

Thursday, December 8 2022

Urban greening for pollinators: from policy to practice



Monitoring and assessment of pollinators and pollination in urban habitats: a focus on Paris (France) and Western Europe

Isabelle DAJOZ and Denis MICHEZ



Denis le logo de ton labo. ici



This presentation is based on collaborative work

- **The Cities Network** (France, Belgium, Switzerland) of the GDR CNRS Pollinéco (a french-speaking group of pollination ecologists)



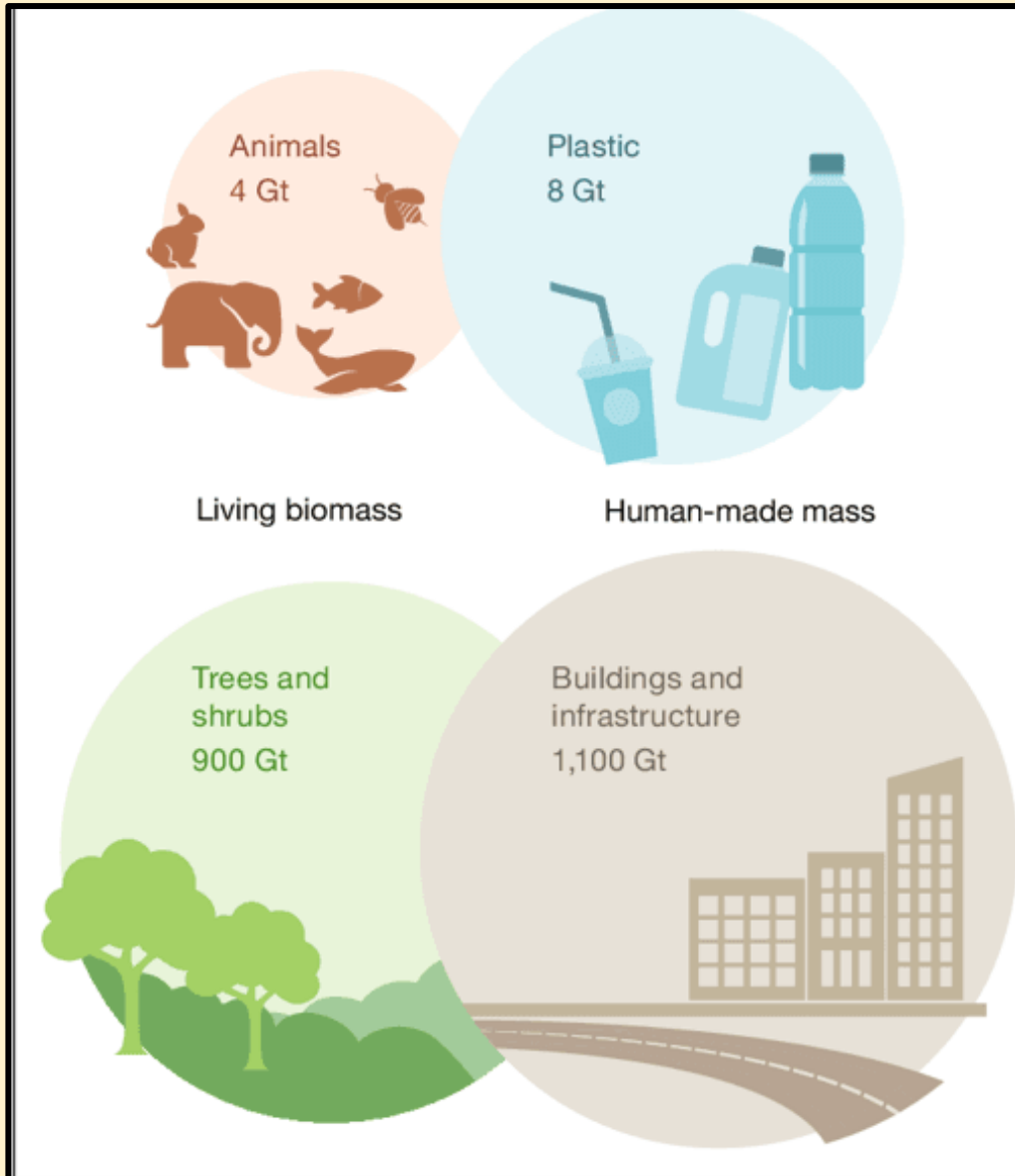
- **Collaboration with the city of Paris** – Department of Urban Green Spaces and Environment



- **Work of 4 PhD students:** Arthur Fauviau, Benoît Geslin, Lise Ropars, Vincent Zaninotto



A comparison of human-made mass and overall living biomass

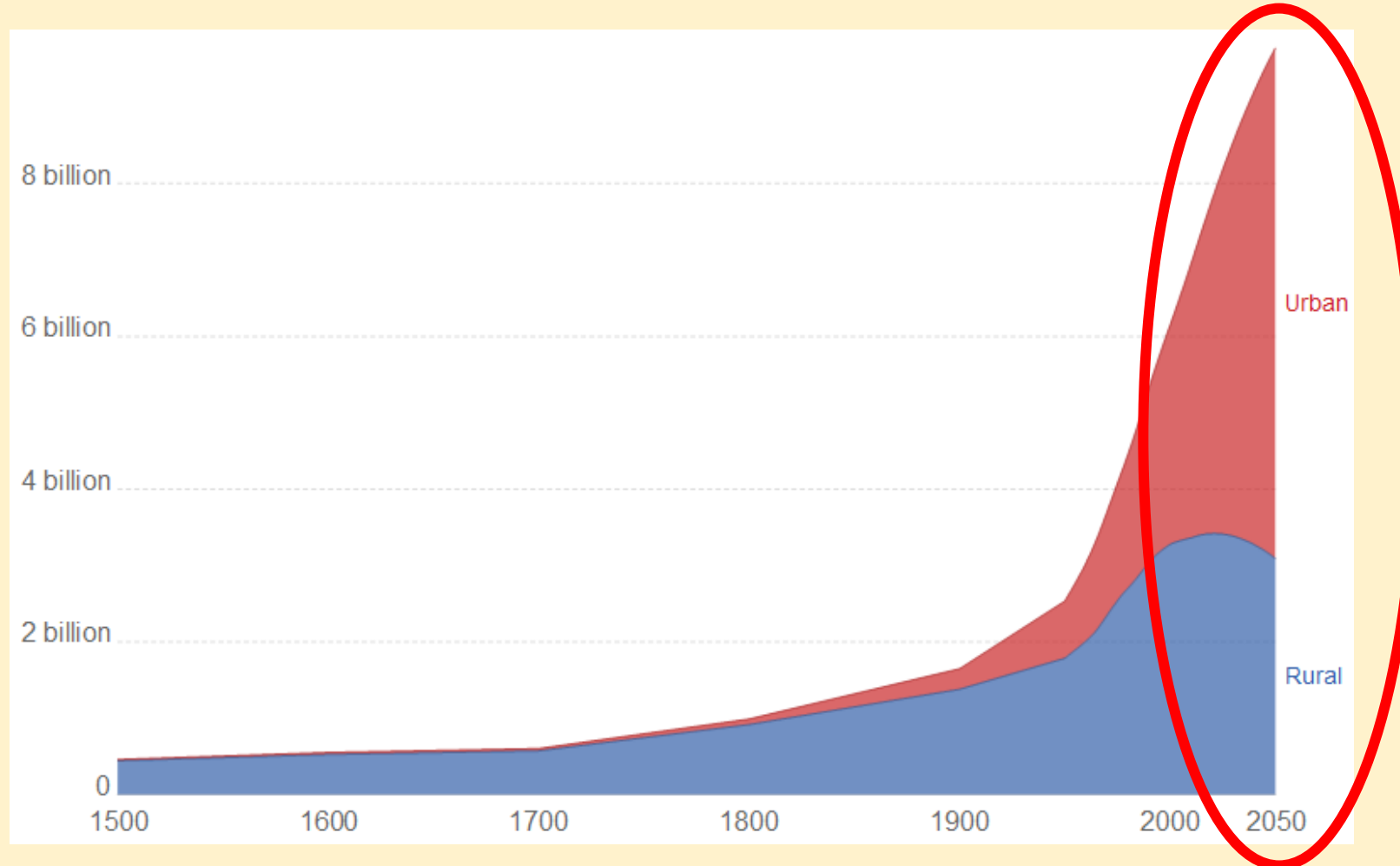


- Since 2020: human made mass exceeds the overall living biomass on Earth

Elhacham et al., Nature, 2020

A direct link with the growth of urban habitats

- A very strong increase scheduled for the next 30 years



United Nations, 2019

Why preserve pollinators and pollination in urban habitats ?



➤ The pollination ecosystem service

=> *Urban/periurban agriculture accounts for 20% of world food production*

Why preserve pollinators and pollination in urban habitats ?



➤ *The pollinator communities*

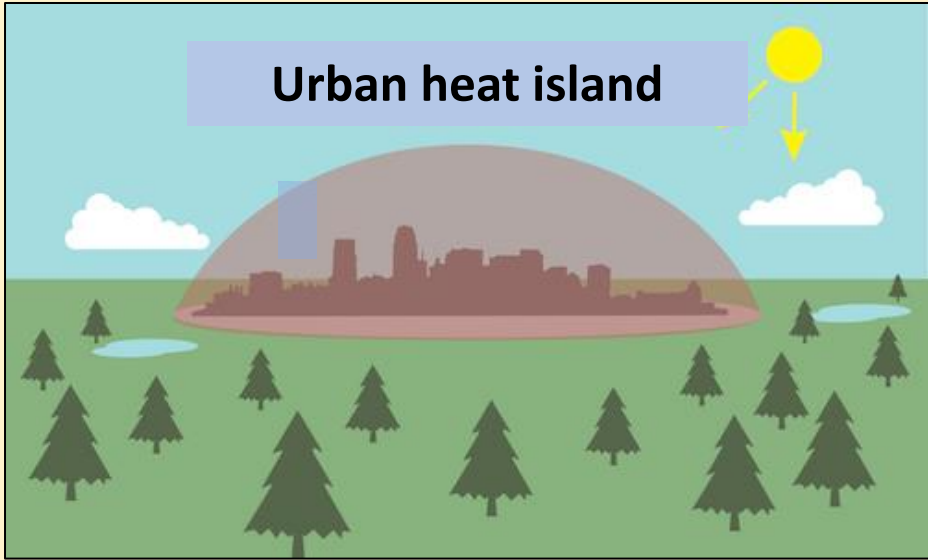
⇒ *Biodiversity of plant communities and associated organisms*

