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GLOBAL HEALTH & WELL BEING

- Measuring health and nutrition transition considering the role of pollution and biodiversity -

WEBINAR - Pavia March 5, 2024

Biodiversity in the urban environment

Prof. **Andrea Galimberti**
andrea.galimberti@unimib.it

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urbano

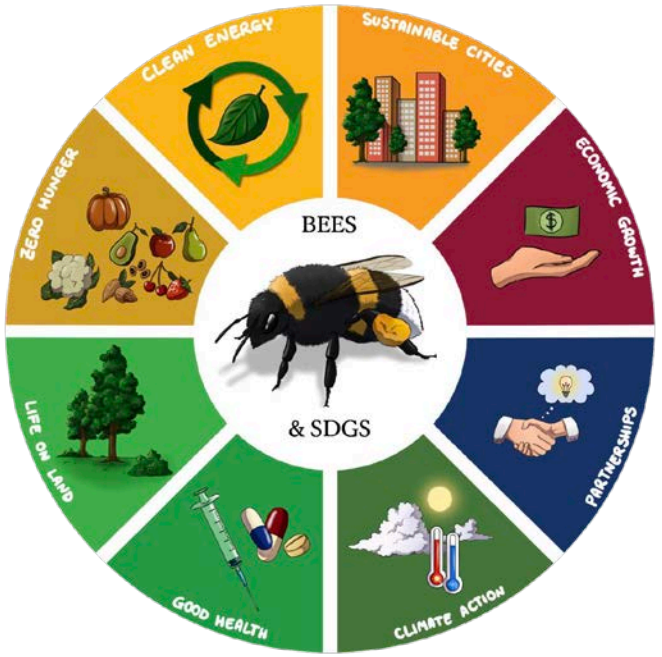
RESEARCH TOPIC:

How does biodiversity adapt to the urban environment?

EXPECTED RESULTS:

- **Identification of genetic, physiological, and morphological adaptations to the urban context**

- **Identification of markers of biodiversity health to evaluate the effectiveness of management interventions**



A FOCUS ON POLLINATORS

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Effect of urbanization and its environmental stressors on the intraspecific variation of flight functional traits in two bumblebee species

