

Alien plants on a city trip: Urban invaders originate from warmer native ranges

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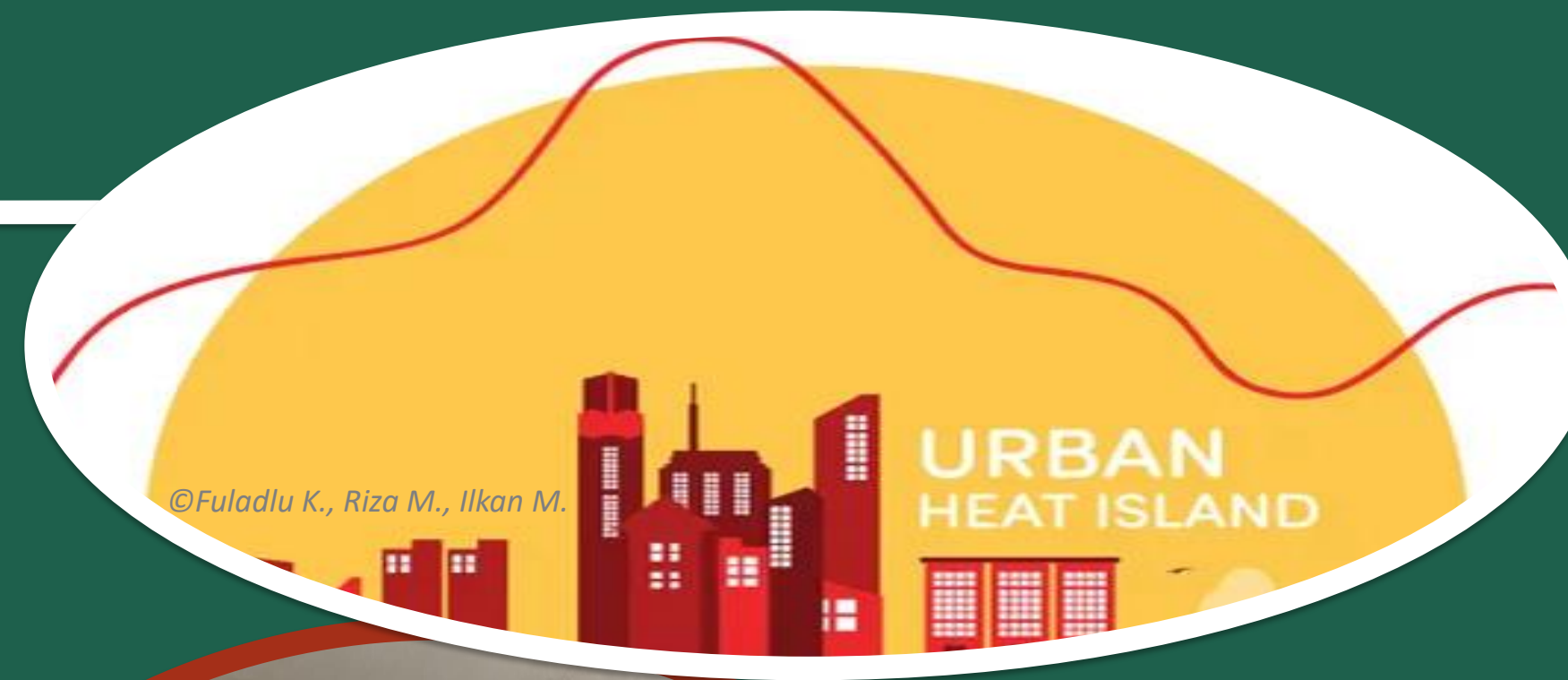
INTRODUCTION

When colonizing new areas, some alien plants prosper in urban areas, while others thrive in rural areas, which might be governed by microclimatic barriers.

Most plants introductions in Europe happened after 1990, during the “globalization era”. Urban areas concentrate alien plant invasions and often host newly arrived alien plant species, due to high propagule pressure and high anthropogenic activities.

Urban areas display warmer and drier urban microclimate notably due to the urban heat island phenomenon

→ Urban-to-rural microclimate variations might filter alien plant species based on their native niche climatic optimum.