⇒ *Awareness of urban citizens to biodiversity issues*

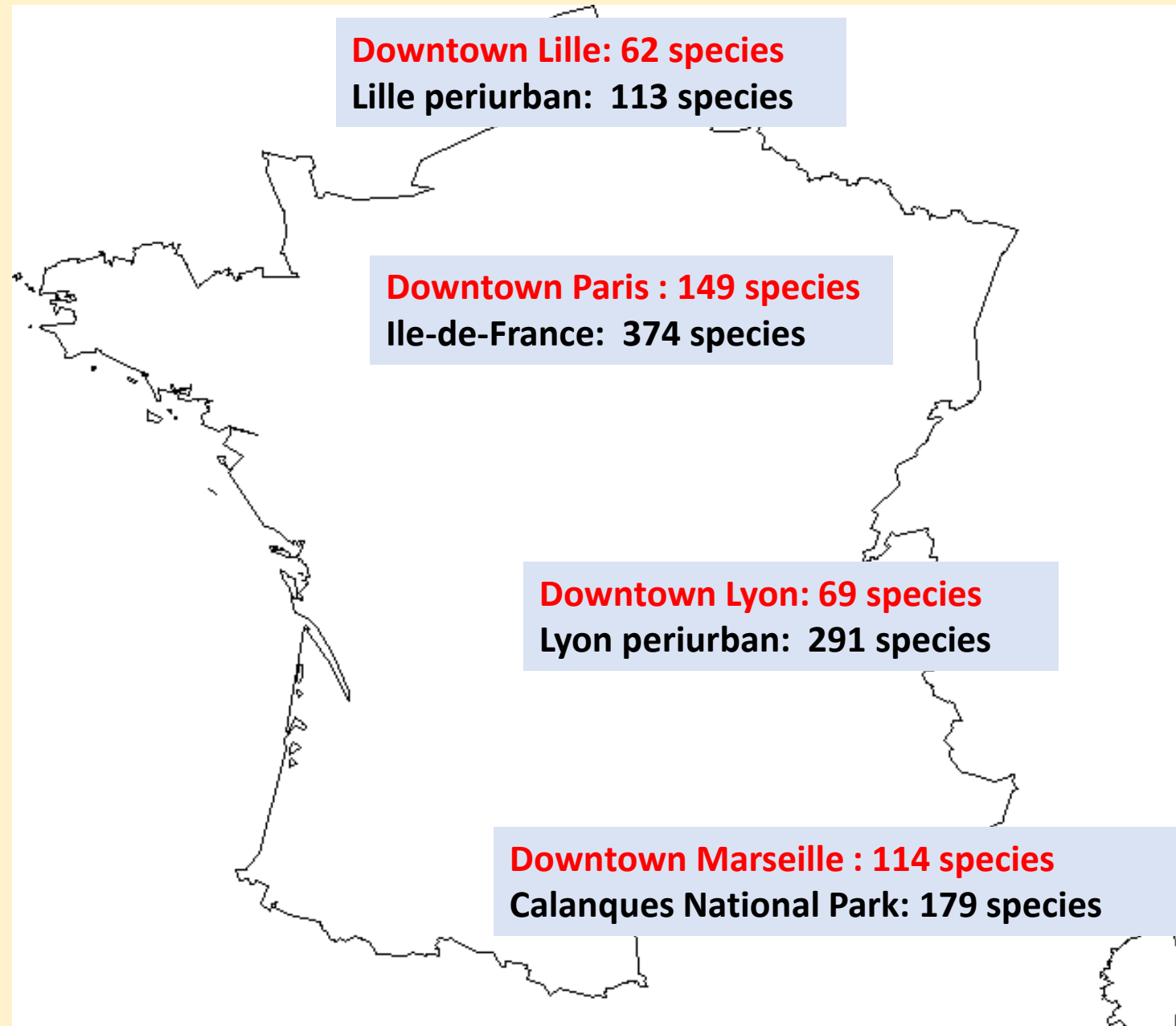
Which cities are appropriate for pollinators and pollination ?



The specificities of urban habitats



French cities host many wild bee species

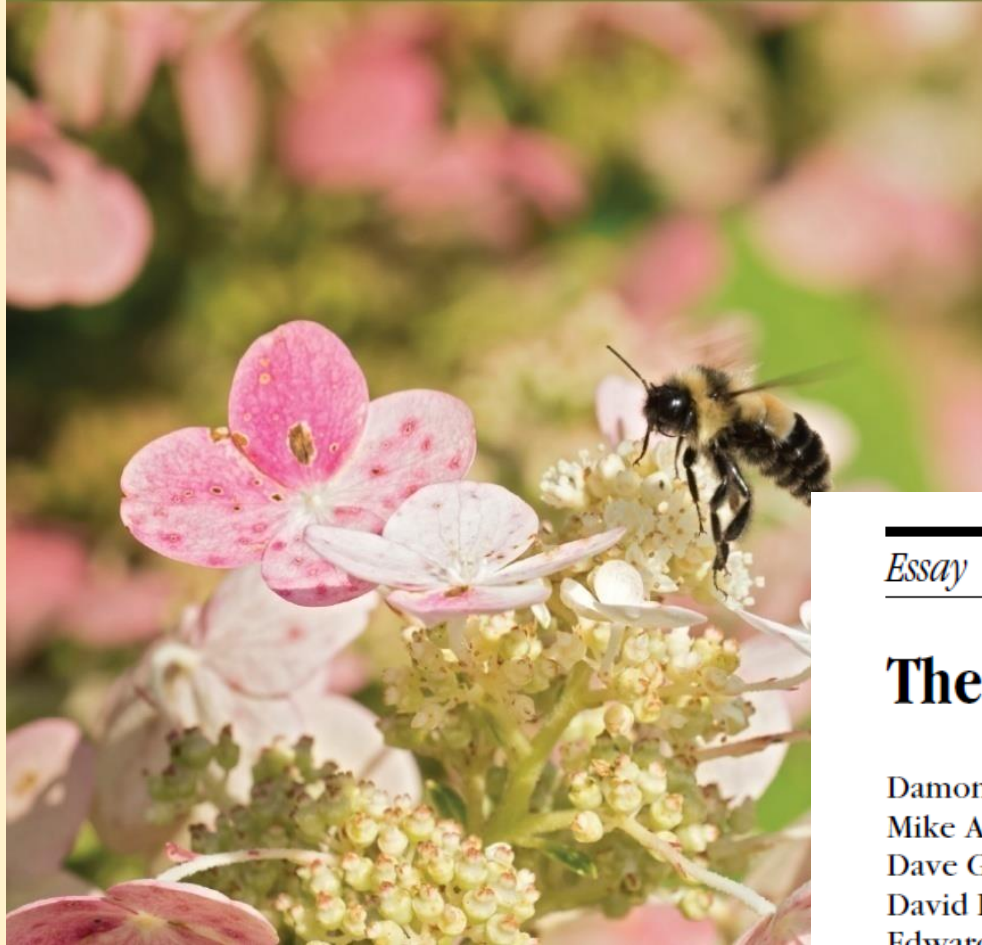


Fisogni et al., 2019
Zaninotto et al., 2022
Fortel et al., 2014
Geslin et al., 2019

But are cities the place to be(e) ?

Conservation Biology

Volume 31, Number 1, February 2017



Bombus affinis

Madison city (USA) 250 000 habitants

Essay

The city as a refuge for insect pollinators

Damon M. Hall,^{1*} Gerardo R. Camilo,² Rebecca K. Tonietto,¹ Jeff Ollerton,³ Karin Ahrné,⁴ Mike Arduser,⁵ John S. Ascher,⁶ Katherine C. R. Baldock,⁷ Robert Fowler,⁸ Gordon Frankie,⁹ Dave Goulson,⁸ Bengt Gunnarsson,¹⁰ Mick E. Hanley,¹¹ Janet I. Jackson,³ Gail Langellotto,¹² David Lowenstein,¹² Emily S. Minor,¹³ Stacy M. Philpott,¹⁴ Simon G. Potts,¹⁵ Muzafar H. Sirohi,³ Edward M. Spevak,¹⁶ Graham N. Stone,¹⁷ and Caragh G. Threlfall¹⁸

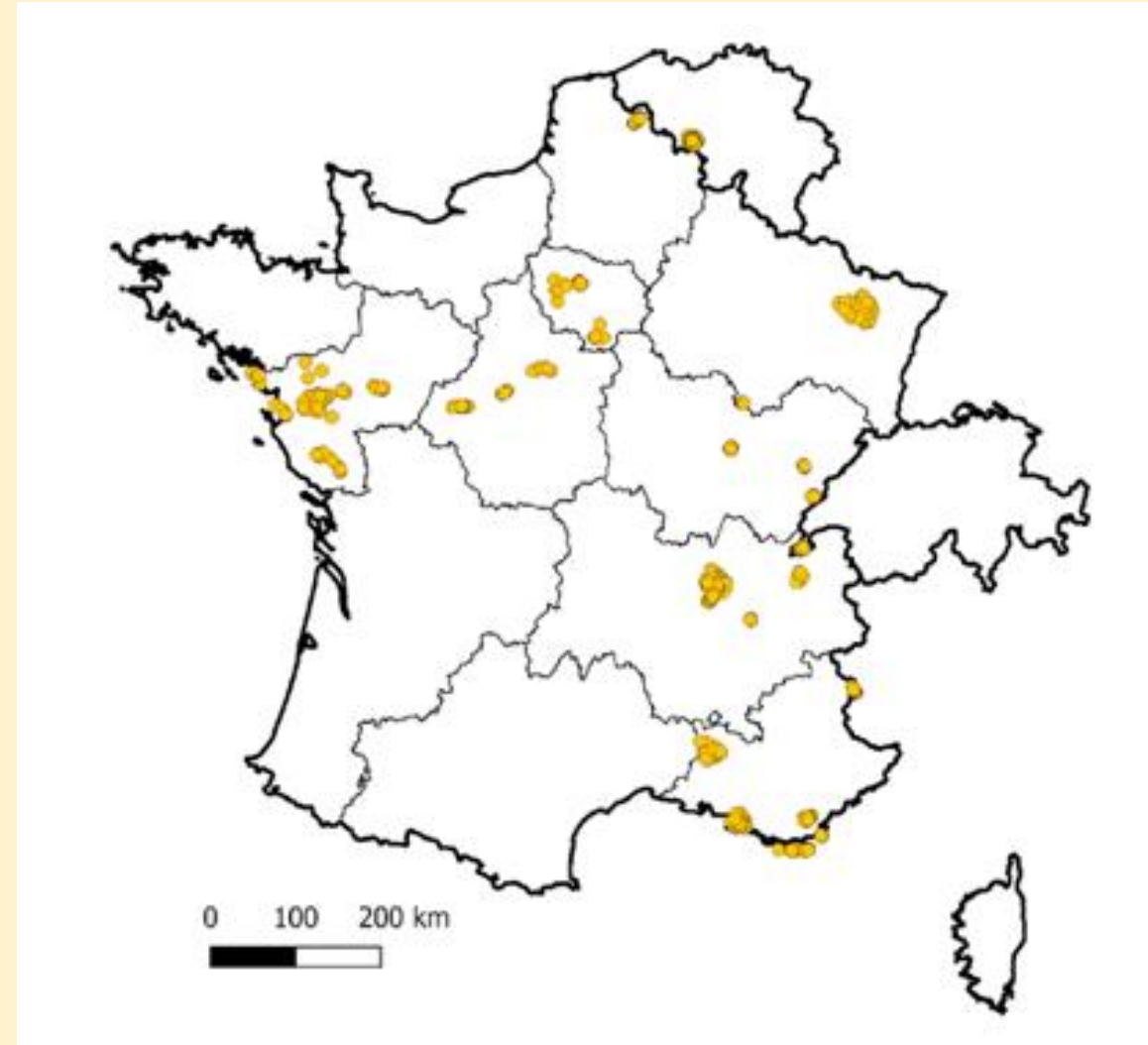
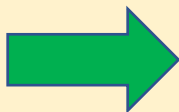
Do urban habitats filter pollinator communities ?



