows the future?



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# Thank you for your attention!



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