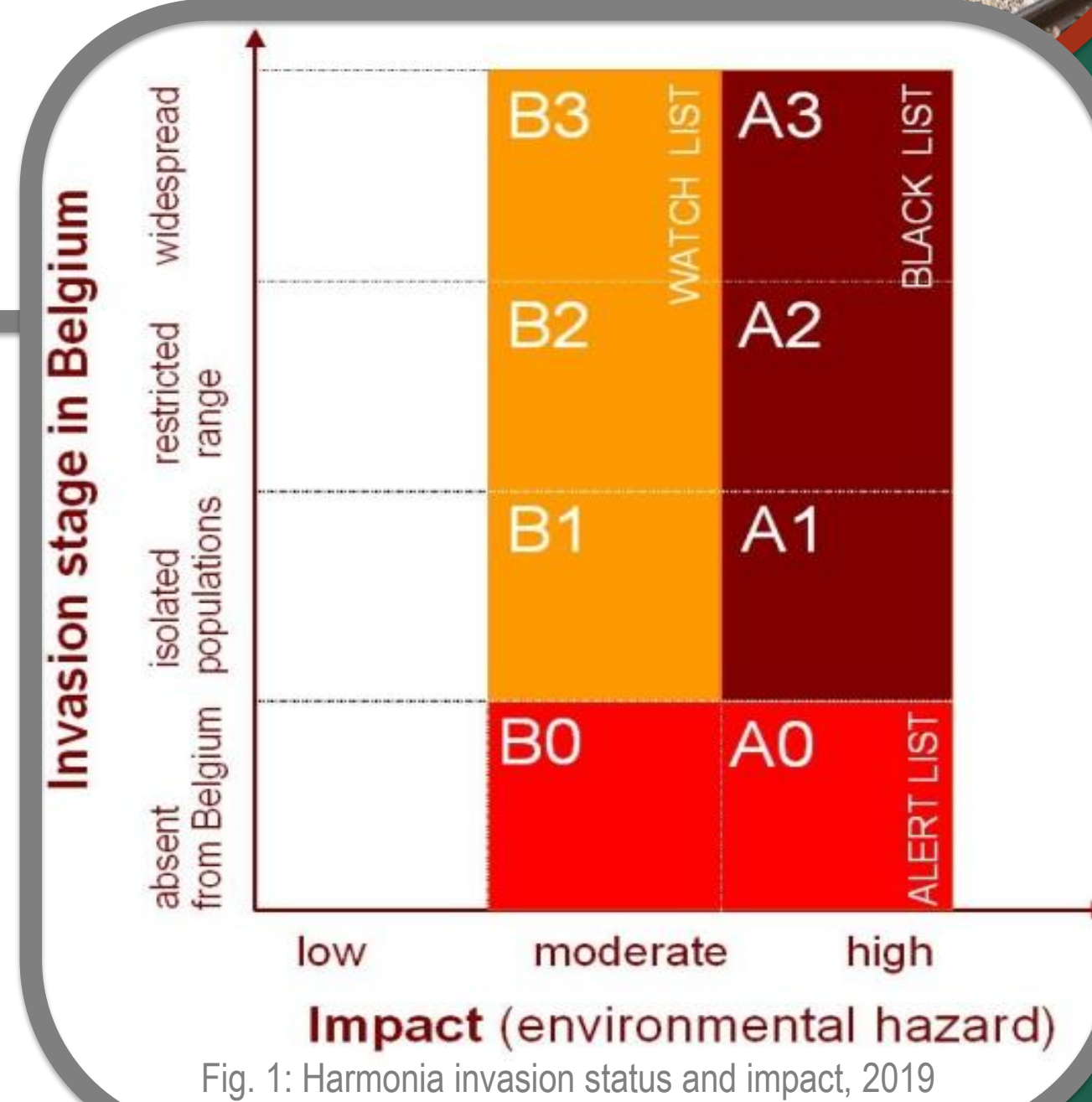
OBJECTIVES

What are the relationships between native range climatic conditions & urbanity and introduction history in the invaded range?

Are more urban alien plant species originating from warmer native ranges than the invaded range?

SPECIES LIST

The alien species list was built with species which have incipient invasions in oceanic Europe, with moderate or high biodiversity impacts, and more than 50 occurrences. It contained 24 species (Fig. 1).



METHODS

Cfb Köppen-Geiger climate classification zones in Europe were defined as oceanic Europe.

