PA5

Seasonal variation in avian 'winners' and 'losers' across the urban matrix

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❶ Introduction

- **Urbanization** is one of the major drivers of the ongoing global decline in biodiversity
- Bird **generalists** thrive in highly urbanized areas at the expense of more **specialized species**
- Most of the studies focus on studying the impact of urbanization during the **breeding period**
- It is fundamental to assess the impacts during other critical periods of the year

How do species and associated traits vary within the urban matrix across seasons?

❸ Results

- **Significant variations** of bird assemblages to urbanization between breeding and wintering seasons associated with species traits
- In highly urbanized areas, **resident**, **long-living** and **insectivorous** species were found during the breeding seasons, and **solitary** and **more generalist** during the winter (Fig 2)
- **Granivorous species** (e.g. Serin and Greenfinch) were filtered out from highly urbanized areas in winter when resources were scarce, whilst **wintering populations** of some insectivorous species not breeding in highly urbanized areas were able to exploit these environments in winter (Fig 3)
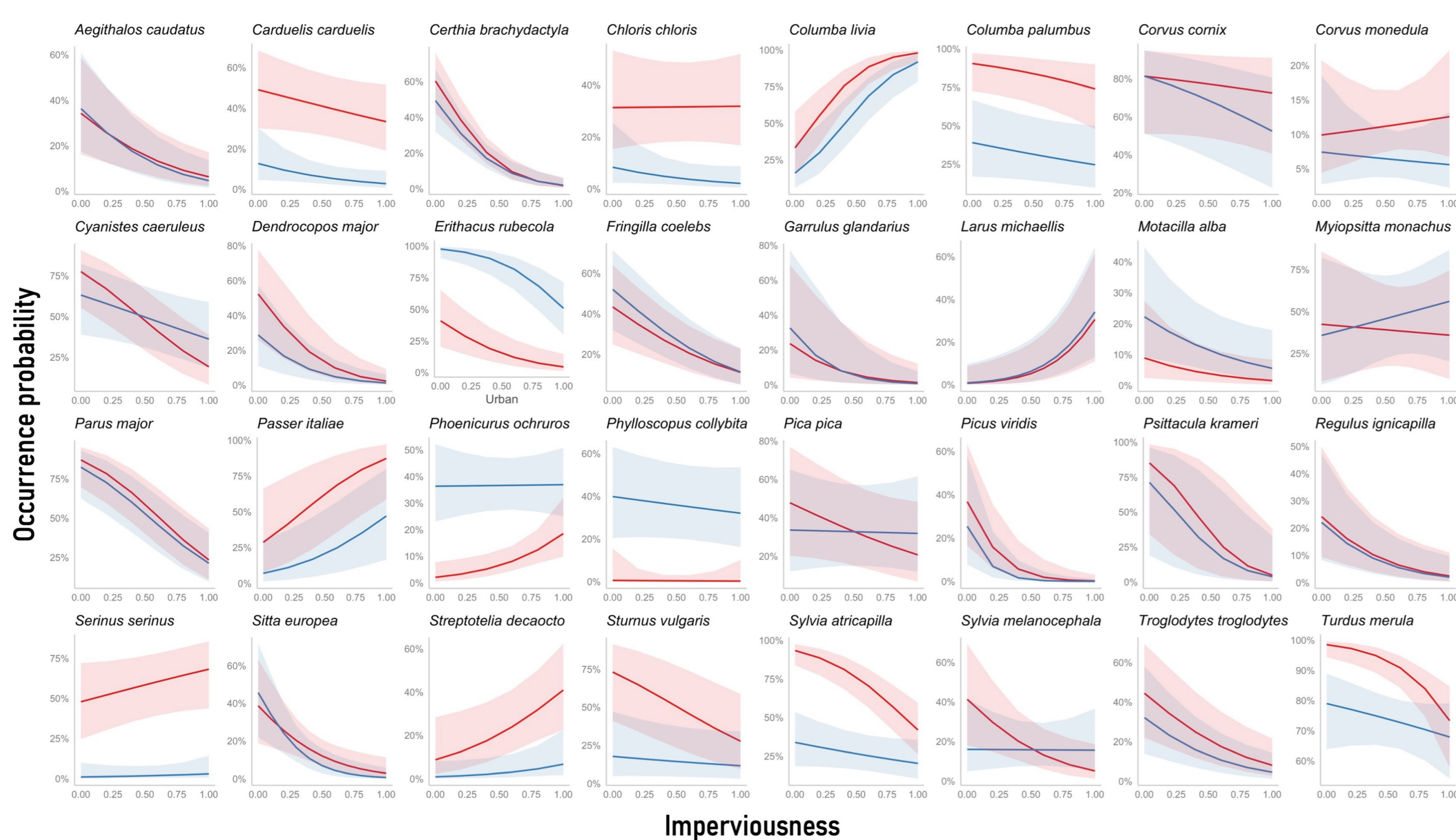

Fig 3 Regression plots from the GLMMs on species occurrence in relation to the imperviousness gradient across seasons (red: breeding season, blue: winter season).