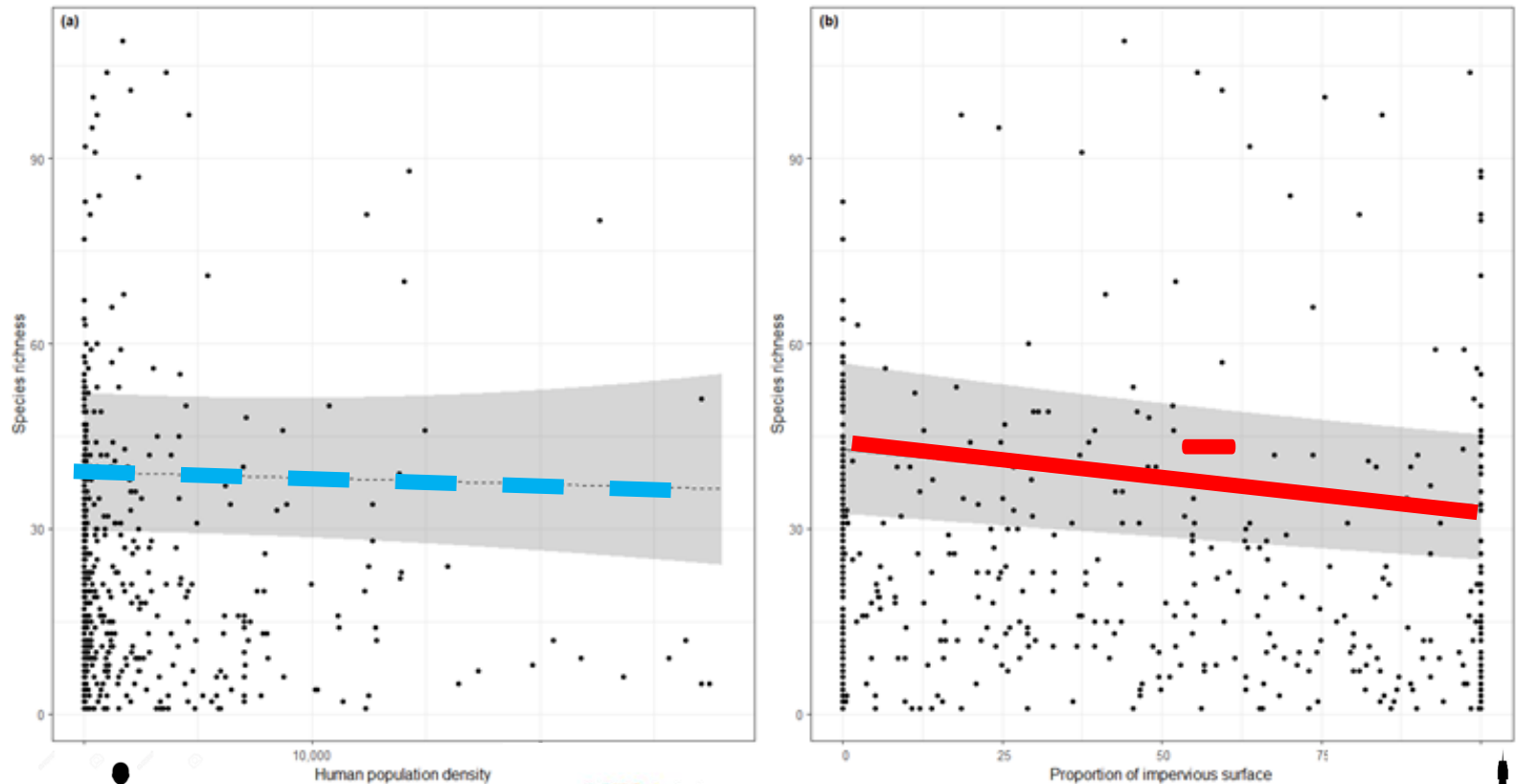
Work of Arthur Fauvau
GDR Pollineco cities network



- Database of wild bee species : France, Belgium, Switzerland
- 63 400 individuals, 507 species
- 357 sites along urbanization gradients



Wild bee species richness decreases with soil sealing but not with human population density



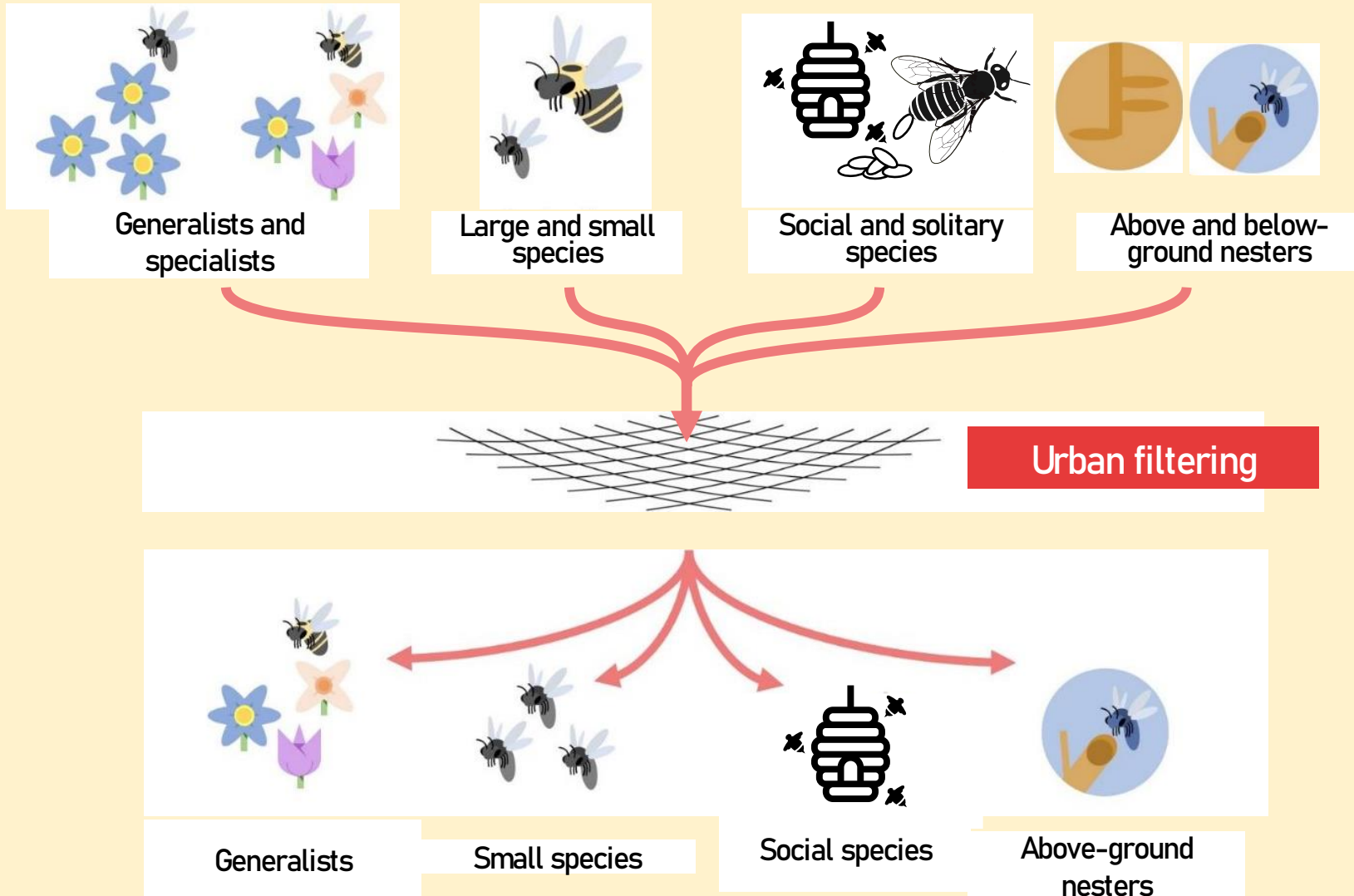
- More soil sealing
- Less nesting sites
- Less floral resources

scientific reports

OPEN A large-scale dataset reveals taxonomic and functional specificities of wild bee communities in urban habitats of Western Europe

Arthur Fauviau^{1,2,3}, Mathilde Baude^{2,3}, Nicolas Bazin⁴, William Fiordaliso⁵, Alessandro Fisogni⁶, Laura Fortel⁷, Joseph Garrigue⁸, Benoît Geslin⁹, Jérémie Goulnik^{10,11}, Laurent Guilbaud⁷, Nina Hautekèete⁶, Charlène Heiniger¹², Michael Kuhlmann¹³, Olivier Lambert¹⁴, Dominique Langlois¹⁵, Violette Le Féon¹⁶, Carlos Lopez Vaamonde^{16,17}, Grégory Maillet¹⁸, François Massol¹⁹, Nadia Michel¹⁰, Alice Michelot-Antalik¹⁰, Denis Michez⁵, Hugues Mouret¹⁰, Yves Piquot⁴, Simon G. Potts²¹, Stuart Roberts²⁷, Lise Ropars^{22,23}, Lucie Schurr⁹, Colin Van Reeth²⁴, Irène Villalta¹⁷, Vincent Zaninotto¹, Isabelle Dajoz^{1,25} & Mickaël Henry⁷

Urban habitats select some functional traits



scientific reports

OPEN [Check for updates](#)

A large-scale dataset reveals taxonomic and functional specificities of wild bee communities in urban habitats of Western Europe

Arthur Fauviau^{1,2,3}, Mathilde Baude^{2,3}, Nicolas Bazin⁴, William Fiordaliso⁵, Alessandro Fisogni⁶, Laura Fortel⁷, Joseph Garrigue⁸, Benoît Geslin⁹, Jérémie Goulnik^{10,11}, Laurent Guilbaud⁷, Nina Hautekèete⁶, Charliène Heiniger¹², Michael Kuhlmann¹³, Olivier Lambert¹⁴, Dominique Langlois¹⁵, Violette Le Féon¹⁶, Carlos Lopez Vaamonde^{16,17}, Grégory Mailet¹⁸, François Massol¹⁹, Nadia Michel²⁰, Alice Michelot-Antalik¹⁰, Denis Michez², Hugues Mouret²⁰, Yves Piquot⁴, Simon G. Potts²¹, Stuart Roberts²⁷, Lise Ropars^{22,23}, Lucie Schurr⁹, Colin Van Reeth²⁴, Irène Villalta¹⁷, Vincent Zaninotto¹, Isabelle Dajoz^{1,2,5} & Mickaël Henry⁷

Which urban greenspaces for pollinators ? The case of Paris (France)



