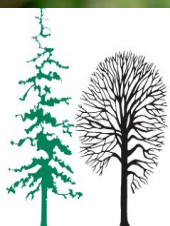


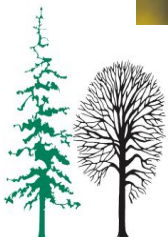


# Hoverflies (Diptera: Syrphidae) as pollinators

Maarten de Groot



# Are bees and bumblebees the most important pollinators?





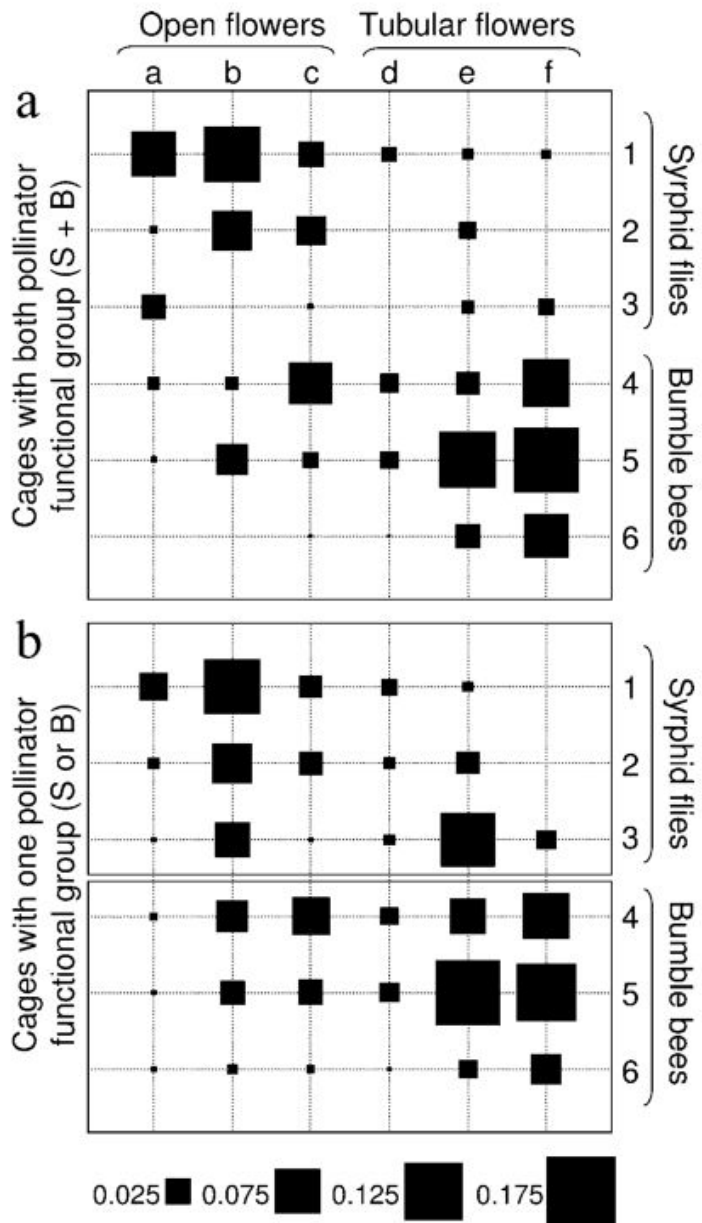
8,5%

91,5%



87,5%

12,5%



# Most common groups

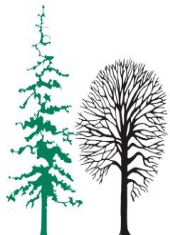
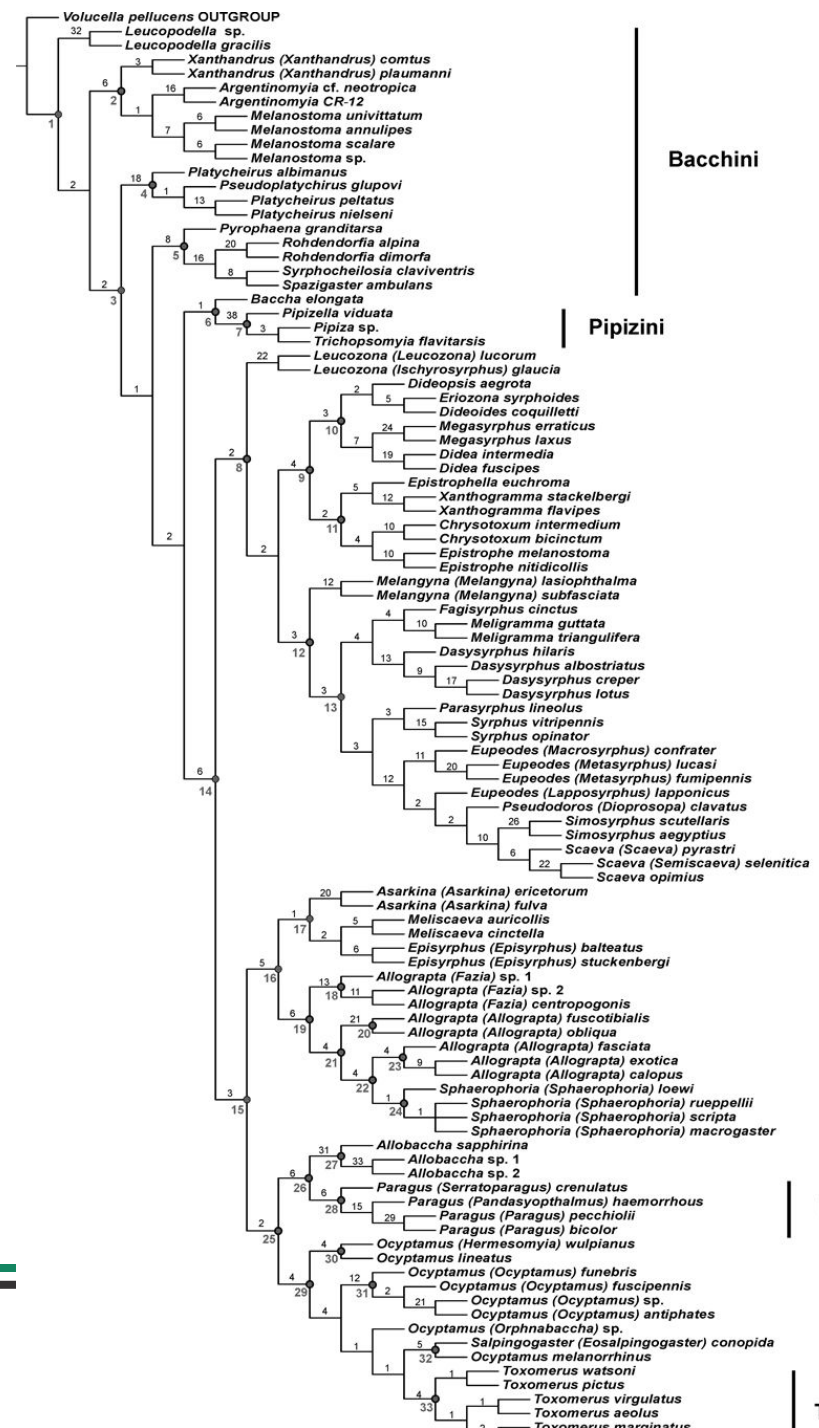


