Tree species composition in and around cities – a biosecurity perspective

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Urban and surrounding forests : connected ecosystems

Management of forests along urbanisation gradient: different, but also common challenges

One common challenge for all forests: invasive forest pests

Invasive species

- Large ecological and economical damages
  - Examples
    - Ash dieback
    - Emerald Ash borer
    - Asian longhorn beetle
- Urban trees: first location of establishment of invasive forest pests

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URBAN INVASIONS

Urban trees: bridge-heads for forest pest invasions and sentinels for early detection

Trudy Paap · Treena I. Burgess · Michael J. Wingfield

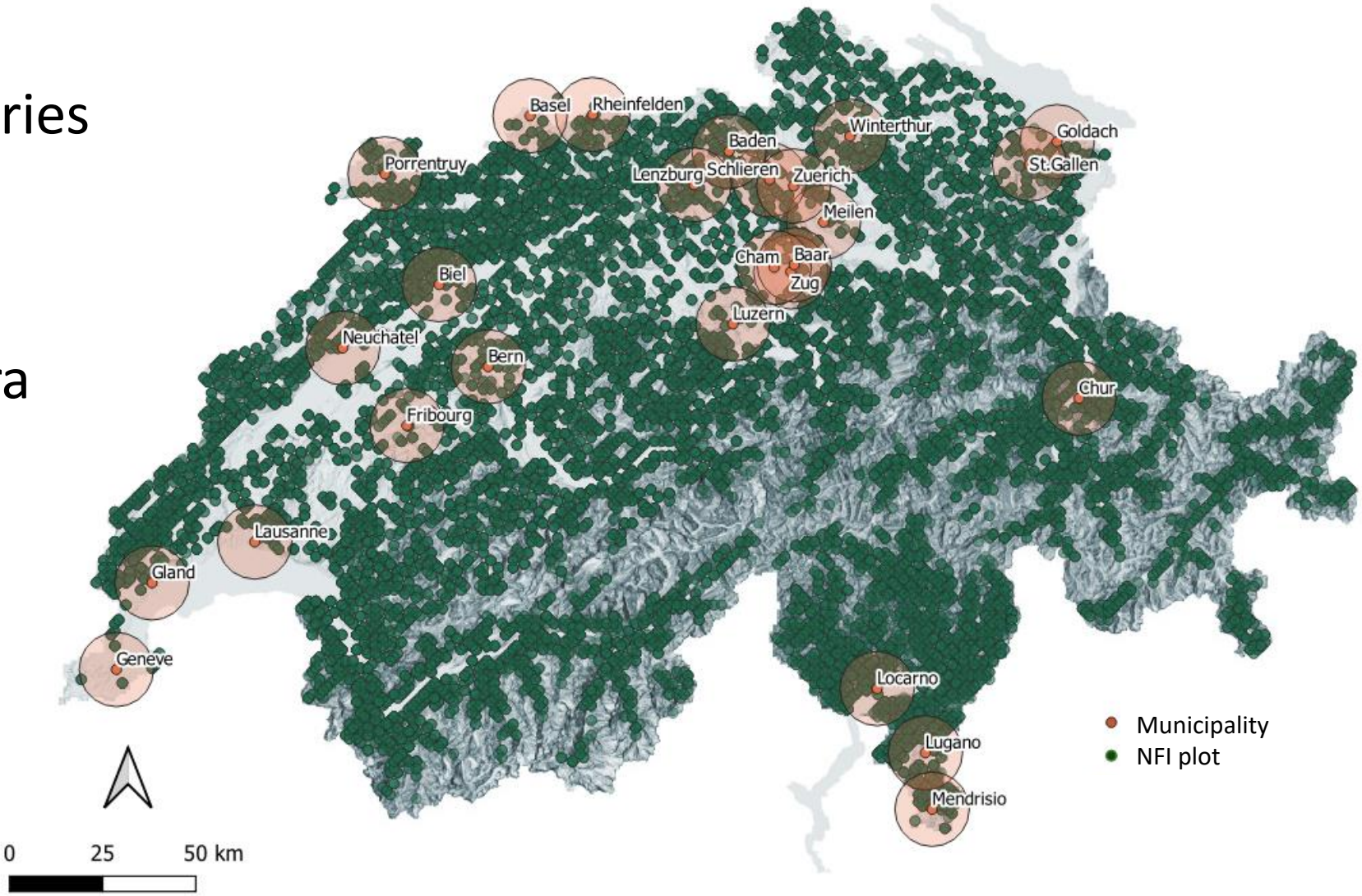
Urban trees facilitate the establishment of non-native forest insects

Manuela Branco[1], Pedro Nunes[1], Alain Roques[2], Maria Rosário Fernandes[1], Christophe Orazio[3], Hervé Jactel[4]