❹ Conclusions

These results provide **new insights** into the complex ecological dynamics occurring in cities during the annual cycle. Urban planning decisions based on only one season may not properly address impacts of urbanization on bird communities. Further studies that adopt a **seasonal approach** may provide a solid base for more sustainable strategies in future urban planning.

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❷ Methods

- **220 points** in the urban matrix of 6 Italian cities (Fig 1)
- Bird and habitat surveys in **breeding and wintering seasons**
- **Imperviousness gradient** (% Impervious Surface Area)
- 11 **functional traits**
- RQL analysis (traits) and GLMMs (occurrence probability)
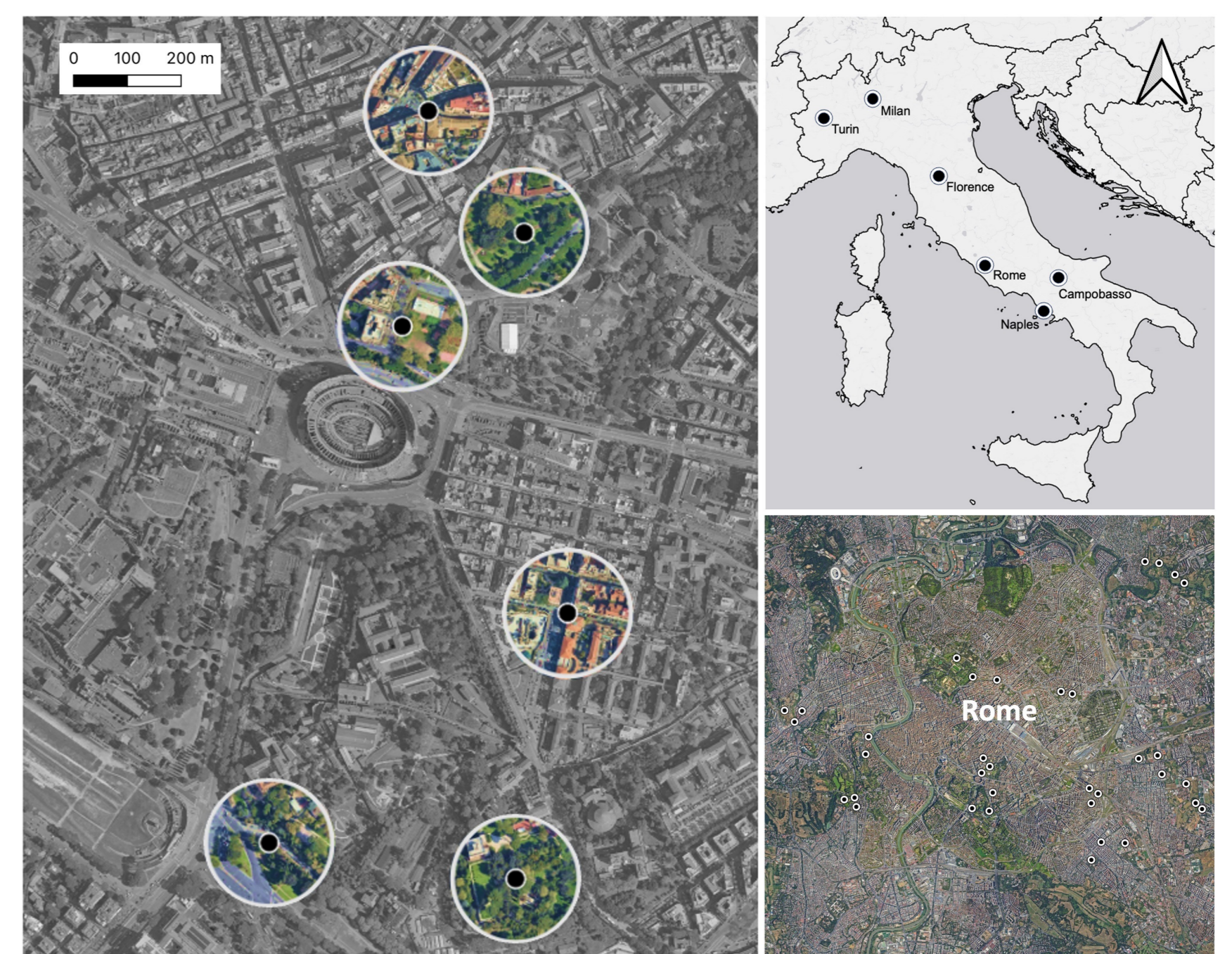

Fig 1 Location of the 6 cities surveyed in the Italian peninsula (right) and details of the study design (left) with point counts (black dots) and the 100 m buffer (white circle) with different urbanization levels in the city of Rome