# Most common groups



# Taxonomy

- Subfamilies
  - Syrphinae
  - Microdontinae
  - Eristalinae



# Diversity of hoverflies

- 
- 



## Number of species

- 800 species in Europe
- 6000 species in the World

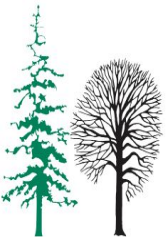
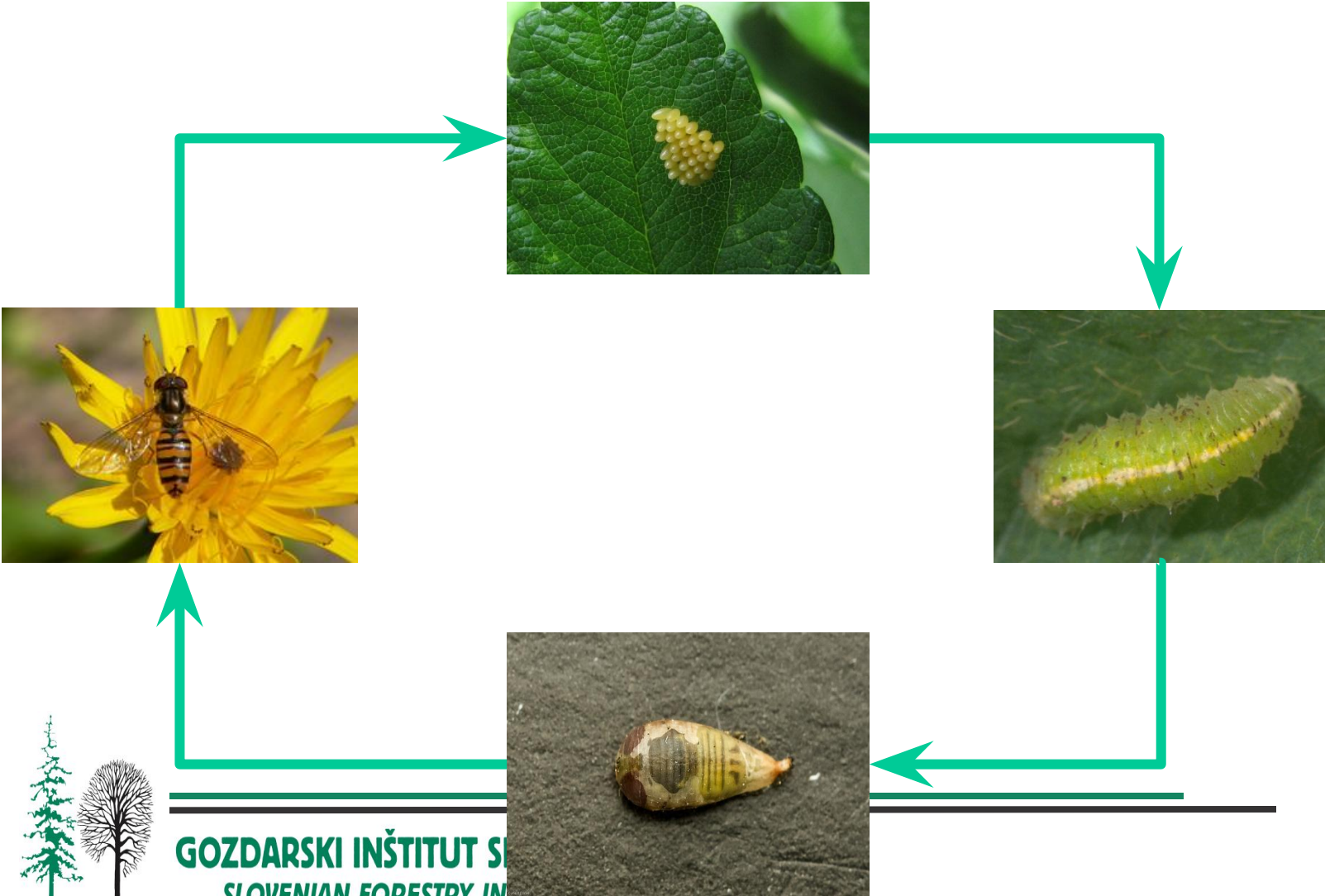
## larvae:

- microphagous
- Plant feeding
- predatoreous

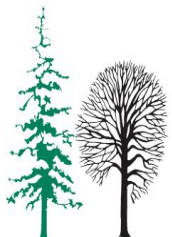




# Life cycle



# Predatoreous larvae



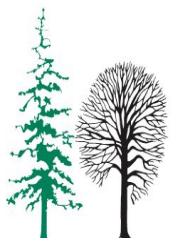
# Microphagous species



*Eristalis tenax*



*Myathropa florea*



# Plant feeding larvae

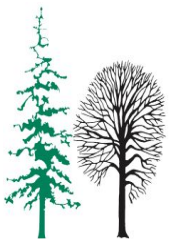
- Plants



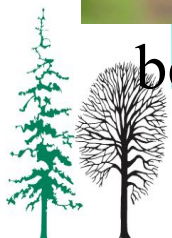
rastlin  
e



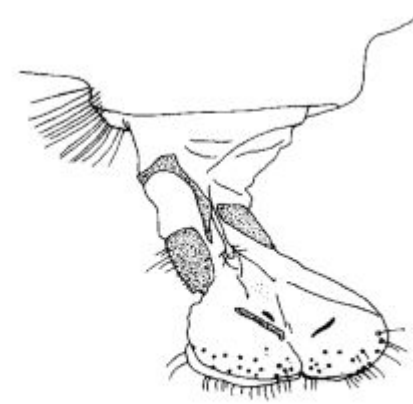
dreve  
sa



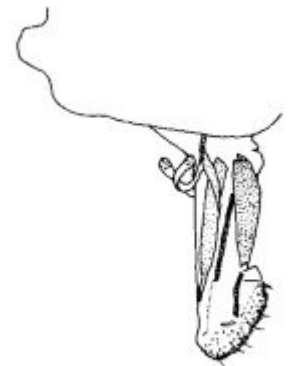
# Mimicry



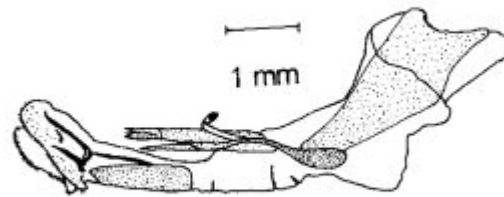
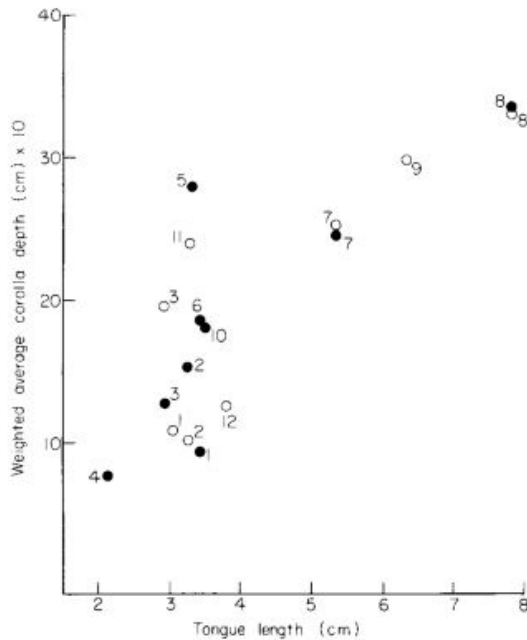
# pollination