B.terrestris

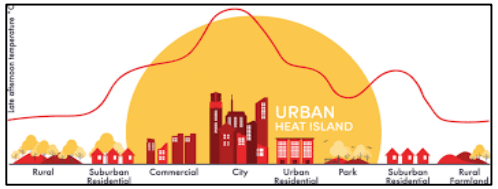
B.pascuorum

BODY SIZE

Heat tolerance & Dispersion ability

Hypothesis 1

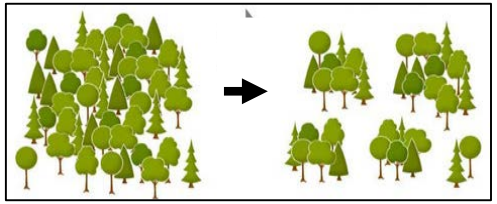
Heat tolerance



Temperature

Hypothesis 2

Improve dispersion ability



Fragmentation

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B.terrestris

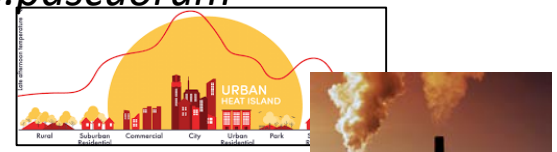
B.pascuorum

WING ASYMMETRY

Hypothesis

STRESS GRADIENT

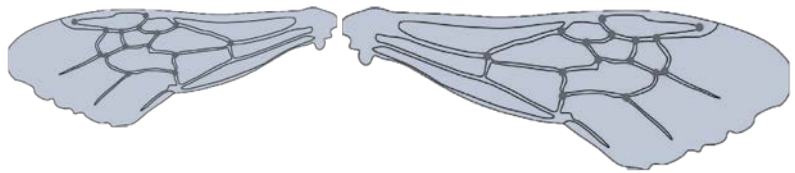
Dispersion ability
&
Stress biomarker



Temperature

Pollutants

Resource availability



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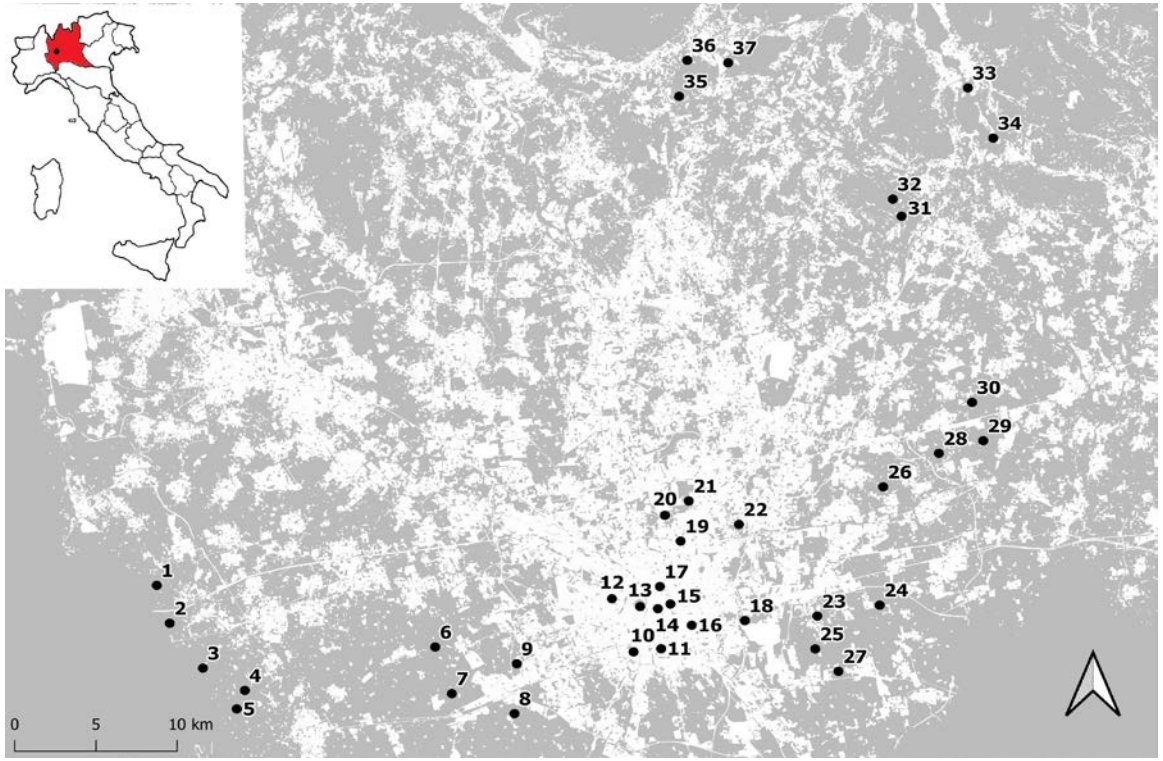
URBANIZATION GRADIENT

Milan metropolitan area & closer provinces



37 sites

169 B.terrestris

171 B.pascuorum

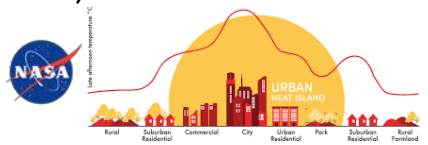
LANDSCAPE VARIABLES

DUSAF 6,0

-> Semi-natural habitat **fragmentation** (1km buffer)

MODIS

-> June-July **temperature** (mean 8 days)