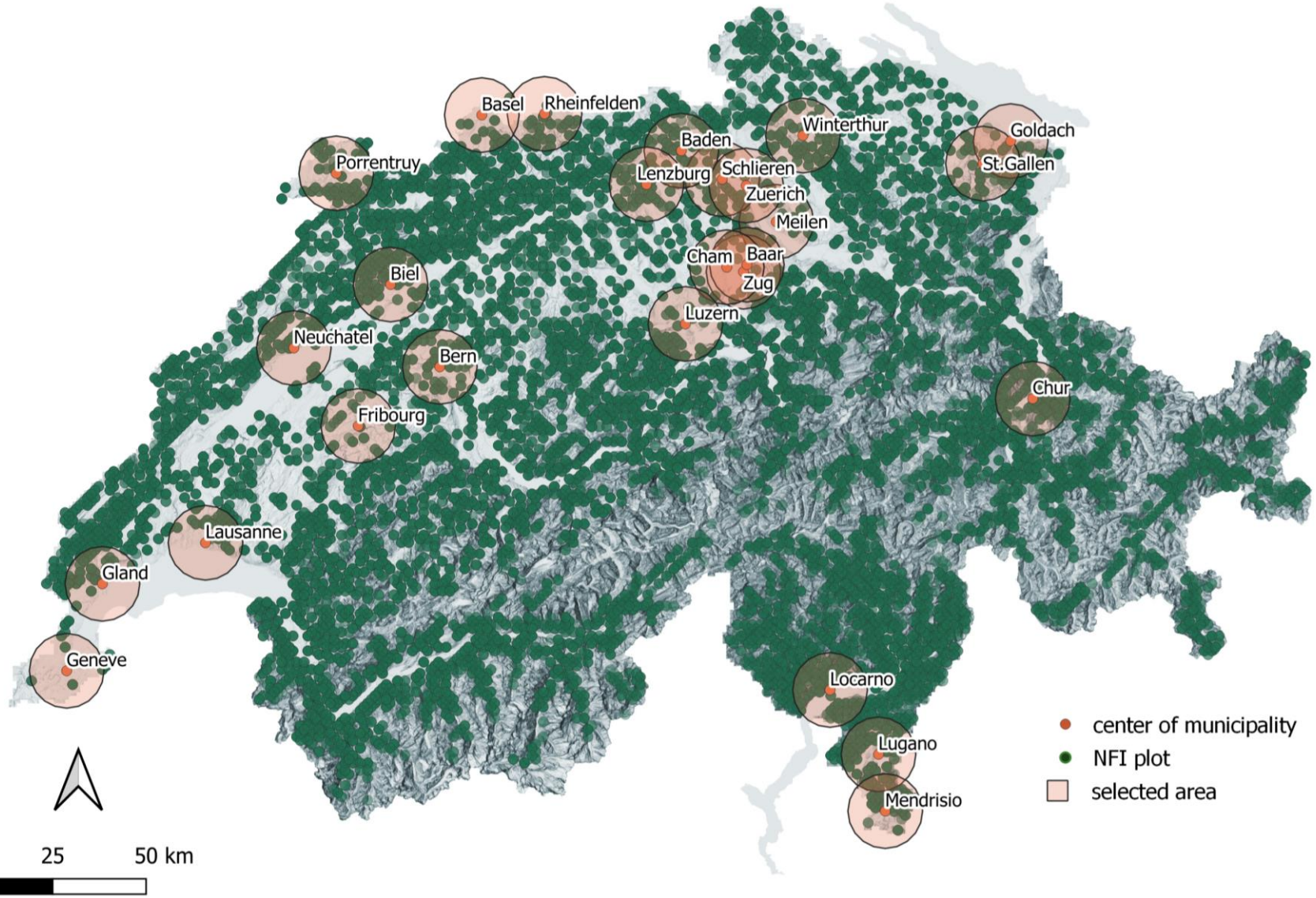
Vivanne Dubach

Data

- Swiss urban tree inventories
- n = 26
- n trees: 458’977
- 1360 species, 292 genera
- NFI: ~130 species!
- 76 native tree species