*Episyrphus balteatus*



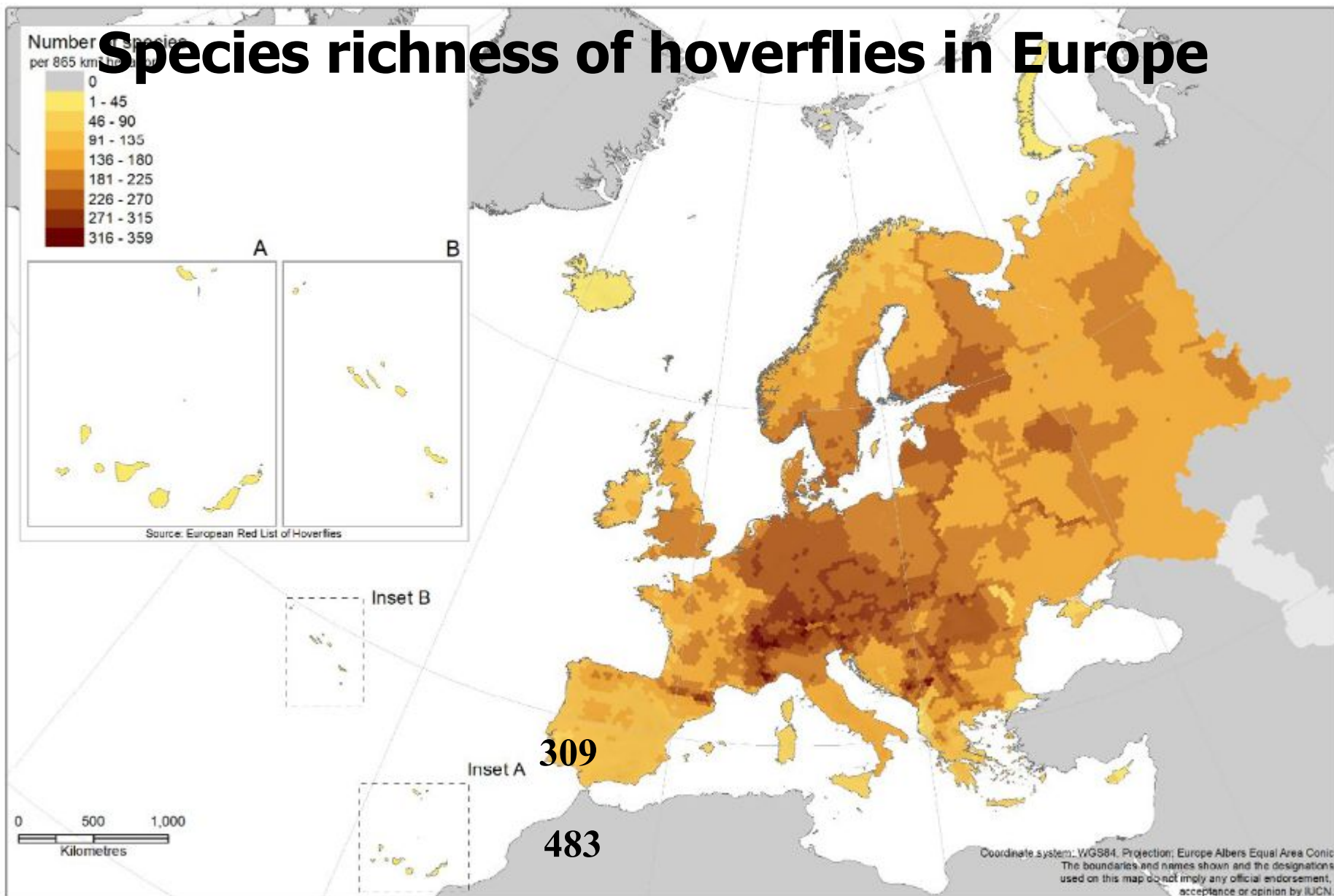
*Platycheirus albimanus*

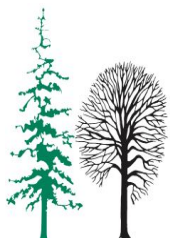
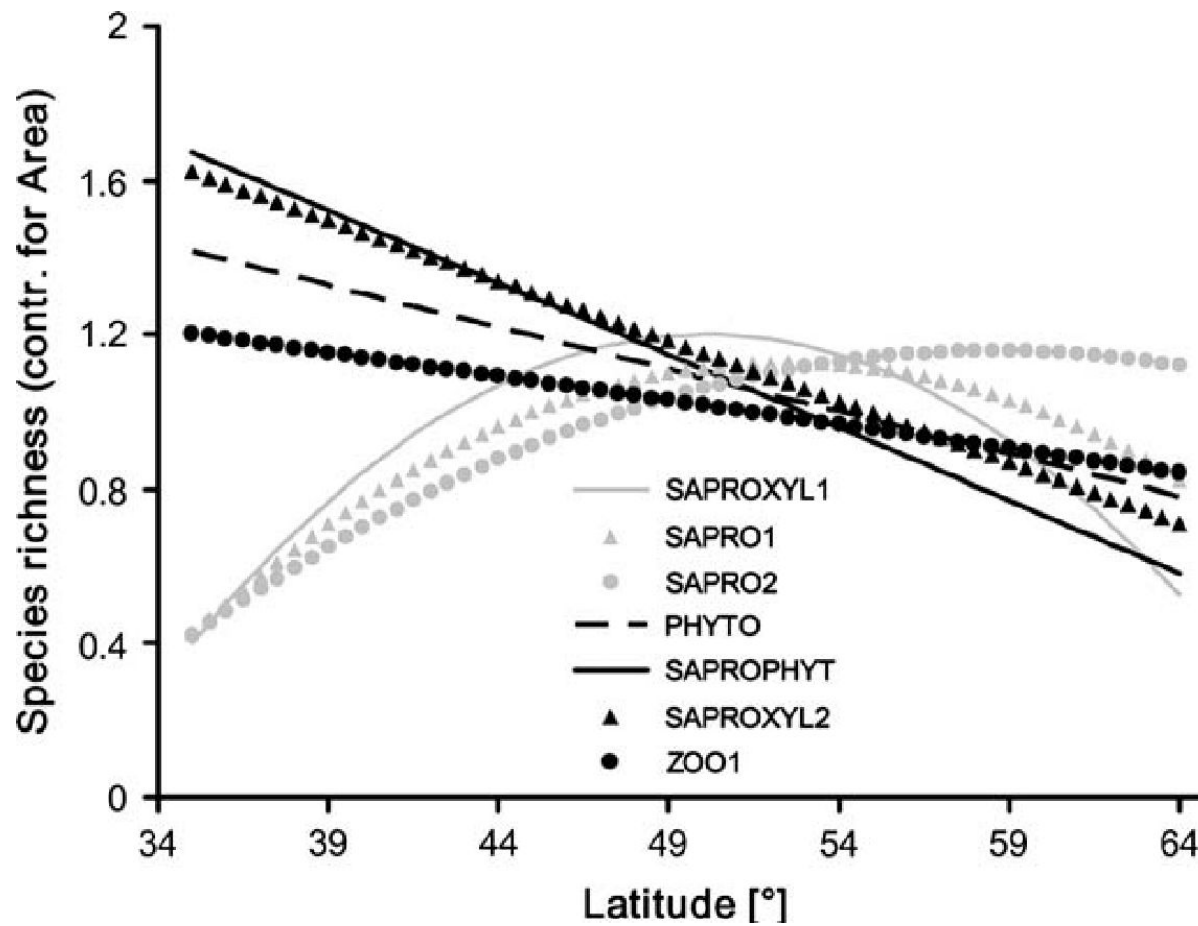


*Eristalis tenax*

Gilbert 1981

# Species richness of hoverflies in Europe







# Genus Volucella

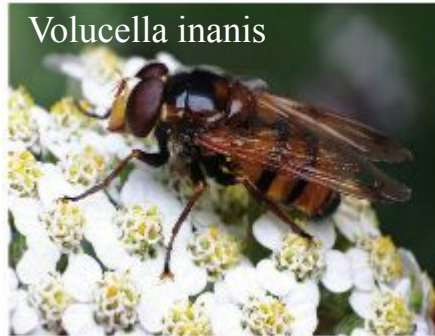
Volucella bombylans



Volucella pellucens



Volucella inanis



Volucella inanis

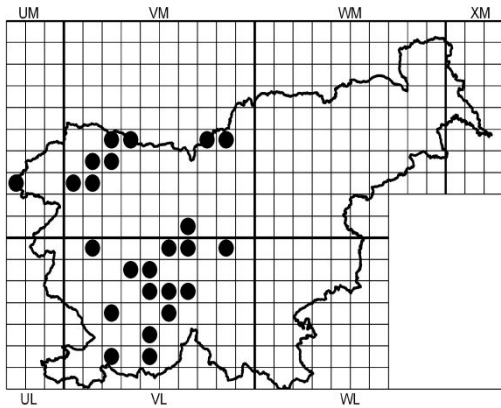


Volucella zonaria

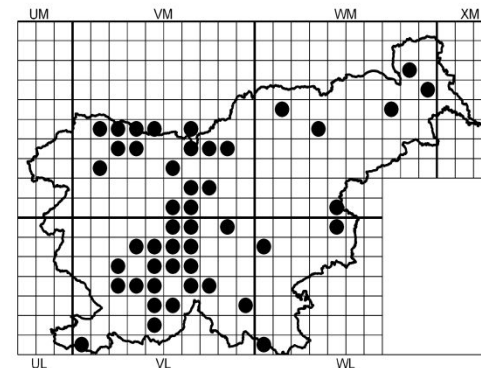
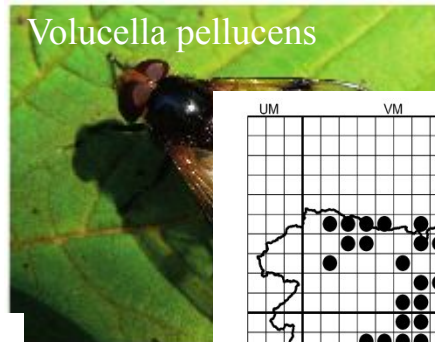