Work of Vincent Zaninotto
City of Paris



12 greenspaces with a diversity of management practices



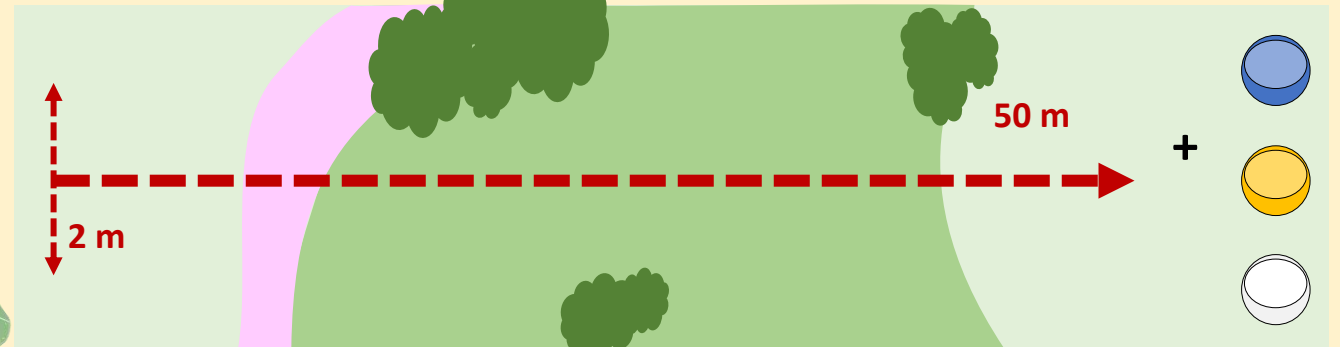
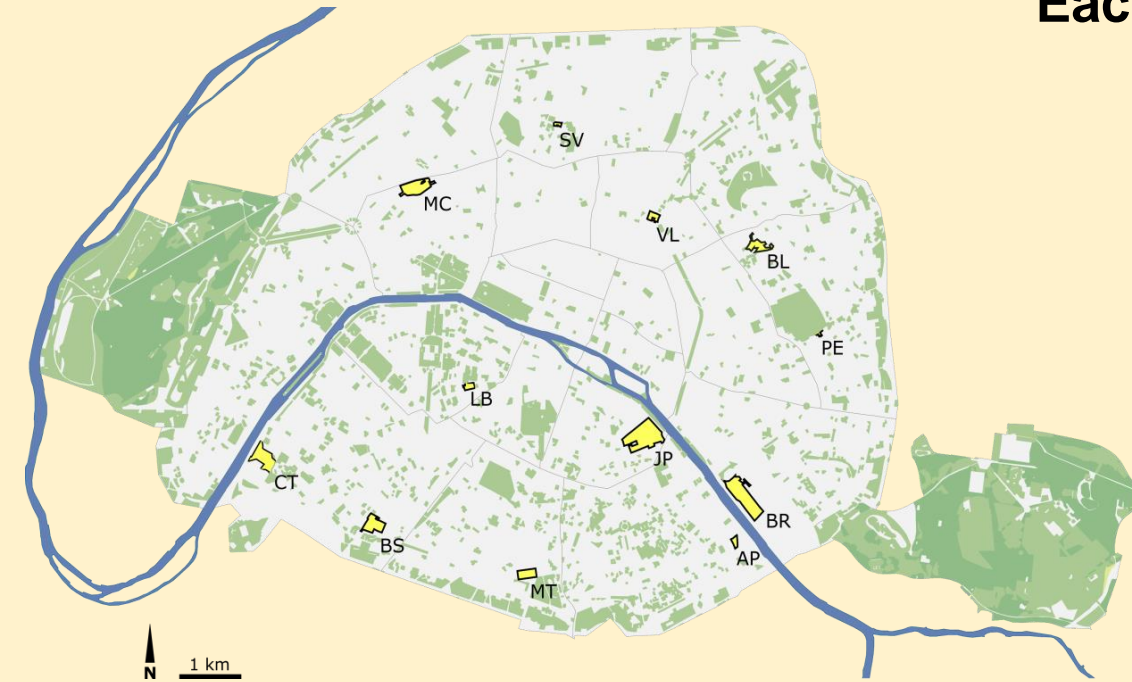
Light management
mainly wild plant species



Intensive management
mainly ornamental flora

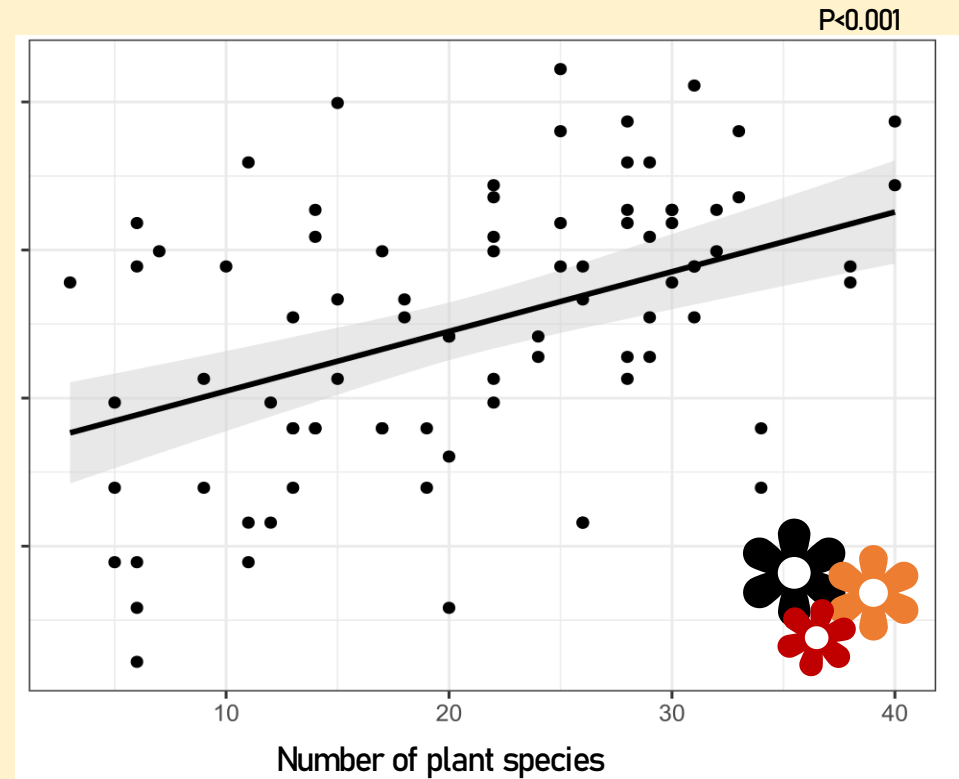
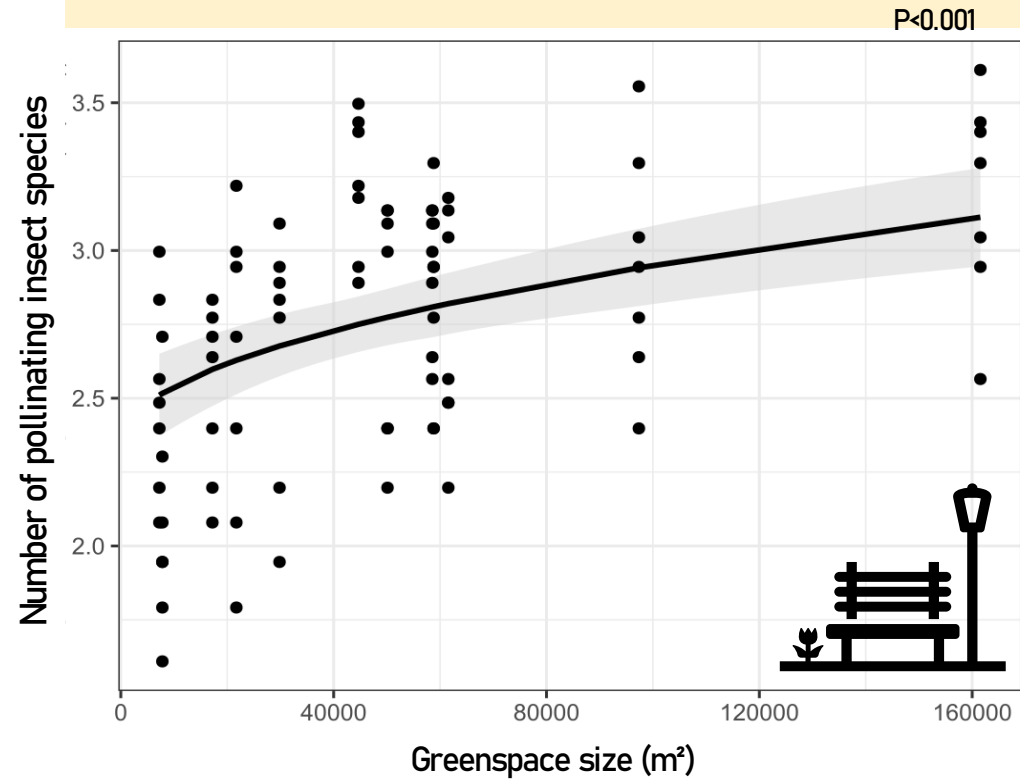
Monitoring pollinators in greenspaces of Paris (France)

Each greenspace sampled each month (March to October), during 2 years (2019-2020)



- Pan traps for 2 hours
- Net catching and flowering plant species survey along a 50m transect

The case of Paris (France)



At the local scale, pollinator species richness is positively associated with

- Greenspace size
- Plant species richness

Zaninotto et al.
Urban Ecosystems
(in review)

Which plant species should be favoured in Parisian green spaces ?

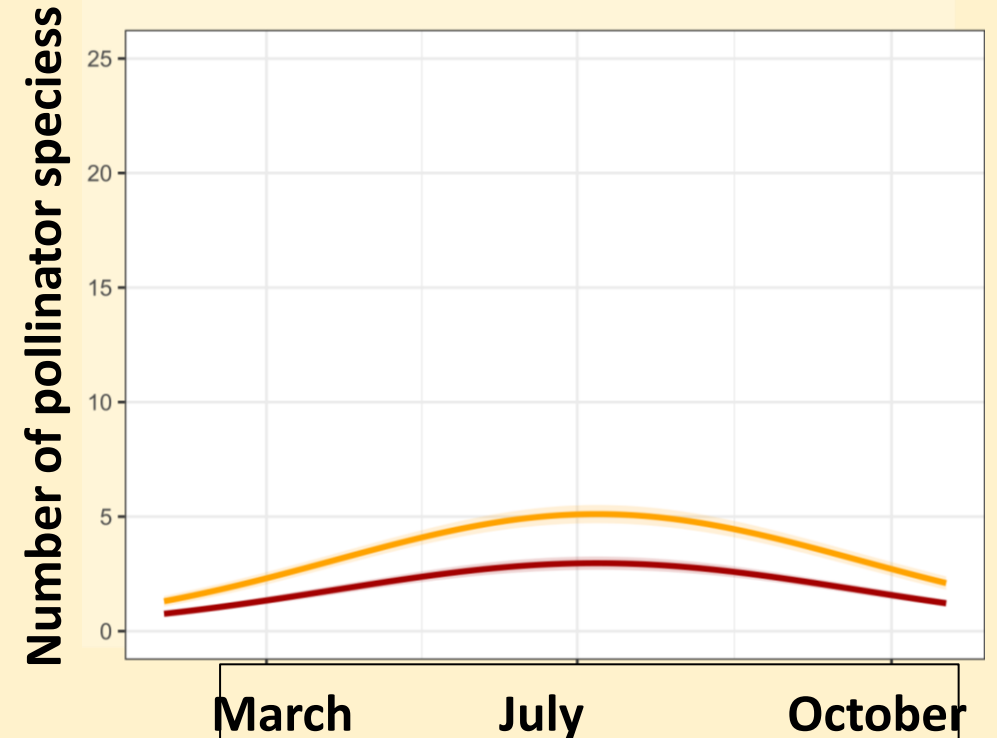
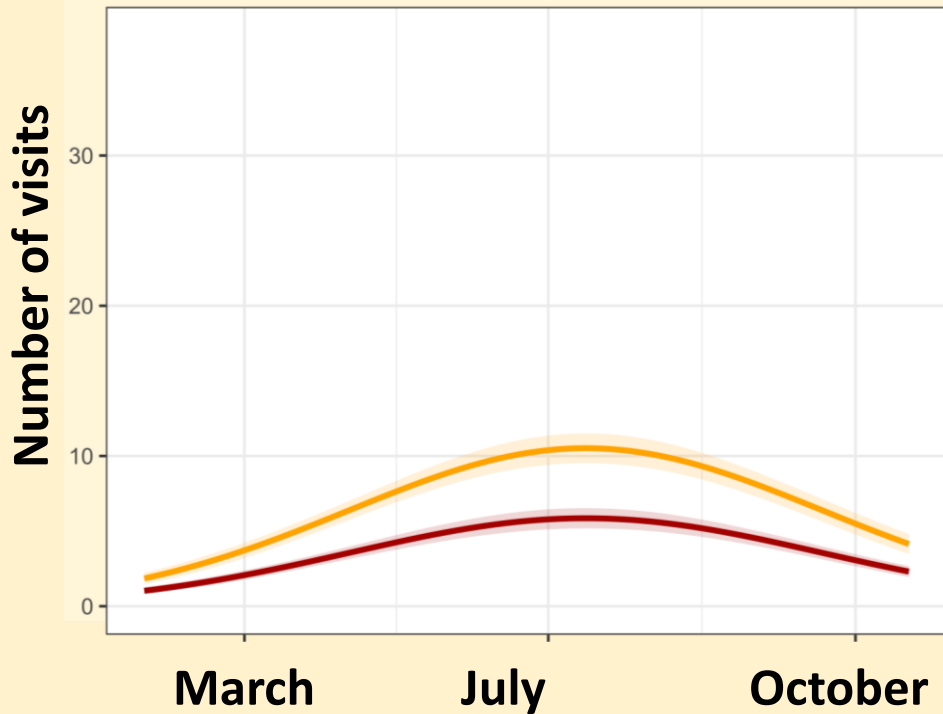
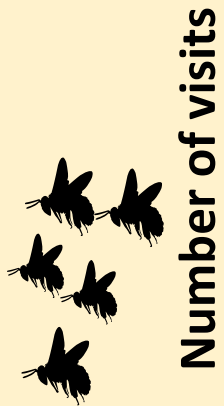