Urban trees vs. forest trees



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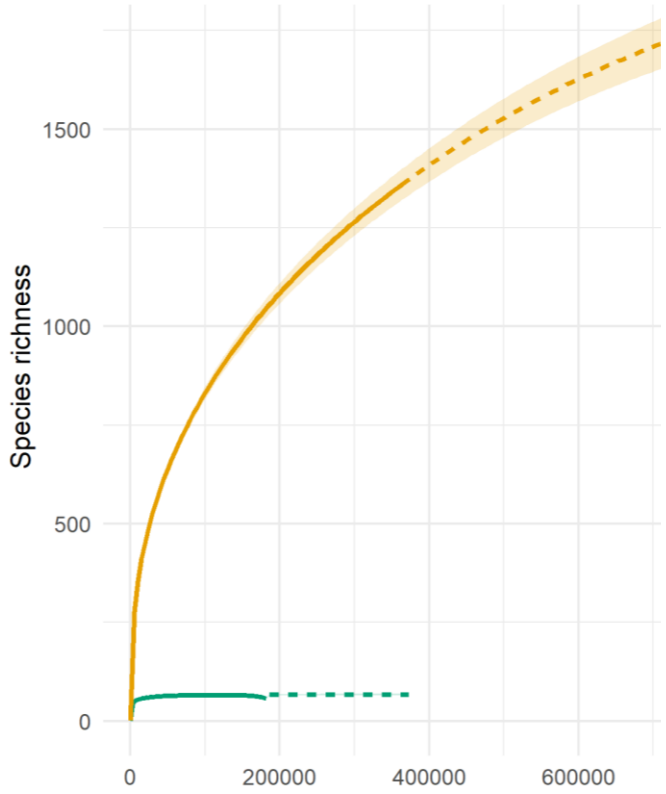
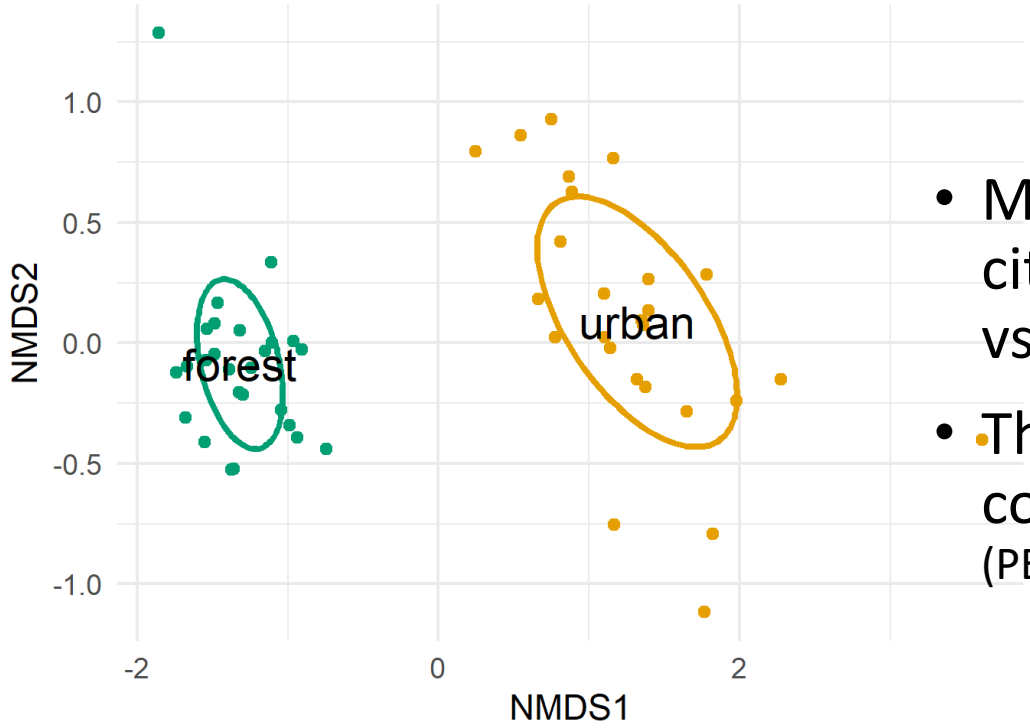
Urban trees vs. forest trees





- Many more tree species in cities than in forests (1306 vs. 76)
- Therefore: tree species composition different (PERMANOVA)

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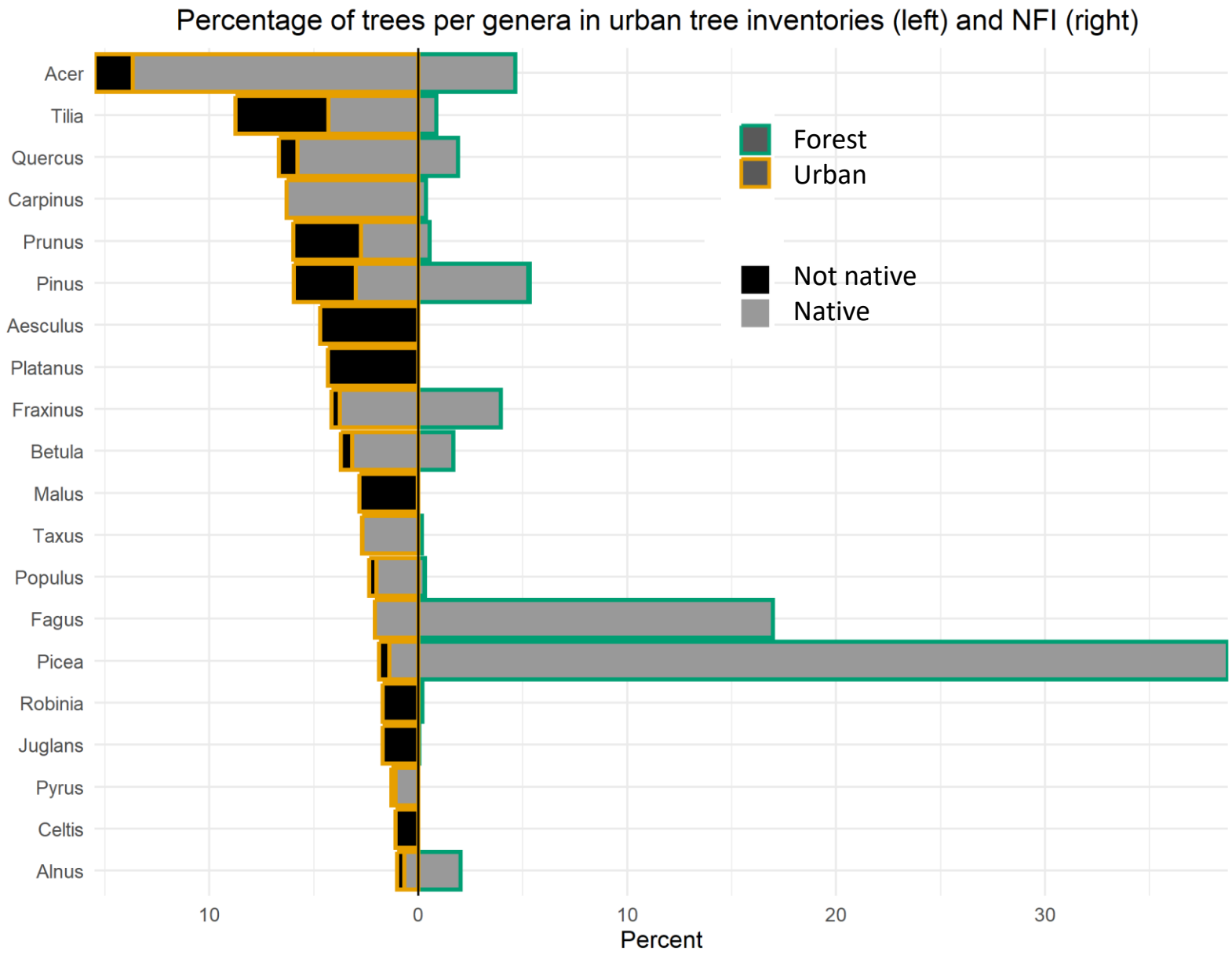
Urban trees vs. forest trees