Maxent Species Distribution Models were performed based on occurrences in native countries/regions with WorldClim and Land Cover conditions → 1 SDM per species (Fig. 2).

Betaregression and confusion matrixes were performed. Climatic baselines in oceanic Europe, and mean urbanity cut-off value of the studied species (= 8.6%) were used for the latter.

RESULTS

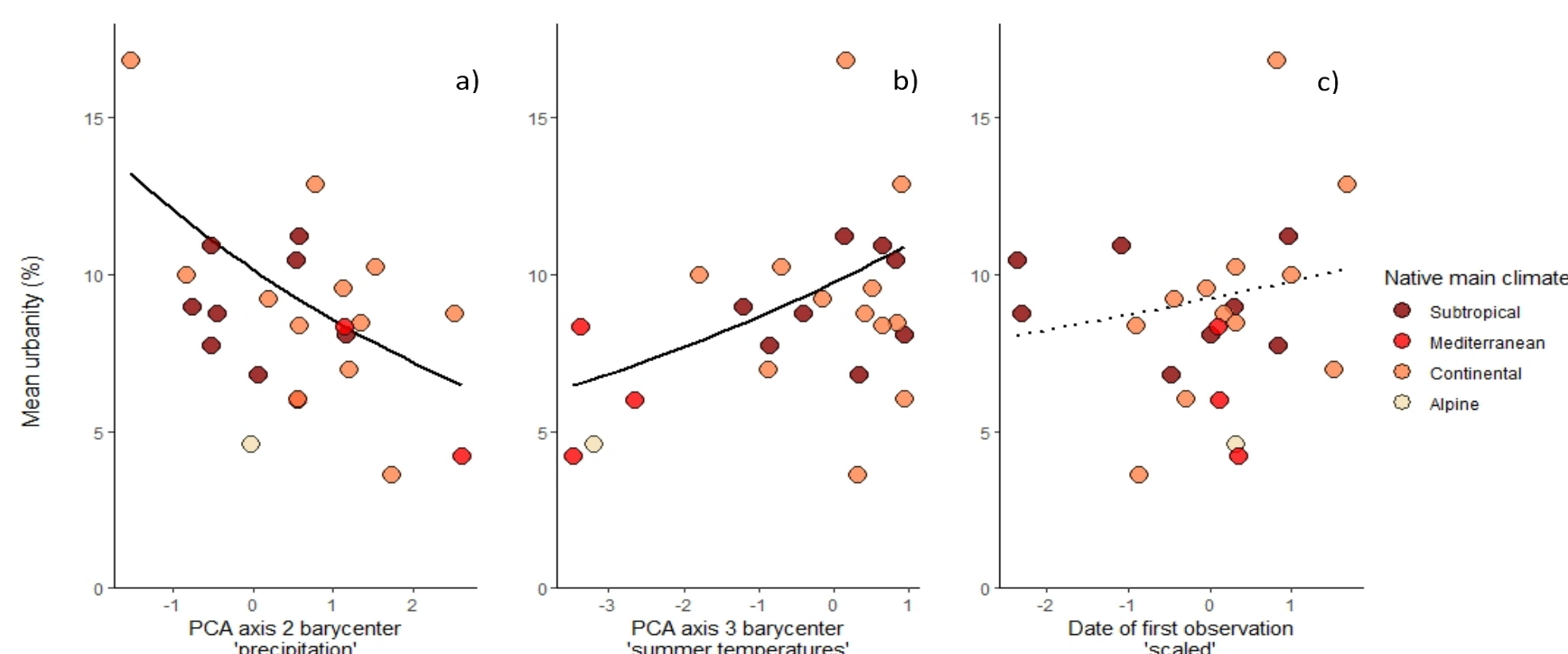


Fig. 3: Mean urbanity (in %) of the studied alien plant species as a function of their native range barycenter. Full lines correspond to significant effects and dashed line corresponds to a non-significant effect.

Native climate “precipitation” had a negative effect and “summer temperature” had a positive effect on species mean urbanity in oceanic Europe. Alien plant species from warmer and/or drier native ranges were found in more urban environments (Fig. 3 a), b)). Date of first observation in the wild had a weak positive but non-significant effect on species mean urbanity (Fig. 3 c)).

Although native Köppen-Geiger main climate was not significant, more urban alien species tended to originate from subtropical climates (Fig. 3, 4).