WILD PLANTS

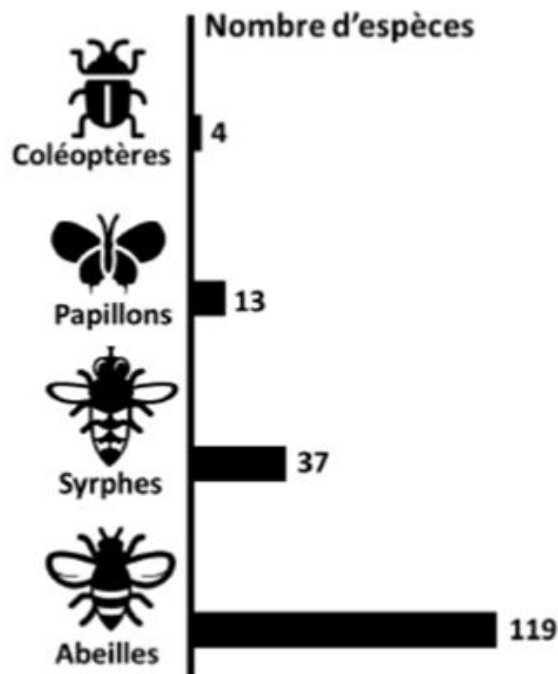
- Attract more pollinators
- Attract more diverse pollinators



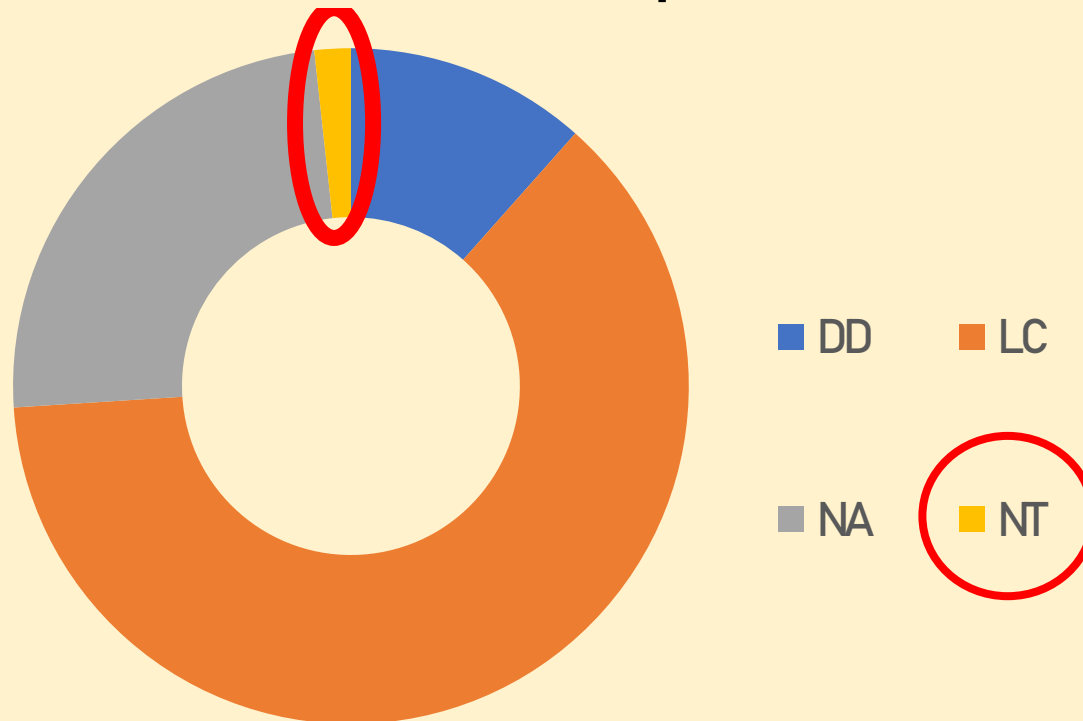
ORNAMENTAL PLANTS



But most Parisian pollinator species do not have a conservation status....



UICN status of Parisian pollinators



Article

Keeping up with Insect Pollinators in Paris

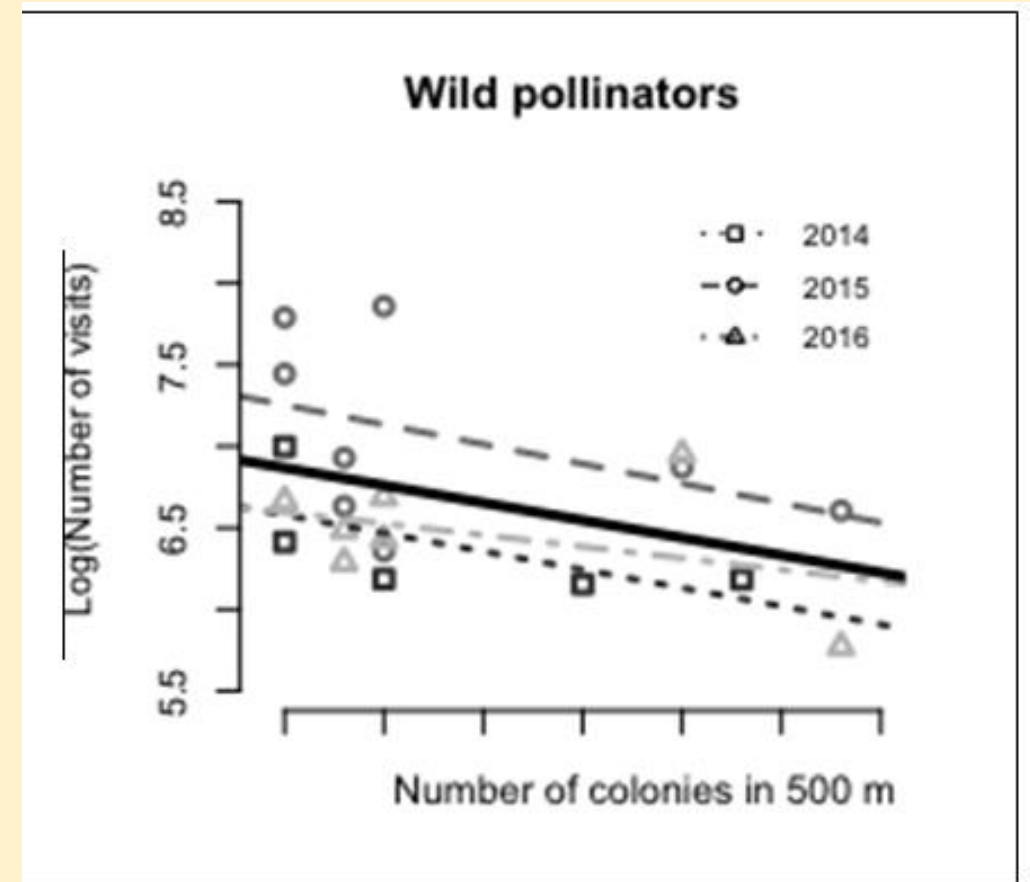
Vincent Zaninotto ^{1,2,*} and Isabelle Dajoz ¹

And domesticated honeybees interfere with wild Parisian pollinators

Work of Lise Ropars



- City of Paris: **2000 hives** => **20 hives/km²**
- A **negative impact** of the local density of honeybee colonies on wild pollinator visits



And urban pollinators might not always benefit from insect hotels

Work of Benoît Geslin



- Marseille : **114 wild bee species**
- **4 species** nested in bee hotels
- **40%** of emerging individuals = **the invasive *Megachile sculpturalis***



Bee hotels host a high abundance of exotic bees in an urban context

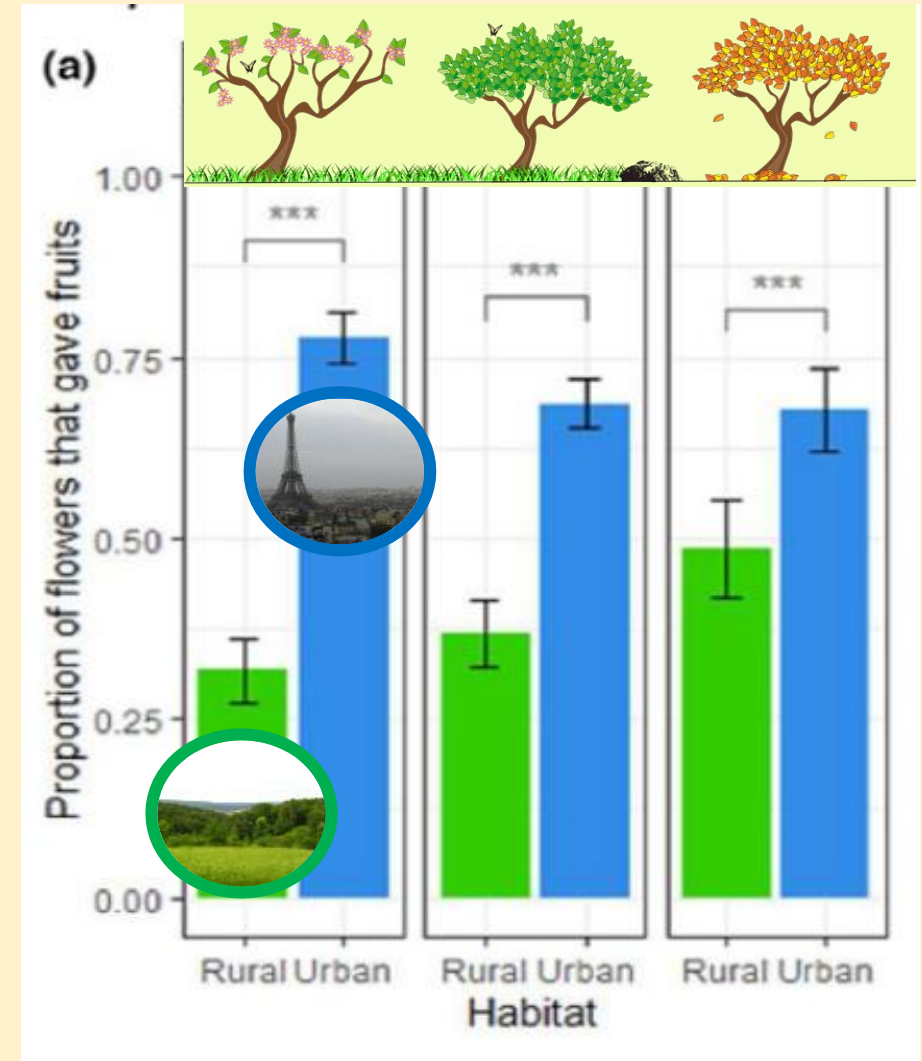
Benoît Geslin^{a,*}, Sophie Gachet^a, Magali Deschamps-Cottin^b, Floriane Flacher^a, Benjamin Ignace^a, Corentin Knoploch^a, Éric Meineri^a, Christine Robles^b, Lise Ropars^a, Lucie Schurr^a, Violette Le Féon^c



What about the pollination function?