Most common trees in urban tree inventories

Tree species	Percent
Carpinus betulus	6.3%
Acer platanoides	6.1%
Quercus robur	5.0%
Acer campestre	4.2%
Aesculus hippocastanum	4.0%
Acer pseudoplatanus	3.4%
Fraxinus excelsior	3.4%
Platanus hispanica	3.2%
Betula pendula	3.1%
Pinus sylvestris	2.8%
Pinus nigra	2.7%
Malus domestica	2.7%
Taxus baccata	2.7%
Tilia cordata	2.5%
Prunus avium	2.4%



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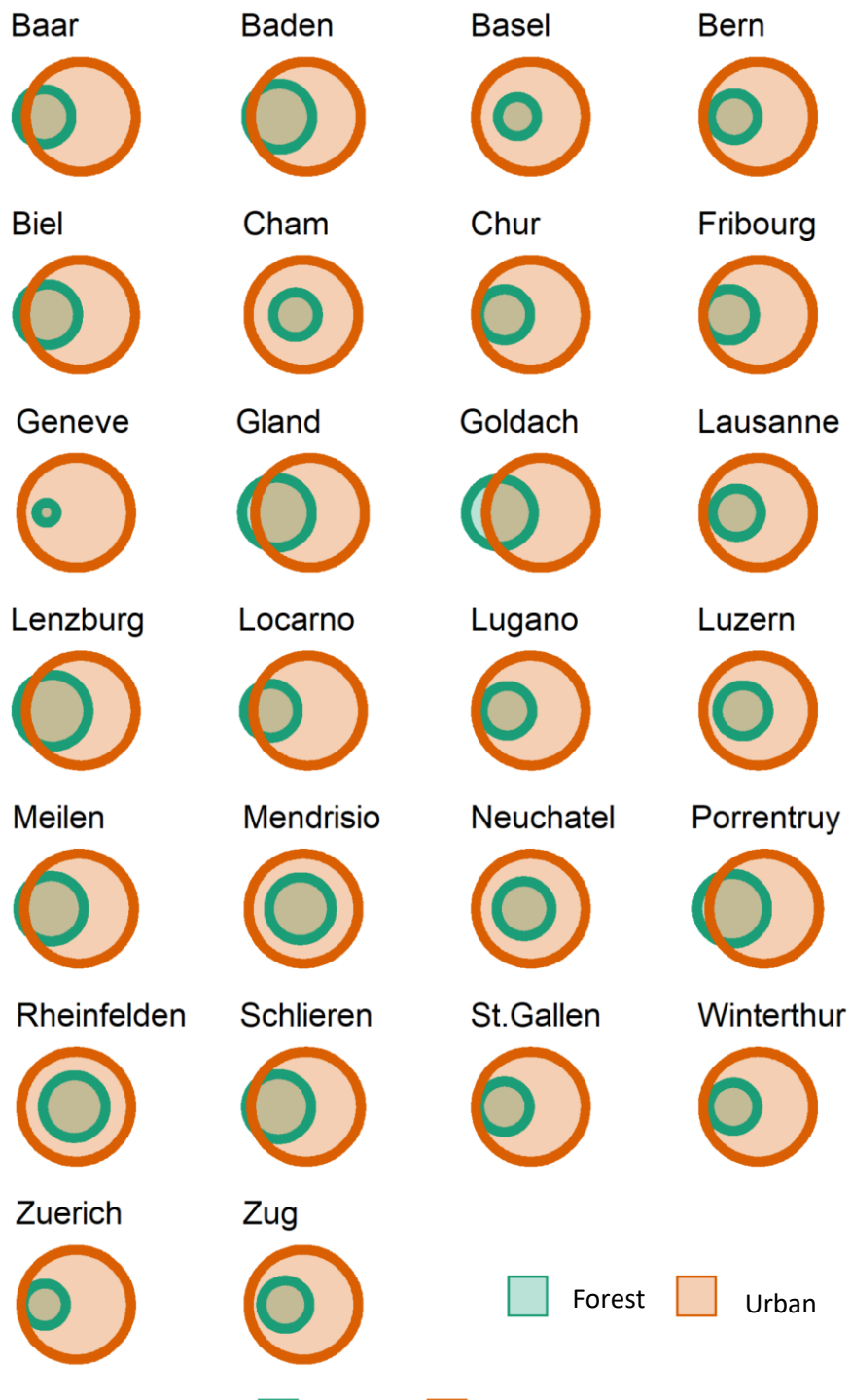
Urban trees vs. forest trees

- Genus level:
  - Trees in forests are represented in the urban environments they surround