# Genus Volucella

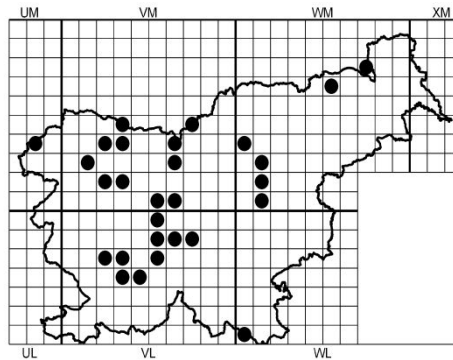
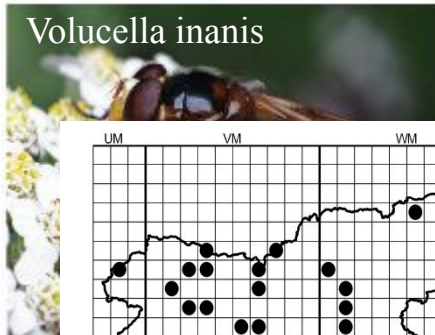
Volucella bombylans



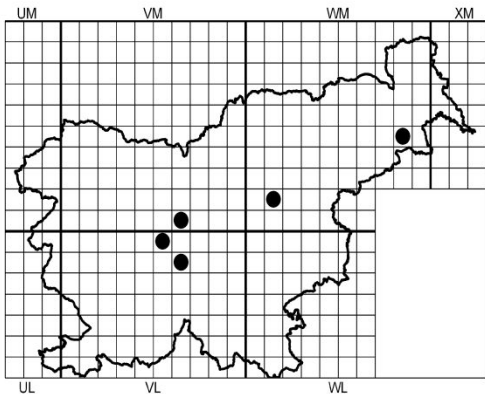
Volucella pellucens



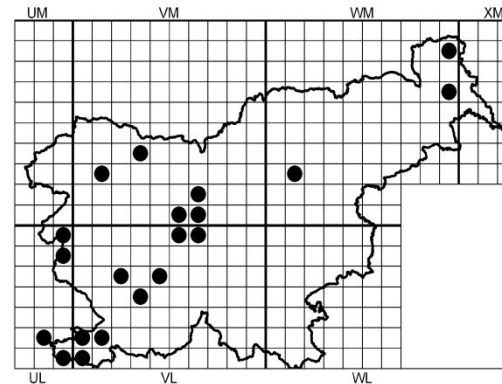
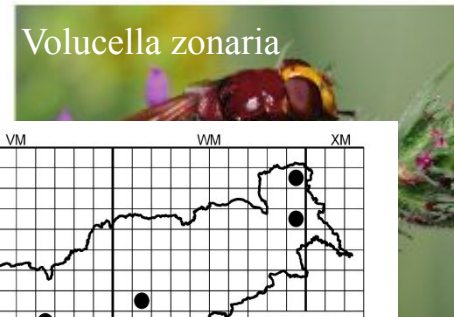
Volucella inanis



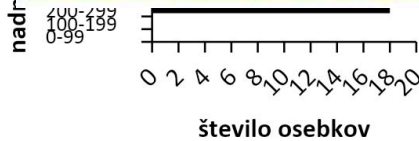
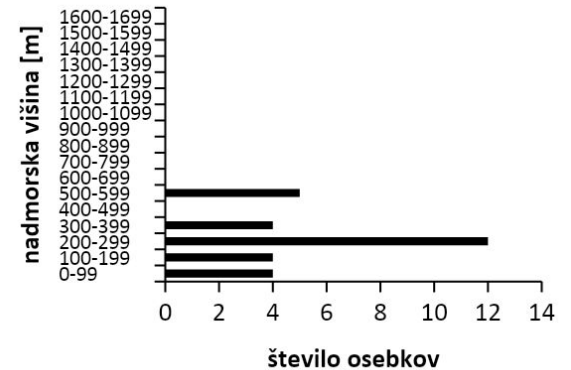
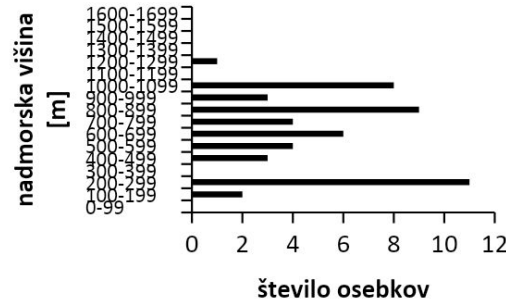
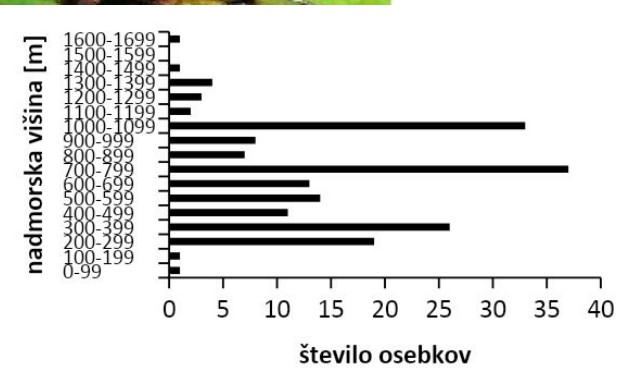
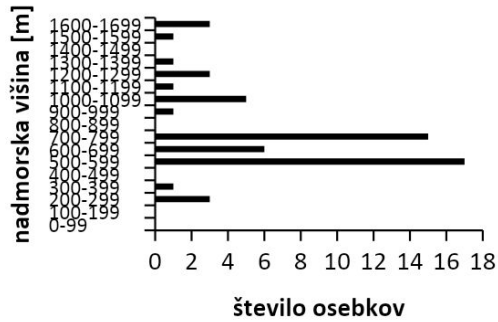
Volucella inanis