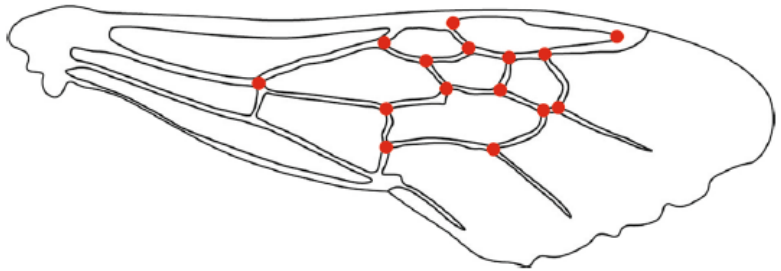


LOCAL VARIABLES

VEGETATIONAL QUADRATS

-> Floral resources availability

GEOMETRIC MORPHOMETRICS



Body size
Wing Asymmetry

CENTROID SIZE

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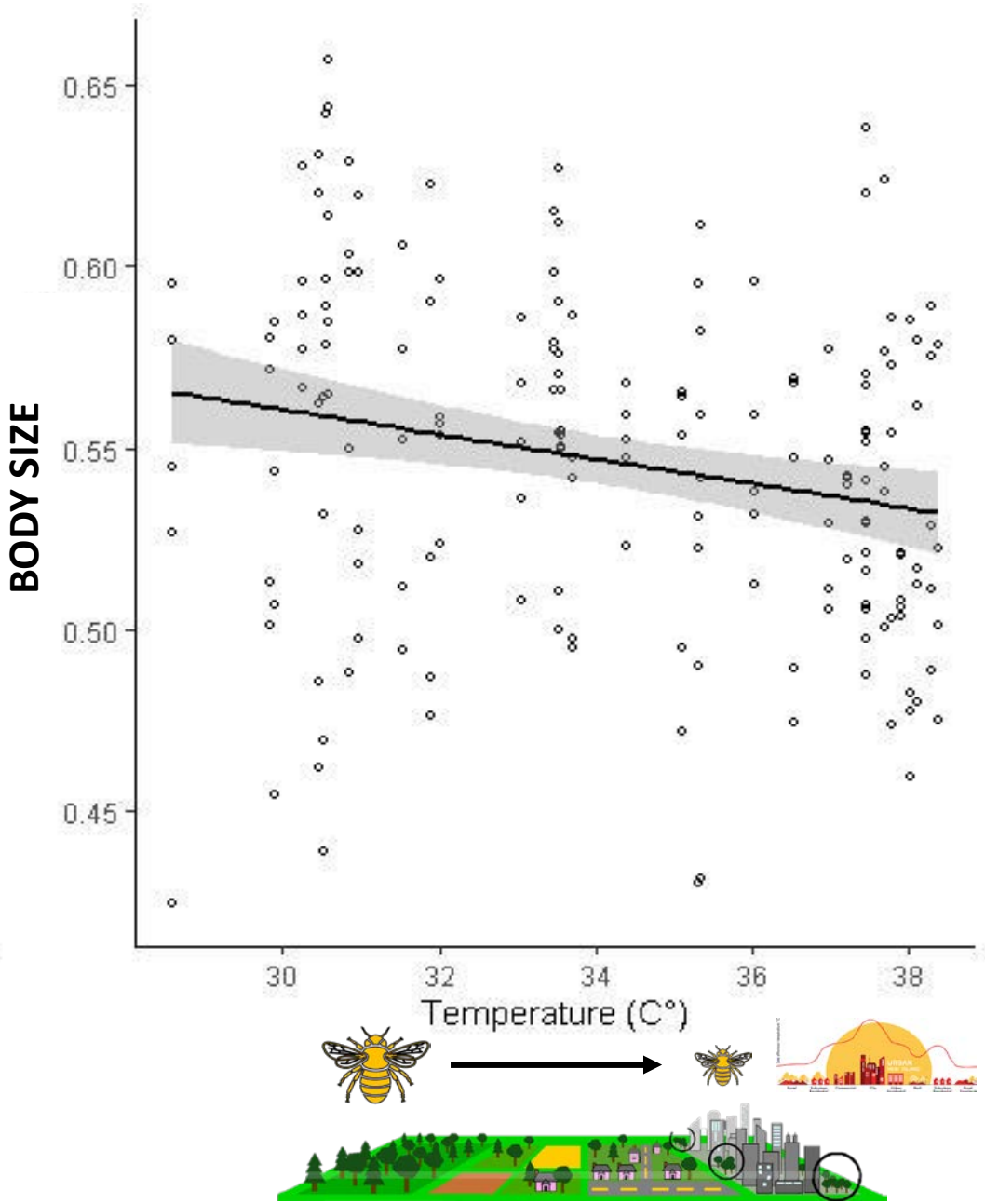