- Importance for invasive species:
  - Pests, that are a danger to the Swiss forest find hosts in cities
  - ‘stepping stone’ Theory



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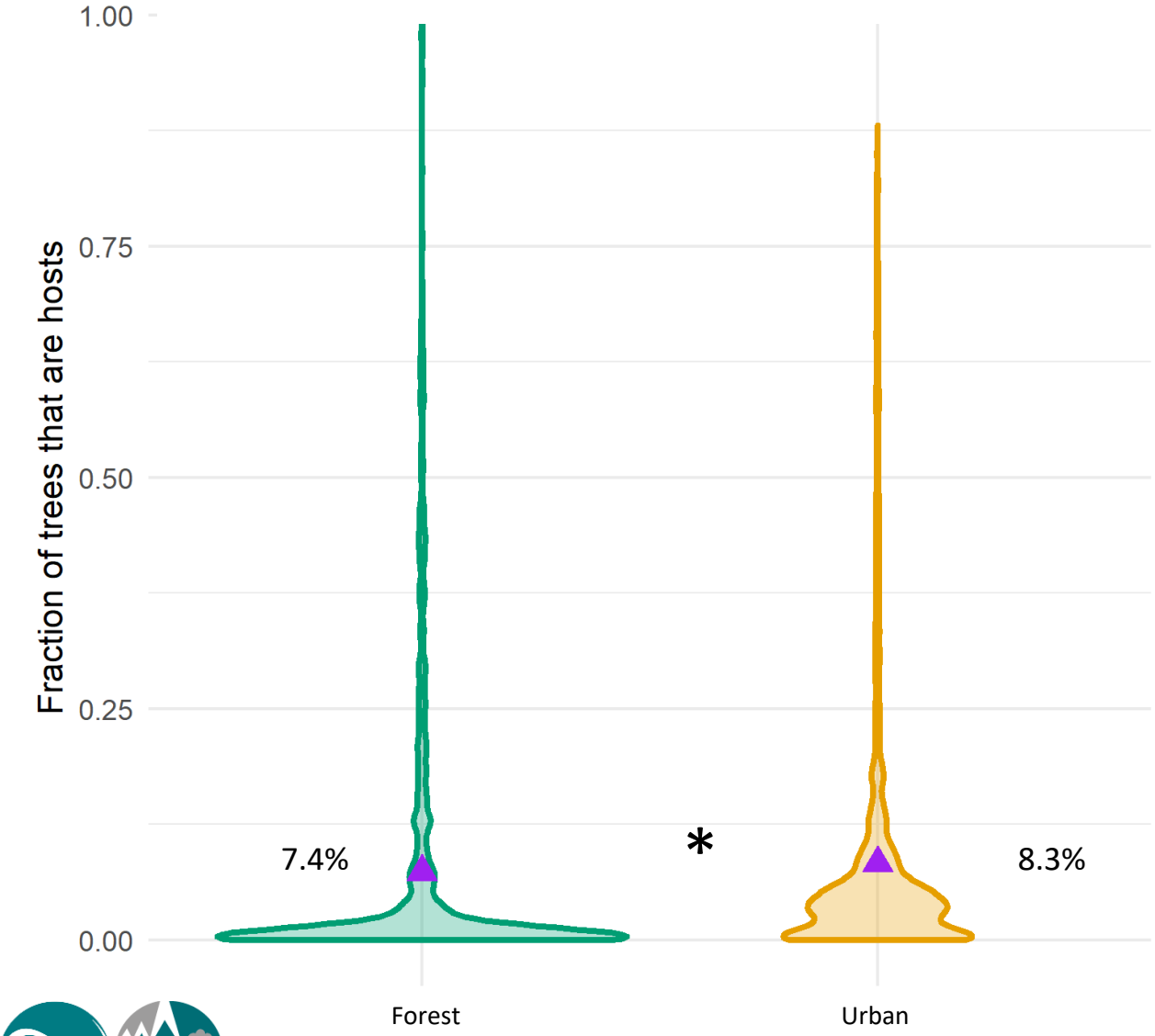
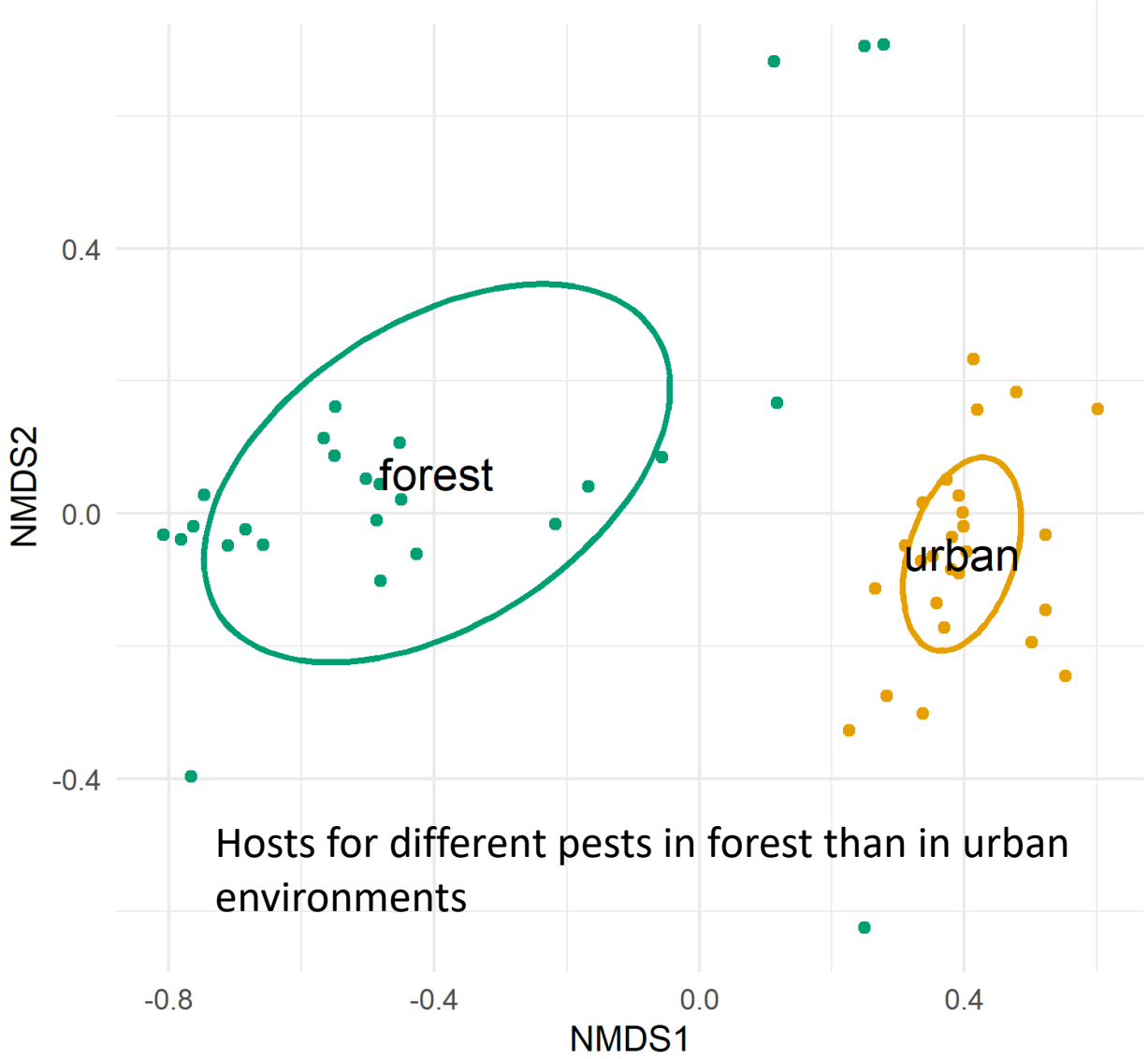
Urban trees vs. forest trees