Comparing the city of Paris (France) to rural habitats

- Fruit set of a focal species: *Sinapis alba*
- A higher reproductive success in the city compared to rural habitats



Received: 23 June 2020 | Revised: 5 August 2020 | Accepted: 18 August 2020

DOI: 10.1002/ece3.6794

ORIGINAL RESEARCH

Ecology and Evolution
WILEY

Broader phenology of pollinator activity and higher plant reproductive success in an urban habitat compared to a rural one

Vincent Zaninotto^{1,2} | Xavier Raynaud¹ | Emmanuel Gendreau¹ |
Yvan Kraepiel¹ | Eric Motard¹ | Olivier Babiar³ | Amandine Hansart⁴ |
Cécile Hignard³ | Isabelle Dajoz¹



Work of Vincent Zaninotto

Which cities characteristics are best for the pollination function?

The « Pollinometers » experiment



- A « pollinometer » plant: *Sinapis alba*
- Pollinometers are set up in different cities
- Analysis of the pollinator assemblage and of the fruit set of pollinometers in spring, summer, and autumn



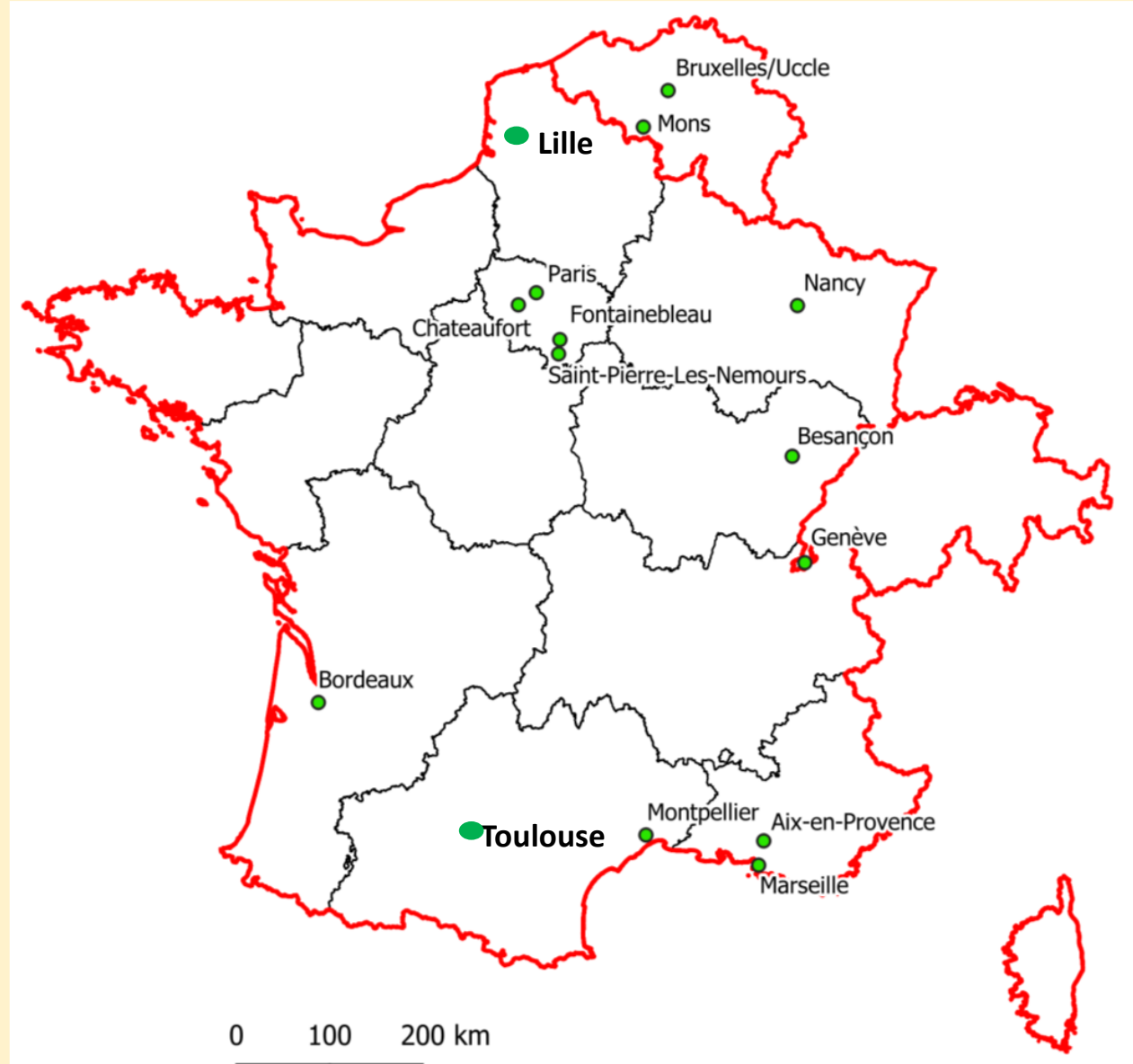
The « Pollinometers » experiment is set up in cities of 3 West European countries



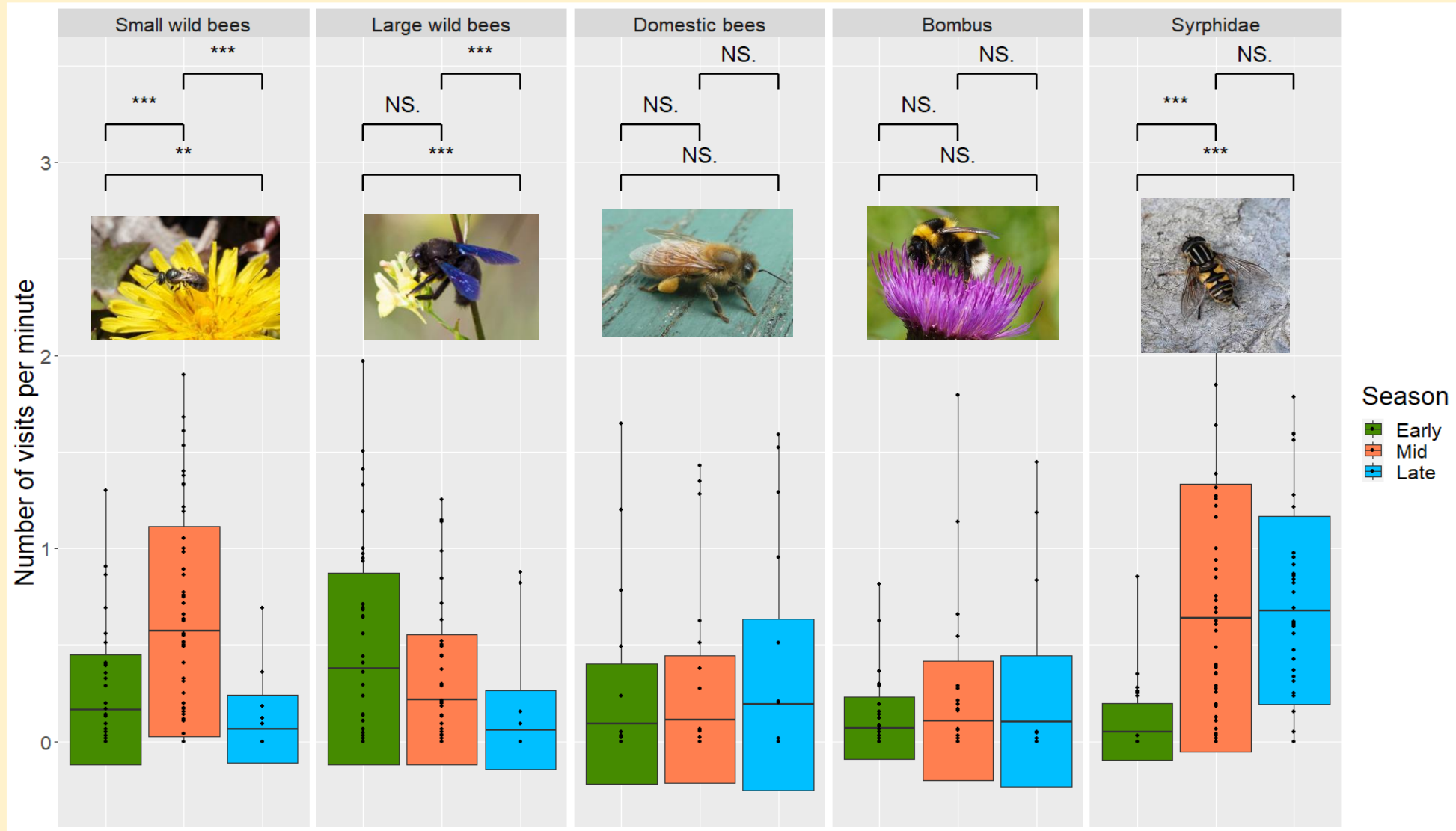
Work of Arthur Fauvau
GDR Pollinéco cities network