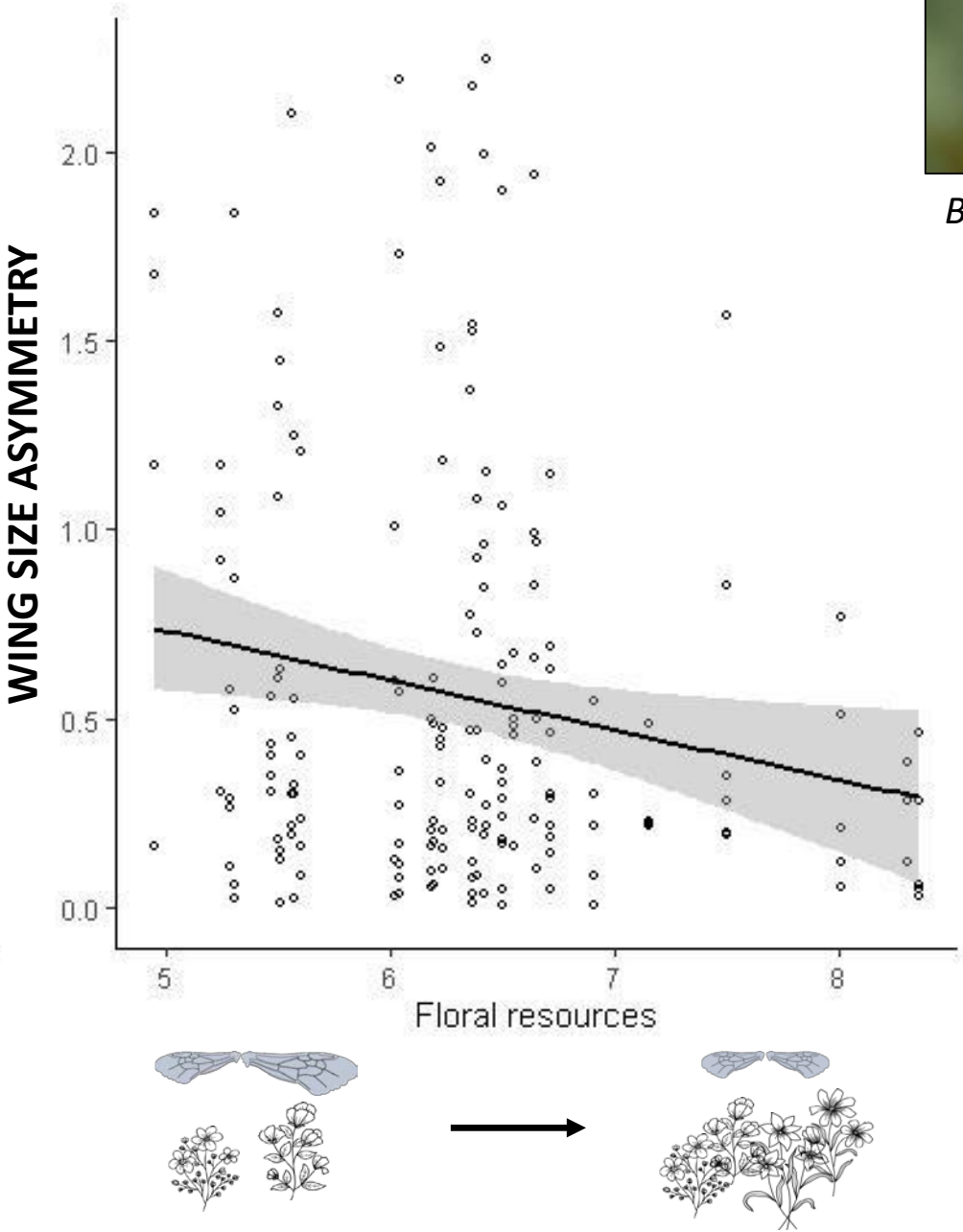

B.pascuorum

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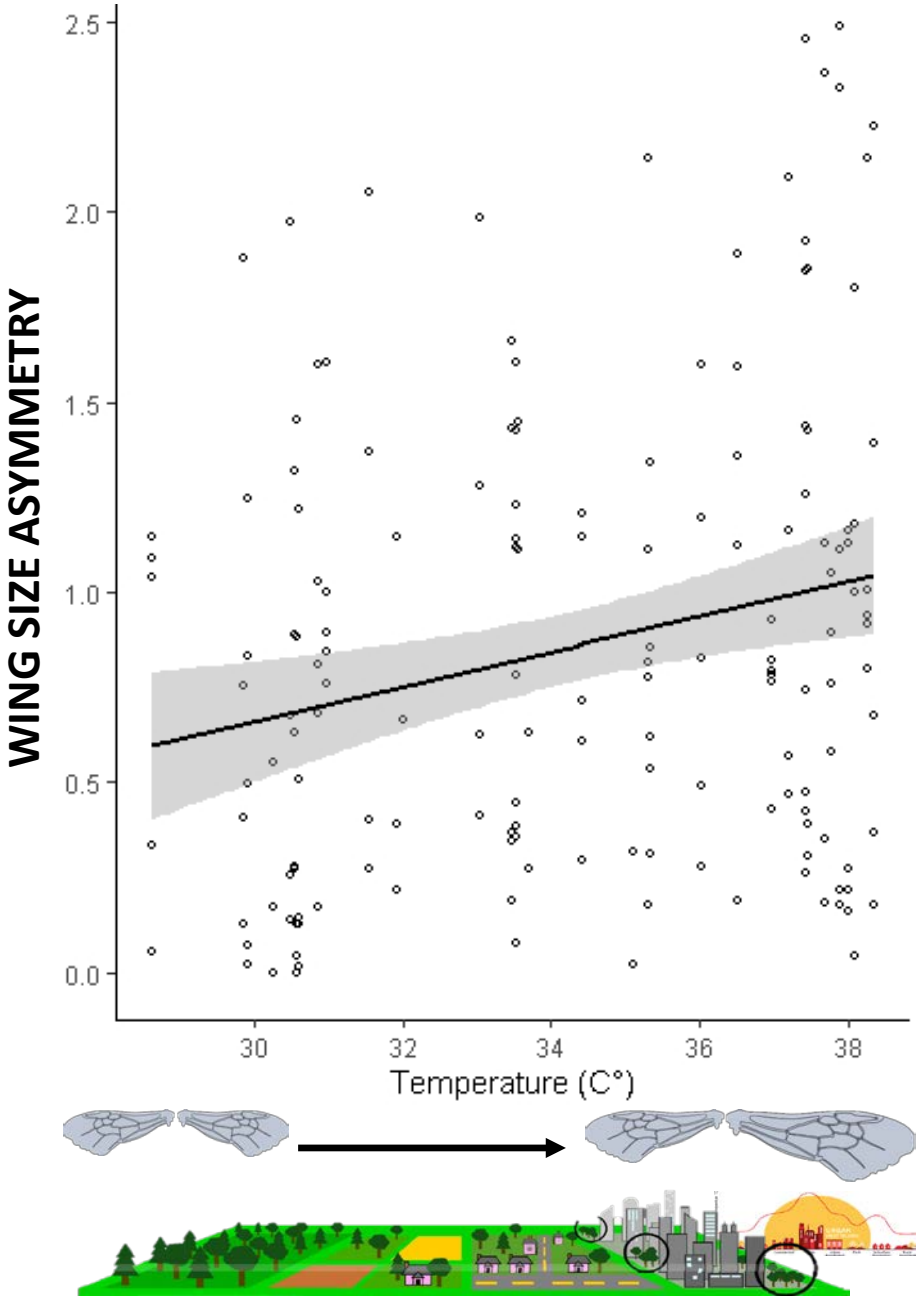