EPPO proposed quarantine pests (A1 and A2 lists)

A





Hosts for different pests in forest than in urban environments

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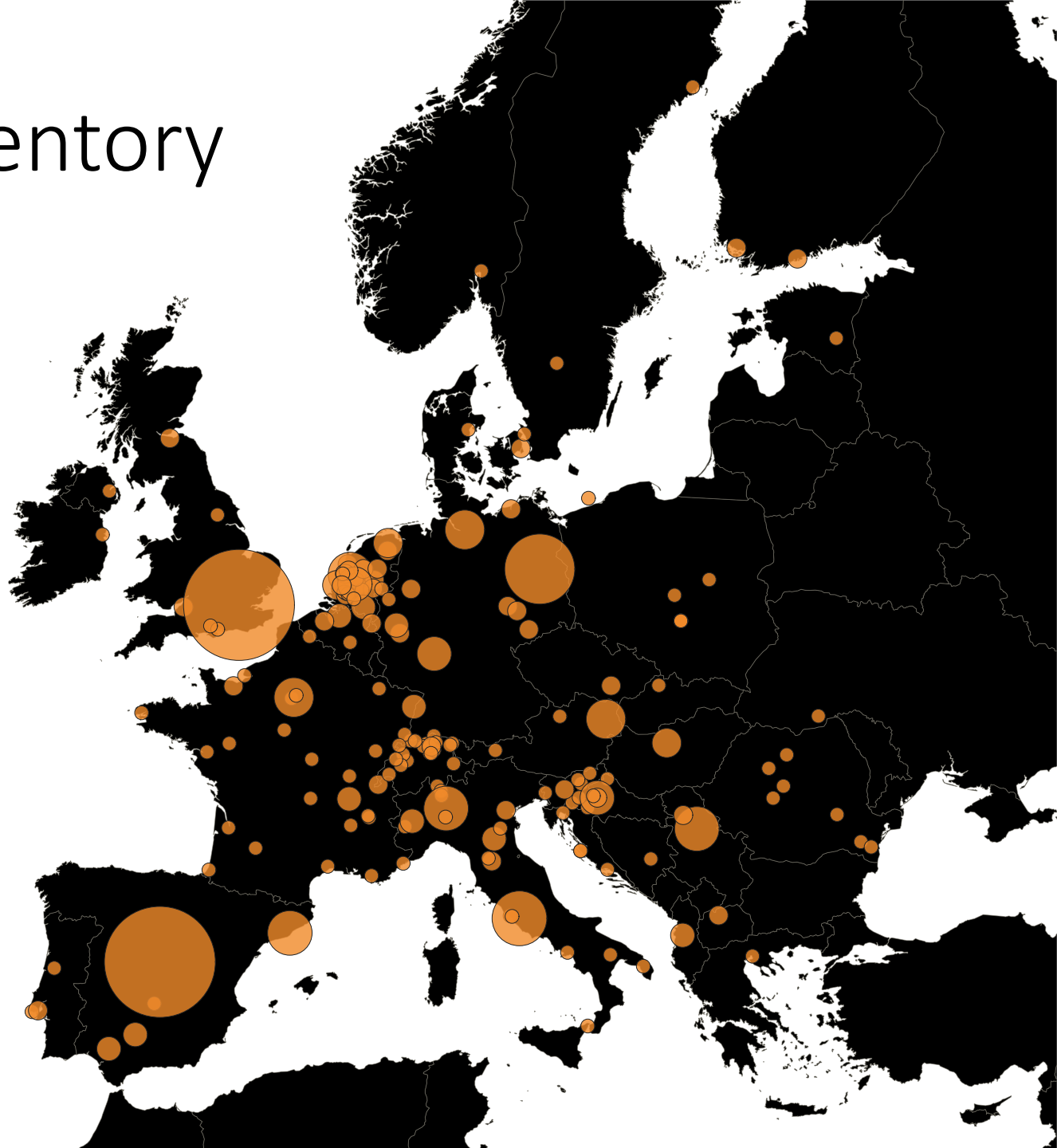
Source: www.myswitzerland.com