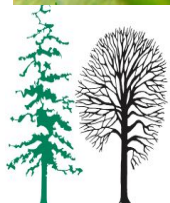
Volucella zonaria



# Genus Volucella



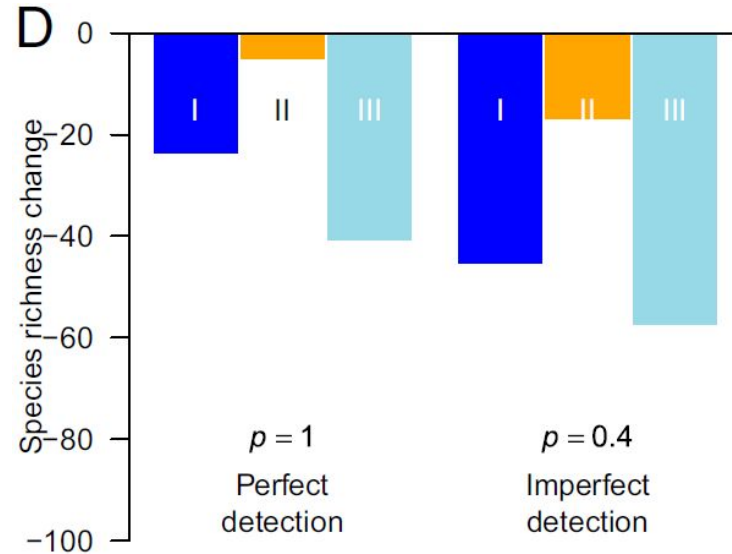
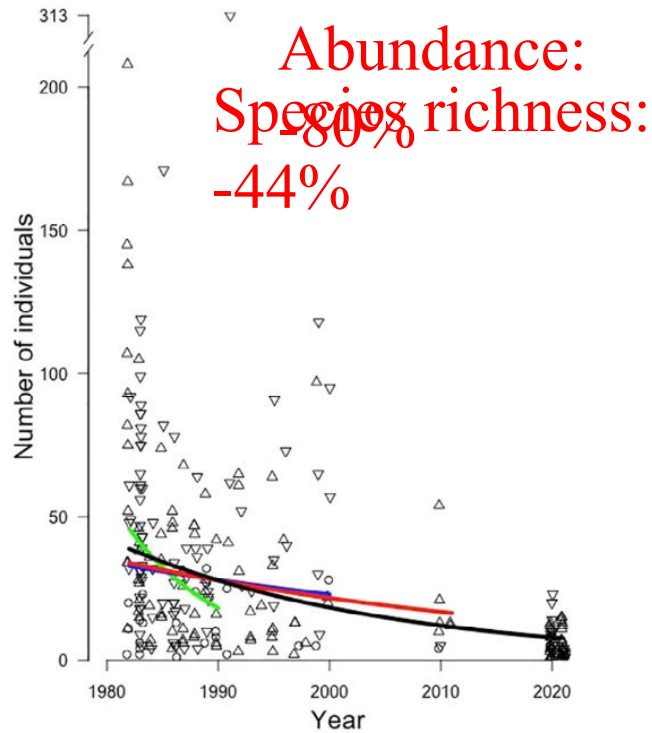
# Genus *Temnostoma*



# Habitats and species



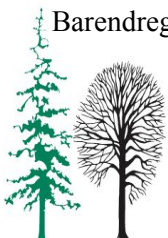
# Population declines



Hallmann et al 2021  
PNAS

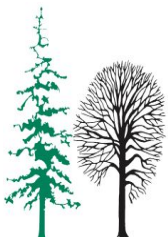
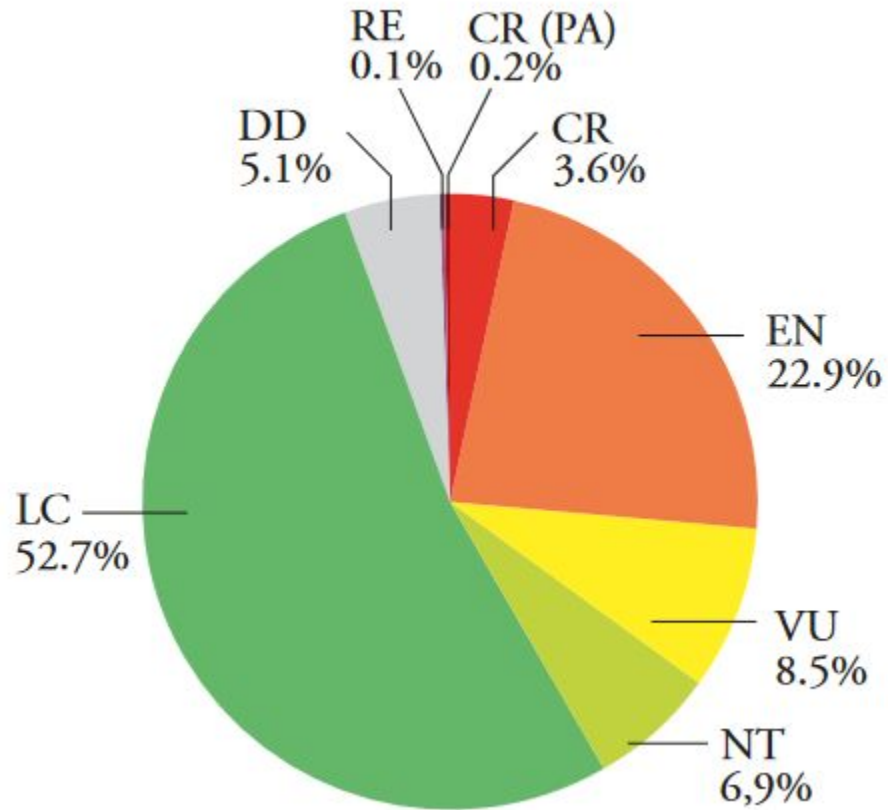
-23% over the season  
-82% at the daily level