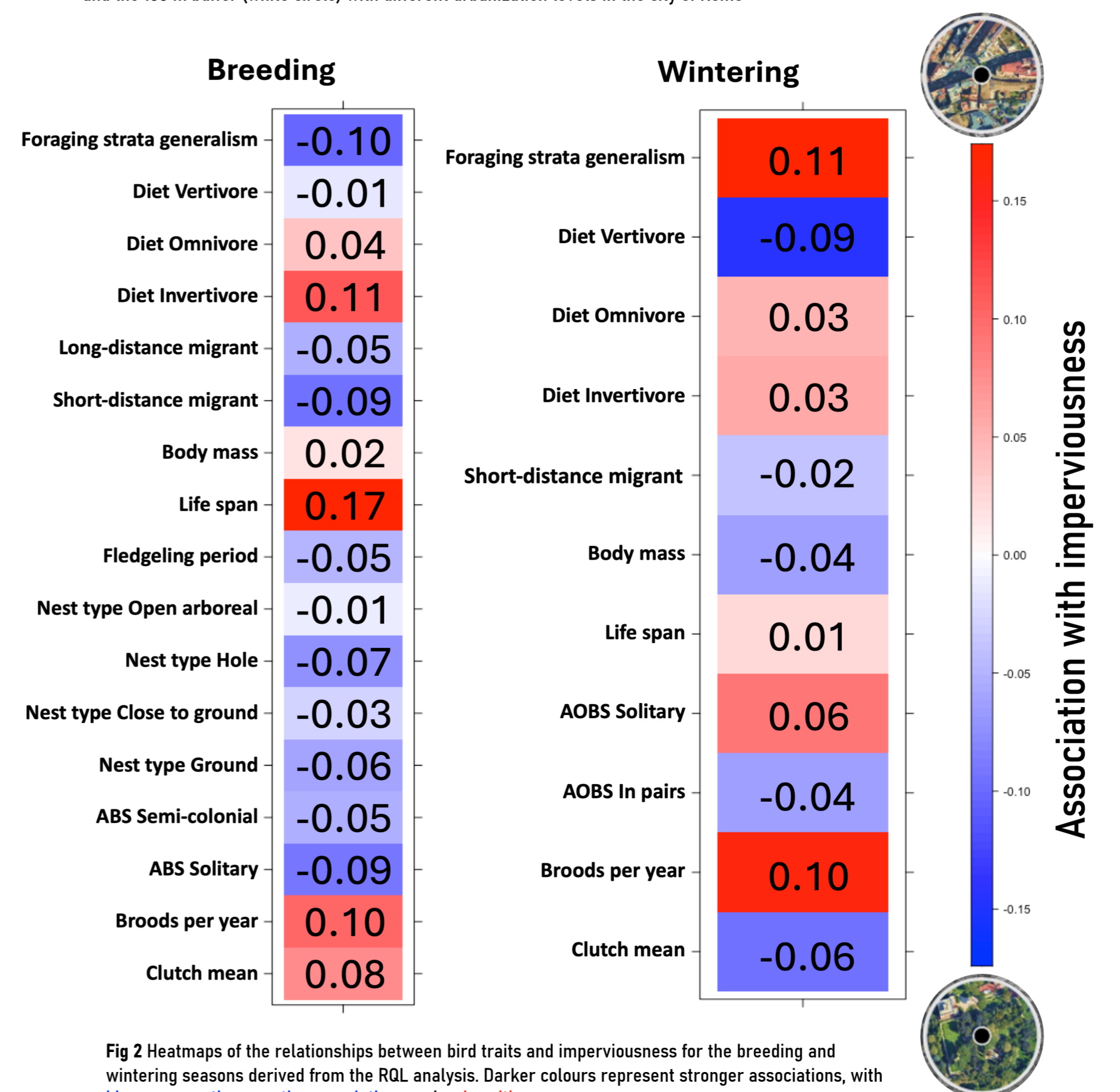|	Breeding		Wintering
Foraging strata generalism	-0.10	Foraging strata generalism	0.11
Diet Vertivore	-0.01	Diet Vertivore	-0.09
Diet Omnivore	0.04	Diet Omnivore	0.03
Diet Invertivore	0.11	Diet Invertivore	0.03
Long-distance migrant	-0.05	Short-distance migrant	-0.02
Short-distance migrant	-0.09	Body mass	-0.04
Body mass	0.02	Life span	0.01
Life span	0.17	AOBS Solitary	0.06
Fledgeling period	-0.05	AOBS In pairs	-0.04
Nest type Open arboreal	-0.01	Broods per year	0.10
Nest type Hole	-0.07	Clutch mean	-0.06
Nest type Close to ground	-0.03		
Nest type Ground	-0.06		
ABS Semi-colonial	-0.05		
ABS Solitary	-0.09		
Broods per year	0.10		
Clutch mean	0.08		

Association with imperviousness

Fig 2 Heatmaps of the relationships between bird traits and imperviousness for the breeding and wintering seasons derived from the RQL analysis. Darker colours represent stronger associations, with blue representing negative correlations and red positive ones.