European urban tree inventory

- 29 countries
- 170 inventories
- ~200 - >700’000 trees
- ~8.7 mio trees in total
- >3’400 species



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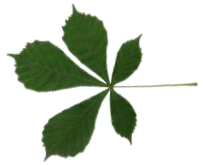
Most common trees – percentage of all trees by number

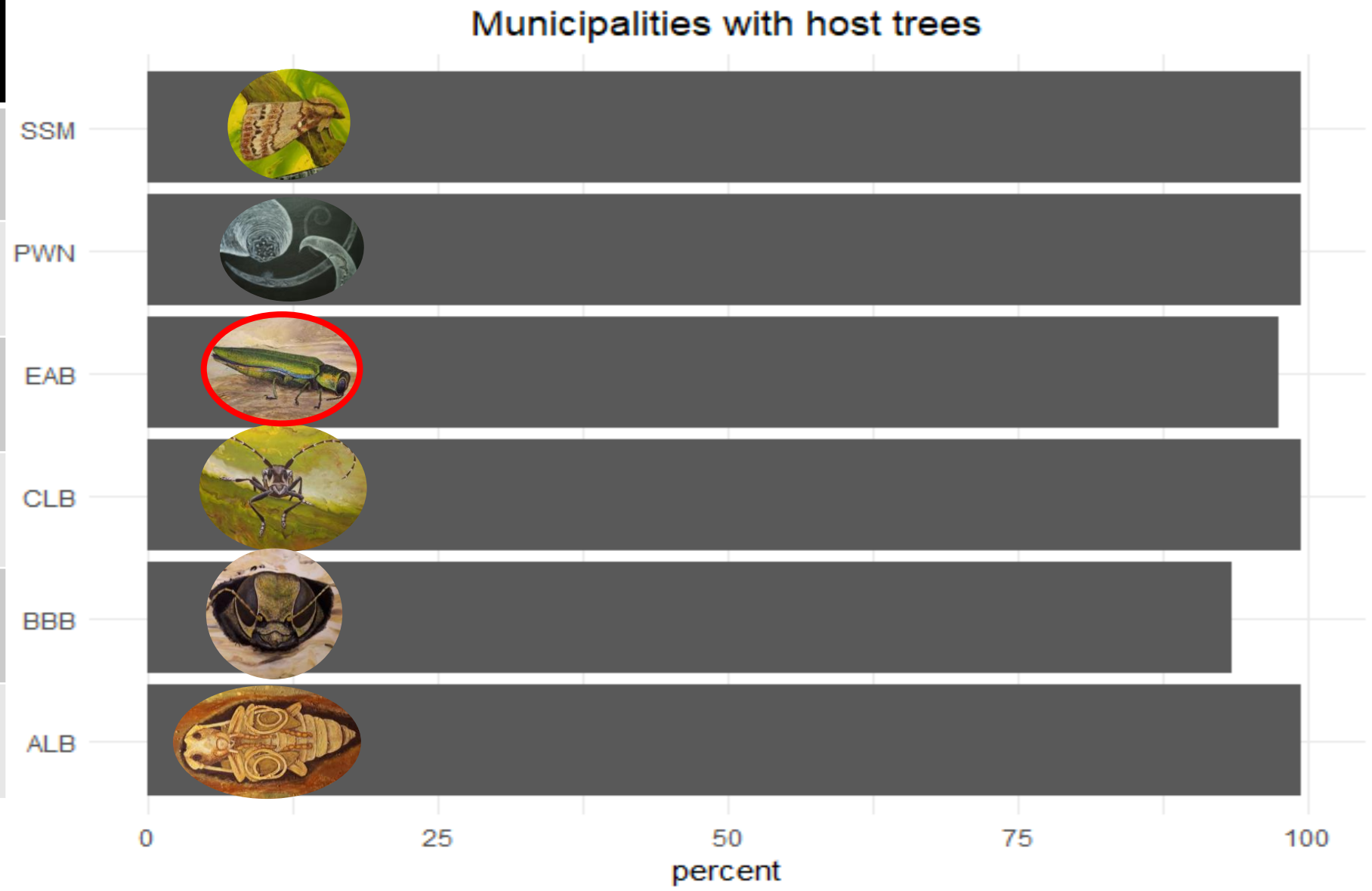


Species	Percent
Acer platanoides	4.9
Quercus robur	4.8
Fraxinus excelsior	4.2
Platanus x hispanica	3.7
Tilia cordata	3.5
Acer pseudoplatanus	3.4
Aesculus hippocastanum	2.7
Tilia xeuropaea	2.6
Carpinus betulus	2.5
Celtis australis	2.4