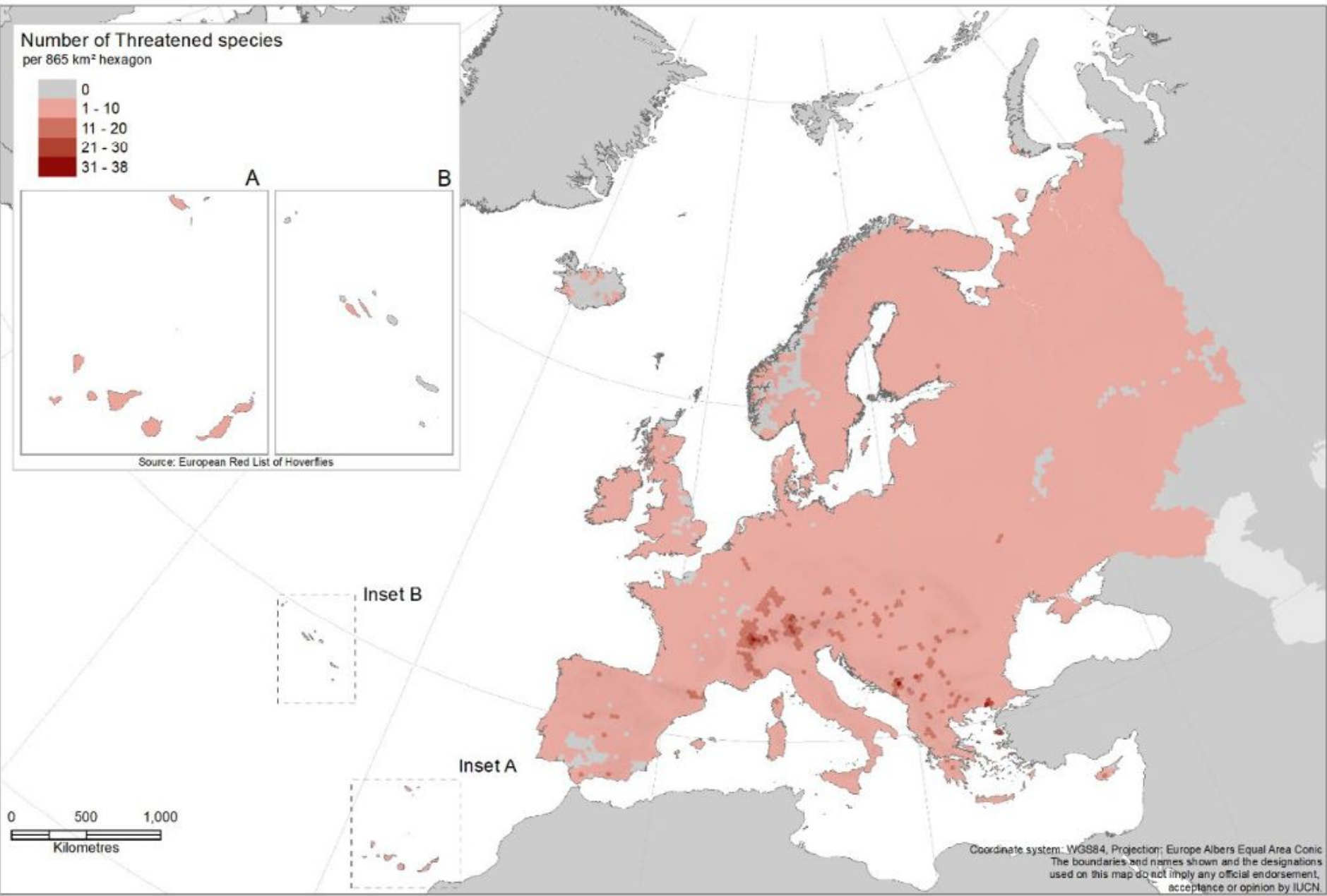
Barendregt et al 2022



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SLOVENIAN FORESTRY INSTITUTE

# Red list







# Climate change

Britain bees

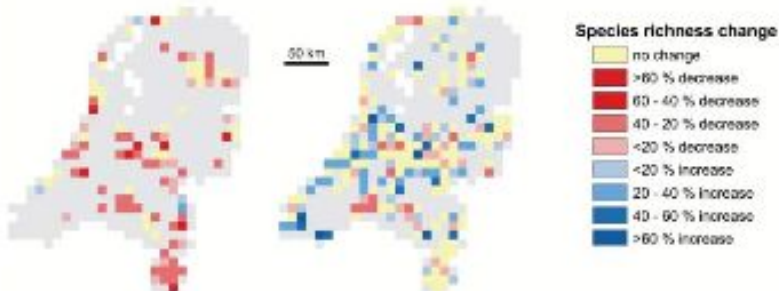
Britain syrphids



-

Netherlands bees

Netherlands syrphids



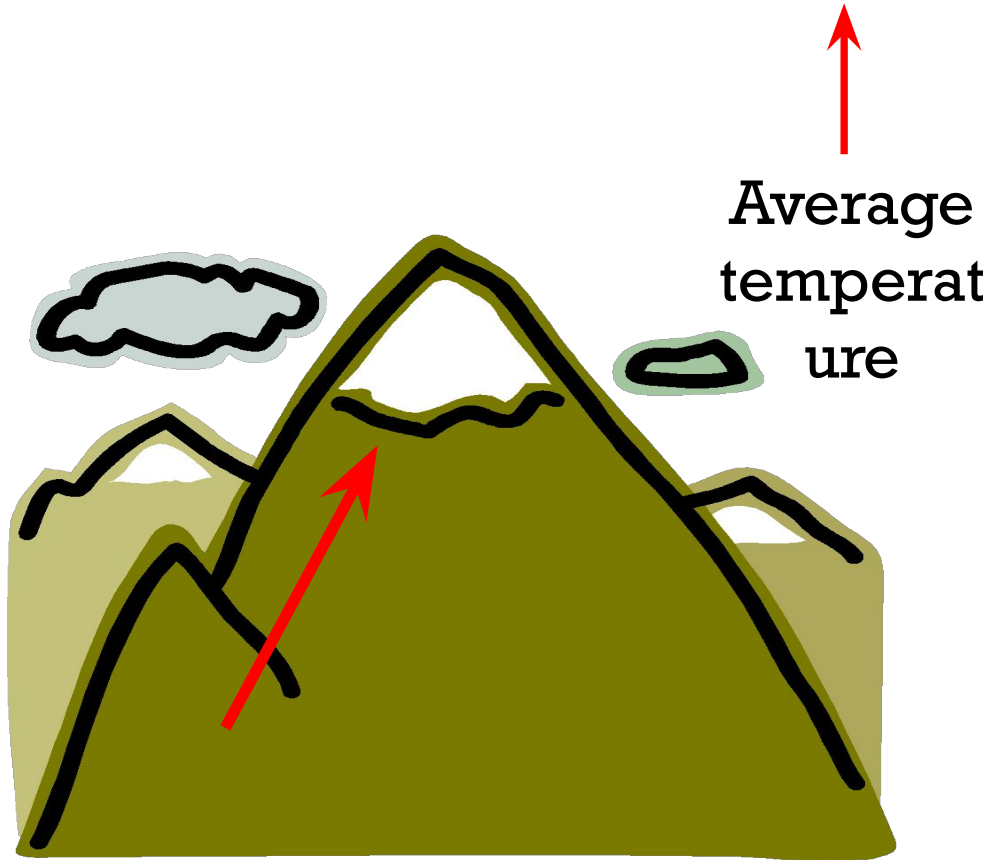
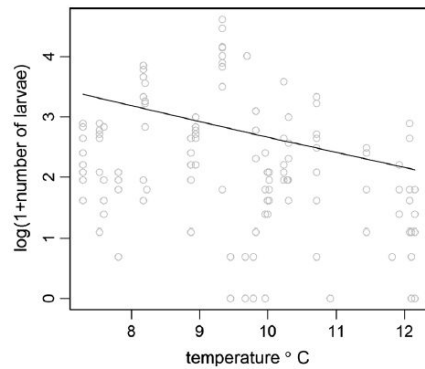
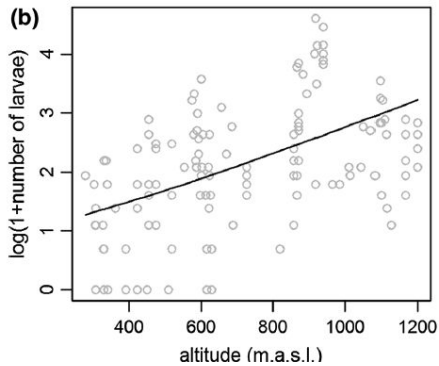
+/-