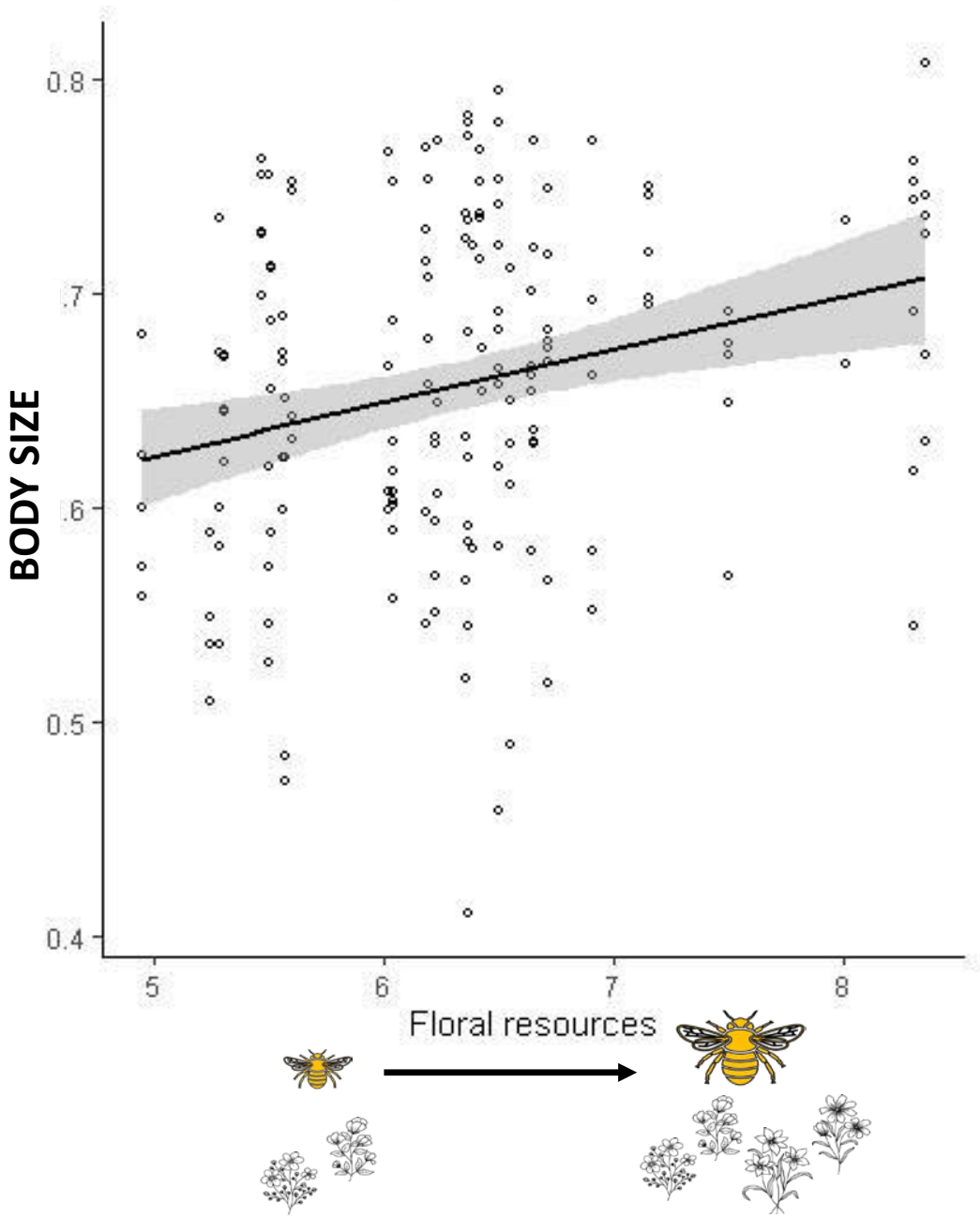

B.terrestris

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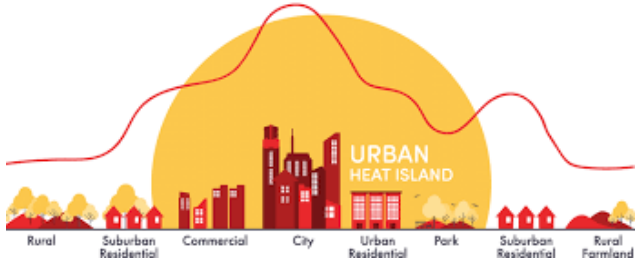

LOWER POLLINATION EFFICIENCY?

INDIVIDUAL SIZE ⬇

WING ASYMMETRY ⬆

LOCAL CONDITIONS IMPROVE POLLINATION EFFICIENCY?

INDIVIDUAL SIZE ⬆