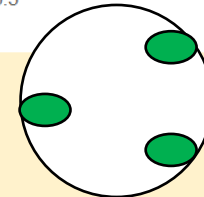
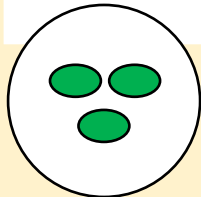
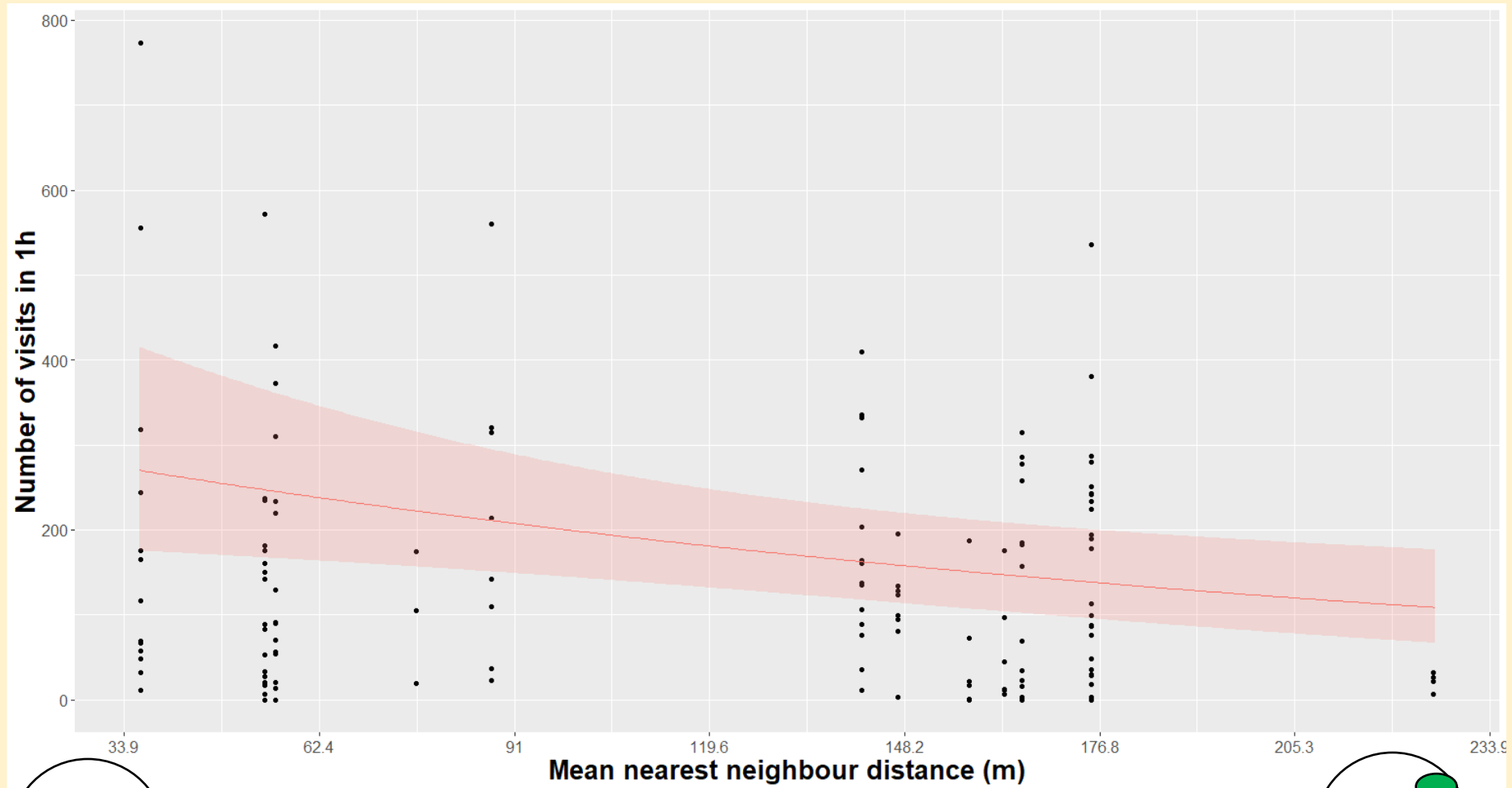
- 2021: 12 cities involved
- 2022 : 14 cities involved



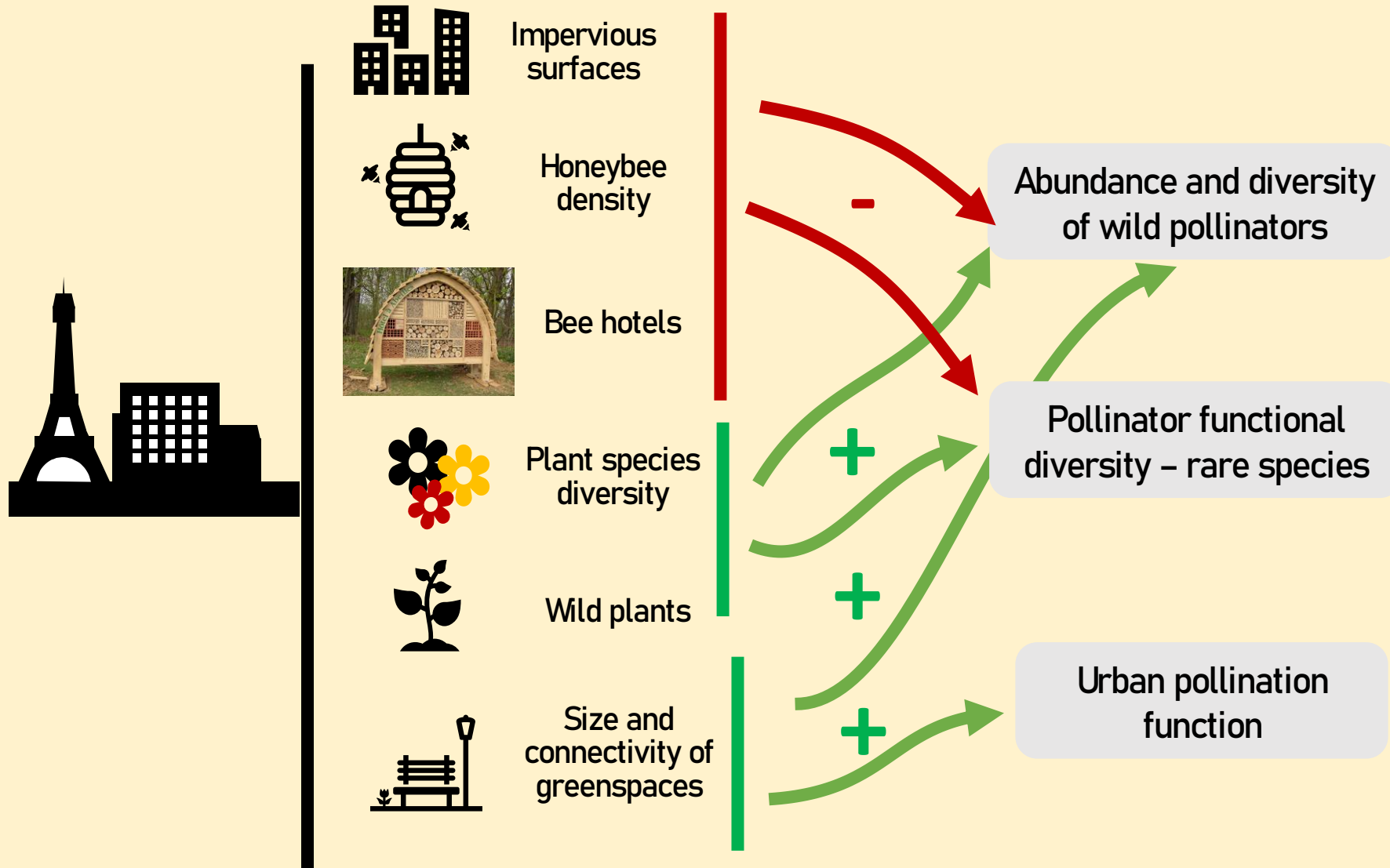
Preliminary results: a diverse assemblage of floral visitors but important variations in abundance over the season



Preliminary results: connectance among urban greenspaces increases pollinators visitation frequency



Take-home message: which management practices for urban greenspaces?

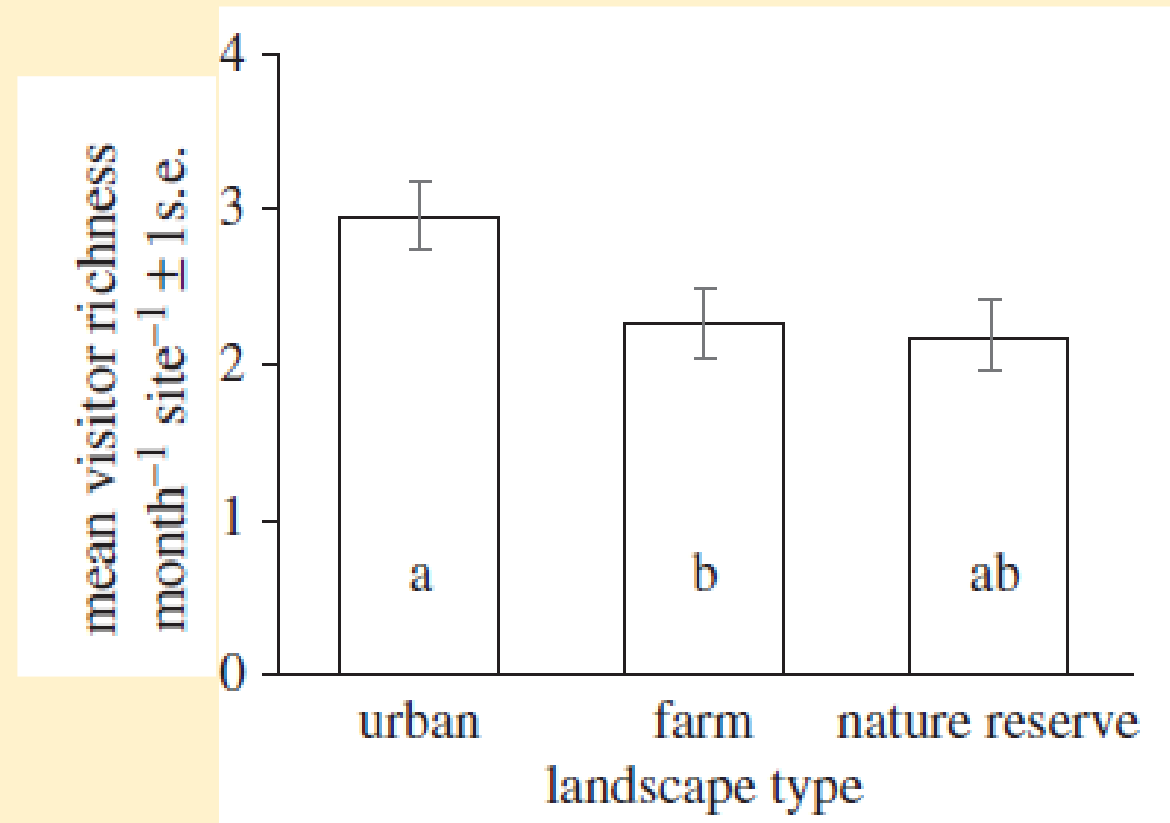


**Thanks for your
attention !**



Diapos supplémentaires

In Great Britain: urban wild bee communities are more diverse than those of semi-natural or agricultural habitats



PROCEEDINGS B

rspb.royalsocietypublishing.org

Where is the UK's pollinator biodiversity?
The importance of urban areas for flower-visiting insects

Katherine C. R. Baldock^{1,2}, Mark A. Goddard^{3,4}, Damien M. Hicks⁵, William E. Kunin³, Nadine Mitschunas^{1,6}, Lynne M. Osgathorpe¹, Simon G. Potts⁶, Kirsty M. Robertson³, Anna V. Scott⁶, Graham N. Stone⁵, Ian P. Vaughan⁷ and Jane Memmott^{1,2}

Which urban filtering on pollinator communities ?