Source: wikimedia commons or treeguide

‘Urban trees as stepping stones for invasive forest pests’

Species
Siberian silk moth *Dendrolimus sibiricus*
Pinewood nematode *Bursaphelenchus xylophilus*
Emerald ash borer *Agrilus planipennis*
Chinese longhorn beetle *Anoplophora chinensis*
Bronze birch borer *Agrilus anxius*
Asian longhorn beetle *Anoplophora glabripennis*



Approaching invasive forest pests in Europe Example: Emerald Ash Borer

- Emerald Ash Borer in Europe
  - First detected in 2003 near Moscow
  - Spreading
- Concerning, because 5.3% of trees in the EUTI are *Fraxinus* sp.
- 97% of urban tree inventories contain *Fraxinus* sp.
- 4.7% *Fraxinus* sp. In trees trees planted from 2018-2023

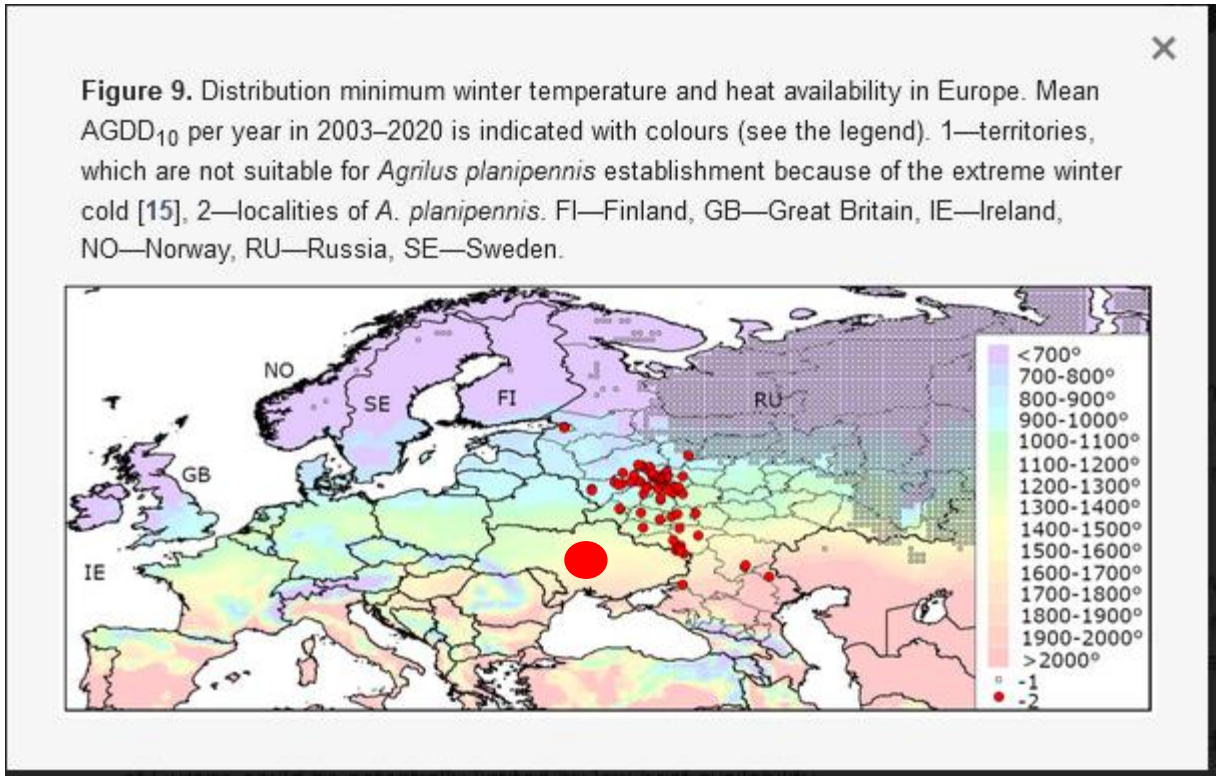


Figure 9. Distribution minimum winter temperature and heat availability in Europe. Mean $AGDD_{10}$ per year in 2003–2020 is indicated with colours (see the legend). 1—territories, which are not suitable for *Agrilus planipennis* establishment because of the extreme winter cold [15], 2—localities of *A. planipennis*. FI—Finland, GB—Great Britain, IE—Ireland, NO—Norway, RU—Russia, SE—Sweden.

insects

MDPI

Article

Low Heat Availability Could Limit the Potential Spread of the Emerald Ash Borer to Northern Europe (Prognosis Based on Growing Degree Days per Year)

Marina J. Orlova-Bienkowskaja * and Andrzej O. Bieńkowski

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Conclusions

- EU priority quarantine pests and pathogens:
  - most will find abundant host trees in European cities.

- Specific situation EAB:
  - Advise against planting more Ash trees in European cities

Conclusions

- Urban trees: massive species richness

- From the perspective of invasive forest pests:
  - Higher percentage of hosts in the city than in the forest
  - High species richness → high host availability (invasion paradox)
  - → we suggest monitoring for invasive forest pests in and around urban environments

Thank you!

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