WING ASYMMETRY ⬇

NATURE BASED SOLUTIONS

PLANTING TREES

IMPROVE PLANT DENSITY IN GREEN SPACES

FLOWER STRIPS

PROPER MOWING STRATEGIES

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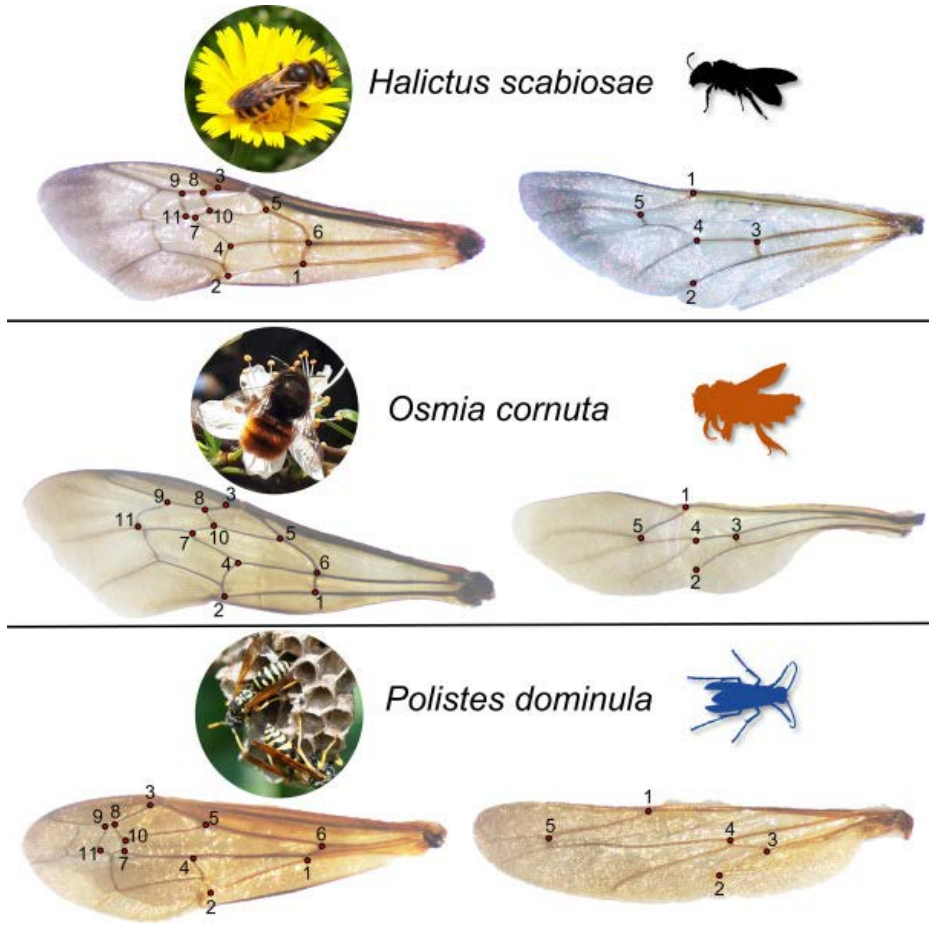
Urban areas affect functional traits related to adaptation and seems to