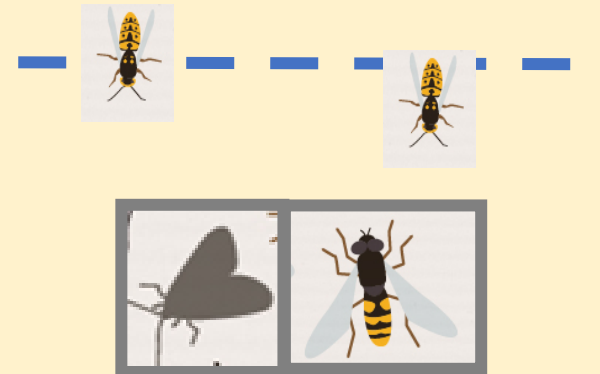
Natural habitats



Environmental filtering

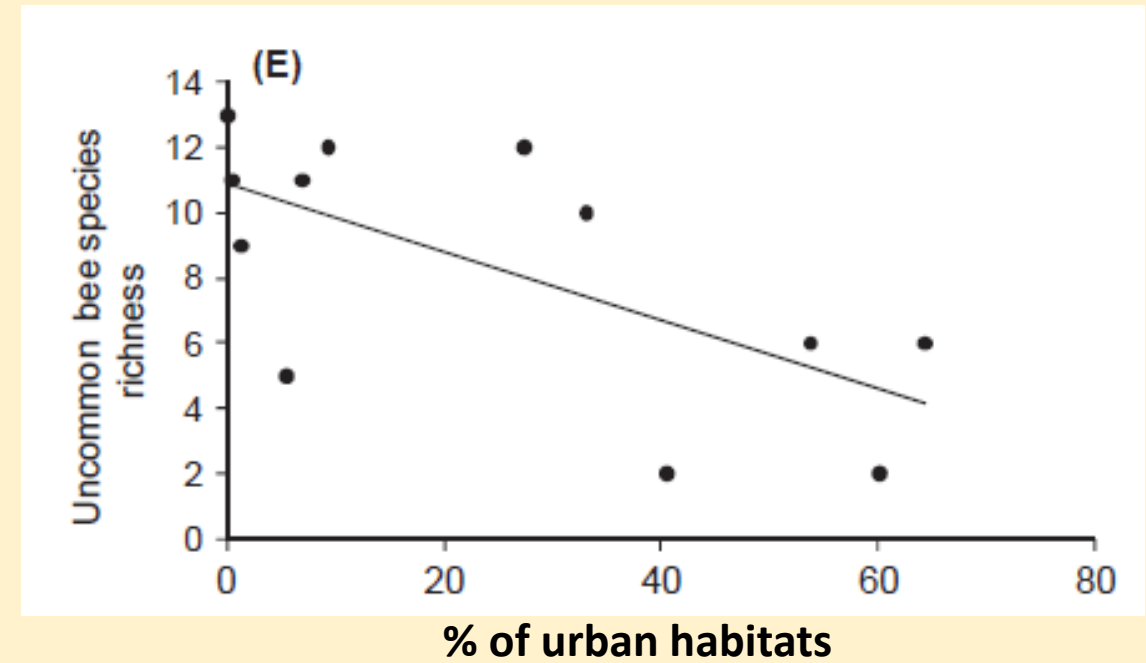
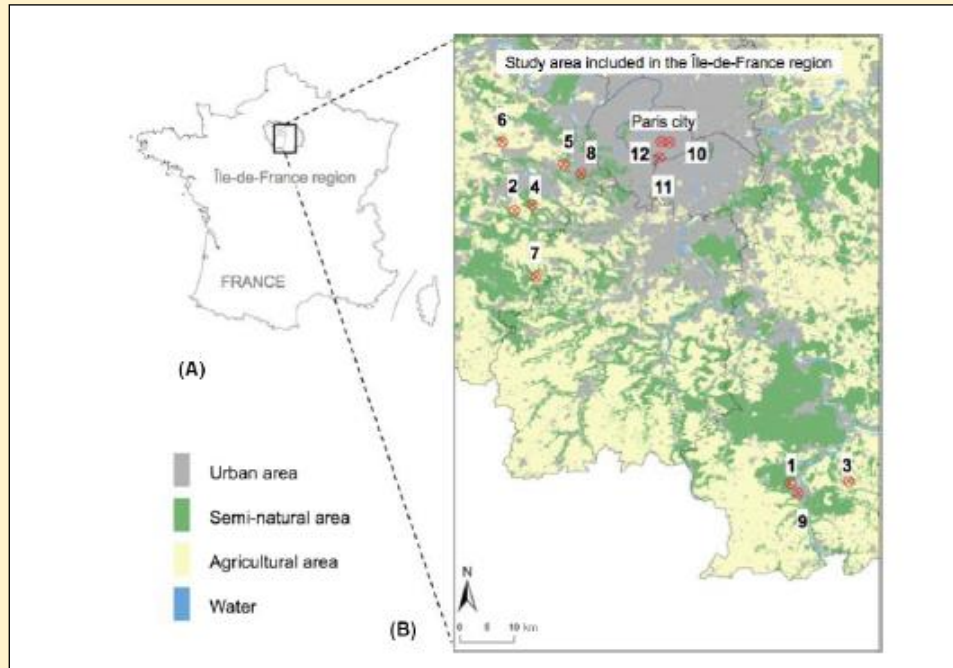


Urban habitats



Hypothesis: species and traits assemblages specific to urban habitats

In Ile-de-France: urban bee communities host significantly fewer rare species



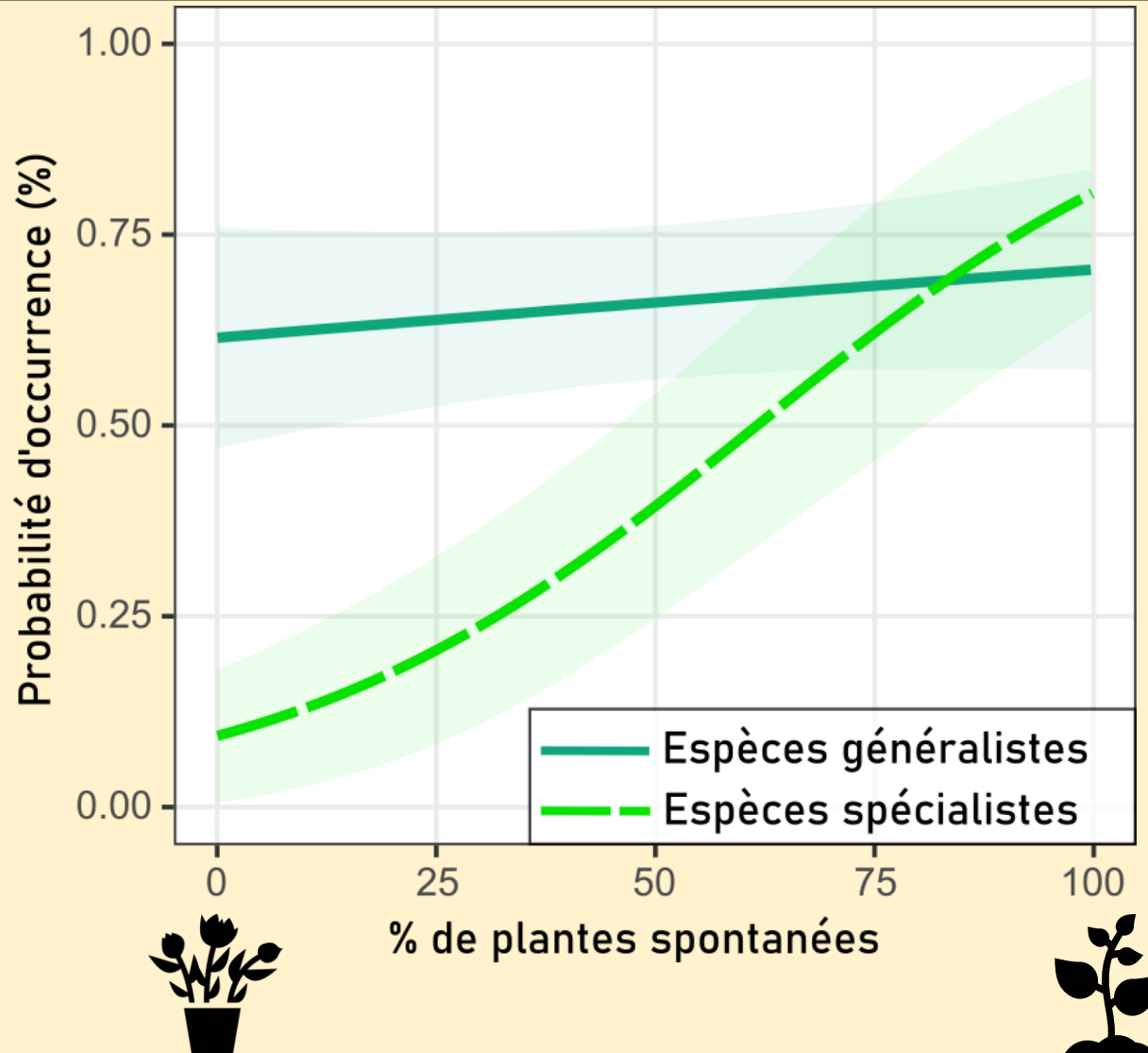
Ecology and Evolution

Open Access

The proportion of impervious surfaces at the landscape scale structures wild bee assemblages in a densely populated region

Benoît Geslin^{1,2}, Violette Le Féon³, Morgane Folschweiller², Floriane Flacher^{2,4}, David Carmignac², Eric Motard^{2,5}, Samuel Perret⁶ & Isabelle Dajoz^{2,5}

Which plant species should be favoured in Parisian green spaces ?



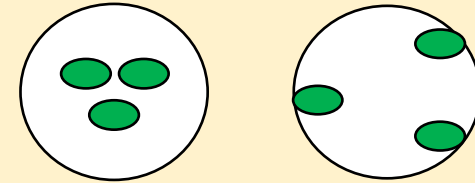
Specialist pollinator species depend on wild plant species

Zaninotto et al.
Urban Ecosystems (in review)

Aims of the pollinometers experiment (2023):

A synthetic vision

➤ Which impact of the **distribution of greenspaces** within the urban matrix ?



➤ What about **greenspaces size** ?



➤ Impact of **management practices** ?



Future questions: which eco-evolutionary dynamics of urban communities ?

Age of the urban sprawl



Species and functional diversities of communities



Ancient inventories



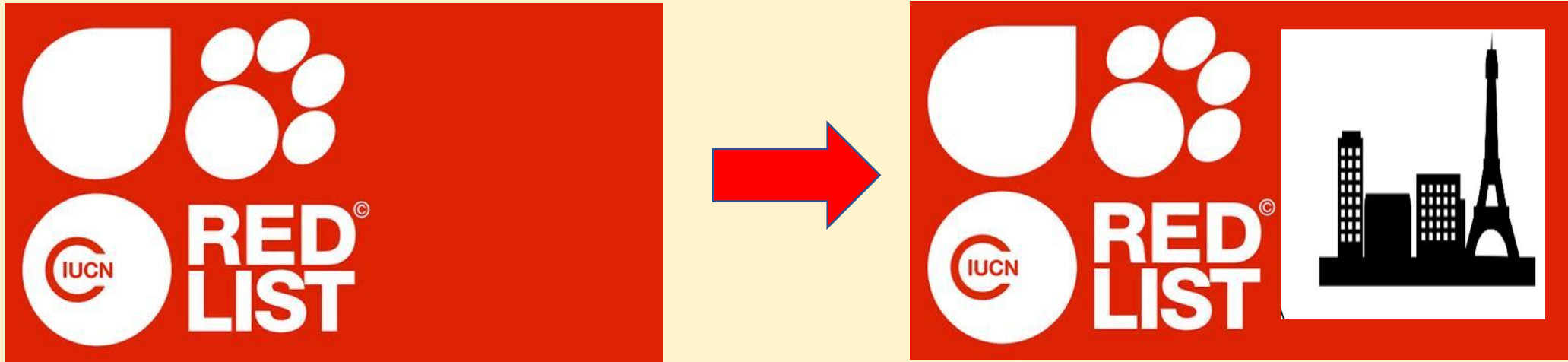
Recent inventories



Hypotheses:

- *Urbanization impacts linked to its age*
- *Emerging species and traits in urban habitats*

Future questions: establishing Urban Red Lists ?



Aims: Conservation and management priorities in urban habitats