Biesmeijer et al 2006

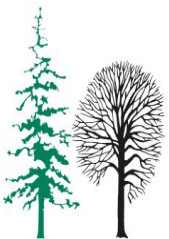


# Effects of change in temperature

- Altitude



De Groot and Kogoj 2015



# Pesticides

insekticides



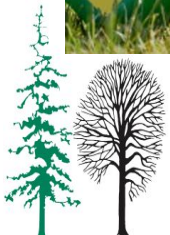
Direct effect



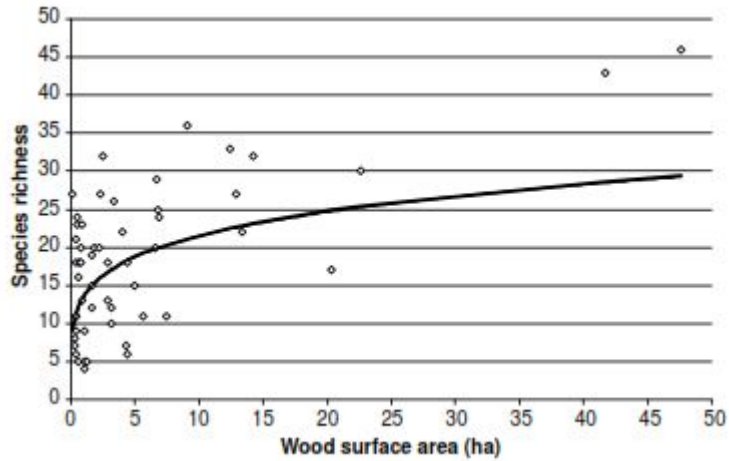
herbicides



Indirect effect



# management

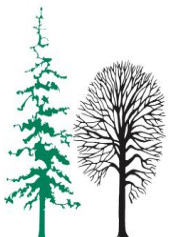


Larger area forest, more species

Ouin et al 2006

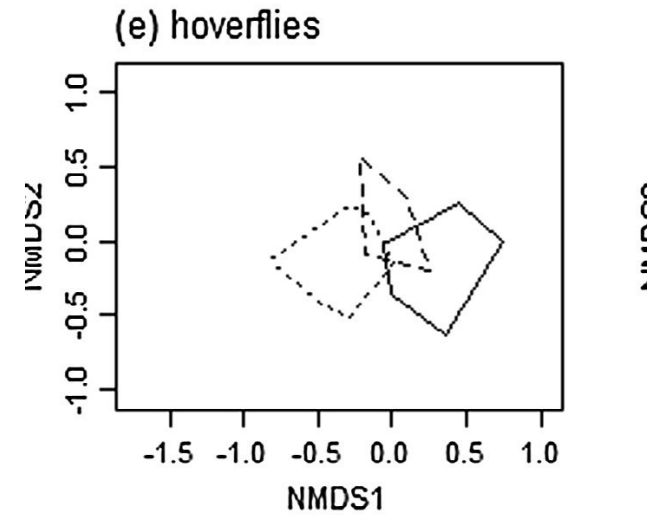
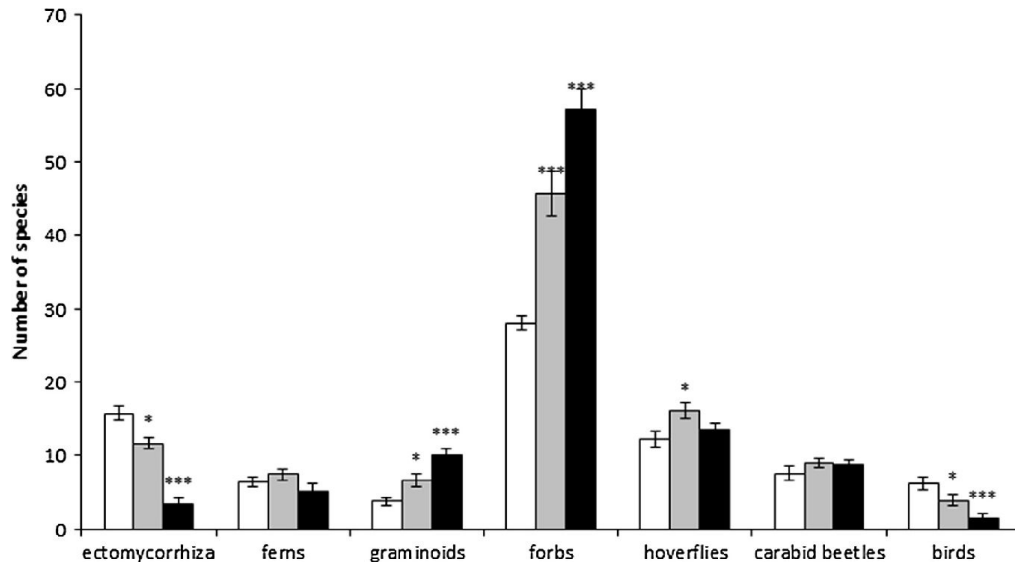


Heterogenous forest

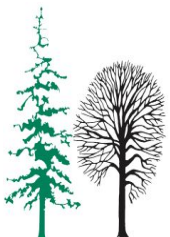


# Management

- Cutting intensity



De Groot et al 2016



# Questions?