- Host smaller insects
- Improve flight ability
- Lead to higher fluctuating asymmetry



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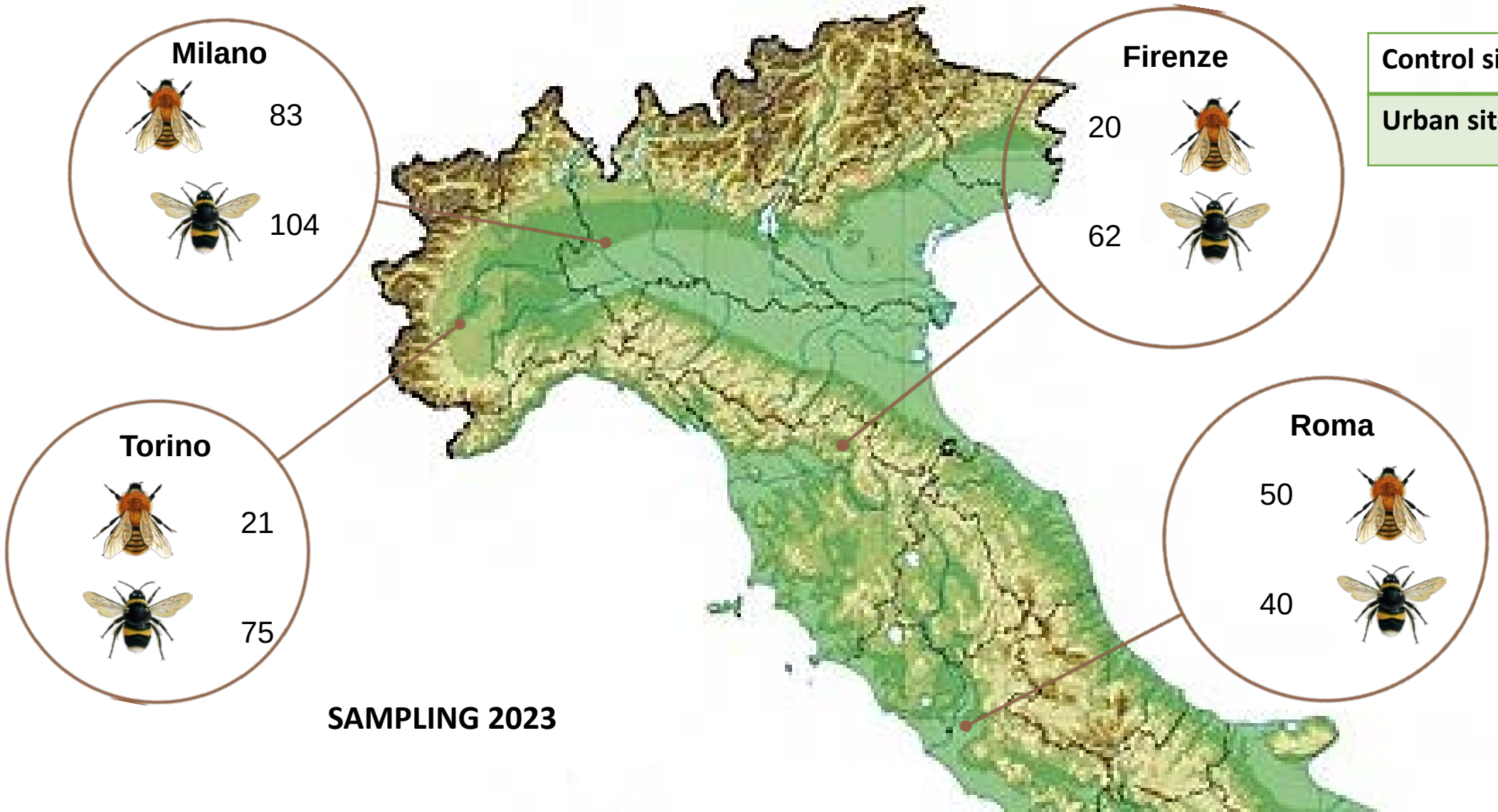
Multi-omic approach to reveal adaptation toward urban environment