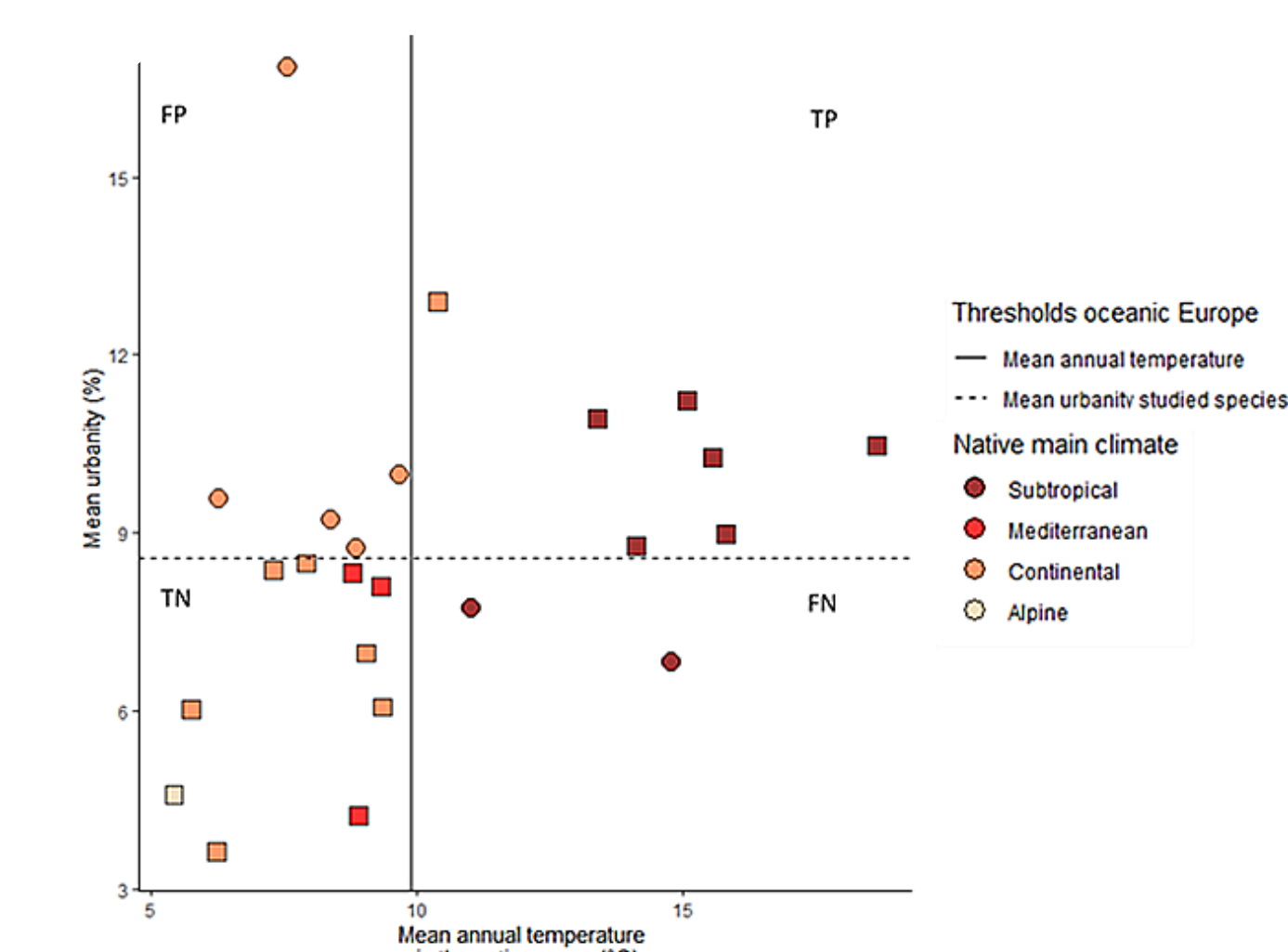
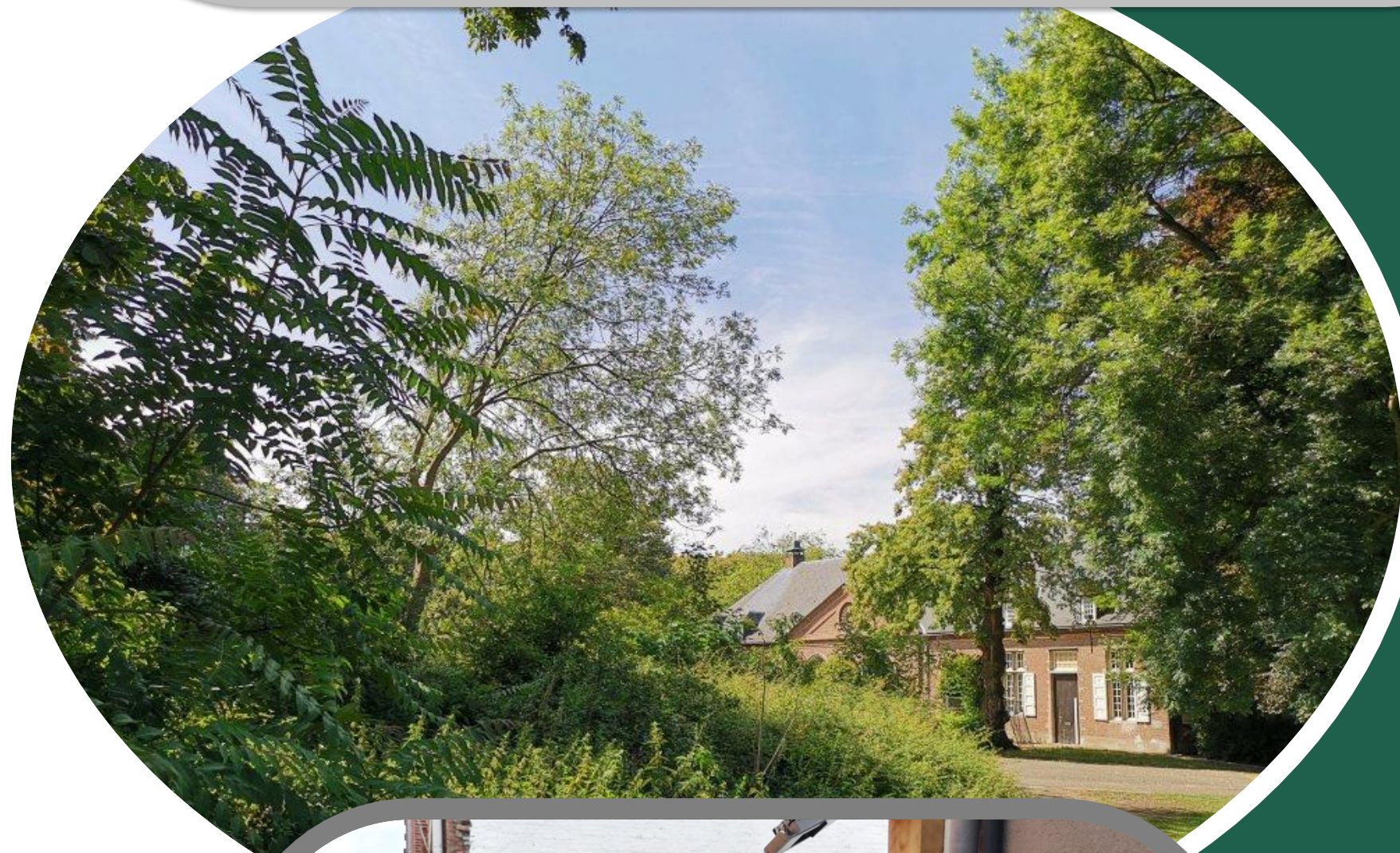


Fig. 4: confusion matrix of the mean urbanity of alien plant species in oceanic Europe as a function of their native range mean annual temperature (°C).

More urban aliens tended to originate from warmer native ranges and more rural aliens tended to originate from cooler native ranges than oceanic Europe (Fig. 4).



DISCUSSION & CONCLUSION

Alien plant species from warmer and/or drier native ranges tend to establish in more urban environments in oceanic Europe. They likely take advantage of the longer growing season and reduced freezing due to the UHI, as well as the more drained substrates which represent favorable humidity conditions for aliens from drier native ranges.

Emphasis should especially be placed on early invasion processes in urban environments. Urban plantations, such as public and/or private gardens, which could help cities to adapt to climate change, might represent potential sites for the “seeding” of future plant invasions.

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