Control sites	11 (2 – 4 x city)
Urban sites	32 (4 – 8 x city)

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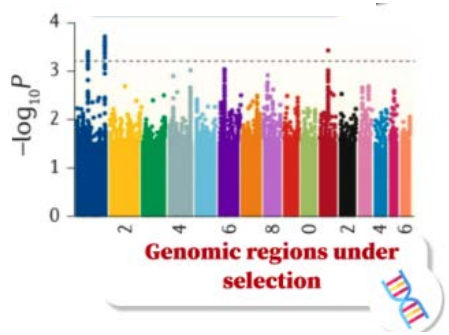
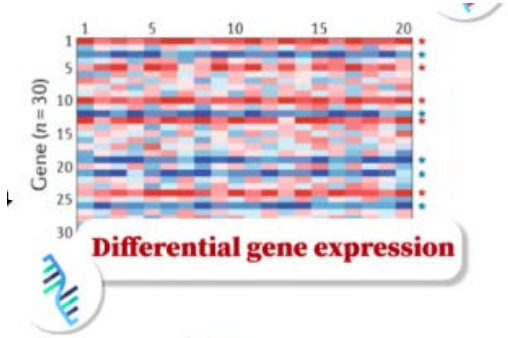
Genomic

Whole genome sequencing
-> Detection of genomic regions under selection
-> Detection of possible population structure in the sampled localities
-> Assessment of habitat connectivity



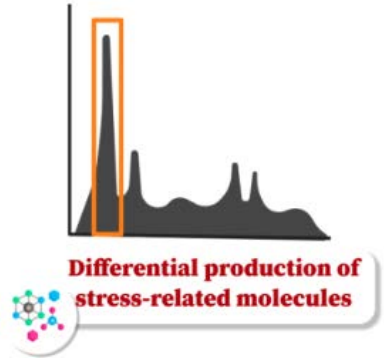
Transcriptomic

mRNA sequencing
-> Assessment of differential gene expression between urban and semi-natural populations
-> Identification of candidate genes eligible as stress biomarkers



Metabolomic

LC-MS analysis
-> Detection of metabolic pathway variation due to urbanization (evidence of adaptation and identification of candidate stress biomarkers)
-> Detection of stress-related molecules (i.e., malondialdehyde)



The "-omics" data will be integrated among them to retrieve a complete picture of the impact of urbanization on individuals' health state.

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Urban habitat fragmentation and floral resources shape the occurrence of gut parasites in two bumblebee species

Nicola Tommasi, Beatrice Colombo, Emiliano Pioltelli, Paolo Biella, Maurizio Casiraghi, Andrea Galimberti

First published: 12 July 2023 | https://doi.org/10.1002/ece3.10299

frontiers | Frontiers in Bee Science

Warming up through buildings and roads: what we know and should know about the urban heat island effect on bees

Carlo Polidori[1]*, Andrea Ferrari[1], Federico Ronchetti[2], Nicola Tommasi[3] and Elia Nalini[1]

[1]Department of Environmental Science and Policy (ESP), University of Milan, Milan, Italy, [2]Department of Biosciences and Pediatric Clinical Research Center "Romeo and Enrica Invernizzi", University of Milan, Milan, Italy, [3]ZooPlantLab, Department of Biotechnology and Biosciences, University of Milano-Bicocca, Milan, Italy

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RESEARCH PAPER

Urbanisation reduced body size but potentially improved flight performance in bees and wasps

Andrea Ferrari [a], Nicola Tommasi [b c], Carlo Polidori [a]

PHYSIOLOGICAL ECOLOGY – ORIGINAL RESEARCH

Check for updates

Effect of urbanization and its environmental stressors on the intraspecific variation of flight functional traits in two bumblebee species

Nicola Tommasi[1,2] · Emiliano Pioltelli[1] · Paolo Biella[1] · Massimo Labra[1,2] · Maurizio Casiraghi[1] · Andrea Galimberti[1,2]

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THE TEAM

Andrea Galimberti – PA

Davide Maggioni – RtdB (BIO/05)

Nicola Tommasi –RtdA (BIO/05)

Beatrice Colombo – Phd student